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Rouge River Benthic Macroinvertebrate Monitoring Program Fall 2022 Report

This report contains benthic macroinvertebrate sampling results from 46 Rouge tributary and river sites. The Fall Bug Hunt on October 15, 2022 had 89 attendees that sampled 30 sites in 16 teams. Groups that participated included Wayne State University's Transformative Research in Urban Sustainability Training program and the Sustainability Learning Community; Schoolcraft College; and teachers in Wayne County RESA's Master

Science Teacher Fellowship. Additional sites were sampled during the Team Leader Training, with the University of Michigan-Dearborn's Watershed Analysis class, by Wayne County Department of Public Services Environmental Services Division separately and with FOTR staff and interns, and by Sue Thompson for a total of 46 sites. Funding for the monitoring was provided by the communities of Beverly Hills, Canton Township, Farmington, Livonia, Northville Township, Novi, Plymouth, Plymouth Township, Southfield, Troy and Washtenaw County Water Resources who sponsored sites the Michigan Clean Water Corps and a donation from Lynn DeGrande and Stuart Steele.

Overall Scores

The average Stream Quality Index (SQI) for sites was FAIR (26) (map p.6-8, Table 1 & 5). Seven sites rated GOOD; 29 sites were FAIR and nine sites scored POOR. The average Water Quality Rating (WQR) was FAIR (6.00) with 1 site very good, 17 good, 16 fair, 7 fairly poor, 1 poor, and 3 very poor. Sites averaged 12 taxa, 8 Aquatic Insect Taxa, and 2 EPT. SQI was highest at Up2 and John1 (41) and WQR highest at Sprag (4.45). The number of taxa found at sites was highest at Main6 (19) and lowest at Fel2 (6). Insect taxa which includes the more sensitive groups, was highest at Up2 (14) and lowest at MR-24 (4). Some mayfly, stonefly and caddisfly families (EPT) were found at all but nine sites with an average of 2 of these families per site. Up2 had the highest number of EPT (5). In comparison to last fall, SQI and taxa were lower but WQR was higher and EPT was the same.

Table 1: Averages

	Average SQI	Average WQR	Average # of taxa	Average # Insect Taxa	Average EPT
2022	26 fair	6.00 fair	12	8	2
2021	30 fair	6.25 fair	13		2

Data Trends

In comparison to past years, 78% of sites were stable, more than last year (Chart 1). But only 11% were improving and 9% were declining. Last fall, 22% were improving and 6% were declining.

Understanding Benthic Scores

Each site is given a **Stream Quality Index (SQI)** which is determined by weighting each type and number of organisms found by their sensitivity ratings. A higher proportion of sensitive organisms such as mayflies and caddisflies results in a higher **SQI**. A greater number of different organisms also results in a high **SQI**. The **SQI** has four different levels: **>48=EXCELLENT, 34-48=GOOD, 19-33=FAIR, <19=POOR**.

SQI – Stream Quality Index, a measure of the degree of organic pollution that is calculated by rating and scoring organisms based on their sensitivity (sensitive, somewhat sensitive and tolerant) and frequency in the sample (rare or common). Higher scores reflect better quality sites. Recommend keeping SQI paragraphs together

Number of taxa represents the number of different families of organisms. Like SQI, a higher number of taxa indicate a healthier site.

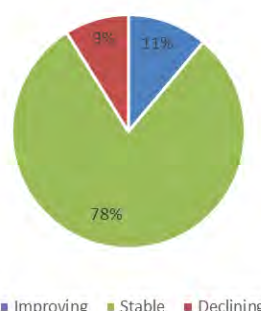
Number of insect taxa – insects are more sensitive than the non-insect taxa.

EPT refers to the number of mayfly, caddisfly and stonefly families found; these three orders contain some of the most sensitive organisms.

NEW in Fall 2021

WQR – Water Quality Rating is a measure of the degree of organic pollution similar to SQI. Organisms are rated based on the Hilsenhoff Index of Biotic Integrity and scores are weighted by the number of individuals found. Unlike SQI, a LOWER score is indicative of less pollution. There are seven categories rather than four. 0.0-3.50=excellent, 3.51-4.50=very good, 4.51-5.50=good, 5.51-6.50=fair, 6.51-7.50=fairly poor, 7.51-8.50=poor, 8.51-10.0=very poor. WQR is calculated based on family level identification.

Chart 1: Data Trends



To compare change over time, we analyzed the trends by subwatershed, with Johnson Creek analyzed separately as it is a coldwater tributary (Table 2 and graphs p. 11-19). The Middle 3 subwatershed and Johnson Creek had significant positive trends. The Main 1-2, the Upper and the Lower 1 subwatersheds had significant negative trends. These trends are similar to last year.

Table 2: Fall Bug Hunt Trend Summary All Sites 2001-2022					
Subwatershed	slope	p-value	True trend	Subwatershed average score	Water Quality Rating
Main 1-2	-0.4679	0.00007	yes, negative	29	Fair
Upper	-0.2446	0.0123	yes, negative	24	Fair
Johnson Creek	0.2765	0.0330	yes, positive	35	Good
Middle 1	-0.1539	0.1948	no trend	32	Fair
Middle 3*	0.5255	0.00002	yes, positive	23	Fair
Lower 1	-0.3435	0.0052	yes, negative	28	Fair
Lower 2**	-0.2370	0.1790	no trend	26	Fair
Main3-4**	-0.4411	0.2203	no trend	27	Fair
* no sites sampled in Fall 2020-2021 **no sites sampled in Fall 2019-2021					

The data was further analyzed for trends by tributaries and subareas. Table 3 contains a summary of this analysis; the graphs are on p. 11-19. When the upper and lower sections of the Main, Middle and Lower subwatersheds were combined, the trends stood – negative for the Main and Lower and positive for the Middle. The Middle also remained positive when combined with Johnson Creek. When all the sites were combined, there was no significant trend.

