A REPORT FROM

The State Hygienic Laboratory

MEDICAL LABORATORIES BUILDING

THE UNIVERSITY OF IOWA
IOWA CITY, IOWA 52242

Water Quality Survey of Lizard Creek

Report #79-24

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

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INTRODUCTION

Lizard Creek originates in northwest Pocahontas County, flows southeasterly for approximately seventy-three kilometers (forty-five miles) before joining with the Des Moines River near Fort Dodge. Total drainage area for the Lizard Creek Basin is 1,130 square kilometers (437 square miles) and major tributaries include the north and south branches of Lizard Creek.

Lizard Creek is classified as a class B warmwater stream from its mouth to its confluence with the North Branch Lizard Creek. The South Branch of Lizard is also classified as a class B warmwater stream from its mouth to Pocahontas County Road N-65. The appropriate Iowa Water Quality Standards for aquatic life propagation apply to each of these stream segments.

No previous surveys have been conducted on Lizard Creek by the University Hygienic Laboratory. The purpose of this survey was to obtain background data and to assess the water quality of Lizard Creek under late summer conditions. Figure 1 is a map of the sampling area, while Table 1 is a list of the sampling locations. Table 2 lists the status in the construction grants program of each of the municipalities on Lizard Creek and its tributaries.

The 7 day 7 year low flow for Lizard Creek has been calculated to be 0.15 cfs near Clare, Iowa (1). On September 25, 1978, stream flow at this location was determined to be 188 cfs which is equalled or exceeded only 12% of the time. One reason for this elevated flow was that during the twelve days prior to the survey, Fort Dodge received approximately 5 inches of rain while Pocahontas received approximately 7.5 inches of rain.

METHODS

Procedures used in sample collection, preservation, and analysis are described in Standard Methods (2), and the Manual of Methods for Chemical Analysis of Water and Wastes (3).

