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A REPORT FROM

*The State Hygienic
Laboratory*




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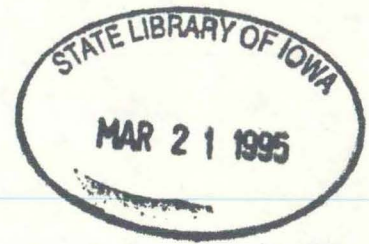
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Summer Water Quality Survey
of the
Maple River Basin
#79-10

Prepared for the Iowa Department of Environmental Quality by the University of Iowa, University Hygienic Laboratory.

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ABSTRACT

A water quality survey of the Maple River was performed by University Hygienic Laboratory personnel during the summer of 1978. Previous water quality studies (UHL #75-20 and #76-18) noted water quality deterioration downstream from several municipal wastewater treatment plants (WWTP) in the basin under low-flow winter conditions. Flow values determined from this study were about thirty-five times greater than the seven day, ten-year, low-flow and approximately ten and five times greater than the flows measured during the previously noted winter surveys, respectively. The water quality of the river was consistent throughout the river reach and was judged to be fairly good for a river in such an intensively farmed basin. Above normal fecal coliform values and nitrate nitrogen concentrations found throughout the Maple River were attributed to recent rainfall runoff and tile drainage. Dissolved oxygen concentrations in the river were considered more than adequate to support aquatic life. In addition to the bacteriological and chemical analyses, biological sampling was performed at the Maple River sites. Results of the biological collections reflected a community not impacted by deteriorated water quality at most of the stations sampled. Water quality data from the tributaries were similar to that of the Maple River indicating the tributaries had only minor effects on the water quality of the Maple River. The higher stream flows experienced during this survey diluted the impacts of the point source dischargers resulting in water of similar quality throughout the basin. Several point dischargers were noted in previous reports to be responsible for the deterioration in the water quality of the Maple River during low-flow winter conditions.

Information supplied by the Iowa Department of Environmental Quality lists the towns of Galva, Battle Creek, Arthur and Mapleton as not participating in the construction grants program. The municipalities of Aurelia, Alta, Schaller, Odebolt and Holstein are in the construction grants program and are in various phases of Step 1. Ida Grove is currently in Step 3 of constructing its new rotating biological surface treatment unit and expects to be on line in November 1978.

INTRODUCTION

The Maple River, located in west central Iowa, originates in western Cherokee County and flows in a southwesterly direction for approximately seventy miles where it joins the Little Sioux River in central Monona County; (see Figure 1 and Table 3 for the study area within the Maple River Basin and sampling locations). Along its course several tributaries discharge into the Maple River, including Maple Creek, the Little Maple River, Halfway Creek, Pitcher Creek, Silver Creek, Elk Creek, Odebolt Creek and Battle Creek. The drainage area of 742 square miles in the Maple River Basin is covered with a thick, highly erodible loess mantle and the region supports intensive agricultural usage. Current Iowa Water Standards classify the Maple River as a Class "B" warm water stream from its mouth to Highway 3 in Cherokee County. In addition, segments of the Little Maple River, Odebolt Creek and Battle Creek are also Class "B" warm waters. The Maple River is a very silty stream, especially during high flows and only tolerant fish species inhabit the Maple River. As a result the stream is of limited value for fishing (Iowa Fish and Fishing).

Several small municipalities are the major point source dischargers in the Maple River Basin, with the town of Ida Grove (population 2,261) being the largest. Pertinent information regarding the municipal wastewater treatment facilities located in the basin are listed in Table 1, including their design criteria and status in the construction grants

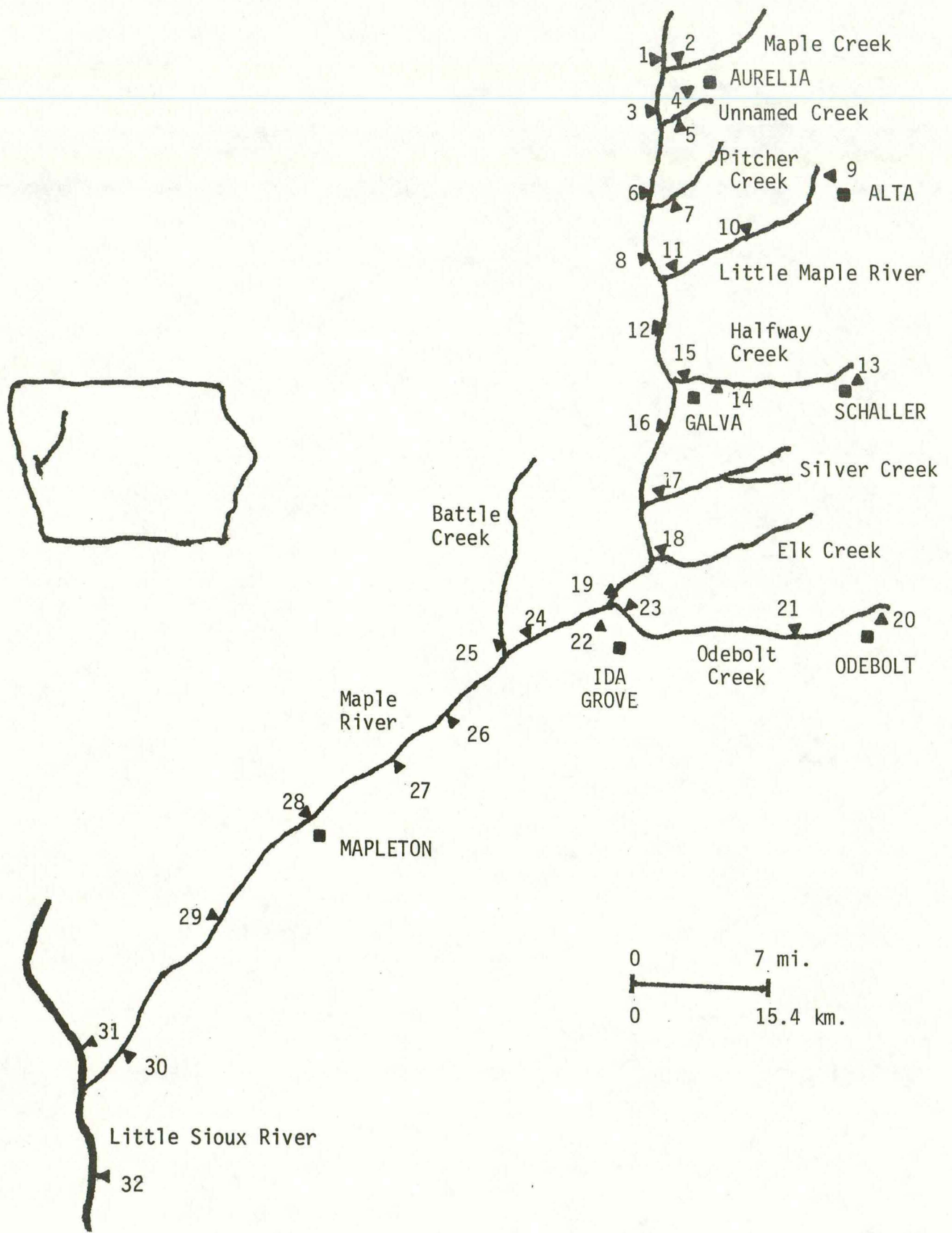


FIGURE 1

MAPLE RIVER BASIN AND SAMPLING LOCATIONS

Table 1

Maple River Basin Wastewater Treatment Facilities

<u>Dischargers</u>	<u>Population^a</u>	<u>Wastewater Plant Type^a</u>	<u>Average Flow mgd^a</u>	<u>Design Capacity mgd^a</u>	<u>Construction Grants Program^d</u>	<u>Stream Receiving Discharge</u>
Aurelia ^c	1,065	Trickling Filter	0.091 (0.202) ^d	0.125	Step 1 Grant, Doing SSES	Maple River
Alta ^c	1,717	Trickling Filter	0.180 (0.432)	0.161	Step 1 Grant, No submitted information to date	Little Maple River
Schaller ^c	835	Two-Cell Lagoon	0.700 (N/A)	0.112	Step 1 Grant	Halfway Creek
Galva ^c	412	Trickling Filter	0.041 (0.187)	0.074	Not in Construction Grants Program	Halfway Creek
Odebolt ^c	1,323	Trickling Filter	0.113 (N/A)	0.187	Step 1 Grant, Doing SSES	Odebolt Creek
Arthur	273	Two-Cell Lagoon	0.038 (N/A)	0.036	Not in Construction Grants Program	Tributary to Odebolt Creek
Ida Grove ^c	2,261	Trickling Filter	0.267 (0.300)	0.240	Step 3 Grant, RBS over 50% Completed	Maple River
Holstein	1,445	Two-Cell Lagoon	0.147 (N/A)	0.142	Step 1 Grant, Doing SSES	Battle Creek
Battle Creek	835	Two-Cell Lagoon	0.094 (N/A)	0.084	Not in Construction Grants Program	Maple River
Mapleton ^e	1,647	Activated Sludge with 12-day polishing pond	0.124 (N/A)	0.122	Not in Construction Grants Program	Maple River

^a Data from Western Iowa Basin Study.

