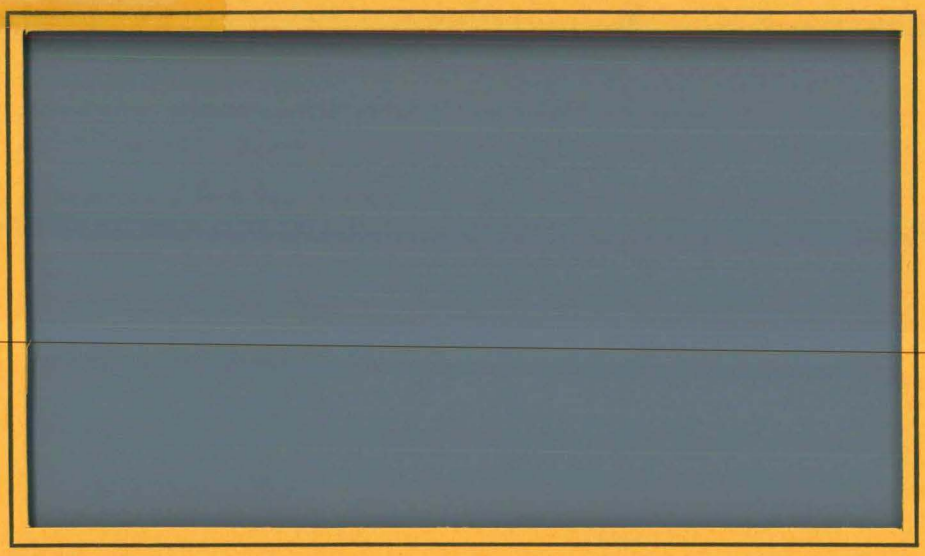

A REPORT FROM

The State Hygienic Laboratory

MEDICAL LABORATORIES BUILDING

THE UNIVERSITY OF IOWA

IOWA CITY, IOWA 52242

WATER QUALITY SURVEY OF THE SOLDIER RIVER AND ITS TRIBUTARIES

#78 - 10

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

The publication of this report was financially acted through a contract between the Iowa Department of Environmental Quality and University of Iowa, State Hygienic Laboratory utilizing funds made available to the Iowa Department of Environmental Quality by the United States Environmental Protection Agency.

ABSTRACT

A water quality survey of the Soldier River and its tributaries was conducted during June 1977. The purpose of the survey was to obtain background data from a stream on which future rainfall runoff surveys are planned. Water quality data indicates an average quality stream with most values falling in ranges expected for Western Iowa streams during early summer. Fecal coliform values at several stations were higher than expected and will be closely observed during future surveys. Information from this survey will serve as a data base for comparison to rainfall runoff surveys that are planned.

INTRODUCTION

The Soldier River originates in southeastern Ida county and flows southwesterly for approximately 72 miles before its juncture with the Missouri River near Mondamin in Harrison County, Iowa. The Soldier River flows mostly through agricultural land with no major communities situated along its banks. Much of the river has been straightened, resulting in a heavily silted stream bottom. The stream is of minor fishing importance with only the lower reaches providing any value for fishing (Iowa Conservation Commission).

The drainage area of the Soldier River encompasses some 445 square miles with the East Soldier River as its main tributary. Other tributaries include Jordan Creek, Beaver Creek, Norway Creek, Elk Creek and the Middle Soldier River.

The Soldier River is classified as a class B warmwater stream from its mouth to its confluence with the East Soldier River (Figure 1) and the appropriate Iowa Water Quality Standards apply to this reach.

The purpose of this survey was to obtain data on stream quality as affected by rainfall runoff. The extremely dry spring and summer conditions made that type of survey virtually impossible. As a result, the survey was conducted during June to provide background levels for comparison to future rainfall runoff surveys of the Soldier River.

A permanent United States Geological Survey gage station is located on the Soldier River at Pisgah, Iowa. Flow data obtained from the USGS for 9 June 1977 was 10.2 cfs which is approximately the 7 day Q_{10} of 3 cfs.

Figure 1 is a map of the sampling area and Table 1 is a list of the approximate sampling locations.

