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A REPORT FROM

*The State Hygienic
Laboratory*

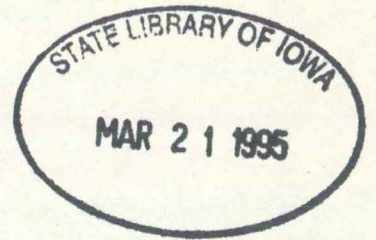


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Water Quality Survey of the
East, Middle and West Nodaway Rivers

Report #79-22

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

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ABSTRACT

A water quality survey of the East, Middle and West Nodaway Rivers was conducted on August 14 and 15, 1978 by personnel of the University Hygienic Laboratory. Stream flows were quite high at approximately thirty times the 7 day Q_{10} . Water quality was found to be generally good throughout the reach. Scattered showers occurred on August 15 which caused increases in fecal coliforms, turbidity and BOD as well as a decrease in specific conductance to be observed at some stations. Water quality is expected to remain good at these high flows.

INTRODUCTION

The Nodaway River originates in Cass and Adair counties and flows southwesterly joining the Missouri River in Missouri. Four major tributaries, Seven Mile Creek, West Nodaway, Middle Nodaway and East Nodaway Rivers, join to form the Nodaway River near Shambaugh, Iowa. Like many western Iowa streams, a considerable amount of channel straightening has been done on all three branches. The Nodaway river valley is fertile and heavily farmed with almost no forested areas along the waterways. During favorable conditions, channel catfish are frequently taken from some sections of the river (1). Total Iowa drainage area for the Nodaway amounts to approximately 1,182 square miles. Except for portions of its extreme upper reaches, most of the Iowa reach of the Nodaway River is classified as a class B warmwater stream and as such, the appropriate water quality standards for aquatic life propagation apply.

A previous water quality survey (2) conducted on the Nodaway River during both summer and winter conditions indicated generally good water quality throughout the reach with only a slight decline in water quality noted during winter ice cover conditions. In a continuing assessment of Iowa streams, this survey was conducted on August 14 and 15, 1978 to determine if any change in water quality had occurred since the previous survey.

Figure 1 is a map of the East, Middle and West Nodaway Rivers showing the sampling area, while Table 1 is a list of the sampling locations. Flow data obtained during the survey are tabulated below.

<u>Location</u>	<u>August 14, 1978</u>	<u>7 day Q_{10}</u>
West Nodaway at Mortons Mill	66 cfs	not calculated
West Nodaway at Clarinda	168 cfs	5.4 cfs
East Nodaway near Shambaugh	106 cfs	not calculated

TABLE 1
 NODAWAY RIVER SAMPLING LOCATIONS
 14,15 August 1978

<u>Station</u>	<u>Location</u>
1. Sevenmile Creek	Montgomery County Road H20 Bridge, T73N, R36W, Sec. 20/29
2. West Nodaway River	Montgomery Co. Rd. H20 Br., T73N, R36W, Sec. 21/28
3. West Nodaway River	Montgomery Co. Rd. H46 Br., T71N, R36W, Sec. 21
WWTP effluent	Massena, Iowa
WWTP effluent	Cumberland, Iowa
4. West Fork Middle Nodaway River	Adair Co. Rd. Br., T74N, R33W, Sec. 28
5. Middle Nodaway River	Adams Co. Rd. H20 Br., T73N, R34W, Sec. 14
6. Middle Nodaway River	Adams Co. Rd. Br., T72N, R35W, Sec. 20/21
WWTP effluent	Villisca, Iowa
7. Middle Nodaway River	Montgomery Co. Hwy 71 Br., T71N, R36W, Sec. 33/34
8. West Nodaway River	Page Co. Rd. Br., T69N, R36W, Sec. 16
WWTP effluent	Clarinda, Iowa
9. West Nodaway River	Page Co. Rd. J53 Br., T68N, R36W, Sec. 31
10. East Nodaway River	Adams Co. Rd. N55 Br., T72N, R33W, Sec. 27/28
WWTP effluent	Corning, Iowa
11. East Nodaway River	Adams Co. Rd. Br., T71N, R35W, Sec. 12
12. Kemp Creek	Adams Co. Hwy 34 Br., T71N, R35W, Sec. 1
13. East Nodaway River	Adams Co. Rd. N55 Br., T71N, R35W, Sec. 17
14. East Nodaway River	Taylor Co. Rd. Br., T70N, R35W, Sec. 8
15. East Nodaway River	Page Co. Rd. J53 Br., T67N, R36W, Sec. 5/6
16. Nodaway River	Page Co. Rd., J55 Br., T67N, R36W, Sec. 30/31