Table 3: Fall Bug Hunt Trend Summary Branches/Tributaries 2001-2022					
Branch	slope	p-value	True trend	Branch average score	Water Quality Rating
Main combined (Main 1/2 and Main 3/4)	-0.4671	0.00002	yes, negative	29	Fair
Bell Creek only	-0.1479	0.3554	no trend	23	Fair
Upper only	-0.0878	0.0652	no trend	27	Fair
Middle 1 and 3 combined	0.1491	0.1468	yes, positive	29	Fair
Tonquish Creek only	0.0877	0.6783	no trend	31	Fair
Johnson Creek and Middle Rouge	0.2459	0.00320	yes, positive	31	Fair
Middle without Tonquish Creek	0.1407	0.23750	no trend	29	Fair
Lower 1 and Lower 2 combined	-0.3223	0.0015	yes, negative	27	Fair
Rouge all subwatersheds combined	-0.0599	0.3024	no trend	29.5	Fair

Individual sites were examined for long term trends (Table 4). Of the sites sampled in fall 2022, six had a significant negative trend.

Table: 4 Fall Bug Hunt Data Trend 2001-2022 by site					
Site	slope	p-value	Statistically significant trend	Site average score	Water Quality Rating
Main6	-0.3841	0.0348	yes, negative	33	Fair
Nott	-0.5540	0.0178	yes, negative	26	Fair
Bell2	-0.5925	0.0418	yes, negative	24	Fair
MR-14	-0.9744	0.0061	yes, negative	28	Fair
Fowl2	-0.4070	0.0468	yes, negative	24	Fair
LR-3	-0.6013	0.0448	yes, negative	27	Fair



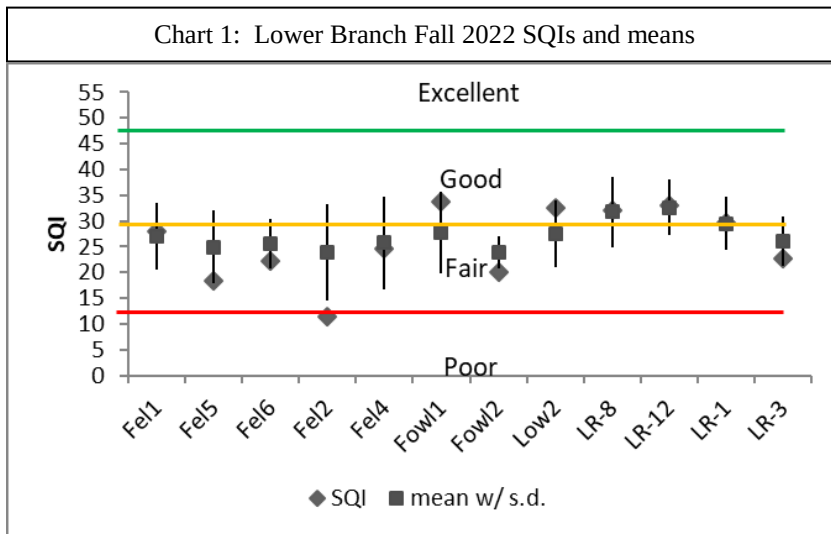
Since 2020, we have been testing sites for road salt (chloride) through the Izaak Walton League's Salt Watch program during the Stonefly Search and Bug Hunts. Salt we apply to our roads and sidewalks for snow and ice removal washes into our streams and is toxic to aquatic life when it reaches high levels. Recognizing this, the State of Michigan Department of Environment, Great Lakes and Energy (EGLE) set water quality values aiming to protect surface water from chloride, based on parts per million (ppm) concentrations. These are:

- 150 ppm and above - causes long term effects to aquatic life (chronic)
- 320 ppm and above - causes acute effects to aquatic life (toxic)

This fall, seven sites had toxic levels of chloride (table 5, map p. 9). This is particularly concerning as one would expect road salt applied last winter to be washed out of the system by October. EGLE has already listed Bishop Creek as "impaired" due to high salt levels. Tonquish Creek, Bell Creek and Evans Creek also need further examination due to elevated concentrations.

Table 5: Sites with Toxic Levels of Chloride				
BRANCH	Stream Name	FIELDID	Site Description	Cl ppm
Main	Evans Creek	Evan2	LTU	551
Middle	Bishop Creek	Bish2	Bishop Scarborough	637
Middle	Tonquish Creek	Nton	S Evergreen St	365
Middle	Tonquish Creek	MR-24	Lion's Pk	440
Middle	Tonquish Creek	Ton2	Ann Arbor Rd	341
Upper	Bell Branch	Bell1	Bicentennial Park	418
Upper	Bell Branch	Bell3	Livonia 6 Mile	391