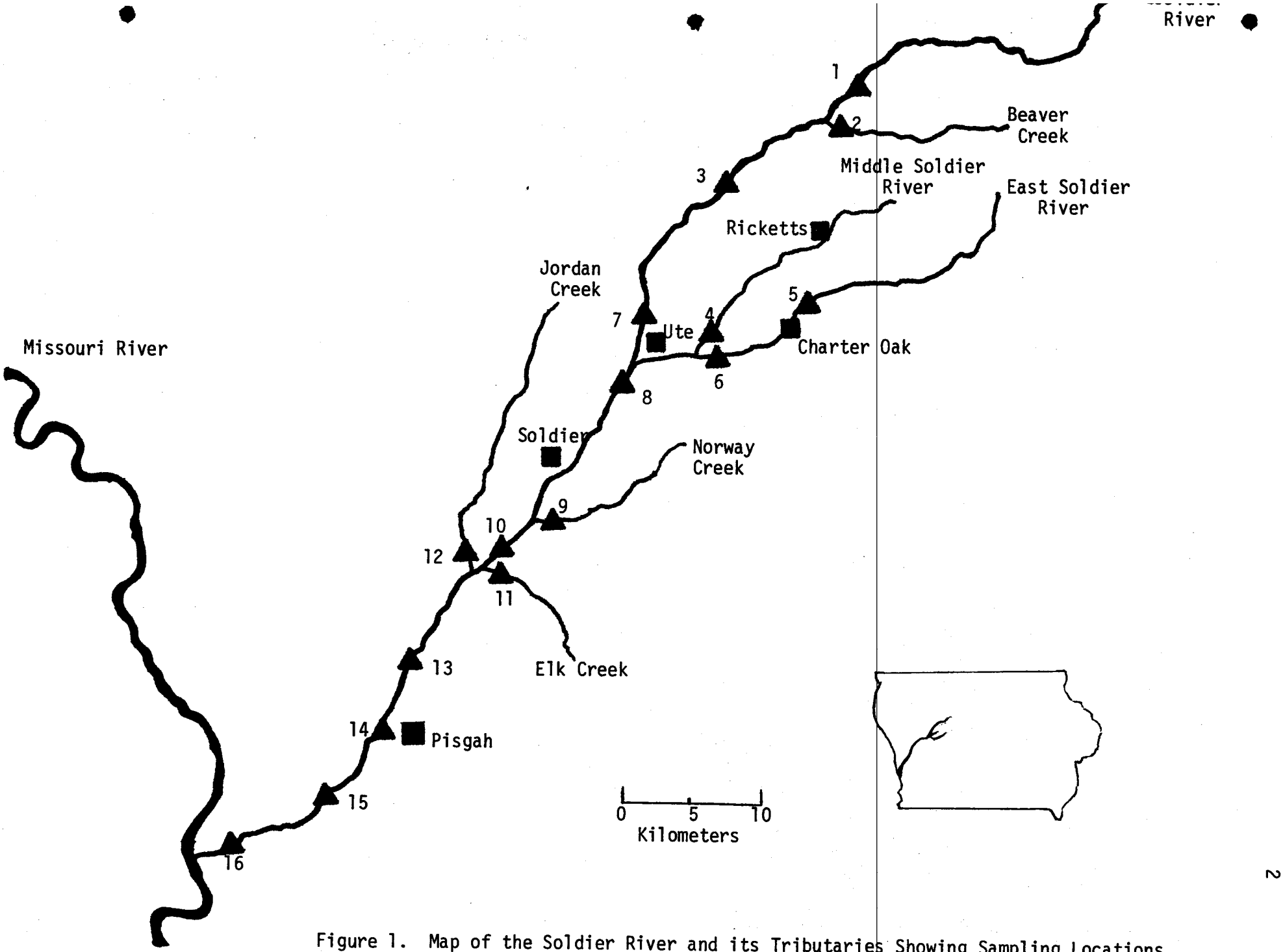

Figure 1. Map of the Soldier River and its Tributaries Showing Sampling Locations.

