Aquatic Enhancement
& Survey, Inc.

2024 Water Quality Sampling Report
Steuben County Lakes Council
Steuben County, Indiana

December 5, 2024

Aquatic Enhancement
& Survey, Inc.
P.O. Box 1036
Angola, IN 46703

1-888-867-5253
260-665-8226
www.aquaticenhancement.com

Acknowledgements

I would like to thank the following people for making possible the 2024 season sampling and the preparation of this report: Bill Schmidt, Cheri Stroh, and the membership of the Steuben County Lakes Council, the Anthony Wayne Council, Keith Chrysler, and Dean Rosener. Laboratory analysis for this work was performed by Sandhill Environmental, Waterloo Indiana. Field work and report preparation was performed by Scott Banfield, Tyler Harrington, Gunnar Psurny, and Sue Smith of Aquatic Enhancement & Survey, Inc.

Table of Contents

List of Figures

List of Tables

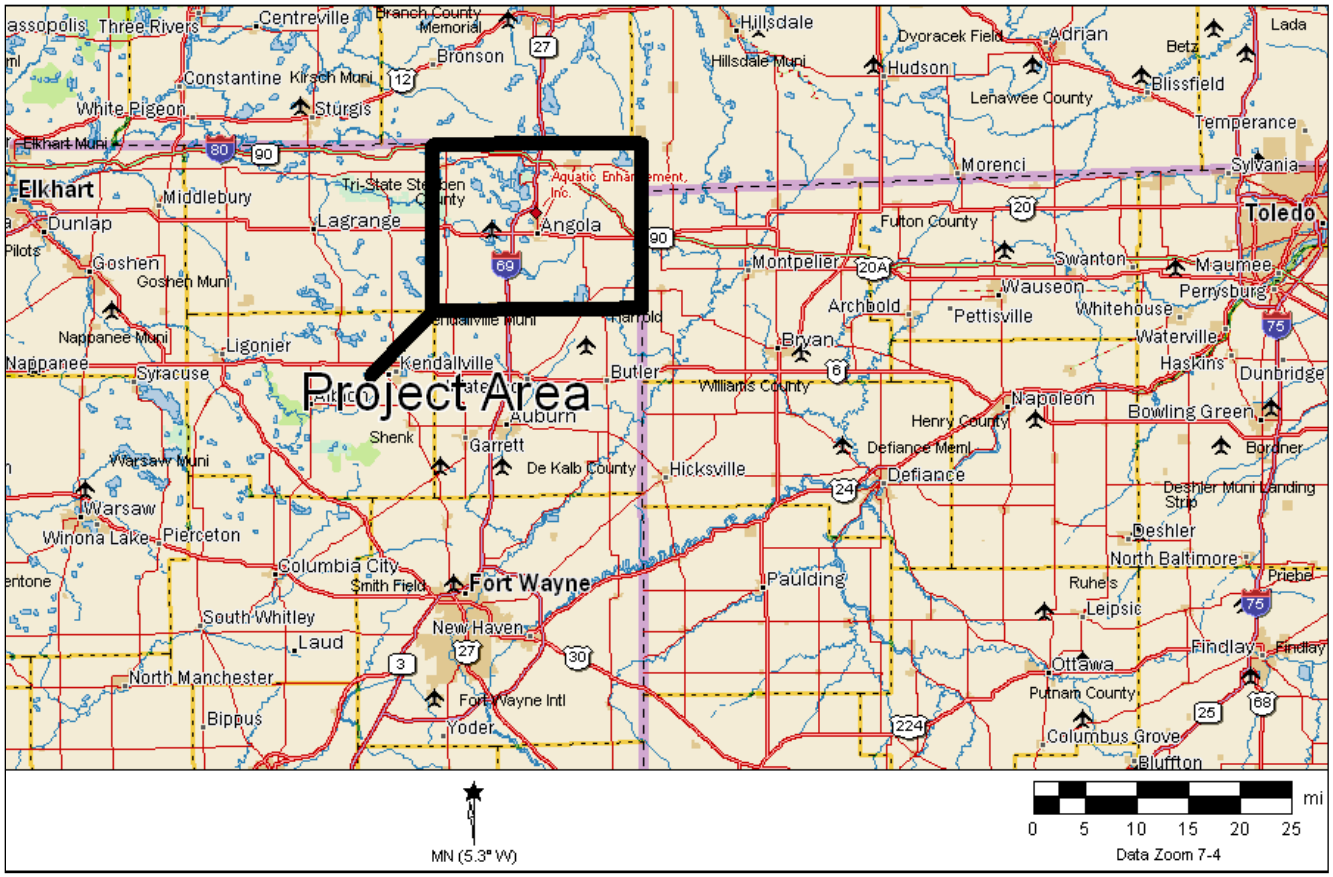

Figure 1 Project location map

1. Project Overview and Purpose:

This project was completed by Aquatic Enhancement & Survey, Inc. under contract with the Steuben County Lakes Council (SCLC) and Angola/Trine MS4. Also partnered with the SCLC in support of this work was the Steuben County Surveyor's Office, the Clear Lake Township Land Conservancy, and the Lake George Conservancy. Basic water quality data and stream flow (discharge) measurements were collected from 58 sites on several streams and lakes in Steuben County, Indiana, LaGrange County, Indiana, and Branch County, Michigan. Two additional sites were sampled by volunteers and included in the data in this report. Sampling reported in this work was completed in May, July, August and September of 2024. Figure 2 (page 6) displays sampling locations and associated surface water features. For most sites, measured parameters included total phosphorus, total suspended solids, pH, dissolved oxygen, temperature, specific conductance, and E-coli. A basic measurement of stream flow-rate (discharge) at each sampling site was taken when conditions permitted.