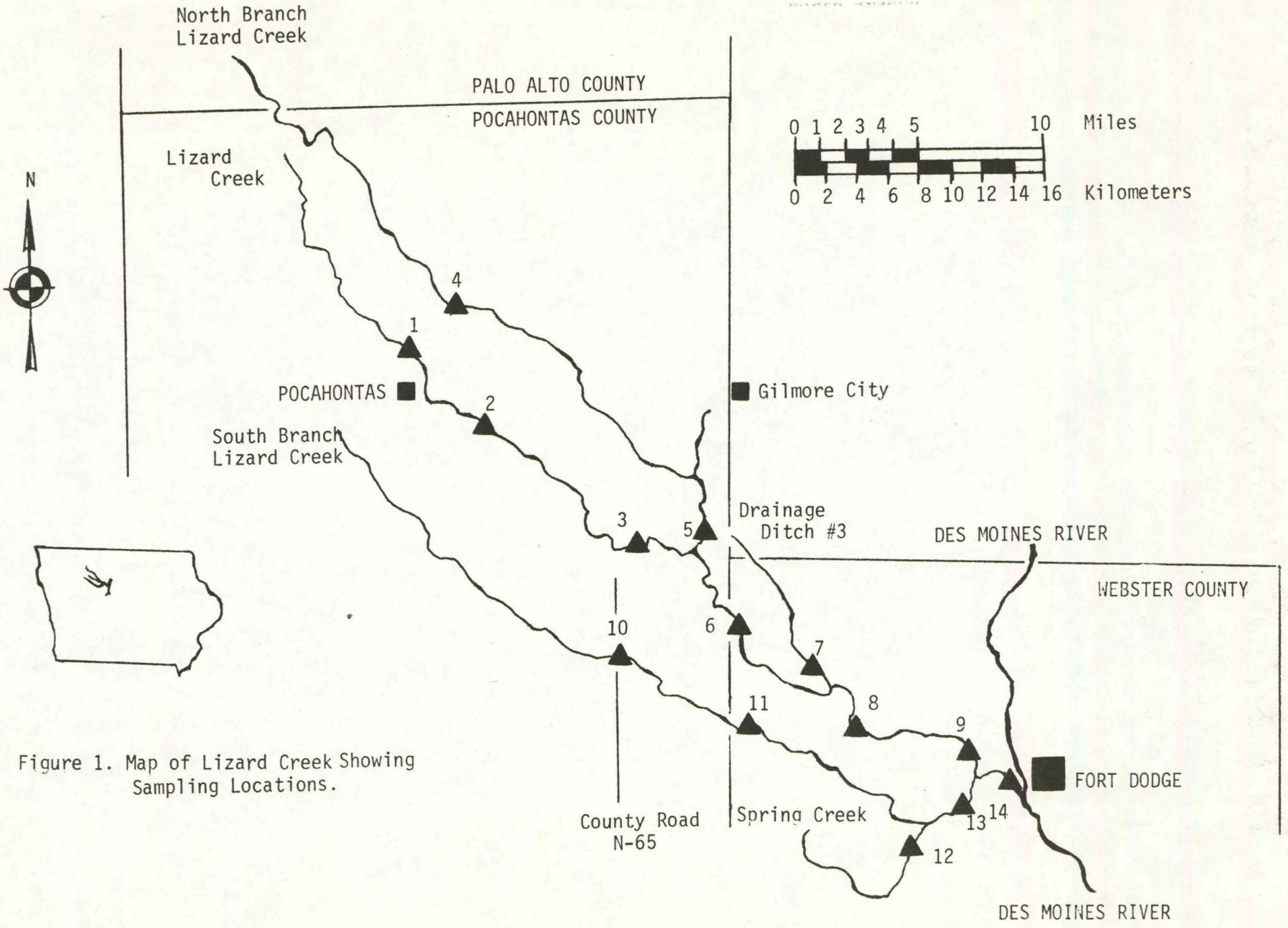

Figure 1. Map of Lizard Creek Showing Sampling Locations.

TABLE 1

LIZARD CREEK SAMPLING LOCATIONS

25,26 September 1978

Station	Location
1. Lizard Creek	Pocahontas County Road Bridge, T92N, R33W Section 23/24
WWTP effluent	Pocahontas, Iowa
2. Lizard Creek	Pocahontas Co. Rd. Br., T91N, R32W, Sec. 5/8
3. Lizard Creek	Pocahontas Co. Rd. Br., T90N, R31W, Sec. 3/4
4. North Lizard Creek	Pocahontas Co. Rd. Br., T92N, R32W, Sec. 6/7
Lagoon effluent	Gilmore City, Iowa
5. North Lizard Creek	Pocahontas Co. Rd. Br., T91N, R31W, Sec. 35
6. Lizard Creek	Webster Co. Rd. C66 Br., T90N, R30W, Sec. 19/30
7. Drainage Ditch #3	Webster Co. Rd. Br., T90N, R30W, Sec. 34/35
8. Lizard Creek	Webster Co. Rd. P29 Br., T89N, R30W, Sec. 11/12
9. Lizard Creek	Webster Co. Hwy 7 Br., T89N, R29W, Sec. 14/23
10. South Branch Lizard Creek	Pocahontas Co. Rd. N65 Br., T90N, R31W, Sec. 29/30
11. South Branch Lizard Creek	Webster Co. Rd. Br., T89N, R30W, Sec. 7/8
12. Spring Creek	Webster Co. Rd. Br., T88N, R30W, Sec. 1
13. South Branch Lizard Creek	Webster Co. Rd. Br., T89N, R29W, Sec. 26
14. Lizard Creek	Webster Co. Hwy 169 Br., T89N, R29W, Sec. 13

TABLE 2

Lizard Creek Wastewater Treatment Facilities

September 25 and 26, 1978

Dischargers	Population+	Wastewater Plant Type+	Average Flow mgd+	Design Capacity mgd+	Construction Grants Program*	Stream Receiving Discharge
Pocahontas**	2,338	Trickling Filter	0.236	0.156	Received Step III	Lizard Creek
Havelock	248	NEMTF	-----	-----	Step I being funded from reserve funds; report submitted	North Branch Lizard Creek
Gilmore City**	766	2-cell lagoon	0.087	0.100	Not In Program	Drainage Ditch 168
Clare	249	3-cell lagoon	-----	0.030	Facility completed in 1977	Lizard Creek
Palmer	246	NEMTF	-----	-----	Applied for Step I	South Branch Lizard Creek
Barnum	147	3-cell lagoon	-----	-----	Facility completed in 1977	South Branch Lizard Creek
Moorland	269	NEMTF	-----	-----	Step I being funded from reserve funds	Spring Creek

\+ Data from Des Moines River Basin Study

* Information supplied by the Department of Environmental Quality

** Effluent sampled during survey

NEMTF No Existing Municipal Treatment Facility

mgd millions of gallons per day

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

Gage height readings were obtained from a U.S. Geological Survey gage station and converted to flow.