Lower Branch



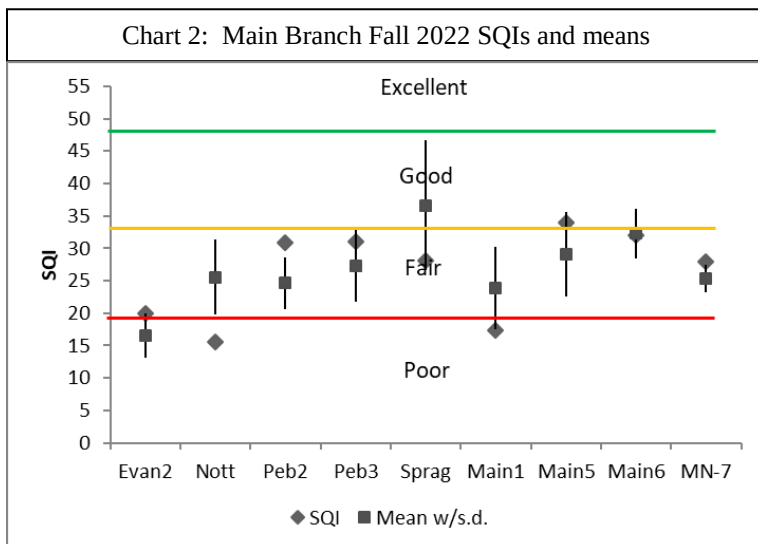
Thirteen sites were sampled on the Lower Branch (Table 5), including two tributaries: Fellows and Fowler Creeks. LR-9 was sampled but the results were not included in the analysis since water was too low to adequately sample. SQIs averaged FAIR (24). One site had a GOOD SQI, nine had FAIR SQIs and two were POOR. In the new WQR system, sites averaged fair – 6.45. Sites had an average of 11 taxa, 7 insect taxa and 1 EPT. Chloride levels were the lowest overall in the Lower branch with most below the standard, two sites at chronic levels (Fel2 and Fel4) and none at the toxic level.

SQI scores were compared with past data (Chart 1). Eleven were within a standard deviation of the average for the site and one was below.

Long term trend analysis showed a significant negative trend for the Lower 1 and for all of the Lower when the subwatersheds are combined (Table 2-3 above, graphs p. 17-18). Fowl2 and LR-3 both had significant negative trends (Table 4).

Main Branch

Nine sites on the Main Branch were sampled, including four tributaries: Evans, Nottingham, Pebble and Sprague Creek. Creeks. SQIs averaged FAIR (25). One rated GOOD, six rated FAIR and two POOR. WQRs averaged fair (6.27). Taxa averaged 12, 7 insect taxa and 2 EPT. Chloride levels averaged 238 ppm, and most sites were at the chronic effects level, with one site at the toxic level (Evan2).



In comparing averages and past data (Chart 2), one site was above a standard deviation of the mean (Peb2) and one was below (Nott).

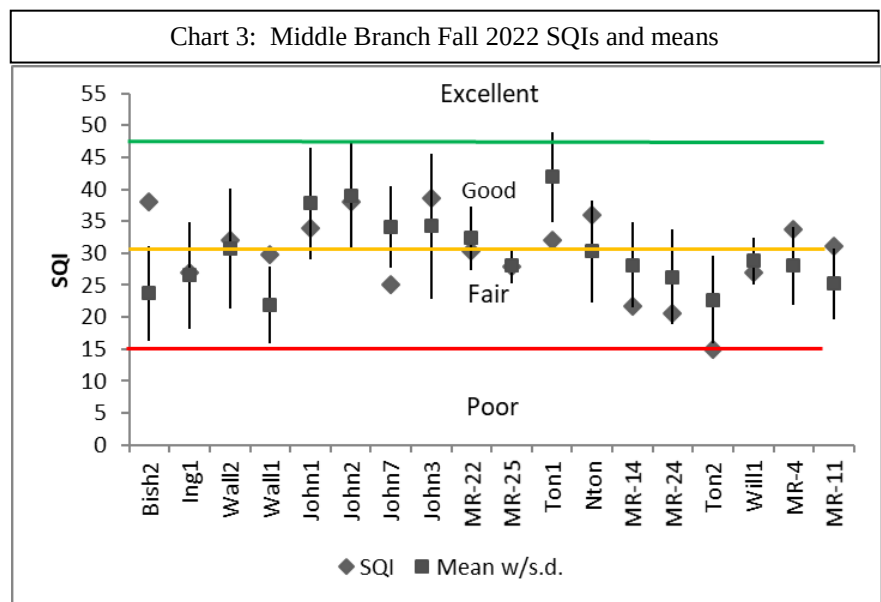
Long term trend analysis shows a significant negative trend for the Main 1-2 subwatershed as

well as for all of the Main when the subwatersheds are combined (Table 2-3 above, graphs p. 11-12). Main6 and Nott had significant negative trends when considered separately (Table 4).