Total phosphorus and total suspended solids loading figures were calculated for certain sites at which these measurements were detectible and at which a flow measurement was taken. The purpose of the sampling was to gain a basic understanding of the fate and source of contaminants in these systems with a goal of directing future sampling or directing remediation of watershed point and non-point pollution sources. Table 1 provides a site key showing brief written descriptions of each numbered sampling site. Collected data and calculated loading rates are provided in tables 1-6.

2. Methods:

All samples collected were grab samples. All samples were placed on ice immediately after collection. Measurements for temperature, dissolved oxygen, and specific conductance were taken in the field using a meter. Measurements of pH were taken in the field using a meter or measured in the laboratory. Meters were calibrated at the beginning of each sampling day. Where possible, stream flows were calculated using measurements of the stream cross-sectional area and stream velocity. Stream flow cross-sectional area was calculated by measuring stream width using a tape measure and calculating average stream depth by measuring depth at multiple equidistant points using a measuring staff or tape measure. Quality Assurance Procedures and EPA method codes for laboratory analysis are available upon request.

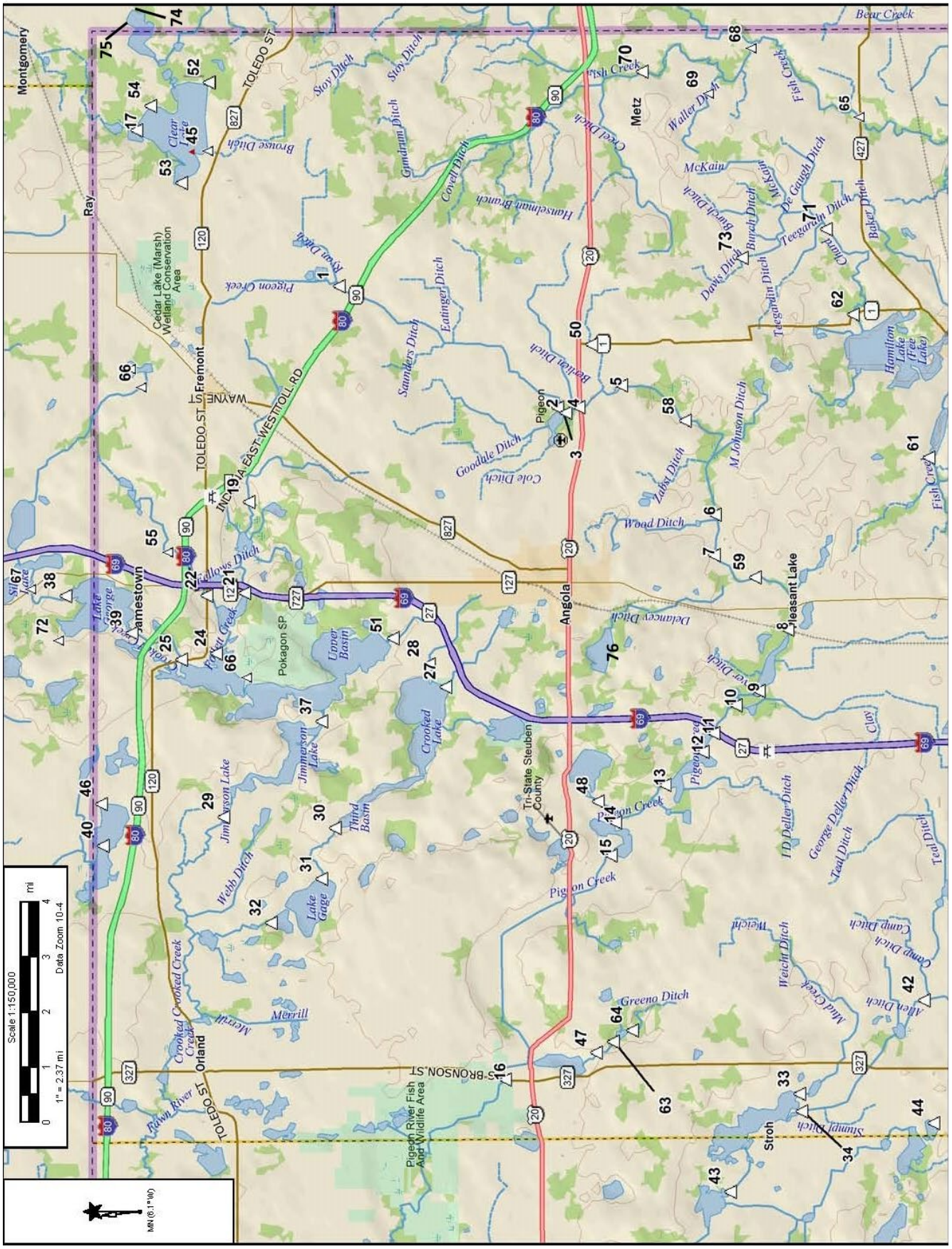

Figure 2 Sampling site map

Samp. Site	SCLC funded	At or near HUC 12 Outlet (10)	At or near HUC14 Outlet Site (13)	Steuben Surveyor Funding (6)	MS4 Funding (2 sites)	Clear Lake funding (2)	Ham. Funding (2)	George Funding (2)	Snow Funding (1)	Location Description
1.	yes		yes							Pigeon, East Ray Clark Road at culvert, below juncture with the Ryan Ditch.
2.	yes									Pigeon Creek, Pigeon Lake Inlet.
3.*	yes									Pigeon Creek, Pigeon Lake Outlet. *May only
4.	yes	yes	yes							Pigeon, U.S. 20 Bridge, Below juncture with Berlien Ditch.
5.	yes									Pigeon Creek, Metz Road.
7.					yes					Pigeon Creek, Meridian Road.
8.	yes									Pigeon Creek, Long Lake Inlet.
9.*	yes									Pigeon Creek, Long Lake Outlet. *May only
10.	yes	yes	yes							Pigeon Creek, Mud Lake Outlet just west of Long Lake, Johnson Ditch from Ashley.
11.*	yes									Pigeon Creek, Big Bower Lake Inlet. *May only
12.	yes									Pigeon Creek, Big Bower Lake Outlet/Golden Lake Inlet.
13.*	yes									Pigeon Creek, Golden Lake Outlet. *May only
14.	yes									Pigeon Creek, Hogback Lake Inlet.
15.	yes	yes	yes							Pigeon Creek, Hogback Lake Outlet.
16.	yes	yes*	yes*							Pigeon Creek at 327.