RESULTS AND DISCUSSION

To facilitate the discussion of this report, the tributaries of Lizard Creek will be discussed first, followed by Lizard Creek. All data collected can be found in the appendix.

North Branch Lizard Creek

Stations 4 and 5 were located on North Branch Lizard Creek. Selected data from those stations are presented below.

North Branch Lizard Creek

September 25 and 26, 1978

(All values in mg/l unless designated otherwise)

Station	Fecal Coliforms per 100 ml	Specific Conductance*	Nitrate Nitrogen	Ammonia Nitrogen	DO	BOD	Chloride	TOC
4	570	930	12.0	0.07	9.1	<1	28	8
Gilmore City WWTP Lagoon Effluent	30	660	0.2	0.03	18.3	14	43	22
5	540	920	16.0	0.05	9.0	2	30	9

*micromhos per cm at 25°C

Water quality at station 4 was good (fecal coliforms 570 organisms/100 ml, ammonia nitrogen 0.07 mg/l, dissolved oxygen 9.1 mg/l, BOD <1 mg/l, chloride 28 mg/l, TOC 8 mg/l) except for specific conductance which was rather high at 930 micromhos. Specific conductance is an indication of the total dissolved solids (TDS) in water and data indicated that the TDS were higher than expected

at 596 mg/l. The level of nitrate nitrogen was also higher than expected at 12 mg/l. A possible explanation of the high specific conductance, TDS, and nitrate nitrogen was field tile drainage. As previously mentioned, the Lizard Creek area received substantial amounts of rainfall several days prior to the time of this survey. Rainfall percolating through the soil could pick up nitrate nitrogen and dissolved solids, be collected by the field drainage tile, and discharge into the stream.

The Gilmore City wastewater treatment lagoon effluent had lower values of fecal coliforms (30 organisms/100 ml), specific conductance (660 micromhos), nitrate nitrogen (0.2 mg/l) and ammonia nitrogen (0.03 mg/l) than station 4, although values of dissolved oxygen (18.3 mg/l), chloride (43 mg/l), BOD (14 mg/l) and TOC (22 mg/l) were elevated. The effluent was supersaturated (185%) in dissolved oxygen at the time of sample collection (1600 hours). Driven by sunlight, the heavy aquatic plant population in the Gilmore City lagoon produced excess amounts of oxygen as a by-product of photosynthesis.

The North Branch of Lizard Creek was not affected by the Gilmore City effluent, as water quality at station 5, located downstream of the effluent, was good (fecal coliforms 540 organisms/100 ml, ammonia nitrogen 0.05 mg/l, dissolved oxygen 9.0 mg/l, BOD 2 mg/l, chloride 30 mg/l, TOC 9 mg/l) and very similar to water quality at station 4.

South Branch Lizard Creek

Four stations were located on the South Branch of Lizard Creek for assessing water quality. Selected data are tabulated below.

South Branch Lizard Creek
September 25 and 26, 1978
(All values in mg/l unless designated otherwise)

Station	Fecal Coliforms per 100 ml	Specific Conductance*	Nitrate Nitrogen	Ammonia Nitrogen	DO	BOD	Chloride	TOC
10	370	860	17	0.02	9.8	<1	27	6
11	1,100	940	16	0.04	8.8	<1	27	4
12 Spring Creek	3,800	970	17	0.03	9.1	<1	33	3
13	810	910	17	0.04	9.0	<1	30	9

*micromhos per cm at 25°C

Water quality at station 10, located on the South Branch of Lizard Creek, was good with most parameters at relatively low levels (fecal coliforms 370 organisms per 100 ml, ammonia nitrogen 0.02 mg/l, BOD <1 mg/l, chloride 27 mg/l, TOC 6 mg/l). Only dissolved oxygen (9.8 mg/l), total dissolved solids (640 mg/l) and nitrate nitrogen (17 mg/l) were slightly higher than expected and slightly higher than the values found on the North Branch of Lizard Creek.

Station 11, located downstream from station 10, had very similar water quality to the upstream station with two exceptions; fecal coliforms (1,100 organisms per 100 ml) and specific conductance (940 micromhos) increased from 370 organisms/100 ml and 860 micromhos respectively.