TABLE 1
Soldier River Sampling Locations
6 June 1977

Station		Location
1	Soldier River	Ida Co. Rd. D54 Bridge, T86N, R40W, Sec. 30/31
2	Beaver Creek	Carwford Co. Rd. Bridge, T85N, R41W, Sec. 1/12
3	Soldier River	Crawford Co. Rd. E16 Bridge, T85N, R41W, Sec. 17/20
4	Middle Soldier River	Crawford Co. Rd. Bridge, T84N, R41W, Sec. 19/30
5	East Soldier River	Crawford Co. Rd. L51 Bridge, T84N, R41W, Sec. 13/14
6	East Soldier River	Crawford Co. Hwy 141 Bridge, T84N, R41W, Sec. 30/31
7	Soldier River	Monona Co. Rd. E34 Bridge, T84N, R42W, Sec. 22/27
8	Soldier River	Monona Co. Rd. Bridge, T83N, R42W, Sec. 4
9	Norway Creek	Monona Co. Rd. Bridge, T82N, R42W, Sec. 6
10	Soldier River	Monona Co. Rd. E54 Bridge, T82N, R43W, Sec. 10/15
11	Elk Creek	Monona Co. Rd. L16 Bridge, T82N, R43W, Sec. 15
12	Jordan Creek	Monona Co. Hwy 183 Bridge, T82N, R43W, Sec. 16
13	Soldier River	Monona Co. Rd. Bridge, T82N, R43W, Sec. 31
14	Soldier River	Harrison Co. Rd. F20 Bridge, T81N, R44W, Sec. 14
15	Soldier River Drainage Ditch	Harrison Co. Rd. Bridge, T80N, R44W, Sec. 4
16	Soldier River Drainage Ditch	Harrison Co. Rd. Bridge, T80N, R45W, Sec. 14

RESULTS AND DISCUSSION

Tables 2 and 3 are a collection of selected data accumulated from the June 6 survey of the Soldier River and its tributaries. All data collected during that survey may be found in the Appendix. The first section of the discussion will deal with the Soldier River followed by discussion of the Soldier River tributaries.

Soldier River

With the survey collected under non-runoff conditions, and not having any major point source discharges located on the Soldier River, water quality was fairly consistent throughout the entire reach.

Fecal coliforms ranged from 220 - 2100 organisms per 100 ml with a nine station average of 780 organisms/100 ml. These fecal coliform levels under non-runoff conditions, are somewhat higher than would normally be expected. Most of the sampling stations had elevated fecal coliform values indicating that their origin may not have been the usual point source discharge and appears to be a typical background level for the Soldier River. Station 10, located downstream of Soldier, Iowa, had the highest (2100 organisms/100 ml) fecal coliform value. According to the Iowa Department of Enviornmental Quality Western Iowa Basin plan, the waste treatment at Soldier is by individual septic tanks and the drainage from these tanks may be responsible for the elevated fecal coliforms at Station 10.

Organic nitrogen values were less than 1.0 mg/L, ammonia nitrogen values less than 0.1 mg/L and nitrate nitrogen values less than 0.5 mg/L at all stations. The low organic nitrogen indicates there was not much organic matter in the stream. Phosphates, both filtrable and total, were low and at expected early summer levels. Dissolved oxygen was adequate at all

TABLE 2

Selected Chemical and Bacteriological Data

Soldier River
6 June 1977

(all values in mg/L unless designated otherwise)

tations	Fecal Coliforms per 100 ml	Specific Conductance*	Nitrogen Organic	Nitrogen Ammonia	Nitrate	Phosphate Filtrable	Phosphate Total	DO	BOD	COD	Turbidity (NTU)
1	460	550	0.90	0.06	0.3	0.06	0.18	11.8	4	38	18
3	560	560	0.74	0.05	<0.1	0.06	0.15	10.4	4	30	16
7	220	610	0.54	0.06	0.2	0.10	0.17	10.8	3	34	15
8	350	640	0.52	0.06	<0.1	0.08	0.14	9.6	2	28	12
10	2100	670	0.67	0.05	0.1	0.18	0.28	8.7	3	34	27
13	1400	700	0.46	0.08	0.4	0.18	0.24	9.2	1	32	22
14	900	690	0.48	0.06	0.3	0.18	0.24	9.2	2	29	19
15	650	650	0.52	0.04	0.1	0.17	0.25	9.3	1	30	22
16	390	640	0.62	0.02	<0.1	0.16	0.26	9.0	3	31	24

*Micromhos

stations, ranging from 8.7 mg/L to 11.8 mg/L. BOD and COD were low at most stations indicating, as with the organic nitrogen, a lack of organic matter to be decomposed. Turbidity values ranged from 12 to 27 NTUs which are indicative of a stream under non-runoff conditions.