^b Information supplied by the Iowa Department of Environmental Quality

^c Effluent sampled during the survey

^d Estimated discharge during the survey; N/A -not obtained

^e Mechanical problems in the plant. All wastes were discharged into the polishing pond, with no effluent discharged into the river.

SSES - Sewage System Evaluation Survey

RBS - Rotating Biological Surface

program. The final effluents of many of these wastewater treatment facilities were sampled during the survey (data presented in Appendix 1).

Two previous water quality surveys have been conducted on the Maple River (UHL #75-20 and #76-18). The UHL #75-20 report was a result of a summer-winter survey performed during 1974 and 1975. It noted minor changes in the winter water quality of the Maple River including increased fecal coliform concentrations and ammonia nitrogen concentrations, below Aurelia and Ida Grove. The UHL #76-18 survey was conducted during January 1976, and indicated poor water quality existed in the Maple River under winter conditions at moderate flows. Deterioration in water quality of the Maple River occurred below the towns of Aurelia, Galva and Ida Grove, with significant water quality changes apparent downstream of the Little Maple River and Odebolt Creek as a result of their poor water quality. An important aspect of this survey was to further study the effect that the effluents of the municipal wastewater treatment facilities had on the Maple River.

The current survey was conducted during July 18 and 19, 1978. Three flow measurements were determined by University Hygienic Laboratory personnel at Stations 3, 8 and 28 on the Maple River and the results are listed in Table 2. Also included in Table 2 are flow values obtained from the U. S. Geological Survey gage located near Station 28 for July 17 (206 cfs), 18 (200 cfs) and 19 (193 cfs).

TABLE 2
FLOW DATA FROM THE MAPLE RIVER*

Location	7-17-78 ⁺	7-18-78 ⁺	7-19-78 ⁺	7Q10	Computed Average Discharge**	Approximate Drainage Area (sq. mi.)
Station 3	---	24	---	---	---	83
Station 8	---	52	---	---	---	125
Station 28	---	---	212	---	---	669
U.S.G.S. Gage near Station 28	206	200	193	5.8	192	669

* In cubic feet per second (cfs).

** Based on a computed 25 year average 1941 - 1966.

⁺ Computed daily mean.

Thunderstorms moved through the basin during the early morning hours on July 18. The rainfall amounts in the area varied from 0.1 to 1.5 inches and this rainfall had some effect on the flow and water quality in the basin. As indicated in Table 2 the flow measured at Station 28 (212 cfs) on July 19 is approximately equal to the 25-year computed average (192 cfs) and many times greater than the 7-day 10-year low flow (5.8 cfs). Flow values noted in the previous winter surveys (UHL #75-20 and #76-18) were 20 and 45 cfs, respectively, and were considerably less than the discharge of 212 cfs calculated during this study.

TABLE 3

MAPLE RIVER BASIN SAMPLING STATION LOCATIONS

<u>STATION</u>			
1	Maple River	Cherokee Co Hwy 3 Br	T92N, R39W, Sec 28 & 33
2	Maple Creek	Cherokee Co Rd Br	T91 N, R39W, Sec 4 & 5
3	Maple River (Flow)	Cherokee Co Rd C-43 Br	T91N, R39W, Sec 8 & 17
4	Aurelia WWTP		
5	Unnamed Creek	Cherokee Co Rd Br	T91N, R39W, Sec 16 & 17
6	Maple River	Cherokee Co Rd Br	T91N, R39W, Sec 29 & 32
7	Pitcher Creek	Cherokee Co Rd Br	T90N, R39W, Sec 8 & 9
8	Maple River (Flow)	Cherokee Co Rd C-65 Br	T90N, R39W, Sec 17 & 20
9	Alta WWTP		
10	Little Maple River	Buena Vista Co Rd C-65 Br	T90N, R38W, Sec 16 & 21
11	Little Maple River	Cherokee Co Rd C-66 Br	T90N, R39W, Sec 26 & 35
12	Maple River	Ida Co Rd Br	T89N, R39W, Sec 9 & 16
13	Schaller Lagoon Effluent		
14	Galva WWTP		
15	Halfway Creek	Ida Co Rd Br	T89N, R39W, Sec 22 & 23
16	Maple River	Ida Co Hwy 20 Br	T88N, R39W, Sec 6
17	Silver Creek	Ida Co Rd Br	T88N, R39W, Sec 13 & 18
18	Elk Creek	Ida Co Rd Br	T87N, R39W, Sec 1 & 6
19	Maple River	Ida Co Rd M-15 Br	T87N, R40W, Sec 11 & 12
20	Odebolt WWTP		
21	Odebolt Creek	Sac Co Rd Br	T87N, R38W, Sec 28 & 29
22	Ida Grove WWTP		
23	Odebolt Creek	Ida Co Hwy 175 (at mouth)	T87N, R40W, Sec 15
24	Maple River	Ida Co Rd Br	T87N, R40W, Sec 19 & 20
25	Battle Creek	Ida Co Hwy 175 Br	T87N, R41W, Sec 26
26	Maple River	Ida Co Rd Br	T86N, R41W, Sec 7 & 8
27	Maple River	Woodbury Co Rd L-37 Br	T86N, R42W, Sec 27
28	Maple River (Flow)	Monona Co Hwy 175 Br	T85N, R43W, Sec 13
29	Maple River	Monona Co Hwy 175 Br	T84N, R43W, Sec 4
30	Maple River	Monona Co L-14 Br	T83N, R44W, Sec 15 & 16
31	Little Sioux River	Monona Co Hwy 175 Br	T83N, R44W, Sec 9
32	Little Sioux River	Monona Co Rd E-54 Br	T83N, R44W, Sec 28 & 33

RESULTS AND DISCUSSION

Thirteen stations were located on the Maple River, and selected data pertaining to the water quality at each station are presented in Table 4. Selected water quality parameters of the Maple River tributaries are also listed in Table 4, for the purpose of illustrating possible impacts that they may have on the water quality of the Maple River. All data may be found in Appendix 1.

Bacteriological Conditions

Fecal coliform concentrations in the Maple River were highest at Station 1 (45,000 fecal coliforms per 100 ml). From Station 2 downstream, fecal coliform concentrations decreased to 2,000 fecal coliforms per 100 ml at Station 8. For the remaining Maple River stations they were generally within a range of 2,000 to 4,000 fecal coliforms per 100 ml. With the exception of Stations 16 and 29, fecal coliform concentrations at all Maple River sampling sites exceeded the limit of 2,000 fecal coliforms per 100 ml for a Class "B" warm water as set forth in the Iowa Water Quality Standards Code. Sampling sites 10 and 11 located on the Little Maple River and Station 25 on Battle Creek are areas designated as Class "B" warm waters and data from these stations also indicate fecal coliforms exceeded the standard. The fecal coliform standard, however, does not apply when the waters are materially affected by surface runoff. A review of the data would indicate that the elevated fecal coliform concentrations observed throughout the basin were primarily due to non-

TABLE 4

SELECTED WATER QUALITY DATA FOR THE MAPLE RIVER AND TRIBUTARIES
(all values in mg/l unless designated otherwise)