Middle Branch

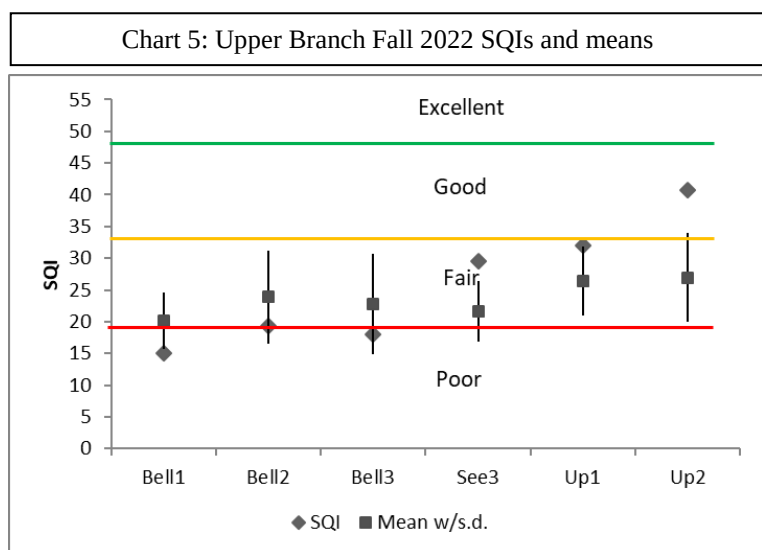
Eighteen sites were sampled on the Middle Branch including Johnson (6), Tonquish (5), the Walled Lake drainage (4 – includes Bishop and Ingersoll Creeks) and Willow Creek. SQI scores averaged FAIR (29). There were six GOOD, 11 FAIR and one POOR SQIs. WQRs averaged fair (5.63). Taxa averaged 13, 8 insect taxa and 2 EPT.

In comparing averages and past data (Chart 3), the majority of sites (14) were within a standard deviation of the average for the sites. Two sites were above (Bish2 & Wall1) and two sites were below (John7 and Ton1). Chloride levels averaged 230 ppm and three sites had toxic levels, all on Tonquish Creek.



In long term trend analysis, the Middle 3 and Johnson Creek had positive trends (Table 2 above, graphs p. 9-10). When the Middle 1 and Middle 3 subwatersheds were combined, there a significant positive trend (Table 3 above, graphs p. 14-17). When Johnson Creek was combined with the Middle branch, there was also a significant positive trend. MR-14 had a negative trend when considered by site (Table 4).

Upper Branch



Six Upper branch sites were sampled including Bell (3), and Seeley Creeks. SQIs averaged FAIR (22). One site was GOOD, three FAIR and two POOR. WQR averaged fair (5.81). Taxa averaged 12, 8 insect taxa and 2 EPT. Chloride levels averaged 296 and 2 sites had toxic levels (Bell1 and Bell3).

In comparing averages and past data (Chart 5), two sites were above a standard deviation of the average (See3 and Up2).

Long term trend analysis shows a significant decline in scores for the Upper Branch but not for Bell Creek or

the Upper considered without Bell Creek (Table 2 & 3, graphs p. 12-13). Bell2 had a negative trend when considered separately.

THANK YOU!!!!

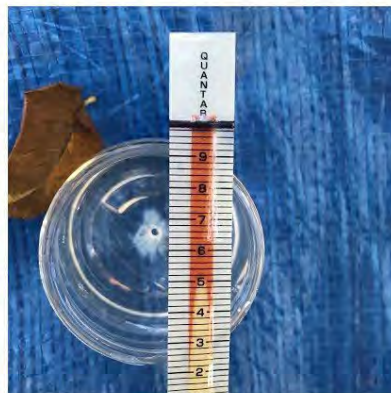
Thank you to all the **volunteers** and **Team Leaders**, Sue Thompson for sampling additional sites, helping with identification, analyzing trends and reviewing the report, and Beverly Hills, Canton Township, Farmington, Livonia, Northville Township, Novi, Plymouth, Plymouth Township, Southfield, Troy and Washtenaw County Water Resources who sponsored sites, the Michigan Clean Water Corps and a donation from Lynn DeGrande and Stuart Steele for funding the program.