Spring Creek, station 12, had elevated levels of fecal coliforms (3,800 organisms per 100 ml), specific conductance (970 micromhos), TDS (660 mg/l) and nitrate nitrogen (17 mg/l). Remaining parameters were low (ammonia nitrogen 0.03 mg/l, BOD <1 mg/l, chloride 33 mg/l). Due to the levels of fecal coliforms and specific conductance, water quality at this station can be considered to be only fair.

Both fecal coliforms (810 organisms/100 ml) and specific conductance (910 micromhos) had started to decline by station 13, with the remaining parameters relatively unchanged from station 11. These levels of specific conductance, total dissolved solids and nitrate nitrogen at stations 10, 11, 12 and 13 were probably due to field tile drainage into the South Branch of Lizard Creek.

Lizard Creek

Eight sampling stations were located on Lizard Creek. Selected data are tabulated below and all data collected can be found in the appendix.

Lizard Creek

September 25 and 26, 1978

(All values in mg/l unless designated otherwise)

Station	Fecal Coliforms per 100 ml	Specific Conductance*	Ammonia Nitrogen	Nitrate Nitrogen	DO	BOD	Chloride	TOC
1	330	870	0.05	14	10.3	<1	26	5
Pocahontas WWTP	2,600,000	1,700	11.0	1.1	3.5	100	97	60
2	110,000	930	0.61	15	8.9	4	33	10
3	12,000	930	0.06	17	9.0	<1	32	9
6	1,600	920	0.05	16	9.2	<1	32	9
7 D.D.#3	500	1,000	0.01	21	9.2	<1	33	6
8	1,300	900	0.04	16	9.2	<1	30	8
9	1,200	900	0.06	16	9.7	<1	30	9
14	1,300	910	0.04	19	9.1	<1	31	9

*micromhos per cm at $25^{o}C$

Station 1, located upstream from Pocahontas, reflected good water quality. At this station, most water quality parameters were low (fecal coliforms 330 organisms/100 ml, ammonia nitrogen 0.05 mg/l, filtrable phosphate 0.10 mg/l, BOD <1 mg/l, chloride 26 mg/l) except for specific conductance (870 micromhos), TDS (602 mg/l) and nitrate nitrogen (14 mg/l). These levels were slightly high and may indicate field tile drainage in the area.

The next station, station 2, located below the Pocahontas WWTP discharge, demonstrated the impact that a waste discharge has on a receiving stream as increases in several parameters (fecal coliforms 110,000 organisms/100 ml, specific conductance 930 micromhos, ammonia nitrogen 0.61 mg/l, BOD 4 mg/l, chloride 33 mg/l, TOC 10 mg/l) indicative of a waste discharge were noted.

Stream assimilation accounts for the declines in fecal coliforms (12,000 organisms per 100 ml), ammonia nitrogen (0.06 mg/l) and BOD (<1 mg/l) observed at station 3. Water quality at this station, except for the elevated level of fecal coliforms, can be considered good.

A dilutional effect from the North Branch Lizard Creek and stream assimilation combined to decrease the fecal coliforms seen at station 6, the next station downstream. Remaining parameters (specific conductance, ammonia nitrogen, dissolved oxygen, BOD and chloride) at station 6 were low and water quality was very similar to station 3.

Station 7, located on Drainage Ditch #3, had water quality similar to stations 3 and 6 in the Lizard Creek watershed although specific conductance (1000 micromhos) and nitrate nitrogen (21 mg/l) at this station were the highest found during this survey. These values may again be attributed to field tile drainage into the stream.

The values of water quality parameters at stations 8 and 9 were nearly identical (fecal coliforms 1,300 and 1,200 organisms/100 ml respectively, specific conductance both 900 micromhos, ammonia nitrogen 0.04 and 0.06 mg/l respectively, nitrate nitrogen both 16 mg/l, BOD both <1 mg/l, chloride both 30 mg/l, TOC 8 and 9 mg/l respectively). Water quality at these stations can also be considered good.

The last station, station 14, on Lizard Creek was located below the juncture of Lizard Creek and South Branch Lizard Creek. Water quality at this station was similar to stations 3, 6, 8, and 9 located on Lizard Creek (fecal coliforms 1,300 organisms/100 ml, specific conductance 910 micromhos, ammonia nitrogen 0.04 mg/l, BOD <1 mg/l, chloride 31 mg/l). The water quality of this station may also be considered good.