Soldier River Tributaries

With a few exceptions, most water quality parameters on the tributaries indicated average background levels (Table 3). The tributaries had a wider range of fecal coliform values (540 - 4600 organisms/100 ml) and a higher average (1400 organisms/100 ml). The high value found at Station 4 may be caused by the municipal point source discharge from Ricketts, Iowa. The remaining values are difficult to attribute to any point source and again probably reflect background levels.

The nitrogen and phosphate values were low and comparable to the Soldier River. Dissolved oxygen content was sufficient at all stations for aquatic life maintenance and propagation.

BOD and COD values were slightly elevated compared to the Soldier River but still within expected ranges.

Turbidity at Station 12 (Jordan Creek) was significantly higher (110 NTUs) as compared to the other tributary stations. Several other parameters (specific conductance, organic nitrogen, nitrate nitrogen, phosphate and BOD) were also elevated compared to the other tributaries. There are no specific sources or causes at this time that may be attributed to the variation in water quality observed on Jordan Creek. Future water quality surveys will attempt to determine if values found on Jordan Creek are typical or atypical.

TABLE 3

SOLDIER RIVER TRIBUTARIES

6 June 1977

(all values in mg/L unless designated otherwise)

tations	Fecal Coliforms per 100 ml	Specific Conductance*	Nitrogen Organic	Nitrogen Ammonia	Nitrate	Phosphate Filtrable	Phosphate Total	DO	BOD	COD	Turbidity (NTU)
Beaver Creek	910	800	0.54	0.14	1.5	0.17	0.18	9.3	2	28	7
Middle Soldier R.	4600	740	0.98	0.18	0.4	0.14	0.22	11.0	4	36	14
East Soldier R.	560	670	0.93	0.04	<0.1	0.22	0.30	10.1	3	37	22
East Soldier R.	1000	710	2.8	0.03	0.2	0.15	0.26	8.0	7	54	23
Norway Creek	1300	700	1.5	0.13	0.5	0.15	0.27	8.8	5	44	29
Elk Creek	910	670	1.2	0.06	0.8	0.01	0.12	9.9	5	41	15
Jordan Creek	540	350	2.3	0.05	2.3	0.41	0.64	11.5	6	63	110

*Micromhos

Metals Data

Water samples for metals analysis were collected at four stations on the Soldier River. The only reportable metals values obtained were for both barium and zinc, which are routinely observed in most water samples collected in Iowa. This background information will provide excellent comparison data for future runoff surveys.

Pesticide Data

Pesticide analysis was performed on five water samples collected from the Soldier River. Results of that analysis are listed below:

SOLDIER RIVER PESTICIDES
6 June 1977
(all values in ug/L - parts per billion)

Station	Lasso	Dyfonate	Atrazine	Bladex	Dieldrin
6 East Soldier River	0.87	0.77	6.0	1.4	0.006
7	0.61	0.19	4.2	0.9	ND
8	1.8	0.31	4.5	1.9	0.005
13	0.59	0.17	3.7	0.62	ND
16	1.0	0.80	5.8	1.3	0.007

ND - Not Detected

Lasso, Atrazine and Bladex are herbicides, applied regularly in the spring to control weeds. As a compound, they are generally more water soluble than insecticides and have a shorter lifetime. The herbicide values found in the Soldier River were low and within ranges expected to occur during this time of year.

Dyfonate, an organophosphate insecticide which is very transient, also has a short soil lifetime. The dyfonate values were also low and represent seasonal levels.

The presence of dieldrin, formed from aldrin, indicates its persistent nature as it has been banned from usage since 1974. The values for dieldrin are very low and similar to what is being found in streams throughout the state during non-runoff conditions.

CONCLUSIONS

Water quality of the Soldier River and its tributaries during June, 1977 was average. Low stream flows (approximately 3 times the 7 day Q_{10}) resulted in only minor variations in water quality. Fecal coliform levels were higher than expected and could not be attributed to any one point source. This survey will provide valuable background data for future runoff surveys.