Join us for the **Winter Stonefly Search**

Sat. Jan. 21, 2023 10 am – 3 pm

Register at www.therouge.org by Jan. 6, 2023

Virtual Stonefly Primer Thurs. Jan. 12 6-7:00 pm on Zoom to get ready



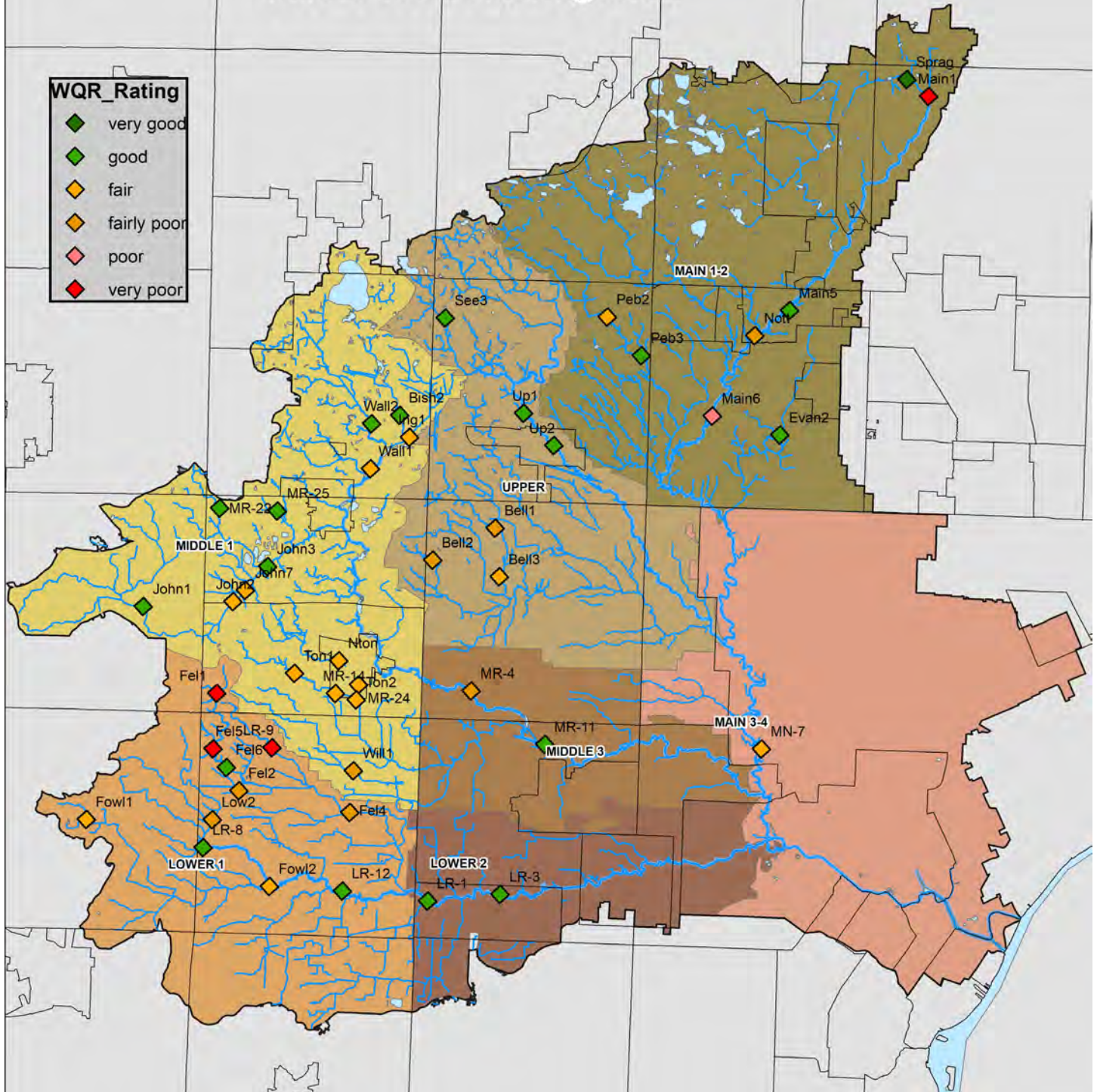
2022 FOTR Fall Bug Hunt

SQI_rating

- good (green circle)
- fair (yellow circle)
- poor (red cross)

The map displays the FOTR area with various sampling locations marked by colored circles (green for good, yellow for fair, red cross for poor) and labeled with names like John1, John2, John3, John7, Ton1, Nton, MR-14, MR-24, Fel1, Fel5, Fel6, Fel2, Fel4, Fow1, Fow2, LR-8, LR-9, LR-12, LR-1, LR-3, MR-4, MR-11, MR-25, MR-22, MR-1, MR-2, MR-3, MR-4, MR-5, MR-6, MR-7, MR-8, MR-9, MR-10, MR-11, MR-12, MR-13, MR-14, MR-15, MR-16, MR-17, MR-18, MR-19, MR-20, MR-21, MR-22, MR-23, MR-24, MR-25, MR-26, MR-27, MR-28, MR-29, MR-30, MR-31, MR-32, MR-33, MR-34, MR-35, MR-36, MR-37, MR-38, MR-39, MR-40, MR-41, MR-42, MR-43, MR-44, MR-45, MR-46, MR-47, MR-48, MR-49, MR-50, MR-51, MR-52, MR-53, MR-54, MR-55, MR-56, MR-57, MR-58, MR-59, MR-60, MR-61, MR-62, MR-63, MR-64, MR-65, MR-66, MR-67, MR-68, MR-69, MR-70, MR-71, MR-72, MR-73, MR-74, MR-75, MR-76, MR-77, MR-78, MR-79, MR-80, MR-81, MR-82, MR-83, MR-84, MR-85, MR-86, MR-87, MR-88, MR-89, MR-90, MR-91, MR-92, MR-93, MR-94, MR-95, MR-96, MR-97, MR-98, MR-99, MR-100. The map also shows major roads and water bodies.