17.	yes		yes							Clear Lake Outlet.
19.	yes									Crane Marsh Outlet, (tributary to Marsh Lake).
21.	yes									Follet Creek, Little Otter Lake Inlet.
22.	yes									Walter's Lakes Drain (tributary to Big Otter Lake).
24.	yes									Follet Creek, Snow Lake Inlet.
25.	yes									Crooked Creek at 120 (Tributary to Snow Lake).
26.	yes									Carpenter Ditch (outlet from Center Lake)
27.	yes									Carpenter Ditch (Tributary to Crooked Lake).
28.	yes									Palfreyman Ditch (Tributary to Crooked Lake).
29. *	yes	yes*	yes*							Crooked Ck (Jimm. Outlet Nevada Mills). *May only
30.	yes									Concorde Creek (Outlet from Crooked Lake).
31.	yes									Concorde Creek (Inlet to Lake Gage).
32.	yes	yes*	yes*							Concorde Creek (Outlet from Lime Lake).
33.	yes									Dewitt Ditch (Tributary to Big Turkey Lake).
34.	yes									Turkey Creek (Tributary to Big Turkey Lake).
35.	yes									Fox Lake Outlet
37.	yes									Crooked Creek (James Outlet, Jimmerson Inlet at 4 corners).
38.	yes									Lake George NE tributary (from Silver Lake).
39.	yes									Crooked Creek (Lake George Outlet).
40.	yes									Lake Pleasant.
42.	yes	yes	yes							Turkey Ck at 700S east of 800W, below Little Turkey and Deetz Ditch juncture.
43.	yes	yes*	yes*							Big Turkey Outlet at 350S on curve north of Stroh or west of Turkey Lake Tavern.
44.	yes									Trib. To McClish Lake (east end).
45.	yes									Trib. To Clear Lake (Cyrus Brouse Ditch).
46.	yes									Trib. To Lake Pleasant (East End).
47.	yes									Trib. To West Otter (Between Arrowhead and Otter).
48.	yes									Trib. Between Silver and Hogback.
50.	yes									William Jack Ditch (at State Rd. 1).
51.	yes									Croxton Ditch (at West 275 North).
52.				yes						Clear Lake Trib. (Harry Teeters Ditch).
53.						yes				Clear Lake Trib. (Peter Smith Ditch).
54.						yes				Clear Lake Trib. (Alvin Patterson Ditch).
58.					yes					Pigeon Creek at Hanselman.
61.				yes						Tributary to Ball Lake.
62.				yes						Black Creek, Tributary to Hamilton Lake.
63.	yes									Tributary just downstream of Arrowhead Lake.
64.				yes						Tributary to Arrowhead Lake at south end of Arrowhead Lake
65.	yes									Fish Creek at 427
68.	yes									Fish Creek at E 400 S
69.	yes									Fish Creek at S 850 E (5/19/17 upstream of S 850 E)
70.	yes									Fish Creek at E Metz Rd.
72.								yes		Trib. to Lake George at 150 W, N. of launch
74*	yes	VOLUNTEER SAMPLED								East Trib. to Little Long Lake * volunteer sampled
75*	yes	VOLUNTEER SAMPLED								Trib. to Lit. Long Lake, Derr Drain * volunteer sampled
76	yes									Fox Lake Beach