Jack O. Kennedy

Jack O Kennedy
Limnologist

APPENDIX

WATER QUALITY REPORT

STATE HYGIENIC LABORATORY, Des Moines Branch
The University of Iowa
E 7th & Court, Rm 405, Des Moines, Iowa 50309

Town			
Source	Soldier River	Beaver Creek	Soldier River
Specific Location	Co. Rd. D54, T86N, R40W Sec. 30/31	Co. Rd. T85N, R41W, Sec. 1/12	Co. Rd. E16, T85N, R41W Sec. 17/20
Date Collected	6 June 1977	6 June 1977	6 June 1977
Date Received	7 June 1977	7 June 1977	7 June 1977
Lab Number	4933	4934	4935
	FIELD DATA		
Collection Time	12:05	12:20	1:40 pm
pH			
Temperature	24.5°C	23°C	26°C
Dissolved Oxygen			
	BACTERIOLOGICAL EXAMINATION		
Fecal Coliform/100 ml	460	910	560
	CHEMICAL ANALYSIS (as mg/l unless designated otherwise)		
Conductance (micromhos)	550	800	560
MBAS (as LAS)			
pH (units)	8.05	7.9	8.0
Alkalinity: P	none	none	none
T	259	355	252
NITROGEN: Organic N	0.90	0.56	0.74
Ammonia N	0.06	0.14	0.05
Nitrite N			
Nitrate N	0.3	1.5	<0.1
Nitrate as NO_3			
RESIDUE: Total	438	572	418
Fixed	333	441	320
Volatile	105	131	98
Filtrable Residue T	343	522	351
F	264	437	284
V	79	85	67
Nonfiltrable Residue T	75	17	49
F	62	11	39
V	13	6	10
Settleable Matter (ml/l)			
PHOSPHATE: Filtrable P	0.06	0.17	0.06
Total P	0.18	0.18	0.15
Dissolved Oxygen	11.8	9.3	10.4
BOD	4	2	4
COD	38	28	30
Grease or Oil			
Turbidity (JTU)	18	7.0	16
Total Hardness (as $CaCO_3$)			
Calcium (Ca^{++})			
Magnesium (Mg^{++})			
Chloride (Cl^-)	9.0	12	8.5
Sulfate (SO_4^{--})			
Total Organic Carbon	14.4	11.2	11.8
Chlorophyll a	44 µg/L	7 µg/L	45 µg/L

REMARKS:

COLLECTOR REPORT TO: Miller, Granston
State Hygienic Lab
Des Moines Branch
Limnology Division

R. L. Morris, Ph.D.
Associate Director & Principal Chemist

JUN 27 1977

WATER QUALITY REPORT

STATE HYGIENIC LABORATORY, Des Moines Branch
The University of Iowa
E 7th & Court, Rm 405, Des Moines, Iowa 50309

Town Source Specific Location	Middle Soldier River Co. Rd. T84N R41W, Sec. 19/30	East Soldier River Co. Rd. L51, T84N, R41W Sec. 13/14	East Soldier River Hwy 141 Br. T84N, R41W Sec. 30/31
Date Collected Date Received Lab Number	6 June 1977 7 June 1977 4936	6 June 1977 7 June 1977 4937	6 June 1977 7 June 1977 4938
FIELD DATA			
Collection Time	1:25 pm	1:00 pm	2:00 pm
pH			
Temperature	27oC	26°C	26°C
Dissolved Oxygen			
BACTERIOLOGICAL EXAMINATION			
Fecal Coliform/100 ml	4600	560	1000
CHEMICAL ANALYSIS (as mg/l unless designated otherwise)			
Conductance (micromhos)	740	670	710
MBAS (as LAS)			
pH (units)	7.7	7.85	7.65
Alkalinity: P	none	none	none
T	361	308	354
NITROGEN: Organic N	0.98	0.93	2.8
Ammonia N	0.18	0.04	0.03
Nitrite N			
Nitrate N	0.4	<0.1	0.2
Nitrate as NO_3			
RESIDUE: Total	510	518	520
Fixed	384	413	389
Volatile	126	105	131
Filtrable Residue T	460	413	448
F	363	336	351
V	97	77	97
Nonfiltrable Residue T	29	88	52
F	21	74	42
V	8	14	10
Settleable Matter (ml/l)			
PHOSPHATE: Filtrable P	0.14	0.22	0.15
Total P	0.22	0.30	0.26
Dissolved Oxygen	11.0	10.1	8.0
BOD	4	3	7
COD	36	37	54
Grease or Oil			
Turbidity (JTU)	14	22	23
Total Hardness (as $CaCO_3$)			
Calcium (Ca^{++})			
Magnesium (Mg^{++})			
Chloride (Cl^-)	14	18	14
Sulfate (SO_4^{--})			
Total Organic Carbon	14.3	11.7	18.3
Chlorophyll a	52 µg/L	35 µg/L	19 µg/L