Station	MAPLE RIVER								
	Fecal Coliforms per 100ml	Nitrogen Ammonia Nitrate		DO	TOC	Turbidity NTU	Chloride	Chlorophyll A	
1	45,000	0.40	11.0	8.6	17	75	13	7	
3	10,000	0.09	11.0	10.0	12	36	14	9	
6	5,900	0.10	12.0	9.6	13	48	15	7	
8	2,000	0.07	12.0	9.7	11	34	16	10	
12	3,700	0.12	12.0	10.2	11	25	18	16	
16	620	0.05	11.0	9.7	9	21	17	16	
19	2,600	0.06	11.0	9.7	9	40	14	15	
24	2,200	0.07	9.3	9.8	12	48	19	23	
26	4,300	0.06	8.7	9.6	11	46	16	21	
27	2,600	0.07	8.7	9.7	11	55	21	23	
28	2,500	0.09	9.3	9.3	11	60	17	23	
29	1,200	0.09	8.1	12.3	12	70	17	30	
30	2,700	0.09	7.3	9.9	11	80	19	27	
		TRIBUTARIES							
2-Maple Creek	9,900	0.14	12.0	8.7	13	38	17	5	
5-Unnamed Creek	34,000	0.38	18.0	8.5	14	23	45	8	
7-Pitcher Creek	3,900	0.07	18.0	10.6	10	24	18	4	
10-Little Maple River	5,700	0.15	15.0	12.0	11	19	45	12	
11-Little Maple River	3,300	0.07	11.0	10.6	10	18	26	6	
15-Halfway Creek	3,400	0.09	13.0	9.7	9	5	27	16	
17-Silver Creek	10,000	0.07	14.0	9.4	9	8	14	9	
18-Elk Creek	8,900	0.09	14.0	9.7	10	6	16	14	
21-Odebolt Creek	28,000	0.19	20.0	10.9	9	21	53	6	
23-Odebolt Creek	500	0.22	13.0	11.7	8	6	29	24	
25-Battle Creek	2,800	0.10	7.1	10.4	11	33	30	20	

point source (runoff) rather than from point source dischargers. Silver Creek and Elk Creek, which have no point source dischargers, also showed high fecal coliform concentrations.

Chemical Conditions

Analysis of the data contained in Table 4 demonstrate that throughout all the sampling locations on the Maple River little change in water quality occurred, and the water quality of the river was considered fairly good. Generally, water quality of the tributaries was similar to that of the Maple River.

The greatest concentration of ammonia nitrogen (0.40 mg/l) was at Station 1, which also had the highest fecal coliform count. The remaining Maple River stations had consistently low concentrations of ammonia nitrogen (0.05 mg/l to 0.12 mg/l).

Nitrate nitrogen levels ranged from 7.3 to 12.0 mg/l, with a trend toward decreasing concentrations at the downstream Maple River sampling sites. The nitrate nitrogen concentrations determined during this survey are considered rather high, when compared to concentrations which seldom exceeded 6 mg/l during previous surveys. Tile drainage is possibly a factor responsible for these elevated concentrations.

Concentrations of dissolved oxygen were near or above saturation at all Maple River sampling locations (8.6 - 12.3 mg/l). The above saturation values is partly attributed to the photosynthetic activity of algae.

Total organic carbon (TOC) concentrations determined during this survey ranged between 9-13 mg/l. The increased concentration of 17 mg/l TOC at Station 1 appeared to be due to runoff. Biochemical oxygen demand (BOD) concentrations (see Appendix 1) varied little (1-3 mg/l) throughout the Maple River. The consistent TOC and BOD concentrations found throughout the Maple River at the time of this survey suggests that any point sources discharging into the river had little impact on the water quality of the Maple River.

Turbidity was high (75 NTUs) at Station 1, but decreased downstream until Station 16 (21 NTUs). At succeeding downstream stations on the Maple River, turbidity gradually increased to the high of 80 NTUs at the farthest downstream station, Station 30. This increase in turbidity at the downstream stations was also noted in the 1974 summer survey (UHL #75-20), and was probably due to an increase in silt load.

Chlorophyll-a is a parameter that measures algal biomass or algal activity. The data contained in Table 4 demonstrates that algal activity in the Maple River gradually increased as the river flowed downstream. A major factor influencing algal activity in the Maple River during this survey was turbidity. The fairly high turbidity levels of the river reduced the amount of sunlight which was available to the algae, thus potentially limiting algal activity.

Analysis for heavy metals was conducted from samples taken at five Maple River sampling locations and the results are given in Appendix 1. Low levels of barium (0.2 - 0.3 mg/l) were detected at all five sites,

and a concentration of 0.05 mg/l of zinc was determined at the farthest downstream sampling location (Station 30) on the Maple River. The occurrence of these metals in low concentrations is not considered unusual in Iowa waters.

Generally, the water quality parameters of the major tributaries to the Maple River were quite similar to those determined in the river itself. Some degradation in water quality did occur on: Unnamed Creek (Station 5) downstream from the Aurelia WWTP, the Little Maple River (Station 10) downstream from the Alta WWTP, and on Odebolt Creek (Station 21) downstream from the Odebolt WWTP. For instance, chloride values of 45, 45, and 53 mg/l at each site, respectively (Table 4), were significantly higher than at other stations in the basin and indicate the municipal point source dischargers were probably responsible for the poorer water quality found at these stations. The effect these tributaries have on the water quality of the Maple River was minimal. Unnamed Creek's discharge was judged to be much less than the flow of the Maple River at their junction, thus minimizing the impact of that tributary on the river. In addition, as shown by the parameters in Table 4, water quality in the Little Maple River and Odebolt Creek improved significantly before entering into the Maple River, i.e., at the downstream station on the Little Maple River (Station 11) the chloride concentration decreased to 26 mg/l when compared to the 45 mg/l concentration found at Station 10. Odebolt Creek experienced a similar reduction in chloride concentration from 53 to 29 mg/l at Stations 21 and 23, respectively. In final analysis,

when examining the chemical and bacteriological data pertaining to this survey, it can be concluded that the tributaries exerted no deleterious impacts on the water quality of the Maple River.

Samples were also taken at locations on the Little Sioux River, upstream (Station 31) and downstream (Station 32) from its junction with the Maple River. The results are listed in Appendix 1. When comparing the parameters at Station 31 to Station 32, only relatively minor differences existed indicating the discharge of the Maple River had a negligible effect on the water quality of the Little Sioux River.

Biological Conditions

In addition to the bacteriological and chemical analyses completed during this survey, biological sampling of the Maple River was also conducted. To aid in this study Hester-Dendy Multiplate Samplers were placed at each of the thirteen Maple River stations during July 18 and 19, 1978. Three samplers were located at each site, with the exception of Stations 24 and 26 in which two samplers were used. Basically, each sampler consisted of six, four inch squares of one-eighth inch hardboard connected by an eyebolt and suspended from a float. These artificial substrates remained in the Maple River until August 28 and 29, during which time the samplers should have been colonized by the organisms that inhabit the surrounding river bottom. When all samplers had been collected, it was observed that 54% of the substrates had been recovered. The remaining 46% were missing, having been either removed by vandalism or carried downstream by the current. Fortunately, at least one substrate was recovered at all but two stations, allowing the entire reach

of the river to be surveyed. Benthic macroinvertebrates obtained from the Maple River survey are listed by species and relative abundance in Appendix 2. A summary of the data presented in the Appendix is given in Table 5.

A definite advantage in using biological data in interpreting water quality is that it can show water quality over a fairly long period of time, whereas a grab water sample reflects only the short-term condition of the water quality.

When examining the biological data of the Maple River it is important to note that the river has a bottom of fine to coarse sand and silt. This type of bottom limits benthic life populations by its constant shifting and abrasive nature. Another factor limiting aquatic macroinvertebrate populations is that most of the land in the basin has been cleared, leaving very few fallen trees and brush piles suitable for colonization in the river. This is especially true in the lower reaches of the Maple River which have been channelized.

Despite the reduction in suitable habitats for the Maple River macroinvertebrate populations, a significant diversity of species and number of organisms were found at nearly all stations. Certain species of Trichoptera (caddisflies) larvae and Ephemeroptera (mayflies) nymphs are usually considered relatively intolerant of degraded water quality. These organisms were the predominate forms collected throughout the Maple River survey.

At Station 1 the fewest number of taxa were collected (five) and

TABLE 5
A SUMMARY OF AQUATIC MACROINVERTEBRATES
OF THE MAPLE RIVER
(July 18/19, 1978 to August 28/29, 1978)

<u>Sampling Stations</u>	<u>Number of Organisms*</u>	<u>Number of Taxa</u>
1	158.0	5
3	1,355.4	13
6	995.7	12
8	2,926.4	19
12	6,685.5	18
16	1,485.5	14
19	5,073.4	17
24	51.5	6
27	620.7	16
29	2,710.9	13
30	4,587.5	14

*in organisms per square meter.

no caddisfly larvae were present. This station had the lowest flow and the poorest water quality of any of the Maple River sampling sites. However, the cause for the low number of organisms is not known.

The most marked difference in the biological collections occurred at Station 24. At that sampling location only six species totaling 51.5 organisms per square meter were noted, the lowest total in the study. Downstream at Station 27, the number of species collected returned to about average for the survey, but total numbers were still somewhat low. Station 24 is on the river reach just downstream from Odebolt Creek and the Ida Grove WWTP which was noted for its degraded water quality in previous reports (UHL #75-20 and #76-18). Whether it was these sources or sampling biases that caused the low number of organisms to be collected at Station 24 cannot be determined at this time.