Table 1 Descriptions of numbered sampling sites

	Date	E-coli (CFU or colonies/100 ml)	CFM Discharge	Total Phos. (ppm)	Total Phos. Loading (kg/day)	TSS (ppm)	TSS Loading (kg/day)	D.O.	pH	Temp (F)	Specific Conductance	Post rain event *
1	5/28/24	272.3	110.70	0.025	0.11	13.0	58.69	8.2	7.73	56.2	836	
2	5/28/24	46.1	700.94	0.042	1.20	16.0	457.36	9.0	7.89	57.7	790	
3	5/28/24	39.9	830.18	0.021	0.71	4.8	162.51	9.7	8.34	65.2	671	
4	5/28/24	1119.9	572.90	0.033	0.77	7.6	177.56	8.1	8.11	64.8	703	
5	5/28/24	98.7	1611.69	0.058	3.81	5.8	381.21	7.3	7.93	65.7	735	
7	5/28/24	1986.3	2625.69	0.100	10.71	19.0	2034.48	8.0	7.87	63.0	779	
8	5/28/24	1203.3	nd	0.084	nd	17.0	nd	8.6	7.88	64.0	760	
9	5/28/24	24.1	690.03	0.035	0.98	5.4	151.96	8.9	8.05	67.2	708	
10	5/28/24	172.3	nd	0.042	nd	5.8	nd	9.4	8.02	66.8	765	
11	5/28/24	272.3	nd	0.031	nd	9.6	nd	8.7	8.02	67.6	743	
12	5/28/24	65.0	1984.08	0.039	3.16	6.2	501.66	8.8	8.06	67.6	749	
13	5/29/24	21.6	nd	0.032	nd	2.1	nd	7.0	8.22	69.2	682	
14	5/29/24	133.3	3077.87	0.020	2.51	2.1	263.59	6.8	8.05	67.2	684	
15	5/29/24	920.8	3415.23	0.099	13.79	5.9	821.73	7.4	8.20	68.8	647	
16	5/29/24	1732.9	2550.20	0.020	2.08	3.7	384.80	7.7	7.89	64.5	654	
17	5/23/24	10.9	nd	0.010	nd	1.9	nd	8.6	8.61	72.0	317	
19	5/30/24	196.8	559.84	0.021	0.48	7.2	164.38	7.9	7.95	59.9	834	
21	5/30/24	48.0	1205.21	<.007*	nd	1.9	93.38	7.0	8.03	64.7	696	
22	5/30/24	143.0	97.89	0.045	0.18	<1.1*	nd	5.2	7.52	61.5	915	
24	5/30/24	35.0	nd	<.007*	nd	2.6	nd	6.6	8.01	66.7	683	
25	5/30/24	57.3	539.63	<.007*	nd	<1.3*	nd	6.7	7.73	66.5	406	
26	5/31/24	159.7	135.58	0.070	0.39	12.0	66.35	8.1	7.95	68.0	455	
27	5/31/24	45.5	110.44	0.031	0.14	<.20*	nd	8.5	7.95	66.7	481	
28	5/31/24	410.6	171.73	0.066	0.46	13.0	91.04	8.4	7.88	61.4	493	
29	5/30/24	21.1	1507.42	<.007*	nd	1.8	110.65	8.3	8.06	73.1	510	
30	5/30/24	17.3	702.72	<.007*	nd	5.0	143.29	7.7	8.12	71.5	428	
31	5/30/24	86.0	519.91	0.013	0.28	3.4	72.09	8.3	8.06	68.7	439	
32	5/30/24	12.1	557.93	<0.007*	nd	<1.1*	nd	8.5	8.33	69.5	440	
33	5/29/24	45.0	126.25	<0.007*	nd	3.9	20.08	8.6	8.07	68.7	664	
34	5/29/24	178.0	1074.51	0.041	1.80	5.0	219.10	9.1	7.72	66.0	674	
35	5/30/24	4.1	188.69	<.007*	nd	1.8	13.85	9.1	8.35	72.9	462	
37	5/30/24	26.9	nd	<.007*	nd	2.0	nd	9.8	8.35	70.9	503	
38	5/30/24	290.9	317.81	<.007*	nd	<2.0*	nd	6.1	7.45	66.4	365	
39	5/30/24	12.1	nd	<.007*	nd	<1.1*	nd	nd	8.65	nd	nd	

Table 2 May data for sites 1 through 39. The notation "nd" denotes that no data was collected or calculated due to a result below lab detection limits or the constraints of field conditions. Data shaded exceeds certain water quality standards selected from those provided by IDEM (see corresponding shaded standards in table 8). An asterisk (*) in the post rain event column indicated sample collection occurred within 48 hours of .5 inches of rainfall or more.

Site	Date	E-coli (CFU or colonies/100 ml)	CFM Discharge	Total Phos. (ppm)	Total Phos. Loading (kg/day)	TSS (ppm)	TSS Loading (kg/day)	D.O.	pH	Temp (F)	Specific Conductance	Post rain event *
40	5/30/24	1.0	nd	<.007*	nd	<1.1*	nd	nd	8.53	nd	nd	
42	5/29/24	>4839.2*	874.71	0.334	11.91	12.0	428.06	8.7	7.72	65.9	633	
43	5/29/24	11.9	1761.99	0.010	0.72	1.4	100.60	8.2	8.19	71.3	586	
44	5/29/24	178.9	159.94	0.011	0.07	10.0	65.22	8.7	7.67	59.6	764	
45	5/23/24	920.8	43.5	0.070	0.12	5.8	10.28	7.0	7.81	63.6	663.0	
46	5/30/24	517.2	nd	<.007*	nd	3.9	nd	nd	7.44	nd	nd	
47	5/29/24	209.8	214.98	0.035	0.31	6.6	57.86	8.1	8.15	66.7	535	
48	5/29/24	66.3	915.52	<.007	nd	2.0	74.67	7.7	8.33	68.8	424	
50	5/23/24	461.1	25.03	0.058	0.06	5.6	5.72	8.1	7.85	65.8	684	
51	5/31/24	228.2	89.06	<.007*	nd	<2.0*	nd	9.7	7.89	54.1	911	
52	5/23/24	488.4	17.23	0.12	0.09	3.00	2.11	5.7	7.87	65.1	678	
53	5/23/24	2.0	4.47	0.010	0.00	2.6	0.47	7.0	7.27	54.1	758	
54	5/23/24	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	
58	5/28/24	3635.0	2702.52	0.715	78.80	260.0	28654.84	7.7	7.74	64.1	652	
61	5/23/24	198.9	381.84	0.178	2.77	6.2	96.54	7.8	7.93	66.5	609	
62	5/23/24	218.7	229.52	0.102	0.95	4.8	44.93	8.2	8.08	66.3	659	
63	5/31/24	141.4	nd	0.030	nd	3.6	nd	8.5	8.36	65.9	554	
64	5/29/24	1299.7	245.83	0.136	1.36	30.0	300.75	8.0	7.81	62.2	560	
65	5/23/24	410.6	1309.25	0.146	7.80	<2.0*	nd	7.2	8.04	68.3	657	
68	5/23/24	1732.9	nd	0.090	nd	15.0	nd	7.4	8.00	69.9	651	
69	5/23/24	613.1	1436.80	0.133	7.79	13.0	761.72	7.5	8.03	69.2	657	
70	5/23/24	193.5	479.12	0.067	1.31	6.4	125.05	7.6	7.82	65.5	689	
72	5/23/24	221.1	nd	0.042	nd	2.9	nd	nd	7.27	nd	nd	
74	5/30/24	176.0	nd	0.274	nd	6.0	nd	nd	7.36	nd	nd	
75	5/30/24	51.8	nd	0.135	nd	<1.0*	nd	nd	6.99	nd	nd	
76	5/30/24	6.2	nd	<.007*	nd	2.4	nd	nd	8.41	nd	nd	