REMARKS:

COLLECTOR REPORT TO: Miller, Granston
Limnology Division
State Hygienic Lab
Des Moines Branch

JUN 27 1977

R. L. Morris, Ph.D.
Associate Director & Principal Chemist

WATER QUALITY REPORT

STATE HYGIENIC LABORATORY, Des Moines Branch
The University of Iowa
E 7th & Court, Rm 405, Des Moines, Iowa 50309

Town Source Specific Location	Soldier River Co. Rd. E34, T84N, R42W Sec. 22/27	Soldier River Co. Rd. T83N, R42W Sec. 4	Norway Creek Co. Rd. T82N, R42W Sec. 6
Date Collected Date Received Lab Number	6 June 1977 7 June 1977 4939	6 June 1977 7 June 1977 4940	6 June 1977 7 June 1977 4941
FIELD DATA			
Collection Time pH Temperature Dissolved Oxygen	2:20 pm 27°C	2:35 pm 28°C	3:00 pm 27°C
BACTERIOLOGICAL EXAMINATION			
Fecal Coliform/100 ml	220	350	1300
CHEMICAL ANALYSIS (as mg/l unless designated otherwise)			
Conductance (micromhos)	610	640	700
MBAS (as LAS)			
pH (units)	7.9	7.9	7.85
Alkalinity: P	none	none	none
T	294	296	348
NITROGEN: Organic N	0.54	0.52	1.5
Ammonia N	0.06	0.06	0.13
Nitrite N			
Nitrate N	0.2	<0.1	0.5
Nitrate as NO_3			
RESIDUE: Total	452	458	638
Fixed	343	337	503
Volatile	109	121	135
Filtrable Residue T	385	402	446
F	306	324	340
V	79	78	106
Nonfiltrable Residue T	50	35	205
F	41	27	188
V	9	8	17
Settleable Matter (ml/l)			
PHOSPHATE: Filtrable P	0.10	0.08	0.15
Total P	0.17	0.14	0.27
Dissolved Oxygen	10.8	9.6	8.8
BOD	3	2	5
COD	34	28	44
Grease or Oil			
Turbidity (JTU)	15	12	29
Total Hardness (as $CaCO_3$)			
Calcium (Ca^{++})			
Magnesium (Mg^{++})			
Chloride (Cl^-)	7.5	12	7.5
Sulfate (SO_4^{--})			
otal organic carbon	8.6	9.0	14.9
Chlorophyll a	22 µg/L	21 µg/L	48 µg/L

REMARKS:

COLLECTOR: Miller, Granston
REPORT TO: Limnology Division
State Hygienic Lab
Des Moines Branch

R. L. Morris, Ph.D.
Associate Director & Principal Chemist

JUN 27 1977

WATER QUALITY REPORT

STATE HYGIENIC LABORATORY, Des Moines Branch
The University of Iowa
E 7th & Court, Rm 405, Des Moines, Iowa 50309