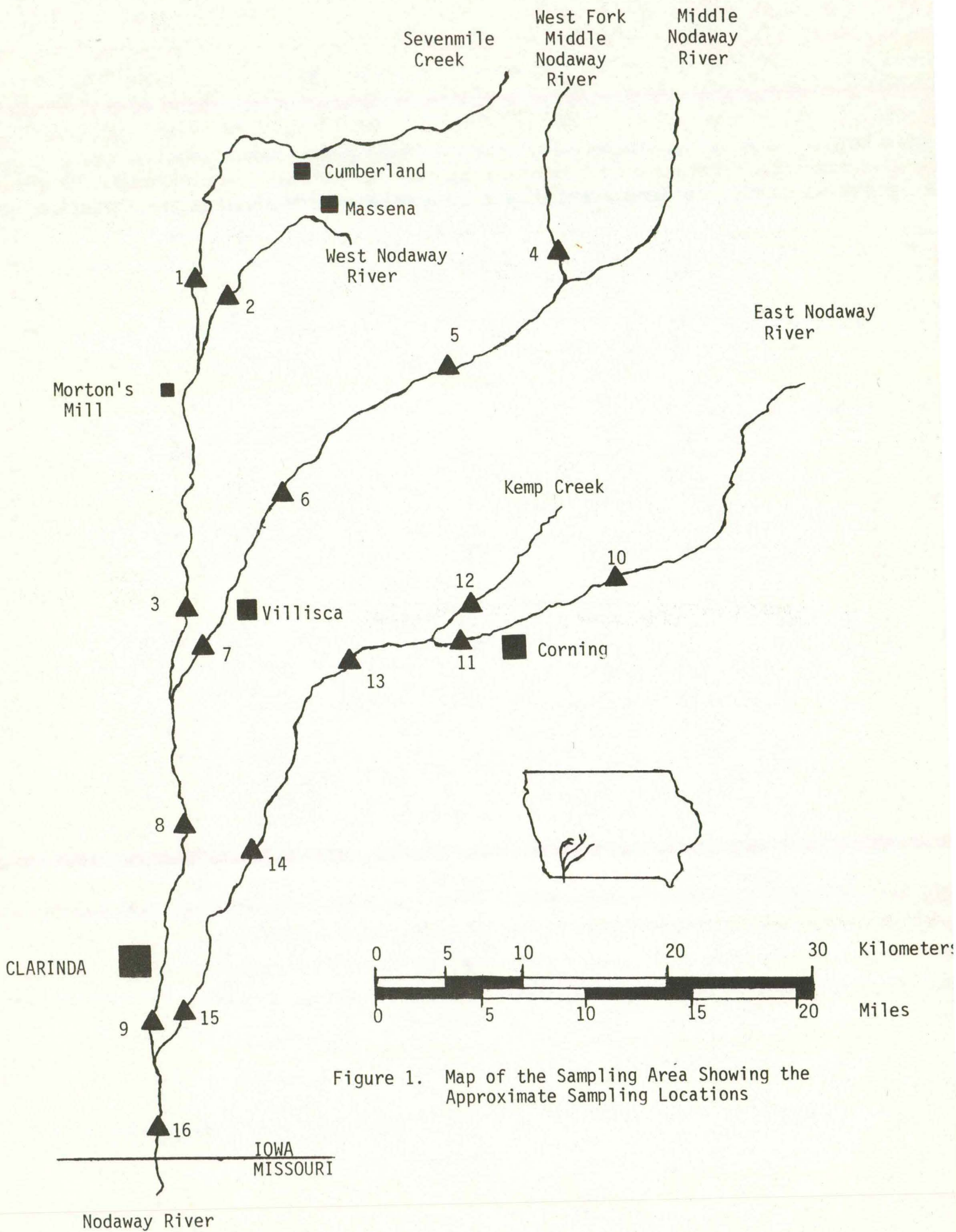


Figure 1. Map of the Sampling Area Showing the Approximate Sampling Locations

Flow on the West Nodaway at Clarinda was quite high at approximately thirty times the 7 day ten year low flow, which is equalled or exceeded only 33% of the time (3). During the early morning hours of August 15, 1978, a scattered, brief but intense rainfall occurred north of the Clarinda area, causing flow at the Clarinda station to increase to 195 cfs.

Table 2 lists the status of each of the municipalities located on the East, Middle and West Nodaway River and tributaries in the construction grants program.

METHODS

Procedures used in sample collection, preservation and analysis are described in Standard Methods (4) and Manual of Methods for Chemical Analysis of Water and Wastes (5).

Grab samples were obtained using a high density polyethylene sampling bucket and a weighted stainless steel DO sampler.

Stream flow measurements were conducted using the U.S. Geological Survey method of computing cross section area (6). A Price type AA current meter and top setting wading rod were used to measure velocity and depth.

RESULTS AND DISCUSSION

To facilitate the discussion of this report, the tributaries of the West Nodaway River will be discussed first followed by the West Nodaway itself.

Middle Nodaway River

The Middle Nodaway River is classified as a class B warmwater stream from its mouth to its junction with the West Fork Middle Nodaway River. The West Fork Middle Nodaway River is also classified as a class B warmwater stream from its mouth to Rutt Branch. Four stations were located on these

TABLE 2

Nodaway River Wastewater Dischargers*

Dischargers	Population ⁺ (1970)	Wastewater Plant Type ⁺	Average Flow (mgd) ⁺	Design Capacity (mgd) ⁺	Construction Grants Program*	Stream Receiving Discharge
College Springs	295	NEMTF	-----	-----	Not in program	Mill Creek
Cumberland**	385	Imhoff Tank, Trickling Filter	0.039	0.051	Not in program	Sevenmile Creek
Massena**	433	Imhoff Tank, Trickling Filter	0.025	0.051	Step I, doing SSES (Reserve Fund)	West Nodaway R.
Grant	152	NEMTF	-----	-----	Step I, (Reserve fund) Facility plan being reviewed	West Nodaway R.
Millisca**	1,402	Trickling Filter	-----	0.189	Step I, doing SSES	Middle Nodaway R.
Montanelle	752	2-cell Lagoon	0.084	0.054	Applied for Step I	Middle Nodaway R.
Bridgewater	188	NEMTF	-----	-----	Step III (Lagoon completed & in operation March, 1977)	W. Fork, Middle Nodaway River
Carbon	135	NEMTF	-----	-----	Not in program	Middle Nodaway R.
Leppburn	38	NEMTF	-----	-----	Not in program	West Nodaway R.
Larinda**	5,420	Trickling Filter	1.287	0.838	Step I, doing SSES	West Nodaway R.
Lambaugh	178	NEMTF	-----	-----	Not in program	West Nodaway R.
Rescott	305	2-cell Lagoon	-----	-----	Not in program	East Nodaway R.
Morning**	2,095	(Activated Sludge) Trickling Filter	0.281	0.500	Step I, doing I/I	East Nodaway R.
Nodaway	176	NEMTF	-----	-----	Applied for Step I	East Nodaway R.
Raddyville	207	2-cell Lagoon	0.028	0.026	Not in program	Nodaway River