Table 3 May data for sites 40 through 76. The notation "nd" denotes that no data was collected or calculated due to a result below lab detection limits or the constraints of field conditions. Data shaded exceeds certain water quality standards selected from those provided by IDEM (see corresponding shaded standards in table 8). An asterisk (*) in the post rain event column indicated sample collection occurred within 48 hours of .5 inches of rainfall or more.

Site	Date	E-coli (CFU or colonies/100 ml)	CFM Discharge	Total Phos. (ppm)	Total Phos. Loading (kg/day)	TSS (ppm)	TSS Loading (kg/day)	D.O.	pH	Temp (F)	Specific Conductance	Post rain event *
1	7/23/24	1158.8	171.62	0.037	0.26	38.0	265.95	8.1	7.74	61.9	866	
2	7/23/24	821.2	788.84	0.078	2.51	6.0	193.02	9.8	7.94	66.7	820	
4	7/23/24	167.2	722.28	0.054	1.59	21.0	618.56	7.7	7.95	75.3	659	
5	7/23/24	119.6	1546.71	0.026	1.64	9.0	567.68	7.4	7.85	69.3	693	
7	7/23/24	203.8	2922.66	<.007*	nd	4.2	500.59	6.8	7.81	72.5	838	
8	7/23/24	383.6	2414.91	0.048	4.73	3.4	334.84	8.3	7.99	72.1	809	
10	7/23/24	14.8	1802.17	0.055	4.04	5.4	396.87	9.0	8.28	77.4	661	
12	7/23/24	6.2	2802.64	0.046	5.26	7.0	800.06	10.5	8.35	77.3	652	
14	7/24/24	27.5	2938.81	<.007*	nd	8.0	958.78	6.7	7.97	76.2	619	
15	7/24/24	2.0	3246.06	<.007*	nd	11.0	1456.15	4.7	8.32	77.7	616	
16	7/24/24	113.0	3580.35	<.007*	nd	11.0	1606.10	6.2	7.88	71.9	626	
17	7/25/24	5.2	nd	<.007*	nd	2.2	nd	7.1	8.18	76.2	314	
19	7/25/24	387.3	239.06	0.038	0.37	6.2	60.44	7.3	7.96	65.5	922	
21	7/25/24	38.4	986.35	0.007	0.28	<2.0*	nd	4.3	7.73	72.4	681	
22	7/25/24	410.6	88.60	0.085	0.31	4.4	15.90	2.7	7.45	69.0	795	
24	7/25/24	2.0	nd	<.007*	nd	3.8	nd	7.5	8.05	76.6	628	
25	7/25/24	193.5	1048.52	<.007*	nd	2.8	119.73	4.7	7.53	76.1	376	
26	7/24/24	78.5	50.84	<.007*	nd	14.0	29.03	6.8	8.04	76.9	451	
27	7/24/24	161.6	12.82	0.030	0.02	20.0	10.46	8.0	7.94	76.3	750	
28	7/24/24	980.4	53.04	<.007*	nd	13.0	28.12	7.5	8.10	72.2	497	
30	7/24/24	36.8	415.90	<.007*	nd	2.7	45.79	6.8	7.82	79.0	418	
31	7/24/24	270.0	299.96	<.007*	nd	3.5	42.81	7.4	8.07	75.6	436	
32	7/24/24	27.2	560.03	<.007*	nd	2.0	nd	7.5	8.31	79.0	413	
33	7/30/24	98.8	nd	0.028	nd	4.0	nd	9.1	8.15	76.9	578	*
34	7/30/24	547.5	832.14	0.049	1.66	3.0	101.81	4.0	7.57	73.2	507	*
35	7/24/24	52.9	27.53	<.007*	nd	<2.0*	nd	6.3	8.17	77.3	447	
37	7/24/24	86.2	nd	<.007*	nd	1.6	nd	8.4	8.40	78.4	488	
38	7/25/24	125.9	237.80	0.013	0.13	<2.0*	nd	4.0	7.28	73.3	359	
39	7/25/24	62.0	1375.09	0.011	0.62	2.4	134.59	7.1	8.25	77.7	343	

Table 4 July data for sites 1 through 39. The notation "nd" denotes that no data was collected or calculated due to a result below lab detection limits or the constraints of field conditions. Data shaded exceeds certain water quality standards selected from those provided by IDEM (see corresponding shaded standards in table 8). An asterisk (*) in the post rain event column indicated sample collection occurred within 48 hours of .5 inches of rainfall or more.