Town			
Source	Soldier River	Elk Creek	Jordan Creek
Specific Location	Co. Rd. E54, T82N R43W Sec. 10/15	Co. Rd. L16, T82N, R43W Sec. 15	Hwy 183, T82N, R43W, Sec. 16
Date Collected	6 June 1977	6 June 1977	6 June 1977
Date Received	7 June 1977	7 June 1977	7 June 1977
Lab Number	4942	4943	4944
	FIELD DATA		
Collection Time	3:25	3:15 pm	3:45 pm
pH			
Temperature	28°C	26°C	29°C
Dissolved Oxygen			
	BACTERIOLOGICAL EXAMINATION		
Fecal Coliform/100 ml	2100	910	540
	CHEMICAL ANALYSIS (as mg/l unless designated otherwise)		
Conductance (micromhos)	670	670	350
MBAS (as LAS)			
pH (units)	8.0	7.9	8.55
Alkalinity: P	none	none	11.0
T	323	336	167
NITROGEN: Organic N	0.67	1.2	2.3
Ammonia N	0.05	0.06	0.05
Nitrite N			
Nitrate N	0.1	0.8	2.3
Nitrate as NO_3			
RESIDUE: Total	532	471	539
Fixed	420	353	430
Volatile	112	118	109
Filtrable Residue T	420	423	235
F	341	334	175
V	79	89	60
Nonfiltrable Residue T	90	29	304
F	78	17	265
V	12	12	39
Settleable Matter (ml/l)			
PHOSPHATE: Filtrable P	0.18	0.01	0.41
Total P	0.28	0.12	0.64
Dissolved Oxygen	8.7	9.9	11.5
BOD	3	5	6
COD	34	41	63
Grease or Oil			
Turbidity (JTU)	27	15	110
Total Hardness (as $CaCO_3$)			
Calcium (Ca^{++})			
Magnesium (Mg^{++})			
Chloride (Cl^-)	9.0	6.0	7.0
Sulfate (SO_4^{--})			
tal organic Carbon	9.6	13.7	17.2
Chlorophyll a	24 µg/L	60 µg/L	41 µg/L

REMARKS: Small dam, flow restricted

COLLECTOR REPORT TO: Miller, Granston
Limnology Division
State Hygienic Lab
Des Moines Branch

R. L. Morris, Ph.D.
Associate Director & Principal Chemist

JUN 27 1977

WATER QUALITY REPORT

STATE HYGIENIC LABORATORY, Des Moines Branch
The University of Iowa
E 7th & Court, Rm 405, Des Moines, Iowa 50309

Town		Pisgah	
Source	Soldier River	Soldier River	Soldier River Drainage Ditch
Specific Location	Co. Rd. T82N R43W Sec. 31	Co. Rd. F20, T81N, R44W, Sec. 14	Co. Rd. T80N, R44W Sec. 4
Date Collected	7 June 1977	7 June 1977	7 June 1977
Date Received	7 June 1977	7 June 1977	7 June 1977
Lab Number	4945	4946	4947
	FIELD DATA		
Collection Time	9:45 am	10:10	10:45
pH			
Temperature	18°C	19°C	20°C
Dissolved Oxygen			
	BACTERIOLOGICAL EXAMINATION		
Fecal Coliform/100 ml	1400	900	650
	CHEMICAL ANALYSIS (as mg/l unless designated otherwise)		
Conductance (micromhos)	700	690	650
MBAS (as LAS)			
pH (units)	7.9	8.0	8.05
Alkalinity: P	none	none	none
T	355	352	332
NITROGEN: Organic N	0.46	0.48	0.52
Ammonia N	0.08	0.06	0.04
Nitrite N			
Nitrate N	0.4	0.3	0.1
Nitrate as NO_3			
RESIDUE: Total	513	499	479
Fixed	405	384	357
Volatile	108	115	122
Filtrable Residue T	435	431	413
F	342	341	320
V	93	90	93
Nonfiltrable Residue T	58	45	49
F	48	35	39
V	10	10	10
Settleable Matter (ml/l)			
PHOSPHATE: Filtrable P	0.18	0.18	0.17
Total P	0.24	0.24	0.25
Dissolved Oxygen	9.2	9.2	9.3
BOD	1	2	1
COD	32	29	30
Grease or Oil			
Turbidity (JTU)	22	19	22
Total Hardness (as $CaCO_3$)			
Calcium (Ca^{++})			
Magnesium (Mg^{++})			
Chloride (Cl^-)	8.0	7.0	8.0
Sulfate (SO_4^{--})			
Total organic carbon	7.6	8.9	9.1
Chlorophyll a	9 µg/L	13 µg/L	20 µg/L