The data also shows an increase in the number of Chironomidae and Simulium sp. at the farthest downstream site (Station 30). This result is not surprising since total solids and chlorophyll-a concentrations, which are indicative of the available food sources for these filter-feeder organisms, were in the greatest concentration at that location.

Generally, the biological results of this survey correspond with the analyses determined from the survey conducted during July 1974. In both surveys mayfly nymphs and caddisfly larvae were the most common macroinvertebrates collected demonstrating typical summer water quality conditions for a river in an agriculturally enriched environment.

CONCLUSIONS AND RECOMMENDATION

*Murray
Mearhoff
Scott
Brill*

A summer water quality survey of the Maple River was performed using bacteriological, chemical and biological methods. Analysis of the bacteriological and chemical data illustrate water quality which was consistent throughout the Maple River. Elevated concentrations of fecal coliforms and nitrate nitrogen found at the Maple River sampling locations were attributed to rain, producing runoff, on the night before the study began. In general, water quality of the tributaries to the Maple River was similar to that of the Maple River, producing no significant impact on the water quality of the Maple River. Analysis of the biological data obtained from the Maple River showed caddisfly larvae and mayfly nymphs, common throughout the survey. These macroinvertebrates are indicators of good water quality. Two stations did have significant decreases in taxa and the number of macroinvertebrates collected. The reason(s) for the reduction in these benthic populations could not be specifically determined from the results of this survey. Generally, the Maple River water quality analyzed in this study is considered good. It is apparent that the higher flow of the river during this survey was responsible for diluting the effects of the point source dischargers, which in previous studies were found to have a negative impact on the water quality during low-flow winter conditions.

The new Ida Grove WWTP, a rotating biological surface unit, is scheduled to go on line in November 1978. It will be important to study

the effectiveness of the new plant in treating its wastes and the subsequent effect of its discharge on the water quality of the river. The quality of the effluent from the present facility (see Appendix 1) is poor.

Scott D. Prill ^{no}

Scott D. Prill
Limnologist

APPENDIX 1
BACTERIOLOGICAL AND CHEMICAL DATA FROM THE MAPLE RIVER
July 18 and 19, 1978

WATER QUALITY REPORT

STATE HYGIENIC LABORATORY, Des Moines Branch
 H.A. WALLACE BUILDING
 DES MOINES, IOWA 50309

-20-

Town	Cherokee 1	Aurelia 2	Aurelia 3
Source	Maple River	Maple Creek	Maple River
Specific Location	Cherokee Co. Hwy 3 T92N, R39W, Sec. 28/33	Cherokee Co. Rd. T91N R39W, Sec. 4/5	T91N, R39W, Sec. 8/17 County Road C43 bridge
Date Collected	7/18/78	7/18/78	7/18/78
Date Received	7/20/78	7/20/78	7/20/78
Lab Number	506	507	508
Collection Time	0815	0845	1215
pH			
Temperature	21.5°C	23°C	25.5°C
Dissolved Oxygen			
	BACTERIOLOGICAL EXAMINATION		
Fecal Coliform/100 ml	45,000	9,900	10,000
	CHEMICAL ANALYSIS (as mg/l unless designated otherwise)		
Conductance (micromhos)	680	740	710
MBAS (as LAS)			
pH (units)	8.0	8.25	8.2
Alkalinity: P	none	none	none
T	274	286	284
NITROGEN: Organic N	0.70	0.36	0.39
Ammonia N	0.40	0.14	0.09
Nitrite N			
Nitrate N	11	12	11
Nitrate as NO ₃			
RESIDUE: Total	636	674	620
Fixed	486	462	428
Volatile	150	212	192
Filtrable Residue T	450	572	532
F	328	374	356
V	122	198	176
Nonfiltrable Residue T	186	102	88
F	158	88	72
V	28	14	16
Settleable Matter (ml/l)			
PHOSPHATE: Filtrable P	0.19	0.16	0.13
Total P	0.38	0.20	0.20
Dissolved Oxygen	8.6	8.7	10.0
BOD	3	2	2
COD	35	27	22
Grease or Oil			
Turbidity (JTU)	75	38	36
Total Hardness (as CaCO ₃)			
Calcium (Ca ⁺⁺)			
Magnesium (Mg ⁺⁺)			
Chloride (Cl ⁻)	13	17	14
Sulfate (SO ₄ ⁻²)			
Total organic carbon	17	13	12
Chlorophyll a	7 µg/l	5 µg/l	9 µg/l

REMARKS:

COLLECTOR
 REPORT TO

Limnology Division
 Hygienic Lab
 Des Moines Branch

W.J. HAUSLER, JR., Ph.D.
 DIRECTOR

SEP 26 1978

WATER QUALITY REPORT

STATE HYGIENIC LABORATORY, Des Moines Branch
H.A. WALLACE BUILDING
DES MOINES, IOWA 50309 -21-

Town Source	Aurelia 4 WWTP final effluent	Aurelia 5 Unnamed Creek T91N, R39W, Sec. 16/17 Co. Rd. Bridge	Maple River - 6 T91N, R39W, Sec. 29/32 Bridge, Cherokee Co. Rd.
Date Collected	7/18/78	7/18/78	7/18/78
Date Received	7/20/78	7/20/78	7/20/78
Lab Number	509	510	511
Collection Time	0945	1100	1200
pH			
Temperature	19 ^o C	23 ^o C	25.5 ^o C
Dissolved Oxygen			
BACTERIOLOGICAL EXAMINATION			
Fecal Coliform/100 ml	410,000	34,000	5,900
CHEMICAL ANALYSIS (as mg/l unless designated otherwise)			
Conductance (micromhos)	1400	870	710
MBAS (as LAS)			
pH (units)	7.7	7.9	8.2
Alkalinity: P	none	none	none
T	325	273	278
NITROGEN: Organic N	2.1	1.5	1.0
Ammonia N	9.1	0.38	0.10
Nitrite N			
Nitrate N	11	18	12
Nitrate as NO ₃			
RESIDUE: Total	924	702	670
Fixed	702	502	434
Volatile	222	200	236
Filtrable Residue T	906	626	508
F	700	440	296
V	206	186	212
Nonfiltrable Residue T	18	76	162
F	2	62	138
V	16	14	24
Settleable Matter (ml/l)			
PHOSPHATE: Filtrable P	4.6	1.1	0.26
Total P	5.8	1.3	0.35
Dissolved Oxygen	11.2	8.5	9.6
BOD	16	4	2
COD	75	38	35
Grease or Oil			
Turbidity (JTU)	36	23	48
Total Hardness (as CaCO ₃)			
Calcium (Ca ⁺⁺)			
Magnesium (Mg ⁺⁺)			
Chloride (Cl ⁻)	170	45	15
Sulfate (SO ₄ ⁻)			
Total organic carbon	23	14	13
Chlorophyll a		8 µg/l	7 µg/l

REMARKS:

COLLECTOR
REPORT TO

Limnology Division
Hygienic Lab
Des Moines Branch

W.J. HAUSLER, JR., Ph.D.
DIRECTOR

SEP 26 1978

WATER QUALITY REPORT

STATE HYGIENIC LABORATORY, Des Moines Branch
 H.A. WALLACE BUILDING
 DES MOINES, IOWA 50309

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Town	Pitcher Creek ⁷	Maple River ⁸	Alta ⁹
Source	Cherokee Co. Rd. T90N,	Cherokee Co. Rd. T90N,	WWTP final effluent
Specific Location	R39W, Sec. 8/9	R39W, Sec. 17/20	
Date Collected	7/18/78	18 July 1978	7/18/78
Date Received	7/20/78	20 July 1978	7/20/78
Lab Number	512	513	514
Collection Time	1140	1445 FIELD DATA	1330
pH			
Temperature	25°C	28°C	20°C
Dissolved Oxygen			
	BACTERIOLOGICAL EXAMINATION		
Fecal Coliform/100 ml	3900	2000	580,000
	CHEMICAL ANALYSIS (as mg/l unless designated otherwise)		
Conductance (micromhos)	790	730	920
MBAS (as LAS)			
pH (units)	8.1	8.2	7.7
Alkalinity: P	none	none	none
T	266	276	240
NITROGEN: Organic N	0.70	0.83	3.2
Ammonia N	0.07	0.07	4.9
Nitrite N			
Nitrate N	18	12	9.1
Nitrate as NO ₃			
RESIDUE: Total	642	650	738
Fixed	448	402	328
Volatile	194	248	410
Filtrable Residue T	570	560	698
F	392	334	324
V	178	226	374
Nonfiltrable Residue T	72	90	40
F	56	68	4
V	16	22	36
Settleable Matter (ml/l)			
PHOSPHATE: Filtrable P	0.11	0.21	5.3
Total P	0.11	0.27	6.9
Dissolved Oxygen	10.6	9.7	6.2
BOD	1	2	18
COD	15	30	79
Grease or Oil			
Turbidity (JTU)	24	34	13
Total Hardness (as CaCO ₃)			
Calcium (Ca ⁺⁺)			
Magnesium (Mg ⁺⁺)			
Chloride (Cl ⁻)	18	16	38
Sulfate (SO ₄ ⁻²)			
Total organic carbon	10	11	28
Chlorophyll a	4 µg/l	10 µg/l	