Data from Southern Iowa Basin

Information supplied by Iowa Department of Environmental Quality

*WWTP sampled during survey

SES-Sewage System Evaluation Survey

EMTF-No Existing Municipal Treatment Facility

/I-Infiltration Inflow

streams to assess water quality. Selected bacteriological and chemical data from the Middle Nodaway River are presented in Table 3. Stations 4, 5, and 7 were collected on August 15 after the rainfall while station 6 was collected on August 14. Water quality at station 4 was good with one exception. Fecal coliform levels were quite high at 58,000 organisms/100 ml. Biochemical oxygen demand (BOD) and turbidity were also slightly elevated at 5 mg/l and 40 Jackson Turbidity Units (JTU) respectively. These high levels can probably be attributed to the rainfall of the previous evening.

The next station downstream (station 5) shows a pattern similar to station 4. Fecal coliforms were even higher at 110,000 organisms/100 ml while BOD and turbidity were still slightly elevated (4 mg/l and 32 JTU). Water quality at this station was also affected by the rainfall.

Station 6 was collected on August 14, 1978 before the rain and thus gives an indication of water quality before the stream was influenced by any non-point source runoff that occurred during the night. Water quality at station 6 can be considered to be good (fecal coliforms 180 organisms/100 ml, specific conductance 400 micromhos, ammonia nitrogen 0.16 mg/l, BOD 4 mg/l, turbidity 6.2 JTU and total organic carbon 9 mg/l).

Station 7, collected after the rainfall, had below average water quality. Fecal coliforms were 75,000 organisms/100 ml, specific conductance 440 micromhos, ammonia nitrogen 1.3 mg/l, BOD 6 mg/l, turbidity 16 JTU and TOC 12 mg/l. The high level of fecal coliforms found at this station can probably be attributed to the runoff that occurred as a result of the rainfall of August 15, 1978. Another contributing factor may be the Villisca WWTP discharge which is located between stations 6 and 7.

East Nodaway River

The East Nodaway River is classified as a class B warmwater stream from its mouth to the East Fork, East Nodaway River. A tributary, Kemp Creek, is also classified as a class B warmwater stream from its mouth to the Lake Icaria Dam. Stations 10 through 12 were collected on August 14 and thus were not affected

TABLE 3

Selected Bacteriological and Chemical Data from the Middle Nodaway River
August 14 and 15, 1978

(All values in mg/l unless specified otherwise)

<u>Station</u>	<u>Fecal Coliforms</u> ¹	<u>Specific Conductance</u> ²	<u>Ammonia Nitrogen</u>	<u>Dissolved Oxygen</u>	<u>BOD</u>	<u>Turbidity</u> ³	<u>Chloride</u>	<u>TOC</u>
4 W.F. Middle Nodaway R.	58,000	380	0.02	8.2	5	40	8.0	12
5 Middle Nodaway River	110,000	360	0.02	10.9	4	32	7.0	12
6 Middle Nodaway River	180	400	0.16	13.2	4	6.2	8.0	9
Villisca WWTP	350,000	1,100	4.3	8.2	8	6.4	90	21
7 Middle Nodaway River	75,000	440	1.3	11.9	6	16	11	12

TABLE 4

Selected Bacteriological and Chemical Data from the East Nodaway River
August 14 and 15, 1978

(All values in mg/l unless specified otherwise)

0 East Nodaway River	70	340	0.03	12.5	6	11	9.0	12
Corning WWTP	48,000	830	0.10	12.9	12	24	56	12
1 East Nodaway River	440	360	0.02	15.3	8	11	10	12
2 Kemp Creek	1,500	300	0.02	8.3	4	17	5	11
3 East Nodaway River	700	380	0.05	16.9	7	11	8	11
4 East Nodaway River	110,000	350	0.10	8.9	8	40	8	18
5 East Nodaway River	1,300	370	0.04	8.3	9	21	7.5	12

¹organisms per 100 ml

²micromhos per cm at 25°C

by the rainfall. Selected chemical and bacteriological data from these stations is presented in Table 4. Water quality at station 10 was good as evidenced by the low levels of fecal coliforms (70 organisms/100 ml), specific conductance (340 micromhos), ammonia nitrogen (0.03 mg/l), BOD (6 mg/l), turbidity (11 JTU), chloride (9.0 mg/l) and TOC (12 mg/l). The next station downstream, station 11, had water quality that was basically unchanged from the previous station.

Water quality at station 12, located on Kemp Creek, a tributary to the East Nodaway River, was also good (specific conductance 300 micromhos, ammonia nitrogen 0.02 mg/l, dissolved oxygen 8.3 mg/l, BOD 4 mg/l, chloride 5 mg/l and TOC 11 mg/l). Only the fecal coliform level was slightly elevated at 1500 organisms/100 ml.

Station 13, downstream from the juncture of Kemp Creek and the East Nodaway River, had water quality that was similar to station 11. Water quality at this station was good and basically unchanged by the inflow from Kemp Creek.

The next two stations, 14 and 15, were collected on August 15, 1978 and were thus influenced by the rain that occurred during the early morning. This is reflected by the increase in fecal coliforms (110,000 organisms/100 ml) and turbidity (40 JTU) values as well as a decrease in specific conductance (350 micromhos) at station 14. Station 15 was less affected by the rain as the fecal coliform level was only 1,300 organisms/100 ml and the turbidity was only 21 JTU at this station. The BOD at each station was also slightly elevated (8 and 9 mg/l respectively). Except for the elevated fecal coliform values, water quality was good at stations 14 and 15.