Site	Date	E-coli (CFU or colonies/100 ml)	CFM Discharge	Total Phos. (ppm)	Total Phos. Loading (kg/day)	TSS (ppm)	TSS Loading (kg/day)	D.O.	pH	Temp (F)	Specific Conductance	Post rain event *
40	7/24/24	1.0	nd	<.007*	nd	2.1	nd	7.7	8.54	76.4	370	
42	7/30/24	>8,065.3*	382.03	0.414	6.45	14.0	218.11	4.9	7.66	72.2	655	*
43	7/30/24	235.9	1441.36	0.020	1.18	6.0	352.68	6.8	8.00	78.6	440	*
44	7/30/24	1119.9	22.05	0.009	0.01	5.2	4.68	6.7	7.42	61.8	763	*
45	7/25/24	1841.6	nd	0.105	nd	36.0	nd	7.2	7.85	62.2	700.0	
46	7/24/24	204.6	29.58	<.007*	nd	1.1	nd	8.3	7.52	62.0	683	
47	7/30/24	1732.9	48.46	0.082	0.16	4.6	9.09	5.9	7.86	72.6	554	*
48	7/23/24	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	
50	7/25/24	574.8	5.95	0.085	0.02	9.6	2.33	8.1	7.90	71.5	716	
51	7/24/24	156.5	30.48	0.027	0.03	1.2	1.49	9.5	8.00	63.9	916	
52	7/25/24	>4839.2*	8.79	0.130	0.05	12.0	4.30	6.2	7.75	65.0	659	
53	7/25/24	6.3	87.43	0.012	0.04	3.2	11.41	6.8	7.21	57.1	772	
54	7/25/24	65.0	nd	0.082	nd	5.8	nd	2.2	7.19	64.6	427.0	
58	7/23/24	254.8	2702.52	0.034	3.75	4.6	506.97	7.4	7.90	73.8	694	
61	7/30/24	467.4	240.98	0.083	0.82	11.0	108.10	7.2	7.90	69.6	618	*
62	7/25/24	206.4	422.93	0.090	1.55	4.2	72.44	8.4	8.04	68.2	654	
63	7/30/24	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	
64	7/30/24	>1,119.9*	44.65	0.081	0.15	5.6	10.20	5.7	7.79	69.6	635	*
65	7/25/24	1046.2	890.88	0.098	3.56	4.4	159.86	8.4	8.18	71.7	684	
68	7/30/24	579.4	nd	0.076	nd	5.2	nd	7.4	8.13	80.3	644	*
69	7/30/24	435.2	1043.91	0.114	4.85	3.2	136.23	6.7	8.08	74.1	682	*
70	7/30/24	624.0	484.56	0.051	1.01	6.4	126.47	8.0	7.84	71.3	741	*
72	7/25/24	166.0	nd	0.031	nd	5.8	nd	5.3	7.17	69.7	690	
74*	7/15/24	>2419.6	nd	0.421	nd	5.8	nd	nd	7.51	nd	nd	
75*	7/15/24	1413.6	nd	0.472	nd	5.2	nd	nd	6.88	nd	nd	
76	7/23/24	2.0	nd	<.007*	nd	2.3	nd	8.4	8.63	82.9	443	

Table 5 July data for sites 42 through 75. The notation "nd" denotes that no data was collected or calculated due to a result below lab detection limits or the constraints of field conditions. Data shaded exceeds certain water quality standards selected from those provided by IDEM (see corresponding shaded standards in table 8). An asterisk (*) in the post rain event column indicated sample collection occurred within 48 hours of .5 inches of rainfall or more. An asterisk (*) after the site number indicates volunteer collected data. An asterisk (*) on data indicates data is suspect, laboratory analysis was performed outside the hold period.