2022 FOTR Fall Bug Hunt



2022 FOTR Fall Bug Hunt

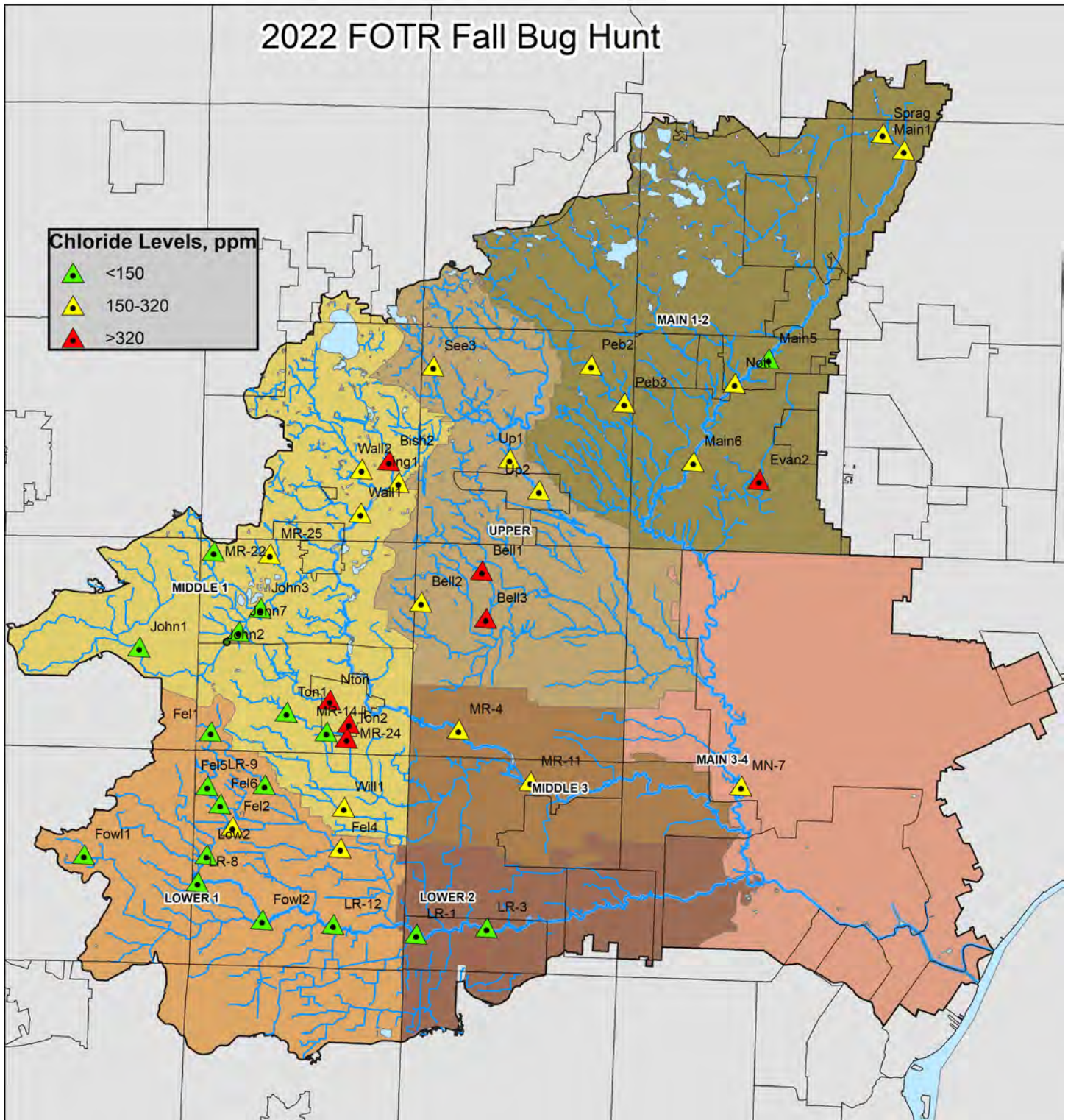