West Nodaway River

The West Nodaway River is classified as a class B warmwater stream from its mouth to Westler's Branch. A tributary, Sevenmile Creek, is also classified as a class B warmwater stream from its mouth to Highway 71. Selected bacteriological and chemical data from the West Nodaway River may be found in Table 5.

TABLE 5
 Selected Bacteriological and Chemical Data from the West Nodaway River
 August 14 and 15, 1978

(All values in mg/l unless specified otherwise)

<u>Station</u>	<u>Fecal Coliforms</u> ¹	<u>Specific Conductance</u> ²	<u>Ammonia Nitrogen</u>	<u>Dissolved Oxygen</u>	<u>BOD</u>	<u>Turbidity</u> ³	<u>Chloride</u>	<u>TOC</u>
1 Sevenmile Creek	7,900	360	0.01	8.6	1	45	5.5	6
2 West Nodaway River	20	350	0.01	12.7	2	6.7	7.5	8
3 West Nodaway River	23,000	370	0.01	9.4	3	40	7.0	8

TABLE 6
 Selected Bacteriological and Chemical Data from the Nodaway River
 August 14 and 15, 1978

(All values in mg/l unless specified otherwise)

8 Nodaway River	550	400	0.05	13.0	7	18	7.0	10
Clarinda WWTP	340,000	1,200	1.80	7.1	5	5.6	200	11
9 Nodaway River	17,000	340	0.30	8.8	5	55	10	12
6 Nodaway River	5,900	400	0.80	8.2	7	20	9.5	9

¹organisms per 100 ml

²micromhos per cm at 25°C

³Jackson Turbidity Units

Water quality at station 1 (located on Sevenmile Creek and collected on August 15) was influenced by the rainfall of the previous night. The rainfall affect was reflected in the elevated level of fecal coliforms (7,900 organisms/100 ml) and turbidity (45 JTU). With these two exceptions, water quality was good at station 1. As previously mentioned, the rainfall was scattered and station 2 was unaffected by the rain as demonstrated by low fecal coliforms (20 organisms per 100 ml) and turbidity (6.7 JTU). Water quality at station 2 was very good. Station 3, located downstream from the juncture of Sevenmile Creek, was affected by both the flow from Sevenmile Creek and the rainfall. The fecal coliform value was high at 23,000 organisms/100 ml. Turbidity was also moderately high at 40 JTU. With these two exceptions, water quality at this station can be considered good.

Nodaway River

The Nodaway River itself is calssified as a class B warmwater stream from the Iowa-Missouri state line to the confluence of the Middle Nodaway and the West Nodaway Rivers. In addition, the area of the river near the city of Clarinda's waterworks intake is classified as a class C water. Table 6 presents selected chemical and bacteriological data from the Nodaway River.

Water samples were collected at station 8 on August 14 and were unaffected by the rain. Water quality at station 8 can be considered good (fecal coliforms 550 organisms/100 ml, specific conductance 400 micromhos, ammonia nitrogen 0.05 mg/l).

The last station, station 16, was located just downstream from the confluence of the East Nodaway River (station 15) and the Nodaway River (station 9). Water quality at this station can be considered good (fecal coliforms 5,900 organisms/100 ml, specific conductance 400 micromhos, ammonia nitrogen 0.80 mg/l, BOD 7 mg/l, turbidity 20 JTU and TOC 9 mg/l). The effects of the scattered rain are evident but reduced at this station (fecal coliforms 5,900 organisms/100 ml, turbidity 20 JTU and specific conductance 400 micromhos).

Metals

Water samples for trace metals analysis were taken at stations 1, 3, 8, 15 and 16. The only reportable values found were for barium (0.1 mg/l at stations 1 and 3 and 0.2 mg/l at station 9 and 16). These levels are frequently found occurring naturally in Iowa surface waters.

Pesticides

Water samples were collected for pesticide analysis at station 16. Reportable values for the chlorinated insecticides dieldrin (0.015 ppb) DDE (0.004 ppb) and the herbicide atrazine (0.20 ppb) were found. These low levels are frequently found in Iowa waters although dieldrin and DDE have been banned from usage for several years.

Biological Sampling

Biological samples were taken at station 3, 7, 9, 11, 15, and 16 using kick-net and surber samplers. A kick-net sample gives an indication of the variety of macroinvertebrates present in a stream while a surber sample gives an indication of the relative abundance of each macroinvertebrate in the stream. All of the biological data collected can be found in the appendix.

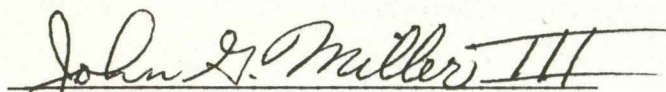
Biological data indicated that water quality was good throughout the reach of the East, Middle and West Nodaway Rivers. Mayflies (Ephemeroptera), caddisflies (Trichoptera), and two-winged flies (Diptera) were found at all stations.

Beetles (Coleoptera) and dragonflies (Odonata) were only found at stations 15 and 16. This may be indicative of the type of substrate present at those stations and does not indicate a change in water quality as compared to other stations.

SUMMARY AND CONCLUSIONS

A survey of the East, Middle and West Nodaway Rivers showed water quality to be generally good throughout the reach. Stream flows were quite high at about 30 times the 7 day Q_{10} . Some scattered rain occurred on August 15, 1978 which

caused an increase in fecal coliforms, turbidity and BOD, as well as a decrease in specific conductance to be observed at some stations. Water quality of the Nodaway River is expected to remain good at these high flows.