	Date	E-coli (CFU or colonies/100 ml)	CFM Discharge	Total Phos. (ppm)	Total Phos. Loading (kg/day)	TSS (ppm)	TSS Loading (kg/day)	D.O.	pH	Temp (F)	Specific Conductance	Post rain event *
1	8/22/24	1986.3	134.52	<.007*	nd	22.0	120.69	11.1	8.10	57.4	810	
2	8/22/24	570.2	422.13	<.007*	nd	1.9	32.71	8.2	7.98	60.0	820	
4	8/22/24	56.3	378.50	<.007*	nd	4.8	74.09	9.3	8.16	68.2	597	
5	8/22/24	55.6	1000.50	<.007*	nd	4.9	199.93	7.7	7.96	68.7	798	
7	8/22/24	82.8	2938.57	<.007*	nd	2.9	347.53	9.9	8.13	65.4	958	
8	8/22/24	166.4	2303.90	<.007*	nd	1.1	103.35	9.3	8.09	65.0	907	
10	8/22/24	51.2	910.99	<.007*	nd	6.2	230.34	8.1	8.06	72.3	763	
12	8/22/24	5.2	2016.17	<.007*	nd	6.0	493.33	7.8	8.02	72.3	738	
14	8/27/24	35.9	1966.13	0.038	nd	2.1	168.38	3.5	7.63	78.0	618	
15	8/27/24	6.3	2894.87	0.04	nd	7.5	885.41	6.2	8.42	79.3	578	
16	8/26/24	77.6	1817.63	0.01	nd	1.9	140.84	12.4	8.27	73.4	618	
17	8/20/24	3.1	nd	0.007	nd	1.5	nd	7.0	8.09	70.6	305	
19	8/20/24	770.1	503.26	0.031	0.64	1.9	38.99	7.8	7.99	62.4	964	
21	8/20/24	98.9	1046.49	<.007*	nd	<1.0*	nd	5.6	7.72	68.3	709	
22	8/20/24	36.3	432.40	0.054	0.95	1.5	26.45	2.7	7.35	65.4	869	
24	8/20/24	21.1	nd	<.007*	nd	1.2	nd	6.2	7.97	71.1	651	
25	8/20/24	151.5	295.07	0.018	nd	1.4	16.85	5.7	7.51	70.2	408	
26	8/21/24	2419.6	14.40	0.105	0.062	6.3	3.70	7.1	7.75	58.7	476	
27	8/21/24	357.8	16.00	0.055	0.036	9.8	6.39	8.5	8.15	58.8	573	
28	8/21/24	54.6	5.80	0.030	0.007	4.10	0.97	7.5	7.80	65.4	537	
30	8/21/24	26.5	48.07	0.022	0.043	2.9	5.68	6.1	7.61	68.5	435	
31	8/21/24	155.3	59.65	0.012	0.029	1.7	4.14	8.8	8.10	61.3	502	
32	8/21/24	19.9	338.24	<.007*	nd	1.5	nd	7.4	8.32	72.8	413	
33	8/21/24	13.3	nd	0.034	nd	3.1	nd	10.2	8.28	70.9	465	
34	8/21/24	344.8	56.81	0.075	0.17	<1.0*	nd	7.0	7.81	66.8	545	
35	8/21/24	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	
37	8/20/24	37.3	nd	<.007*	nd	1.5	nd	9.0	8.33	74.2	480	
38	8/20/24	118.7	223.69	0.011	0.10	3.3	nd	4.5	7.24	65.5	357	
39	8/20/24	76.0	148.77	0.035	0.21	14.0	84.94	6.6	7.65	62.3	680	

Table 6 August data for sites 1 through 39. The notation "nd" denotes that no data was collected or calculated due to a result below lab detection limits or the constraints of field conditions. Data shaded exceeds certain water quality standards selected from those provided by IDEM (see corresponding shaded standards in table 8). An asterisk (*) in the post rain event column indicated sample collection occurred within 48 hours of .5 inches of rainfall or more.

Site	Date	E-coli (CFU or colonies/100 ml)	CFM Discharge	Total Phos. (ppm)	Total Phos. Loading (kg/day)	TSS (ppm)	TSS Loading (kg/day)	D.O.	pH	Temp (F)	Specific Conductance	Post rain event *
40	8/20/24	1.0	nd	<.007*	nd	1.9	nd	7.3	8.33	74.4	371	
42	8/21/24	541.3	29.99	0.082	0.10	<1.0*	nd	8.9	7.94	62.6	652	
43	8/21/24	33.1	67.95	0.025	0.07	1.8	4.99	9.1	8.32	73.4	431	
44	8/26/24	307.6	8.54	<.007*	nd	2.1	0.73	7.3	7.58	62.9	779	
45	8/20/24	115.7	nd	0.075	nd	16.0	nd	8.0	7.85	56.8	723	
46	8/20/24	53.9	32.86	<.007*	nd	1.2	nd	7.6	7.56	61.9	652	
47	8/26/24	1046.2	30.74	0.048	0.06	1.0	1.25	6.6	8.02	75.3	485	
48	8/22/24	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	
50	8/26/24	579.4	3.35	0.090	0.01	17.0	2.32	6.7	7.90	68.4	727	
51	8/27/24	344.8	102.44	<.007*	nd	1.2	5.01	8.7	7.95	62.7	907	
52	8/20/24	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	
53	8/20/24	38.8	5.02	0.015	0.00	3.3	0.68	6.9	7.28	56.7	772	
54	8/20/24	167.0	nd	0.071	nd	6.4	nd	4.0	7.28	59.0	412.0	
58	8/22/24	176.4	1739.03	<.007*	nd	2.0	141.84	8.6	8.04	67.1	721	
61	8/26/24	770.1	481.08	0.054	1.06	4.6	90.25	7.7	7.98	68.2	653	
62	8/26/24	248.1	40.62	0.042	0.07	2.2	3.64	7.1	7.98	66.3	844	
63	8/26/24	64.4	nd	0.04	nd	2.50	nd	6.5	7.77	79.1	532	
64	8/26/24	579.4	292.68	0.098	1.17	4.4	52.52	7.9	8.10	76.2	656	
65	8/26/24	1203.3	500.30	0.163	3.33	7.0	142.82	6.8	8.17	71.2	700	
68	8/26/24	980.4	nd	0.089	nd	5.2	nd	6.5	8.07	70.6	79	
69	8/26/24	727.0	941.73	0.147	5.65	6.2	238.11	6.3	8.10	71.3	681	
70	8/26/24	727.0	222.36	0.044	0.40	9.4	85.24	5.4	7.73	67.5	705	
72	8/20/24	77.1	3.30	0.052	nd	4.4	nd	5.8	7.24	67.1	526	
75	9/4/24	9.8	nd	0.033	nd	3.2	nd	nd	7.12	nd	nd	
76	8/21/24	3.1	nd	<.007*	nd	1.5	nd	7.8	8.41	75.9	449	

Table 7 August data for sites 40 through 76. The notation "nd" denotes that no data was collected or calculated due to a result below lab detection limits or the constraints of field conditions. Data shaded exceeds certain water quality standards selected from those provided by IDEM (see corresponding shaded standards in table 8). An asterisk (*) in the post rain event column indicated sample collection occurred within 48 hours of .5 inches of rainfall or more. An asterisk (*) after the site number indicates volunteer collected data. An asterisk (*) after E-coli data indicates data is suspect, laboratory analysis was performed outside the hold period. An asterisk (*) after T-phos. data indicates result below quantification limit, data is suspect.