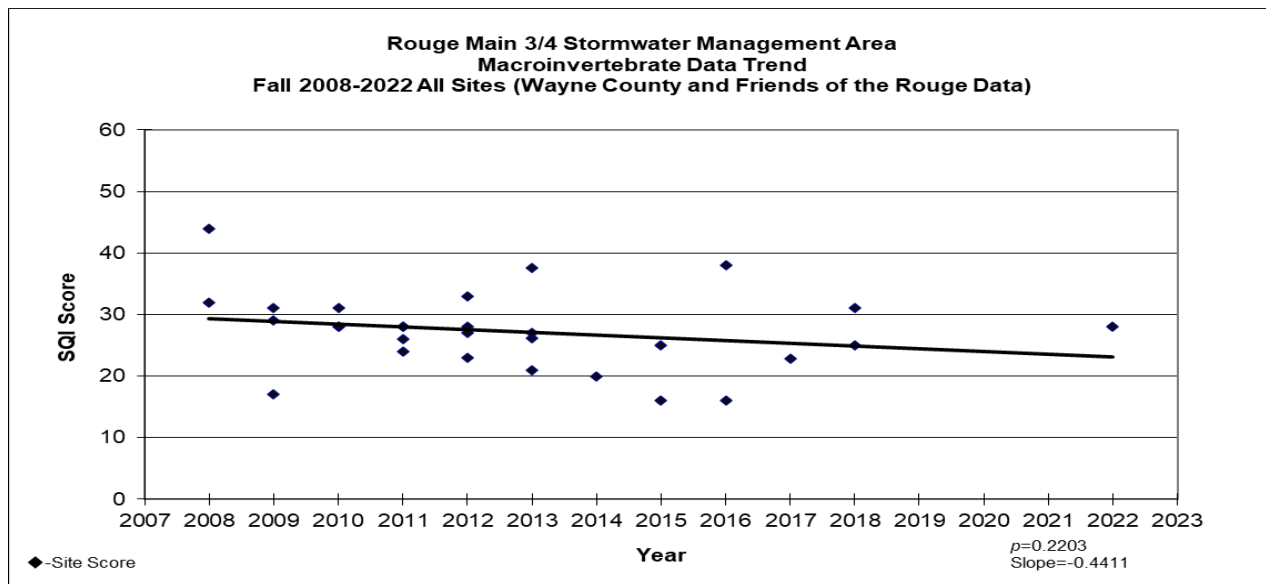
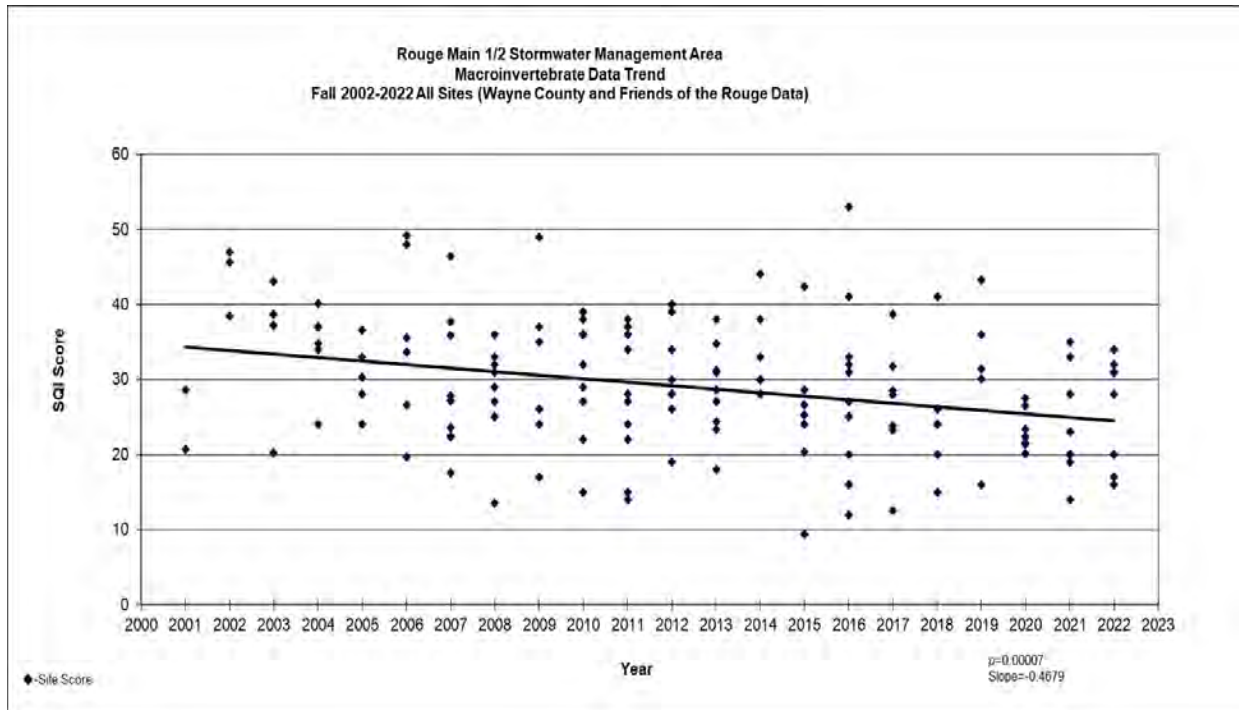
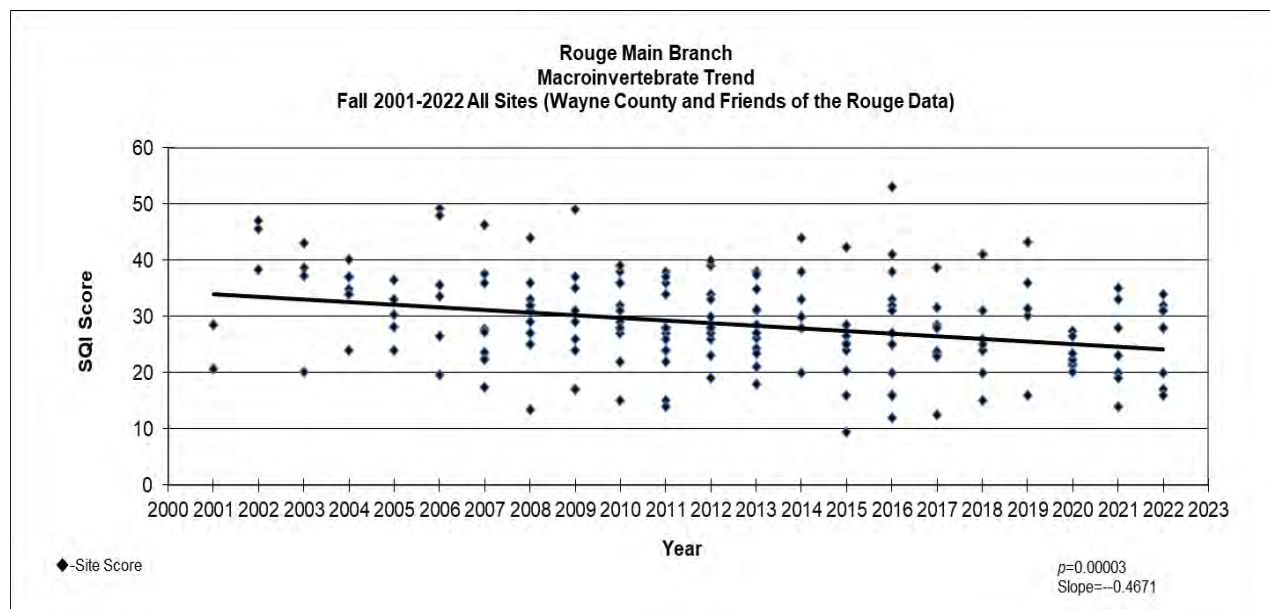