A handwritten signature in cursive script that reads "John G. Miller III". The signature is written in dark ink and is positioned above a horizontal line.

John G Miller III
Limnologist

LITERATURE CITED

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2. Kennedy, Jack O. 1975. East, Middle and West Nodaway Rivers - Water Quality Survey #75-25. University Hygienic Laboratory. Iowa City, Iowa. 31 p.
3. Heinitz, Albert J. 1970. Low Flow Characteristics of Iowa Streams through 1966. Iowa Natural Resources Council Bulletin No. 10. 176 p.
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APPENDIX

MACROINVERTEBRATES COLLECTED IN
THE NODAWAY RIVER BASIN
8-15/16-78
(in numbers/m²)
Surbers and Kicknet

	3	7	9	11	15	16
Ectoprocta						
Phylactolaemata						
<u>Plumatella</u> sp.						+
Arthropoda						
Insecta						
Ephemeroptera						
<u>Baetis</u> sp.	65	122	11	133		
<u>Brachycentrus</u> sp.	11		54		16	5
<u>Caenis</u> sp.	5	219	27		38	27
<u>Heptagenia</u> sp.	11	4	+	+	5	
<u>Isonychia</u> sp.	22	+	+	14	+	+
<u>Stenacron</u> sp.	+				+	
<u>Stenonema</u> sp.	5	43	+	50	+	5
<u>Tricorythodes</u> sp.	32	4	+	+		
Trichoptera						
<u>Cheumatopsyche</u> sp.	+	4	+	104	+	75
<u>Hydropsyche frisoni</u>					+	+
<u>Neureclipsis</u> sp.						+
Odonata						
<u>Argia</u> sp.					+	+
Coleoptera						
<u>Dineutus</u> sp.					+	
<u>Helichus</u> sp.					+	+
<u>Stenelmis</u> sp.						+
<u>Tropisternus</u> sp.		4				
<u>T. lateralis</u>		+			+	
Diptera						
Chironomidae	70	327	59	223	59	124
<u>Simulium</u> sp.	+	4	5	32		
Total Number	221	731	156	556	118	236
Number of Taxa	11	9	10	8	13	12

+ Organisms present but not quantified

WATER QUALITY REPORT
METALS

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

Town Source Specific Location	Villisca Middle Nodaway River Montgomery Co. Hwy 71 Br. T71N, R36W, Sec. 33/34 Station 7	Villisca West Nodaway River Montgomery Co. Rd. H46 Br. T71N, R36W, Sec. 21 Station 3	Shambaugh West Nodaway River Page Co. Rd. J53 Br. T68N, R36W, Sec. 31 Station 9
Date Collected	8/15/78	8/15/78	8/15/78
Date Received	8/16/78	8/16/78	8/16/78
Lab Number	1161	1165	1168
METALS ANALYSIS (as mg/l unless designated otherwise)			
Arsenic	<0.01	<0.01	<0.01
Barium	0.1	0.1	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	<0.1	<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

OCT 6 1978

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

**WATER QUALITY REPORT
METALS**

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

18

Town	Shambaugh	East Nodaway River	Braddyville
Source	W. Nodaway River	Page Co. Rd. J53 Br.	Nodaway River-Page Co.
Specific Location	Page Co. Rd. J53 Br. T68N, R37W, Sec. 31	T67N, R36W, Sec. 5/6 Station 15	Rd. J55 Br. T67N, R36W Sec. 30/31 Station 16
Date Collected	8/14/78. 8/15/78	8/15/78	8/15/78
Date Received	8/16/78	8/16/78	8/16/78
Lab Number	1169	1176	1177

METALS ANALYSIS (as mg/l unless designated otherwise)

Arsenic	<0.01	<0.01	<0.01
Barium	0.2	<0.1	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	<0.1	<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:

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Limnology Division
Hygienic Lab
Des Moines Branch

Date Reported **OCT 6 1978**

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

WATER QUALITY REPORT
METALS

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

Town	Braddyville		
Source	Nodaway River		
Specific Location	Page Co. Rd. J55 Br. T67N, R36W, Sec. 30/31		
Date Collected	Station 16 8/15/78		
Date Received	8/16/78		
Lab Number	1178		

METALS ANALYSIS (as mg/l unless designated otherwise)

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

REMARKS:

COLLECTOR
REPORT TO

Limnology Division
Hygienic Lab
Des Moines Branch

Date Reported **OCT 6 1978**

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

WATER QUALITY REPORT

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

Town	Massena	Cumberland	West Fork Middle Nodaway
Source	WWTP final effluent	WWTP final effluent	River-Adair Co. Rd. Br.
Specific Location	(TF)-BC T75N, R34W Sec. 32 Cass Co.	(TF)-BC, T75N, R35W Sec. 28 Cass Co.	T74N, R33W. Sec. 28
Date Collected	8/15/78	8/15/78	8/15/78
Date Received	8/16/78	8/16/78	8/16/78
Lab Number	1155	1156	1157
Collection Time	1300	FIELD DATA	1350
pH		1230	
Temperature	20°C	22°C	28°C water 26°C air
Dissolved Oxygen			
	BACTERIOLOGICAL EXAMINATION		
Fecal Coliform/100 ml	880,000	1,600,000	58,000
	CHEMICAL ANALYSIS (as mg/l unless designated otherwise)		
Conductance (micromhos)	950	880	380
MBAS (as LAS)			
pH (units)	7.75	7.7	8.1
Alkalinity: P	none	none	none
T	208	217	156
NITROGEN: Organic N	2.6	4.9	0.99
Ammonia N	3.2	7.9	0.02
Nitrite N			
Nitrate N	8.3	11	1.4
Nitrate as NO ₃			
RESIDUE: Total	702	636	348
Fixed	496	418	246
Volatile	206	218	102
Filtrable Residue T	688	600	270
F	496	412	184
V	192	188	86
Nonfiltrable Residue T	14	36	78
F	0	6	62
V	14	30	16
Settleable Matter (ml/l)			
PHOSPHATE: Filtrable P	3.8	8.9	0.25
Total P	6.4	9.9	0.33
Dissolved Oxygen	6.2	5.4	8.2
BOD	14	27	5
COD	69	103	27
Grease or Oil			
Turbidity (JTU)	12	19	40
Total Hardness (as CaCO ₃)			
Calcium (Ca ⁺⁺)			
Magnesium (Mg ⁺⁺)			
Chloride (Cl ⁻)	86	75	8.0
Sulfate (SO ₄ ⁻)			
total organic carbon	22	39	12