Metals

Water samples for trace metals analysis were taken at stations 5 and 14. The only reportable values were for barium (0.1 mg/l at station 5 and 0.2 mg/l at station 14). These are low levels and are frequently found occurring naturally in Iowa surface waters.

SUMMARY AND CONCLUSIONS

Results of a water quality survey of Lizard Creek conducted during a moderately high stream flow on September 25 and 26, 1978 indicated generally good water quality throughout the reach. Most parameters (fecal coliforms, ammonia nitrogen, BOD and chloride) exhibited relatively low levels except for specific conductance, nitrate nitrogen, and total dissolved solids which were elevated at almost all sampling stations. These elevated values were probably due to field tile drainage into the stream from heavy rains that occurred prior to the time the survey was conducted.

John G Miller III

John G Miller III
Limnologist

LITERATURE CITED

1. Heinitz, Albert J. 1970. Low Flow Characteristics of Iowa Streams through 1966. Iowa Natural Resources Council Bulletin No. 10. 176 p.

2. American Public Health Association. 1975. Standard Methods for the Examination of Water and Wastewater, 14th Edition. Washington, D.C. 1193 p.

3. U.S. Environmental Protection Agency. 1976. Methods for Chemical Analysis of Water and Wastes. Cincinnati, Ohio. 298 p.

APPENDIX

WATER QUALITY REPORT
METALS

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

Town	N. Lizard Creek	Fort Dodge	
Source	Co. Rd. Br., T91N	Lizard Creek	
Specific Location	R31W, Sec. 35 Station 5	Hwy 169 Br., T89N R29W, Sec. 13 Station 14	
Date Collected	9/25/78	9/26/78	
Date Received	9/26/78	9/26/78	
Lab Number	2097	2106	
METALS ANALYSIS (as mg/l unless designated otherwise)			
Arsenic	<0.01	<0.01	
Barium	0.1	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	<0.1	<0.1	
Selenium	<0.01	<0.01	
Silver	<0.01	<0.01	
Zinc	<0.01	<0.01	

REMARKS:

COLLECTOR REPORT TO: Limnology Division
Hygienic Lab
Des Moines Branch

Date Reported 1979

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	Lizard Creek	North Lizard Creek	Gilmore City
Source	County Road Bridge	County Road Bridge	Gilmore City Lagoon Eff.
Specific Location	T90N, R31W, Sec. 3/4 Station 3	T92N, R32W, Sec. 6/7 Station 4	
Date Collected	9/25/78	9/25/78	9/25/78
Date Received	9/26/78	9/26/78	9/26/78
Lab Number	2094	2095	2096
FIELD DATA			
Collection Time	1315	1500	1600
pH			
Temperature	water 17°C, air 23°C	18.5°C water, 24°C air	20°C water, 23°C air
Dissolved Oxygen			
BACTERIOLOGICAL EXAMINATION			
Fecal Coliform/100 ml	12000	570	30
CHEMICAL ANALYSIS (as mg/l unless designated otherwise)			
Conductance (micromhos)	930	930	660
MBAS (as LAS)			
pH (units)	8.1	8.0	9.6
Alkalinity: P	none	none	64.6
T	323	310	234
NITROGEN: Organic N	0.83	0.65	3.0
Ammonia N	0.06	0.07	0.03
Nitrite N			
Nitrate N	17	12	0.2
Nitrate as NO_3			
RESIDUE: Total	702	622	494
Fixed	534	466	376
Volatile	168	156	118
Filtrable Residue T	636	596	444
F	472	440	352
V	164	156	92
Nonfiltrable Residue T	66	26	50
F	62	26	24
V	4	0	26
Settleable Matter (ml/l)			
PHOSPHATE: Filtrable P	0.18	0.09	0.60
Total P	0.23	0.12	0.99
Dissolved Oxygen	9.0	9.1	18.3
BOD	<1	<1	14
COD	16	16	64
Grease or Oil			
Turbidity (JTU)	22	8.9	13
Total Hardness (as $CaCO_3$)			
Calcium (Ca^{++})			
Magnesium (Mg^{++})			
Chloride (Cl^-)	32	28	43
Sulfate (SO_4^{--})			
Total Organic Carbon	9	8	22