Parameter	Target	Reference/other information
Temperature	Dependent on time of year and whether stream is designated as a coldwater fishery	Indiana Administrative Code (IAC)
Dissolved Oxygen (DO)	Min: 4.0 mg/L Max: 12.0 mg/L	Indiana Administrative Code (IAC)
	Min: 6.0 mg/L in cold water fishery streams	Indiana Administrative Code (IAC)
	Min: 7.0 mg/L in spawning areas of cold water fishery streams	Indiana Administrative Code (IAC)
E. coli	Max: 235 CFU/ 100mL in a single sample,	Indiana Administrative Code (IAC)
	Max: Geometric Mean of 125 CFU/ 100mL from 5 equally spaced samples over a 30-day period	
Total Phosphorus	Max: 0.076 mg/L	U.S. EPA recommendation
	0.07 mg/L	Dividing line between mesotrophic and eutrophic streams (Dodd et al. 1998)
	Max: 0.08 mg/L	Ohio EPA recommendation to protect aquatic biotic integrity in WWH
	Max: 0.3 mg/L	IDEM draft TMDL target
Total Suspended Solids (TSS)	Max: 80.0 mg/L	Wawasee Area Conservancy Foundation recommendation to protect aquatic life in lake systems
	Max: 30.0 mg/L	IDEM draft TMDL target
	Range: 25.0-80.0 mg/L	Concentrations within this range reduce fish concentrations (Waters, 1995)
	Max: 40.0 mg/L	New Jersey criteria for warm water streams
	Max: 46.0 mg/L	Minnesota TMDL criteria for protection of fish/macroinvertebrate health
Turbidity	Max: 10.4 NTU	U.S. EPA recommendation

Table 8 Indiana Department of Environmental Quality Table of Water Quality Targets. Standards shaded on results tables correspond to standards shaded in this table.

3. Results: May Sampling

May sampling was scheduled to include 58 sites, but only 57 sites were sampled. Site 54, Alvin Patterson Ditch was not sampled due to an elevated lake level at the collection site. The culvert the sample is normally collected from was inundated with lake water. May sampling results are listed in tables 2 and 3. The two volunteer-collected samples are also shown in the May data. Samples collected represented baseline-flow conditions at all sites. Table 8 contains a variety of stream water quality targets provided by the Indiana Department of Environmental Management (IDEM) for comparison with the 2024 season data. Also provided for comparison is table 9 containing averages of stream data from the IDEM probabilistic data set. The data used to calculate these averages was collected from Indiana Streams within the St. Joseph River watershed from year 2000 to 2005. Most of the collection sites included in the 2024 data are also within the St. Joseph River watershed and therefore represent somewhat similar soil types, topography, and land uses. This allows some amount of judgment to be made as to whether the 2023 samples were "below average", "average" or "above average" in terms of northern Indiana stream water quality. In May 17 sites exceeded the E-coli standard of 235 MPN/100 ml and 13 sites exceeded the total phosphorus standard of .076 ppm.

Parameter	IDEM Mean Stream Data
	St. Joseph Watershed 2000-2005
pH	n/d
D.O. (ppm)	7.14
Temp. (deg C)	19.91
Specific conductance umho/cm	764.19
Total Suspended Solids (ppm)	36
Total Phosphorus (ppm)	0.382
E-coli (CFU/100ml)/(MPN)	1895.58

Table 9 Average of IDEM-collected probabilistic Indiana stream data for the St Joseph River Watershed 2000-2005

4. Results: July Sampling

July sampling was scheduled to include 53 sampling sites, but only 51 sites were sampled. Site 48 was not sampled because no flow was present at the site and site 63 was not sampled because the property owner denied permission for entry. The two volunteer-collected samples are also shown in the July data. A total of 11 sites were considered "rain event" samples in July with the remaining samples representing baseline-flow conditions. Sampling results are listed in tables 4 and 5. E-coli standards were exceeded at 24 sites. Total phosphorus standards were exceeded at 15 sites.

5. Results: August Sampling

August sampling was scheduled to include 53 sampling sites. Samples were collected at 50 sites. Sites 35, 48, and 52 were omitted due to "no flow" conditions. Site 75 was sampled by volunteer samplers on Sept. 4. Sampling results are listed in tables 6 and 7. All sites represented

"baseline" flow conditions. E-coli standards were exceeded at 18 sites while total phosphorus standards were exceeded at 7 sites.

6. Conclusions

Over several years the SCLC has built an extensive body of local water quality data. There are many ways to examine the statistical content of the data and glean information to assist in meeting the needs of local lake residents, government agencies, and land users. The SCLC is encouraged to continue to convey the water quality information through its website, meetings, and other outlets, fostering cooperative community water-quality improvement efforts and encouraging new input and ideas to direct future sampling and steps toward water quality improvement.