REMARKS:

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 Hygienic Lab
 Des Moines Branch

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WATER QUALITY REPORT

STATE HYGIENIC LABORATORY, Des Moines Branch
H.A. WALLACE BUILDING
DES MOINES, IOWA 50309

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Town Source	Alta 10	Little Maple River 11	Maple River 12
Specific Location	Little Maple River Buena Vista Co. Rd. C65, T90N, R38W, Sec. 16/21	Cherokee Co. Rd. C66 T90N, R39W, Sec. 26/35	T89N, R39W, Sec. 9/16 Ida Co. Rd. Bridge
Date Collected	7/18/78	7/18/78	7/18/78
Date Received	7/20/78	7/20/78	7/20/78
Lab Number	515	516	517
Collection Time	1420	FIELD DATA	1400
pH		1530	
Temperature	26.5°C	28.5°C	27°C
Dissolved Oxygen			
BACTERIOLOGICAL EXAMINATION			
Fecal Coliform/100 ml	5700	3,300	3,700
CHEMICAL ANALYSIS (as mg/l unless designated otherwise)			
Conductance (micromhos)	910	800	730
MBAS (as LAS)			
pH (units)	8.1	8.2	8.2
Alkalinity: P	none	none	none
T	258	273	272
NITROGEN: Organic N	0.84	1.0	0.78
Ammonia N	0.15	0.07	0.12
Nitrite N			
Nitrate N	15	11	12
Nitrate as NO ₃			
RESIDUE: Total	948	646	652
Fixed	538	332	402
Volatile	410	314	250
Filtrable Residue T	896	588	574
F	498	286	338
V	398	302	236
Nonfiltrable Residue T	52	58	78
F	40	46	64
V	12	12	14
Settleable Matter (ml/l)			
PHOSPHATE: Filtrable P	0.71	0.24	0.21
Total P	0.76	0.29	0.25
Dissolved Oxygen	12.0	10.6	10.2
BOD	2	2	2
COD	28	19	27
Grease or Oil			
Turbidity (JTU)	19	18	25
Total Hardness (as CaCO ₃)			
Calcium (Ca ⁺⁺)			
Magnesium (Mg ⁺⁺)			
Chloride (Cl ⁻)	45	26	18
Sulfate (SO ₄ ⁻²)			
total organic carbon	11	10	11
lorophyll a	12 µg/l	6 µg/l	16 µg/l

REMARKS:

COLLECTOR
REPORT TO

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Hygienic Lab
Des Moines Branch

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WATER QUALITY REPORT

STATE HYGIENIC LABORATORY, Des Moines Branch
 H.A. WALLACE BUILDING
 DES MOINES, IOWA 50309

Town Source Specific Location	Schaller Lagoon effluent 13	Galva WWTP final effluent 14	Halfway Creek T89N, R39W, Sec. 22/23 Co. Rd. Bridge 15
Date Collected	7/18/78	7/18/78	7/18/78
Date Received	7/20/78	7/20/78	7/20/78
Lab Number	518	519	520
Collection Time	1810	1610	1830
pH			
Temperature	27°C	19.5°C	27°C
Dissolved Oxygen			
	BACTERIOLOGICAL EXAMINATION		
Fecal Coliform/100 ml	1,700	2,500	3,400
	CHEMICAL ANALYSIS (as mg/l unless designated otherwise)		
Conductance (micromhos)	2900	1000	820
MBAS (as LAS)			
pH (units)	7.9	7.7	8.2
Alkalinity: P	none	none	none
T	207	278	255
NITROGEN: Organic N	12	3.1	0.69
Ammonia N	0.80	1.4	0.09
Nitrite N			
Nitrate N	0.2	16	13
Nitrate as NO ₃			
RESIDUE: Total	2370	830	622
Fixed	1870	554	344
Volatile	500	276	278
Filtrable Residue T	2270	776	612
F	1870	546	340
V	400	230	272
Nonfiltrable Residue T	104	54	10
F	0	8	4
V	104	46	6
Settleable Matter (ml/l)			
PHOSPHATE: Filtrable P	2.2	6.3	0.15
Total P	2.7	6.5	0.15
Dissolved Oxygen	6.9	7.2	9.7
BOD	50	8	1
COD	212	79	26
Grease or Oil			
Turbidity (JTU)	100	17	5.3
Total Hardness (as CaCO ₃)			
Calcium (Ca ⁺⁺)			
Magnesium (Mg ⁺⁺)			
Chloride (Cl ⁻)	410	72	27
Sulfate (SO ₄ ⁻)			
Total organic carbon	56	27	9
Chlorophyll a			16 µg/l

REMARKS:

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 REPORT TO

Limnology Division
 Hygienic Lab
 Des Moines Branch

W.J. HAUSLER, JR., Ph.D.
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SEP 26 1978

WATER QUALITY REPORT

STATE HYGIENIC LABORATORY, Des Moines Branch
 H.A. WALLACE BUILDING
 DES MOINES, IOWA 50309

Town	Maple River 16	Maple River	Silver Creek 17
Source	Ida Co. Hwy 20 Bridge	Ida Co. Hwy 20 Bridge	T88N, R39W, Sec. 13/18
Specific Location	T88N, R39W, Sec. 6	T88N, R39W, Sec. 6	Ida Co. Rd. Bridge
Date Collected	7/18/78	16 - Duplicate 7/18/78	7/18/78
Date Received	7/20/78	7/20/78	7/20/78
Lab Number	521	522	523
Collection Time	1930	1935	2000
pH			
Temperature	27°C	27°C	26°C
Dissolved Oxygen			
BACTERIOLOGICAL EXAMINATION			
Fecal Coliform/100 ml	620	1400	10,000
CHEMICAL ANALYSIS (as mg/l unless designated otherwise)			
Conductance (micromhos)	740	740	720
MBAS (as LAS)			
pH (units)	8.3	8.1	8.2
Alkalinity: P	none	none	none
T	267	267	248
NITROGEN: Organic N	0.78	0.70	0.68
Ammonia N	0.05	0.18	0.07
Nitrite N			
Nitrate N	11	12	14
Nitrate as NO ₃			
RESIDUE: Total	596	620	558
Fixed	366	346	292
Volatile	230	274	266
Filtrable Residue T	524	536	544
F	308	282	282
V	216	254	262
Nonfiltrable Residue T	72	84	14
F	58	64	10
V	14	20	4
Settleable Matter (ml/l)			
PHOSPHATE: Filtrable P	0.19	0.20	0.06
Total P	0.23	0.26	0.09
Dissolved Oxygen	9.7	9.4	9.4
BOD	1	1	1
COD	20	24	
Grease or Oil			
Turbidity (JTU)	21	22	7.6
Total Hardness (as CaCO ₃)			
Calcium (Ca ⁺⁺)			
Magnesium (Mg ⁺⁺)			
Chloride (Cl ⁻)	17	18	14
Sulfate (SO ₄ ⁻)			
Total organic carbon	9	10	9
Chlorophyll a	16 µg/l	14 µg/l	9 µg/l

REMARKS:

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 REPORT TO

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SEP 26 1978

WATER QUALITY REPORT

STATE HYGIENIC LABORATORY, Des Moines Branch
H.A. WALLACE BUILDING
DES MOINES, IOWA 50309

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Town Source Specific Location	Elk Creek 18 Ida Co. Rd. Bridge T87N, R39W Sec. 6/1	Maple River 19 Ida Co. Rd M15, T87N R40W, Sec. 11/12	Odebolt 20 WWTP final effluent
Date Collected	7/18/78	7/18/78	7/18/78
Date Received	7/20/78	7/20/78	7/20/78
Lab Number	524	525	526
Collection Time	2010	FIELD DATA 2030	1710
pH			
Temperature	27° C	27° C	21° C
Dissolved Oxygen			
BACTERIOLOGICAL EXAMINATION			
Fecal Coliform/100 ml	8900	2600	1,000,000
CHEMICAL ANALYSIS (as mg/l unless designated otherwise)			
Conductance (micromhos)	740	720	2400
MBAS (as LAS)			
pH (units)	8.25	8.25	7.6
Alkalinity: P	none	none	none
T	255	264	286
NITROGEN: Organic N	0.93	0.96	2.5
Ammonia N	0.09	0.06	3.1
Nitrite N			
Nitrate N	14	11	14
Nitrate as NO ₃			
RESIDUE: Total	556	708	1750
Fixed	298	444	1520
Volatile	258	264	230
Filtrable Residue T	536	550	1740
F	284	308	1520
V	252	242	220
Nonfiltrable Residue T	20	158	10
F	14	136	0
V	6	22	10
Settleable Matter (ml/l)			
PHOSPHATE: Filtrable P	0.09	0.19	4.9
Total P	0.12	0.29	5.2
Dissolved Oxygen	9.7	9.7	6.1
BOD	2	1	15
COD	25	29	79
Grease or Oil			
Turbidity (JTU)	6.2	40	10
Total Hardness (as CaCO ₃)			
Calcium (Ca ⁺⁺)			
Magnesium (Mg ⁺⁺)			
Chloride (Cl ⁻)	16	14	310
Sulfate (SO ₄ ⁻²)			
Total organic carbon	10	9	21
Chlorophyll a	14 µg/l	15 µg/l	

REMARKS:

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REPORT TO

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Des Moines Branch

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SEP 26 1978

WATER QUALITY REPORT

**STATE HYGIENIC LABORATORY, Des Moines Branch
H.A. WALLACE BUILDING
DES MOINES, IOWA 50309**

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Town	Odebolt Creek 21	Ida Grove 22	Ida Grove 23
Source	T87N, R38W, Sec. 28/29	WWTP final effluent	Odebolt Creek
Specific Location	Co. Rd. Bridge		T87N, R40W, Sec.15 about 50 yds from the mouth
Date Collected	7/18/78	7/18/78	7/19/78
Date Received	7/20/78	7/20/78	7/20/78
Lab Number	527	528	529
Collection Time	1720	1630 FIELD DATA	1345
pH			
Temperature	25°C	23°C	28.5°C
Dissolved Oxygen			
Fecal Coliform/100 ml	28,000	BACTERIOLOGICAL EXAMINATION	
		1,800,000	500
Conductance (micromhos)	930	CHEMICAL ANALYSIS (as mg/l unless designated otherwise)	
MBAS (as LAS)		1700	760
pH (units)	7.8	7.5	8.3
Alkalinity: P	none	none	none
T	255	294	261
NITROGEN: Organic N	0.89	3.4	0.81
Ammonia N	0.19	5.0	0.22
Nitrite N			
Nitrate N	20	12	13
Nitrate as NO ₃			
RESIDUE: Total	726	1180	578
Fixed	468	944	388
Volatile	258	236	190
Filtrable Residue T	660	1130	558
F	412	928	370
V	248	202	188
Nonfiltrable Residue T	66	46	20
F	56	16	18
V	10	30	2
Settleable Matter (ml/l)			
PHOSPHATE: Filtrable P	0.30	8.5	0.11
Total P	0.39	9.1	0.16
Dissolved Oxygen	10.9	4.6	11.7
BOD	2	30	1
COD	27	116	24
Grease or Oil			
Turbidity (JTU)	21	16	6.4
Total Hardness (as CaCO ₃)			
Calcium (Ca ⁺⁺)			
Magnesium (Mg ⁺⁺)			
Chloride (Cl ⁻)	53	290	29
Sulfate (SO ₄ ⁻²)			
total organic carbon	9	38	8
lorophyll a	6 µg/l		24 µg/l

REMARKS:

COLLECTOR
REPORT TO

Limnology Division
Hygienic Lab
Des Moines Branch

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WATER QUALITY REPORT

STATE HYGIENIC LABORATORY, Des Moines Branch
H.A. WALLACE BUILDING
DES MOINES, IOWA 50309

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Town Source Specific Location	Maple River 24 Ida Co. Rd. T87N, R40W, Sec. 19/20	Battle Creek 25 Battle Creek Ida Co. Hwy 175, T87N R41W, Sec. 26	Battle Creek 26 Maple River Ida Co. Rd. T86N, R41W Sec. 7/8
Date Collected	7/19/78	7/19/78	7/19/78
Date Received	7/20/78	7/20/78	7/20/78
Lab Number	530	531	532
Collection Time	1330	1310	1245
pH		FIELD DATA	
Temperature	28°C	30°C	27.5°C
Dissolved Oxygen			
BACTERIOLOGICAL EXAMINATION			
Fecal Coliform/100 ml	2,200	2,800	4300
CHEMICAL ANALYSIS (as mg/l unless designated otherwise)			
Conductance (micromhos)	730	850	720
MBAS (as LAS)			
pH (units)	8.3	8.3	8.3
Alkalinity: P	none	none	none
T	269	270	270
NITROGEN: Organic N	0.60	0.70	0.93
Ammonia N	0.07	0.10	0.06
Nitrite N			
Nitrate N	9.3	7.1	8.7
Nitrate as NO ₃			
RESIDUE: Total	752	734	722
Fixed	528	578	526
Volatile	224	156	196
Filtrable Residue T	536	608	530
F	342	468	366
V	294	140	164
Nonfiltrable Residue T	206	126	192
F	186	110	160
V	20	16	32
Settleable Matter (ml/l)			
PHOSPHATE: Filtrable P	0.16	0.20	0.24
Total P	0.19	1.0	0.35
Dissolved Oxygen	9.8	10.4	9.6
BOD	1	2	1
COD	20	17	27
Grease or Oil			
Turbidity (JTU)	48	33	46
Total Hardness (as CaCO ₃)			
Calcium (Ca ⁺⁺)			
Magnesium (Mg ⁺⁺)			
Chloride (Cl ⁻)	19	30	16
Sulfate (SO ₄ ⁻²)			
Total organic carbon	12	11	11
Chlorophyll a	23 µg/l	20 µg/l	21 µg/l

REMARKS:

COLLECTOR
REPORT TO

Limnology Division
Hygienic Lab
Des Moines Branch

W.J. HAUSLER, JR., Ph.D.
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SEP 26 1978

WATER QUALITY REPORT

STATE HYGIENIC LABORATORY, Des Moines Branch
H.A. WALLACE BUILDING
DES MOINES, IOWA 50309

Town Source Specific Location	Danbury 27 Maple River Woodbury Co. Rd. L37 T86N, R42W, Sec. 27	Mapleton 28 Maple River Monona Co. Hwy 175 T85N, R43W, Sec. 13	Castana 29 Maple River Monona Co. Hwy 175 Bridge T84N, R43W, Sec. 4
Date Collected	7/19/78	7/19/78	7/19/78
Date Received	7/20/78	7/20/78	7/20/78
Lab Number	533	534	535
Collection Time	1215	0830	1130
pH			
Temperature	27°C	25°C	27°C
Dissolved Oxygen			
	BACTERIOLOGICAL EXAMINATION		
Fecal Coliform/100 ml	2,600	2500	1,200
	CHEMICAL ANALYSIS (as mg/l unless designated otherwise)		
Conductance (micromhos)	750	730	720
MBAS (as LAS)			
pH (units)	8.3	8.3	8.3
Alkalinity: P	none	none	none
T	273	268	267
NITROGEN: Organic N	0.88	0.93	1.0
Ammonia N	0.07	0.09	0.09
Nitrite N			
Nitrate N	8.7	9.3	8.1
Nitrate as NO ₃			
RESIDUE: Total	736	770	772
Fixed	564	590	564
Volatile	172	180	208
Filtrable Residue T	536	528	548
F	386	374	364
V	150	154	184
Nonfiltrable Residue T	200	242	224
F	178	216	200
V	22	26	24
Settleable Matter (ml/l)			
PHOSPHATE: Filtrable P	0.26	0.17	0.19
Total P	0.37	0.42	0.42
Dissolved Oxygen	9.7	9.3	12.3
BOD	1	1	2
COD	29	30	35
Grease or Oil			
Turbidity (JTU)	55	60	70
Total Hardness (as CaCO ₃)			
Calcium (Ca ⁺⁺)			
Magnesium (Mg ⁺⁺)			
Chloride (Cl ⁻)	21	17	17
Sulfate (SO ₄ ⁻²)			
Total organic carbon	11	11	12
total suspended solids	23 µg/l	23 µg/l	30 µg/l