REMARKS:

COLLECTOR
REPORT TO Limnology Division
Hygienic Laboratory
Des Moines, Iowa

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

JAN 08 1979

WATER QUALITY REPORT

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

Town	North Lizard Creek	West Branch Lizard	Drainage Ditch #3
Source	County Road Bridge	Creek-Co. Rd. C66	County Road Bridge
Specific Location	T91N, R31W, Sec. 35	Br., T90N, R30W,	R30W, Sec. 34/35
	Station 5	Sec. 19/30	Station 7
		Station 6	
Date Collected	9/25/78	9/25/78	9/25/78
Date Received	9/26/78	9/26/78	9/26/78
Lab Number	2097	2098	2099
		FIELD DATA	
Collection Time	1245	1230	1205
pH			
Temperature	17°C water, 23°C air	17°C water, 23°C air	17°C water, 23°C a
Dissolved Oxygen			
	BACTERIOLOGICAL EXAMINATION		
Fecal Coliform/100 ml	540	1600	500
	CHEMICAL ANALYSIS (as mg/l unless designated otherwise)		
Conductance (micromhos)	920	920	1000
MBAS (as LAS)			
pH (units)	8.2	8.2	8.1
Alkalinity: P	none	none	none
T	324	325	358
NITROGEN: Organic N	0.69	0.74	0.33
Ammonia N	0.05	0.05	0.01
Nitrite N			
Nitrate N	16	16	21
Nitrate as NO_3			
RESIDUE: Total	702	702	700
Fixed	516	508	592
Volatile	186	194	108
Filtrable Residue T	630	628	698
F	456	442	590
V	174	186	108
Nonfiltrable Residue T	72	74	2
F	60	66	2
V	12	8	0
Settleable Matter (ml/l)			
PHOSPHATE: Filtrable P	0.11	0.14	0.05
Total P	0.13	0.17	0.06
Dissolved Oxygen	9.0	9.2	9.2
BOD	2	<1	<1
COD	22	15	7
Grease or Oil			
Turbidity (JTU)	21	23	1.8
Total Hardness (as $CaCO_3$)			
Calcium (Ca^{++})			
Magnesium (Mg^{++})			
Chloride (Cl^-)	30	31	33
Sulfate (SO_4^{--})			
otal Organic Carbon	9	9	6

REMARKS:

COLLECTOR
REPORT TO

Limnology Division
Hygienic Laboratory
Des Moines, Iowa

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

JAN 08 1979

WATER QUALITY REPORT

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

Town	West Branch Lizard Cr.	Fort Dodge	Branch S. Lizard Creek
Source	Co. Rd. P29 Br., T89N	West Branch Lizard Cr.	Co. Rd. N65 Br., T90N,
Specific Location	R30W, Sec. 11/12 Station 8	Hwy 7 Br., T89N, R29W Sec. 14, Station 9	R31W, Sec. 29/30 Station 10
Date Collected	9/25/78	9/25/78	9/25/78
Date Received	9/26/78	9/26/78	9/26/78
Lab Number	2100	2101	2102
FIELD DATA			
Collection Time	1135	1100	1645
pH			
Temperature	water 16.5°C, air 22°C	water 16.5°C, air 22°C	17.5°C water, 22°C air
Dissolved Oxygen			
BACTERIOLOGICAL EXAMINATION			
Fecal Coliform/100 ml	1300	1200	370
CHEMICAL ANALYSIS (as mg/l unless designated otherwise)			
Conductance (micromhos)	900	900	860
MBAS (as LAS)			
pH (units)	8.3	8.3	8.1
Alkalinity: P	none	none	none
T	328	320	336
NITROGEN: Organic N	0.67	0.77	0.44
Ammonia N	0.04	0.06	0.02
Nitrite N			
Nitrate N	16	16	17
Nitrate as NO_3			
RESIDUE: Total	710	702	674
Fixed	532	500	468
Volatile	178	202	206
Filtrable Residue T	620	612	640
F	454	422	454
V	166	190	186
Nonfiltrable Residue T	90	90	14
F	78	78	14
V	12	12	0
Settleable Matter (ml/l)			
PHOSPHATE: Filtrable P	0.16	0.14	0.07
Total P	0.18	0.18	0.07
Dissolved Oxygen	9.2	9.7	9.8
BOD	<1	<1	<1
COD	17	15	13
Grease or Oil			
Turbidity (JTU)	26	32	5.8
Total Hardness (as $CaCO_3$)			
Calcium (Ca^{++})			
Magnesium (Mg^{++})			
Chloride (Cl^-)	30	30	27
Sulfate (SO_4^{--})			
Total Organic Carbon	8	9	6