REMARKS: Gage (W) 4.14 (E) 4.75
Manual gage - mud (E)

COLLECTOR REPORT TO: Miller, Granston
Limnology Division
State Hygienic Lab
Des Moines Branch

R. L. Morris, Ph.D. JUN 27 1977
Associate Director & Principal Chemist

WATER QUALITY REPORT

STATE HYGIENIC LABORATORY, Des Moines Branch
The University of Iowa
E 7th & Court, Rm 405, Des Moines, Iowa 50309

Town			
Source	Soldier River Drainage		
Specific Location	Ditch, Co. Rd. T80N R45W, Sec. 14		
Date Collected	7 June 1977		
Date Received	7 June 1977		
Lab Number	4948		
		FIELD DATA	
Collection Time	11:30		
pH			
Temperature	26°C		
Dissolved Oxygen			
	BACTERIOLOGICAL EXAMINATION		
Fecal Coliform/100 ml	390		
	CHEMICAL ANALYSIS (as mg/l unless designated otherwise)		
Conductance (micromhos)	640		
MBAS (as LAS)			
pH (units)	8.0		
Alkalinity: P	none		
T	320		
NITROGEN: Organic N	0.62		
Ammonia N	0.02		
Nitrite N			
Nitrate N	<0.1		
Nitrate as NO_3			
RESIDUE: Total	473		
Fixed	355		
Volatile	118		
Filtrable Residue T	403		
F	307		
V	96		
Nonfiltrable Residue T	52		
F	42		
V	10		
Settleable Matter (ml/l)			
PHOSPHATE: Filtrable P	0.16		
Total P	0.26		
Dissolved Oxygen	9.0		
BOD	3		
COD	31		
Grease or Oil			
Turbidity (JTU)	24		
Total Hardness (as $CaCO_3$)			
Calcium (Ca^{++})			
Magnesium (Mg^{++})			
Chloride (Cl^-)	7.0		
Sulfate (SO_4^{--})			
tal organic carbon	10.0		
Chlorophyll a	28 µg/L		

REMARKS:

COLLECTOR REPORT TO: Miller, Granston
Limnology Division
State Hygienic Lab
Des Moines Branch

JUN 27 1977

R. L. Morris, Ph.D.
Associate Director & Principal Chemist

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

WATER QUALITY REPORT
METALS

Town Source Specific Location	East Soldier River Hwy 141 br., T84N,R41W, Sec. 30/31	Soldier River Co.Rd. E34, T84N, R42W, Sec. 22/27	Soldier River Co.Rd. T83N, R42W, Sec. 4
Date Collected	6 June 1977	6 June 1977	6 June 1977
Date Received	7 June 1977	7 June 1977	7 June 1977
Lab Number	4938	4939	4940
METALS ANALYSIS (as mg/l unless designated otherwise)			
Arsenic	0.01	<0.01	<0.01
Barium	0.5	0.3	0.3
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			
Nickel	<0.1	<0.1	<0.1
Selenium			
Silver	<0.01	<0.01	<0.01
Zinc	0.01	0.01	0.01

REMARKS:

COLLECTOR
REPORT TO

Miller & Granston
Limnology Division
SHL
Des Moines, Ia.

Date Reported

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

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

WATER QUALITY REPORT
METALS

Town	Soldier River	Soldier River Drainage Ditch	
Source	Co.Rd. T82N, R43W,	Co. Rd. T80N, R45W,	
Specific Location	Sec. 31	Sec. 14	
Date Collected	7 June 1977	7 June 1977	
Date Received	7 June 1977	7 June 1977	
Lab Number	4945	4948	
METALS ANALYSIS (as mg/l unless designated otherwise)			
Arsenic	<0.01	0.01	
Barium	0.4	0.3	
Cadmium	<0.01	<0.01	
Chromium, Total	<0.01	<0.01	
Chromium, Hexavalent			
Copper	<0.01	<0.01	
Lead	<0.01	<0.01	
Mercury			
Nickel	<0.1	<0.1	
Selenium			
Silver	<0.01	<0.01	
Zinc	0.01	0.01	

REMARKS:

COLLECTOR
REPORT TO

Miller & Granston
Limnology Division
SHL
Des Moines, Ia.

Date Reported

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