REMARKS:

Limnology Division
Hygienic Lab
Des Moines Branch

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WATER QUALITY REPORT

**STATE HYGIENIC LABORATORY, Des Moines Branch
H.A. WALLACE BUILDING
DES MOINES, IOWA 50309**

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Town	Turin 30	Turin 31	Turin 32
Source	Maple River	Little Sioux River	Little Sioux River
Specific Location	Monona Co. Rd. L14 T83N, R44W Sec. 15/16	T83N, R44W, Sec. 9 Bridge on Hwy 175	Monona Co. Rd. E 54 T83N, R44W, Sec. 28/33
Date Collected	7/19/78	7/19/78	7/19/78
Date Received	7/20/78	7/20/78	7/20/78
Lab Number	536	537	538
Collection Time	1030	1010	1050
pH			
Temperature	27°C	27°C	26°C
Dissolved Oxygen			
	BACTERIOLOGICAL EXAMINATION		
Fecal Coliform/100 ml	2700	1500	5,400
	CHEMICAL ANALYSIS (as mg/l unless designated otherwise)		
Conductance (micromhos)	720	700	690
MBAS (as LAS)			
pH (units)	8.3	8.1	8.1
Alkalinity: P	none	none	none
T	269	239	238
NITROGEN: Organic N	0.49	1.7	1.8
Ammonia N	0.09	0.10	0.10
Nitrite N			
Nitrate N	7.3	5.2	5.4
Nitrate as NO ₃			
RESIDUE: Total	808	1010	1050
Fixed	626	744	866
Volatile	182	266	184
Filtrable Residue T	496	534	500
F	352	322	372
V	144	212	128
Nonfiltrable Residue T	312	478	546
F	274	422	494
V	38	56	52
Settleable Matter (ml/l)			
PHOSPHATE: Filtrable P	0.19	0.41	0.43
Total P	0.23	0.64	0.69
Dissolved Oxygen	9.9	8.0	10.1
BOD	2	2	3
COD	13	47	57
Grease or Oil			
Turbidity (JTU)	80	130	150
Total Hardness (as CaCO ₃)			
Calcium (Ca ⁺⁺)			
Magnesium (Mg ⁺⁺)			
Chloride (Cl ⁻)	19	20	20
Sulfate (SO ₄ ⁻)			
total organic carbon	11	21	28
Chlorophyll a	27 µg/l	27 µg/l	28 µg/l

REMARKS:

COLLECTOR
REPORT TO

Limnology Division
Hygienic Lab
Des Moines Branch

W.J. HAUSLER, JR., Ph.D.
DIRECTOR

SEP 26 1978

**WATER QUALITY REPORT
METALS**

STATE HYGIENIC LABORATORY, Des Moines Branch
The University of Iowa
515:281-5371

Town	Cherokee 1	Maple River 16	Maple River
Source	Maple River	Ida Co. Hwy 20 Bridge	Ida Co. Hwy 20 Bridge
Specific Location	Cherokee Co. Hwy 3 T92N, R39W, Sec. 28/33	T98N, R39W, Sec. 6	T88N, R39W, Sec. 6 16 Duplicate
Date Collected	7/18/78	7/18/78	7/18/78
Date Received	7/20/78	7/20/78	7/20/78
Lab Number	506	521	522

METALS ANALYSIS (as mg/l unless designated otherwise)

Arsenic	<0.01	<0.01	<0.01
Barium	0.3	0.2	0.2
Cadmium	<0.01	<0.01	<0.01
Chromium, Total	<0.01	<0.01	<0.01
Chromium, Hexavalent			
Copper	<0.01	<0.01	<0.01
Lead	<0.01	<0.01	<0.01
Mercury	<0.001	<0.001	<0.001
Nickel	<0.01	<0.1	<0.1
Selenium	<0.01	<0.01	<0.01
Silver	<0.01	<0.01	<0.01
Zinc	<0.01	<0.01	<0.01

REMARKS:

COLLECTOR
REPORT TO

Limnology Division
Hygienic Lab
Des Moines Branch

Date Reported

SEP 26 1978

W.J. Hausler Jr., Ph.D.
Director

**WATER QUALITY REPORT
METALS**

STATE HYGIENIC LABORATORY, Des Moines Branch
The University of Iowa
515:281-5371

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Town	Maple River 24	Turin 30
Source	Ida Co. Rd. T87N, R40W	Maple River
Specific Location	Sec. 19/20	Monona Co. Rd. L14 T83N, R44W, Sec. 15/16
Date Collected	7/19/78	7/19/78
Date Received	7/20/78	7/20/78
Lab Number	530	536

METALS ANALYSIS (as mg/l unless designated otherwise)

Arsenic	<0.01	<0.01
Barium	0.2	0.2
Cadmium	<0.01	<0.01
Chromium, Total	<0.01	<0.01
Chromium, Hexavalent		
Copper	<0.01	<0.01
Lead	<0.01	<0.01
Mercury	<0.001	<0.001
Nickel	<0.01	<0.01
Selenium	<0.01	<0.01
Silver	<0.01	<0.01
Zinc	<0.01	0.05

REMARKS:

COLLECTOR
REPORT TO

Limnology Division
Hygienic Lab
Des Moines Branch

Date Reported **SEP 26 1978**

W.J. Hausler Jr., Ph.D.
Director

APPENDIX 2. SUMMARIES OF BIOLOGICAL
COLLECTIONS FROM THE MAPLE RIVER

July 18/19, 1978 to August 28/29, 1978
(all numbers are per square meter)

Collected from Hester-Dendy Multiplate Samplers

Station 1: Maple River, Cherokee Co. Hwy. 3 Br.: T92N, R39W, Sec 28 & 33
Three substrates were deployed but only one was present on
August 29.

Annelida	
Hirudinea	
Erpobdellidae	
<u>Erpobdella punctata</u>	7.9
Mollusca	
Gastropoda	
<u>Physa sp.</u>	7.9
Arthropoda	
Insecta	
Ephemeroptera	
<u>Heptagenia sp.</u>	110.6
<u>Stenacron sp.</u>	23.7
<u>Isonychia sp.</u>	7.9
Total #	<hr/> 158.0
Number of taxa	5

Station 3: Maple River, Cherokee Co. Rd C-43 Br.: T91N, R39W, Sec 8 & 17
 Three substrates were deployed but only two were present on
 August 29.

Ectoprocta		
<u>Plumatella</u> sp.		p*
Annelida		
Hirudinea		
Glossiphoniidae		
<u>Placobdella ornata</u>	4.0	
Arthropoda		
Crustacea		
Gammaridae		
<u>Gammarus</u> sp.	7.9	
Insecta		
Trichoptera		
<u>Cheumatopsyche</u> sp.	395.1	
<u>Hydropsyche frisoni</u>	11.9	
<u>Nectopsyche diarina</u>	15.8	
Ephemeroptera		
<u>Heptagenia</u> sp.	102.7	
<u>Stenacron</u> sp.	300.3	
<u>Isonychia</u> sp.	67.2	
<u>Tricorythodes</u> sp.	31.6	
<u>Caenis</u> sp.	19.8	
<u>Baetis</u> sp.	4.0	
Diptera		
Chironomidae	395.1	
Total #	1,355.4	
Number of taxa	13	

p* Indicates presence in non-quantifiable sample.

Station 6: Maple River, Cherokee Co. Rd. Br.: T91N, R39W, Sec 29 & 32
Three Substrates were deployed, but only one was present on
August 29.

Arthroda
Insecta

Trichoptera

<u>Cheumatopsyche</u> sp.	181.8
<u>Hydropsyche frisoni</u>	15.8
<u>Hydropsyche bifida</u> (gp)	7.9
<u>Nectopsyche diarina</u>	102.7

Ephemeroptera

<u>Heptagenia</u> sp.	205.5
<u>Stenacron</u> sp.	71.1
<u>Isonychia</u> sp.	150.2
<u>Tricorythodes</u> sp.	39.5
<u>Caenis</u> sp.	63.2
<u>Baetis</u> sp.	7.9

Diptera

Chironomidae	134.3
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Coleoptera

<u>Stenelmis</u> sp.	15.8
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Total #

995.7

Number of taxa

12

Station 8: Maple River, Cherokee Co. Rd. C-65 Br.: T90N, R39W, Sec 17 & 20
 Three substrates were deployed and three were present on August 29.