REMARKS:

COLLECTOR REPORT TO: Limnology Division
Hygienic Laboratory
Des Moines Branch

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	S. Branch Lizard Cr.,	Spring Creek	Fort Dodge
Source	Co. Rd. Br., T89N	County Road Bridge T88N	S. Branch Lizard Creek
Specific Location	R30W, Sec. 7/8 Station 11	R30W, Sec. 1 Station 12	Co. Rd. Br., T89N, R29W, Sec. 26, Station 13
Date Collected	9/26/78	9/26/78	9/26/78
Date Received	9/26/78	9/26/78	9/26/78
Lab Number	2103	2104	2105
	FIELD DATA		
Collection Time	1035	0915	0940
pH			
Temperature	17°C water, 20°C air	15.5°C water, 19°C air	16°C water, 20°C air
Dissolved Oxygen			
	BACTERIOLOGICAL EXAMINATION		
Fecal Coliform/100 ml	1100	3800	310
	CHEMICAL ANALYSIS (as mg/l unless designated otherwise)		
Conductance (micromhos)	940	970	910
MBAS (as LAS)			
pH (units)	8.2	8.15	8.3
Alkalinity: P	none	none	none
T	341	357	331
NITROGEN: Organic N	0.59	0.23	0.53
Ammonia N	0.04	0.03	0.04
Nitrite N			
Nitrate N	16	17	17
Nitrate as NO_3			
RESIDUE: Total	678	672	726
Fixed	466	450	526
Volatile	212	222	200
Filtrable Residue T	638	660	618
F	430	440	430
V	208	220	188
Nonfiltrable Residue T	40	12	108
F	36	10	96
V	4	2	12
Settleable Matter (ml/l)			
PHOSPHATE: Filtrable P	0.08	0.05	0.09
Total P	0.10	0.06	0.13
Dissolved Oxygen	8.8	9.1	9.0
BOD	<1	<1	<1
COD	11	5	17
Grease or Oil			
Turbidity (JTU)	14	4.5	37
Total Hardness (as $CaCO_3$)			
Calcium (Ca^{++})			
Magnesium (Mg^{++})			
Chloride (Cl^-)	27	33	30
Sulfate (SO_4^{--})			
otal Organic Carbon	4	3	9

REMARKS:

COLLECTOR REPORT TO: Limnology Division, Hygienic Laboratory, Des Moines, Iowa

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	Fort Dodge		
Source	Lizard Creek		
Specific Location	Hwy 169 Br., T89N R29W Sec, 13 Station 14		
Date Collected	9/26/78		
Date Received	9/26/78		
Lab Number	2106		
		FIELD DATA	
Collection Time	1010		
pH			
Temperature	16°C water, 21°C air		
Dissolved Oxygen			
	BACTERIOLOGICAL EXAMINATION		
Fecal Coliform/100 ml	1300		
	CHEMICAL ANALYSIS (as mg/l unless designated otherwise)		
Conductance (micromhos)	910		
MBAS (as LAS)			
pH (units)	8.3		
Alkalinity: P	none		
T	324		
NITROGEN: Organic N	0.58		
Ammonia N	0.04		
Nitrite N			
Nitrate N	19		
Nitrate as NO_3			
RESIDUE: Total	680		
Fixed	494		
Volatile	186		
Filtrable Residue T	586		
F	408		
V	178		
Nonfiltrable Residue T	94		
F	86		
V	8		
Settleable Matter (ml/l)			
PHOSPHATE: Filtrable P	0.11		
Total P	0.16		
Dissolved Oxygen	9.1		
BOD	<1		
COD	14		
Grease or Oil			
Turbidity (JTU)	36		
Total Hardness (as $CaCO_3$)			
Calcium (Ca^{++})			
Magnesium (Mg^{++})			
Chloride (Cl^-)	31		
Sulfate (SO_4^{--})			
Total Organic Carbon	9		

REMARKS:

COLLECTOR REPORT TO

Limnology Division
Hygienic Laboratory
Des Moines Branch

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

OCT 08 1979