REMARKS:

COLLECTOR
REPORT TO

Limnology Division
Hygienic Lab
Des Moines Branch

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

OCT 6 1978

WATER QUALITY REPORT

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

Town	Mount Etna	Dickieville	Villisca
Source	Middle Nodaway River	Middle Nodaway River	WWTP final effluent (TF)-BC
Specific Location	Adams Co. Rd. H20 Br. T73N, R34W, Sec. 14 Station 5	Adams Co. Rd. Br., T72N, R35W, Sec. 20/21 Station 6	T71N, R36W, Sec. 27 Montgomery Co.
Date Collected	8/15/78	8/14/78	8/15/78
Date Received	8/16/78	8/16/78	8/16/78
Lab Number	1158	1159	1160
Collection Time	1415	FIELD DATA	1030
pH			
Temperature	28°C	32°C water 36°C air	18°C
Dissolved Oxygen			
	BACTERIOLOGICAL EXAMINATION		
Fecal Coliform/100 ml	110,000	180	350,000
	CHEMICAL ANALYSIS (as mg/l unless designated otherwise)		
Conductance (micromhos)	360	400	1100
MBAS (as LAS)			
pH (units)	8.3	8.2	7.5
Alkalinity: P	none	none	none
T	150	164	140
NITROGEN: Organic N	1.2	0.74	2.6
Ammonia N	0.02	0.16	4.3
Nitrite N			
Nitrate N	0.4	0.1	19
Nitrate as NO ₃			
RESIDUE: Total	308	282	800
Fixed	250	230	578
Volatile	58	52	222
Filtrable Residue T	248	270	784
F	204	226	572
V	44	44	212
Nonfiltrable Residue T	60	12	16
F	46	4	6
V	14	8	10
Settleable Matter (ml/l)			
PHOSPHATE: Filtrable P	0.21	0.08	2.2
Total P	0.34	0.16	3.3
Dissolved Oxygen	10.9	13.2	8.2
BOD	4	4	8
COD	31	16	46
Grease or Oil			
Turbidity (JTU)	32	6.2	6.4
Total Hardness (as CaCO ₃)			
Calcium (Ca ⁺⁺)			
Magnesium (Mg ⁺⁺)			
Chloride (Cl ⁻)	7.0	8.0	90
Sulfate (SO ₄ ⁻)			
Total Organic Carbon	12	9	21

REMARKS:

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OCT 6 1978

WATER QUALITY REPORT

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

Town	Villisca	Seven Mile Creek	West Nodaway River
Source	Middle Nodaway River	Montgomery Co. Rd. H20	Montgomery Co. Rd. H20 Br.
Specific Location	Montgomery Co. Hwy 71 Br. T71N, R36W, Sec. 33/34 Station 7	Bridge, T73N, R36W, Sec. 20/29	T73N, R36W, Sec. 21/28
Date Collected	8/15/78	Station 1 8/15/78	Station 2 8/15/78
Date Received	8/16/78	8/16/78	8/16/78
Lab Number	1161	1162	1163
Collection Time	1810	1510	1520
pH		FIELD DATA	
Temperature	24°C water, 21°C air	25°C water, 29°C air	29°C water, 28°C air
Dissolved Oxygen			
	BACTERIOLOGICAL EXAMINATION		
Fecal Coliform/100 ml	75,000	7900	20
	CHEMICAL ANALYSIS (as mg/l unless designated otherwise)		
Conductance (micromhos)	440	360	350
MBAS (as LAS)			
pH (units)	8.55	8.1	8.8
Alkalinity: P	6.6	none	5.6
T	167	148	143
NITROGEN: Organic N	1.6	0.58	0.51
Ammonia N	1.3	0.01	0.01
Nitrite N			
Nitrate N	1.0	3.1	1.0
Nitrate as NO ₃			
RESIDUE: Total	316	364	252
Fixed	216	304	174
Volatile	100	60	78
Filtrable Residue T	290	248	240
F	202	200	168
V	88	48	72
Nonfiltrable Residue T	26	116	12
F	16	104	6
V	10	12	6
Settleable Matter (ml/l)			
PHOSPHATE: Filtrable P	0.29	0.21	0.06
Total P	0.36	0.24	0.11
Dissolved Oxygen	11.9	8.6	12.7
BOD	6	1	2
COD	58	10	12
Grease or Oil			
Turbidity (JTU)	16	45	6.7
Total Hardness (as CaCO ₃)			
Calcium (Ca ⁺⁺)			
Magnesium (Mg ⁺⁺)			
Chloride (Cl ⁻)	11	5.5	7.5
Sulfate (SO ₄ ⁻)			
Total Organic Carbon	12	6	8