Annelida	
Hirudinea	
Glossiphoniidae	
<u>Placobdella parasitica</u>	2.6
Arthropoda	
Crustacea	
Gammaridae	
<u>Gammarus</u> sp.	10.5
Insecta	
Trichoptera	
<u>Cheumatopsyche</u> sp.	1,543.6
<u>Hydropsyche frisoni</u>	2.6
<u>Hydropsyche bifida</u> (gp)	13.2
<u>Hydropsyche betteni</u>	5.3
<u>Nectopsyche diarina</u>	50.1
Ephemeroptera	
<u>Heptagenia</u> sp.	126.4
<u>Stenacron</u> sp.	44.8
<u>Stenonema</u> sp.	34.2
<u>Isonychia</u> sp.	563.7
<u>Tricorythodes</u> sp.	218.6
<u>Caenis</u> sp.	18.4
<u>Baetis</u> sp.	7.9
Odonata	
Gomphidae sp.	2.6
Diptera	
Chironomidae	247.6
Coleoptera	
Dryopidae	
<u>Helichus</u> sp.	5.3
Elmidae	
<u>Stenelmis</u> sp.	21.1
<u>Dubiraphia vittata</u>	7.9
Total #	<hr/> 2,926.4
Number of taxa	19

Station 12: Maple River, Ida Co. Rd. Br.: T89N, R39W, Sec 9 & 16
 Three Substrates were deployed, but only one was present on
 August 29.

Annelida

Hirudinea

Glossiphoniidae

Placobdella ornata 7.9

Erpobdellidae

Erpobdella punctata 7.9

Arthropoda

Insecta

Trichoptera

Cheumatopsyche sp. 2,117.9

Hydropsyche frisoni 63.2

Hydropsyche bifida (gp) 23.7

Nectopsyche diarina 31.6

Ephemeroptera

Heptagenia sp. 371.4

Stenacron sp. 71.1

Stenonema sp. 142.2

Isonychia sp. 2,615.8

Tricorythodes sp. 474.2

Caenis sp. 308.2

Odonata

Gomphus crassus 7.9

Diptera

Chironomidae 379.3

Simuliidae

Simulium sp. 7.9

Coleoptera

Dryopidae

Helichus sp. 7.9

Elmidae

Stenelmis sp. 39.5

Dubiraphia vittata 7.9

Total #

6,685.5

Number of taxa

18

Station 16: Maple River, Ida Co. Hwy. 20 Br.: T88N, R39W, Sec 6
Three substrates were deployed, but only one was present on
August 29.

Arthropoda

Insecta

Trichoptera

<u>Cheumatopsyche</u> sp.	71.1
<u>Hydropsyche frisoni</u>	7.9
<u>Nectopsyche diarina</u>	7.9

Ephemeroptera

<u>Heptagenia</u> sp.	86.9
<u>Stenacron</u> sp.	23.7
<u>Stenonema</u> sp.	308.2
<u>Isonychia</u> sp.	679.6
<u>Trycorythodes</u> sp.	79.0
<u>Caenis</u> sp.	86.9

Odonata

<u>Gomphidae</u> sp.	7.9
<u>Gomphus crassus</u>	7.9

Diptera

<u>Chironomidae</u>	55.3
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Coleoptera

<u>Dryopidae</u>	
<u>Helichus</u> sp.	7.9

Elmidae

<u>Stenelmis</u> sp.	55.3
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Total #

1,485.5

Number of taxa

14

Station 19: Maple River, Ida Co. Rd. M-15 Br.: T87N, R40W, Sec 11 & 12
Three substrates were deployed and three were present on August 29.

Arthropoda	
Crustacea	
Gammaridae	
<u>Gammarus</u> sp.	2.6
Insecta	
Trichoptera	
<u>Cheumatopsyche</u> sp.	2,760.7
<u>Hydropsyche frisoni</u>	524.2
<u>Hydropsyche bifida</u>	29.0
<u>Hydropsyche betteni</u>	2.6
<u>Nectopsyche diarina</u>	15.8
<u>Neureclipsis</u> sp.	5.3
Ephemeroptera	
<u>Heptagenia</u> sp.	44.8
<u>Stenonema</u> sp.	94.8
<u>Isonychia</u> sp.	1,132.7
<u>Tricorythodes</u> sp.	21.1
<u>Caenis</u> sp.	7.9
<u>Baetis</u> sp.	71.1
Diptera	
Chironomidae	318.7
Simuliidae	
<u>Simulium</u> sp.	26.3
Coleoptera	
Dryopidae	
<u>Helichus</u> sp.	10.5
Elmidae	
<u>Stenelmis</u>	5.3
Total #	5,073.4
Number of taxa	17

Station 24: Maple River, Ida Co. Rd. Br.: T87N, R40W, Sec 19 & 20
Two substrates were deployed and two were present on August 29.

Arthropoda	
Insecta	
Trichoptera	
<u>Hydropsyche frisoni</u>	11.8
Ephemeroptera	
Heptagenia sp.	4.0
Stenonema sp.	4.0
Caenis sp.	4.0
Diptera	
Chironomidae	19.8
Simuliidae	
<u>Simulium</u> sp.	7.9
	<hr/>
Total #	51.5
Number of taxa	6

Station 26: Maple River, Ida Co. Rd. Br.: T86N, R41W, Sec 7 & 8
Two substrates were deployed but none were present on August 29.

Station 27: Maple River, Woodbury Co. Rd. L-37, Br.: T86N, R42W, Sec 27
Three substrates were deployed, but only two were present on
August 29.

Arthropoda	
Crustacea	
Gammaridae	
<u>Gammarus</u> sp.	4.0
Insecta	
Trichoptera	
<u>Cheumatopsyche</u> sp.	142.2
<u>Hydropsyche frisoni</u>	67.2
<u>Nectopsyche diarina</u>	7.9
<u>Neureclipsis</u> sp.	7.9
Ephemeroptera	
<u>Heptagenia</u> sp.	43.5
<u>Stenonema</u> sp.	98.8
<u>Isonychia</u> sp.	11.9
<u>Tricorythodes</u> sp.	126.4
<u>Caenis</u> sp.	11.9
<u>Baetis</u> sp.	7.9
Odonata	
<u>Anomalagrion hastatum</u>	4.0
<u>Libellula forensis</u>	4.0
<u>Argia</u> sp.	4.0
Diptera	
Chironomidae	75.1
Coleoptera	
Elmidae	
<u>Stenelmis</u> sp.	4.0
	<hr/>
Total #	620.7
Number of taxa	16

Station 28: Maple River, Monona Co. Hwy. 175 Br.: T85N, R43W, Sec 13
Three substrates were deployed, but none were present on August 29.

Station 29: Maple River, Monona Co. Hwy. 175 Br.:T84N, R43W, Sec 4
Three substrates were deployed, but only two were present
on August 28.

Arthropoda

Insecta

Trichoptera

<u>Cheumatopsyche</u> sp.	2,042.8
<u>Hydropsyche frisoni</u>	169.9
<u>Hydropsyche orris</u>	4.0
<u>Neureclipsis</u> sp.	4.0

Ephemeroptera

<u>Heptagenia</u> sp.	27.7
<u>Stenonema</u> sp.	75.1
<u>Isonychia</u> sp.	27.7
<u>Tricorythodes</u> sp.	35.6
<u>Caenis</u> sp.	23.7
<u>Baetis</u> sp.	67.2

Diptera

Chironomidae	189.7
Simuliidae	
<u>Simulium</u> sp.	35.6

Coleoptera

Elmidae	
<u>Stenelmis</u> sp.	7.9

Total #	2,710.9
Number of taxa	13

Station 30: Maple River, Monona Co. Rd. L-14 Br.: T83N, R44W, Sec 15 & 16
Three substrates were deployed, but only two were present on
August 28.

Arthropoda

Insecta

Trichoptera

<u>Cheumatopsyche</u> sp.	1,394.8
<u>Hydropsyche frisoni</u>	410.9
<u>Hydropsyche orris</u>	7.9
<u>Neureclipsis</u> sp.	90.9

Ephemeroptera

<u>Heptagenia</u> sp.	63.2
<u>Stenonema</u> sp.	217.3
<u>Isonychia</u> sp.	146.2
<u>Tricorythodes</u> sp.	414.9
<u>Caenis</u> sp.	102.7
<u>Baetis</u> sp.	177.8

Odonata

<u>Neurocordulia molesta</u>	7.9
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Diptera

Chironomidae	450.5
Simuliidae	
<u>Simulium</u> sp.	1,098.5

Coleoptera

Elmidae	
<u>Stenelmis</u> sp.	4.0

Total #	4,587.5
Number of taxa	14