REMARKS:

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OCT 6 1978

WATER QUALITY REPORT

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

Town	West Nodaway River	Villisca	West Nodaway River
Source	Montgomery Co. Rd.	West Nodaway River	Page Co. Rd. Bridge
Specific Location	H2O Br. T73N, R36W, Sec. 21/28 Station 2	Montgomery Co. Rd. H46 Br. T71N, R36W Sec. 21 Station 3	T69N. R36W, Sec. 16 Station 8
Date Collected	8/15/78	8/15/78	8/14/78
Date Received	8/16/78	8/16/78	8/16/78
Lab Number	1164	1165	1166
Collection Time	1520	1620	1545
pH		FIELD DATA	
Temperature	29°C water, 28°C air	27°C water, 25°C air	30°C
Dissolved Oxygen			
	BACTERIOLOGICAL EXAMINATION		
Fecal Coliform/100 ml	80	23,000	550
	CHEMICAL ANALYSIS (as mg/l unless designated otherwise)		
Conductance (micromhos)	340	370	400
MBAS (as LAS)			
pH (units)	8.7	8.2	8.7
Alkalinity: P	5.4	none	5.8
T	142	149	160
NITROGEN: Organic N	0.48	0.57	0.80
Ammonia N	0.03	0.01	0.05
Nitrite N			
Nitrate N	1.1	2.0	1.7
Nitrate as NO ₃			
RESIDUE: Total	258	400	352
Fixed	134	302	284
Volatile	124	98	68
Filtrable Residue T	250	272	282
F	132	210	222
V	118	62	60
Nonfiltrable Residue T	8	128	72
F	2	92	62
V	6	36	10
Settleable Matter (ml/l)			
PHOSPHATE: Filtrable P	0.06	0.18	0.14
Total P	0.10	0.23	0.23
Dissolved Oxygen	12.1	9.4	13.0
BOD	3	3	7
COD	9	15	21
Grease or Oil			
Turbidity (JTU)	6.7	40	18
Total Hardness (as CaCO ₃)			
Calcium (Ca ⁺⁺)			
Magnesium (Mg ⁺⁺)			
Chloride (Cl ⁻)	7.0	7.0	7.0
Sulfate (SO ₄ ⁻)			
Total Organic Carbon	7	8	10

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COLLECTOR
REPORT TO

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OCT 6 1978

WATER QUALITY REPORT

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

Town	Clarinda	Shambaugh	Shambaugh
Source	WWTP final effluent	West Nodaway River	West Nodaway River
Specific Location	(TF)-BC, T68N, R37W Sec. 7 Page Co.	Page Co. Rd. J53 Br. T68N, R36W. Sec. 31 Station 9	Page Co. Rd. J53 Br. T68N R36W Sec. 31
Date Collected	8/14/78	8/15/78	8/14/78, 8/15/78
Date Received	8/16/78	8/16/78	8/16/78
Lab Number	1167	1168	1169
Collection Time	1630	FIELD DATA 0820	1800 to 1800 24 hr comp.
pH			
Temperature	22°C	25°C water, 23°C air	
Dissolved Oxygen			
BACTERIOLOGICAL EXAMINATION			
Fecal Coliform/100 ml	340,000	17,000	8900
CHEMICAL ANALYSIS (as mg/l unless designated otherwise)			
Conductance (micromhos)	1200	340	400
MBAS (as LAS)			
pH (units)	7.5	8.4	8.0
Alkalinity: P	none	0.8	none
T	154	153	154
NITROGEN: Organic N	1.6	1.2	2.9
Ammonia N	1.8	0.3	<0.01
Nitrite N			
Nitrate N	5.6	1.5	0.9
Nitrate as NO ₃			
RESIDUE: Total	792	496	1560
Fixed	498	414	1400
Volatile	294	82	160
Filtrable Residue T	792	292	272
F	498	242	244
V	294	50	28
Nonfiltrable Residue T	0	204	1290
F	0	172	1160
V	0	32	130
Settleable Matter (ml/l)			
PHOSPHATE: Filtrable P	3.3	0.29	0.42
Total P	5.3	0.61	0.79
Dissolved Oxygen	7.1	8.8	
BOD	5	5	55
COD	42	29	132
Grease or Oil			
Turbidity (JTU)	5.6	55	90
Total Hardness (as CaCO ₃)			
Calcium (Ca ⁺⁺)			
Magnesium (Mg ⁺⁺)			
Chloride (Cl ⁻)	200	10	11
Sulfate (SO ₄ ⁻²)			
Total Organic Carbon	11	12	40

REMARKS:

COLLECTOR
REPORT TO

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OCT 6 1978

WATER QUALITY REPORT

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

Town	Prescott	Corning	Brooks
Source	E. Nodaway River	WWTP final effluent	E. Nodaway River
Specific Location	Adams Co. Rd. N55 Br. T72N, R33W, Sec. 27/28 Station 10	(TF)-BC, T72N, R34W Sec. 3 Adams Co.	Adams Co. Rd. Bridge T71N, R35W, Sec. 12 Station 11
Date Collected	8/14/78	8/14/78	8/14/78
Date Received	8/16/78	8/16/78	8/16/78
Lab Number	1170	1171	1172
Collection Time	1300	FIELD DATA	1335
pH			
Temperature	30°C	25°C	31°C water, 32°C air
Dissolved Oxygen			
BACTERIOLOGICAL EXAMINATION			
Fecal Coliform/100 ml	70	48,000	440
CHEMICAL ANALYSIS (as mg/l unless designated otherwise)			
Conductance (micromhos)	340	830	360
MBAS (as LAS)			
pH (units)	8.75	7.7	8.8
Alkalinity: P	5.8	none	6.0
T	135	139	137
NITROGEN: Organic N	1.2	2.7	1.3
Ammonia N	0.03	0.10	0.02
Nitrite N			
Nitrate N	0.8	18	<0.1
Nitrate as NO ₃			
RESIDUE: Total	232	654	196
Fixed	194	502	118
Volatile	38	152	78
Filtrable Residue T	222	594	168
F	194	478	112
V	28	116	56
Nonfiltrable Residue T	10	60	28
F	0	24	6
V	10	36	22
Settleable Matter (ml/l)			
PHOSPHATE: Filtrable P	0.06	3.8	0.10
Total P	0.19	7.2	0.19
Dissolved Oxygen	12.5	12.9	15.3
BOD	6	12	8
COD	25	45	29
Grease or Oil			
Turbidity (JTU)	11	24	11
Total Hardness (as CaCO ₃)			
Calcium (Ca ⁺⁺)			
Magnesium (Mg ⁺⁺)			
Chloride (Cl ⁻)	9.0	56	10
Sulfate (SO ₄ ⁻)			
Total Organic Carbon	12	12	12

REMARKS:

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WATER QUALITY REPORT

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

Town	Kemp Creek	Nodaway	E. Nodaway River
Source	Adams Co. Hwy 34 Br.	E. Nodaway River	Taylor Co. Rd. Bridge
Specific Location	T71N, R35W, Sec. 1 Station 12	Adams Co. Hwy 155 Br. T71N, R35W, Sec. 17 Station 13	T70N, R35W, Sec. 8 Station 14
Date Collected	8/14/78	8/14/78	8/15/78
Date Received	8/16/78	8/16/78	8/16/78
Lab Number	1173	1174	1175
Collection Time	1320	FIELD DATA 1415	1000
pH			
Temperature	30°C	31°C water, 32°C air	23°C water, 24°C air
Dissolved Oxygen			
	BACTERIOLOGICAL EXAMINATION		
Fecal Coliform/100 ml	1500	700	110,000
	CHEMICAL ANALYSIS (as mg/l unless designated otherwise)		
Conductance (micromhos)	300	380	350
MBAS (as LAS)			
pH (units)	8.5	8.4	7.8
Alkalinity: P	3.0	1.0	none
T	136	148	138
NITROGEN: Organic N	0.99	1.0	1.7
Ammonia N	0.02	0.05	0.10
Nitrite N			
Nitrate N	<0.1	<0.1	0.2
Nitrate as NO ₃			
RESIDUE: Total	222	262	364
Fixed	136	196	282
Volatile	86	66	82
Filtrable Residue T	196	246	234
F	134	196	178
V	62	50	56
Nonfiltrable Residue T	26	16	130
F	2	0	104
V	24	16	26
Settleable Matter (ml/l)			
PHOSPHATE: Filtrable P	0.08	0.06	0.22
Total P	0.15	0.16	0.41
Dissolved Oxygen	8.3	16.9	8.9
BOD	4	7	8
COD	27	27	37
Grease or Oil			
Turbidity (JTU)	17	11	40
Total Hardness (as CaCO ₃)			
Calcium (Ca ⁺⁺)			
Magnesium (Mg ⁺⁺)			
Chloride (Cl ⁻)	5.0	8.0	8.0
Sulfate (SO ₄ ⁻²)			
tal Organic Carbon	11	11	18

REMARKS:

COLLECTOR
REPORT TO

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OCT 6 1978

WATER QUALITY REPORT

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

Town	E. Nodaway River	Braddyville	Braddyville
Source	Page Co. Rd. J53 Br.	Nodaway River	Nodaway River
Specific Location	T67N, R36W, Sec. 5/6 Station 15	Page Co. Rd. J55 Br. T67N, R36W, Sec. 30/31 Station 16	Page Co. Rd. J55 Br., T67N R36W, Sec. 30/31 Station 16
Date Collected	8/15/78	8/15/78	8/15/78
Date Received	8/16/78	8/16/78	8/16/78
Lab Number	1176	1177	1178
Collection Time	0810	FIELD DATA	0750
pH			
Temperature	24°C water, 22°C air	25°C water, 22°C air	25°C water, 22°C air
Dissolved Oxygen			
BACTERIOLOGICAL EXAMINATION			
Fecal Coliform/100 ml	1300	5900	2900
CHEMICAL ANALYSIS (as mg/l unless designated otherwise)			
Conductance (micromhos)	370	400	400
MBAS (as LAS)			
pH (units)	8.1	8.5	8.5
Alkalinity: P	none	2.4	2.4
T	140	157	158
NITROGEN: Organic N	1.1	1.1	1.2
Ammonia N	0.04	0.80	0.07
Nitrite N			
Nitrate N	<0.1	0.9	0.9
Nitrate as NO ₃			
RESIDUE: Total	288	312	344
Fixed	198	258	240
Volatile	90	54	104
Filtrable Residue T	234	242	268
F	168	212	192
V	66	30	76
Nonfiltrable Residue T	54	70	76
F	30	46	48
V	24	24	28
Settleable Matter (ml/l)			
PHOSPHATE: Filtrable P	0.11	0.18	0.17
Total P	0.30	0.33	0.33
Dissolved Oxygen	8.3	8.2	8.5
BOD	9	7	7
COD	34	28	47
Grease or Oil			
Turbidity (JTU)	21	20	20
Total Hardness (as CaCO ₃)			
Calcium (Ca ⁺⁺)			
Magnesium (Mg ⁺⁺)			
Chloride (Cl ⁻)	7.5	9.5	9.0
Sulfate (SO ₄ ⁻²)			
Total Organic Carbon	12	9	9

REMARKS:

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