Table 5: Fall 2022 Data												
BRANCH	Stream Name	FIELDDID	Site Description	SQL	SQL Rating	Taxa	Insect Taxa	EPT	WQR	WQR Score	CI ppm	CI Rating
Lower	Fellows Creek	Fel1	Top of Hill Ct	28	fair	10	6	2	10.00	very poor	106	ok
Lower	Fellows Creek	Fel5	Warren Ridge	18	poor	8	6	0	10.00	very poor	95	ok
Lower	Fellows Creek	Fel6	Hanford	22	fair	9	7	2	5.23	good	95	ok
Lower	Fellows Creek	Fel2	Vintage Valley	11	poor	6	6	0	7.00	fairly poor	276	chronic
Lower	Fellows Creek	LR-9	Fellows Beck Warren	5	poor	3	2	0	10.00	very poor	143	ok
Lower	Fellows Creek	Fel4	Flodin Pk	25	fair	13	4	0	6.61	fairly poor	172	chronic
Lower	Fowler Creek	Fowl1	Prospect	34	good	17	11	2	5.97	fair	31	ok
Lower	Fowler Creek	Fowl2	Fowler Beck	20	fair	9	6	3	5.88	fair	44	ok
Lower	Lower Rouge	Low2	Cherry Hill	33	fair	15	8	1	7.40	fairly poor	44	ok
Lower	Lower Rouge	LR-8	Ridge Proctor	32	fair	12	8	2	4.72	good	85	ok
Lower	Lower Rouge	LR-12	Morton Taylor	33	fair	15	11	2	4.67	good	133	ok
Lower	Lower Rouge	LR-1	Commerce Ct	30	fair	13	8	2	5.17	good	133	ok
Lower	Lower Rouge	LR-3	Goudy Park	23	fair	11	7	2	4.80	good	144	ok
Main	Evans Creek	Evan2	LTU	20	fair	11	7	1	5.02	good	551	acute
Main	Nottingham Creek	Nott	Country Day	16	poor	8	5	0	6.73	fairly poor	172	chronic
Main	Pebble Creek	Peb2	Pebble 13 Mile	31	fair	14	8	2	6.50	fair	238	chronic
Main	Pebble Creek	Peb3	Pebble d/s Dam	31	fair	13	8	2	5.11	good	220	chronic
Main	Sprague Creek	Sprag	Main Lloyd Stage	28	fair	11	9	2	4.45	very good	220	chronic
Main	Main Rouge	Main1	FF Pk	17	poor	10	5	0	9.40	very poor	157	chronic
Main	Main Rouge	Main5	Douglas Evans	34	good	17	8	2	5.40	good	106	ok
Main	Main Rouge	Main6	Sfld Civic Ctr	32	fair	19	10	3	8.21	poor	187	chronic
Main	Main Rouge	MN-7	Rouge Park	28	fair	13	6	3	6.15	fair	292	chronic
Middle	Bishop Creek	Bish2	Bishop Scarborough	38	good	15	10	2	4.74	good	637	acute
Middle	Ingersoll Creek	Ing1	Brookfarm Park	27	fair	14	10	1	6.06	fair	238	chronic
Middle	Walled Lk Drainage	Wall2	WL 10 M	32	fair	12	8	2	4.96	good	276	chronic
Middle	Walled Lk Drainage	Wall1	Rotary Pk	30	fair	16	9	3	5.70	fair	257	chronic
Middle	Johnson Creek	John1	5M Salem	34	good	15	12	2	5.48	good	95	ok
Middle	Johnson Creek	John2	5M NV	38	good	17	11	3	5.52	fair		
Middle	Johnson Creek	John7	Arcadia	25	fair	12	9	1	5.99	fair	50	ok
Middle	Johnson Creek	John3	6M NV	39	good	14	10	3	4.69	good	58	ok
Middle	Johnson Creek	MR-22	Maybury south	30	fair	13	8	2	5.23	good	144	ok
Middle	Johnson Creek	MR-25	Maybury East	28	fair	14	10	2	5.14	good	203	chronic
Middle	Tonquish Creek	Ton1	Plym Twp Pk	32	fair	12	6	1	6.50	fair	78	ok
Middle	Tonquish Creek	Nton	S Evergreen St	36	good	12	8	3	5.73	fair	365	acute
Middle	Tonquish Creek	MR-14	Smith Elem	22	fair	11	6	1	5.56	fair	121	ok
Middle	Tonquish Creek	MR-24	Lion's Pk	21	fair	9	4	1	6.23	fair	440	acute
Middle	Tonquish Creek	Ton2	Ann Arbor Rd	15	poor	9	7	1	5.85	fair	341	acute
Middle	Willow Creek	Will1	Willow Barchester Pk	27	fair	13	5	0	6.60	fairly poor	172	chronic
Middle	Middle Rouge	MR-4	Levan Knoll	34	good	12	8	3	6.69	fairly poor	202	chronic
Middle	Middle Rouge	MR-11	Elm Grove	31	fair	14	8	2	5.20	good	235	chronic
Upper	Bell Branch	Bell1	Bicentennial Park	15	poor	9	6	0	7.01	fairly poor	418	acute
Upper	Bell Branch	Bel2	Schoolcraft College	19	fair	11	8	1	7.23	fairly poor	313	chronic
Upper	Bell Branch	Bell3	Livonia 6 Mile	18	poor	11	7	1	6.00	fair	391	acute
Upper	Seeley Creek	See3	Kennedy Ct	30	fair	14	10	1	4.52	good	157	chronic
Upper	Upper Rouge	Up1	Heritage Park	32	fair	16	11	1	5.39	good	220	chronic
Upper	Upper Rouge	Up2	Shiawassee Park	41	good	18	14	5	4.78	good	275	chronic
LR-9 water levels too low to effectively sample, not included in averages and trends												10

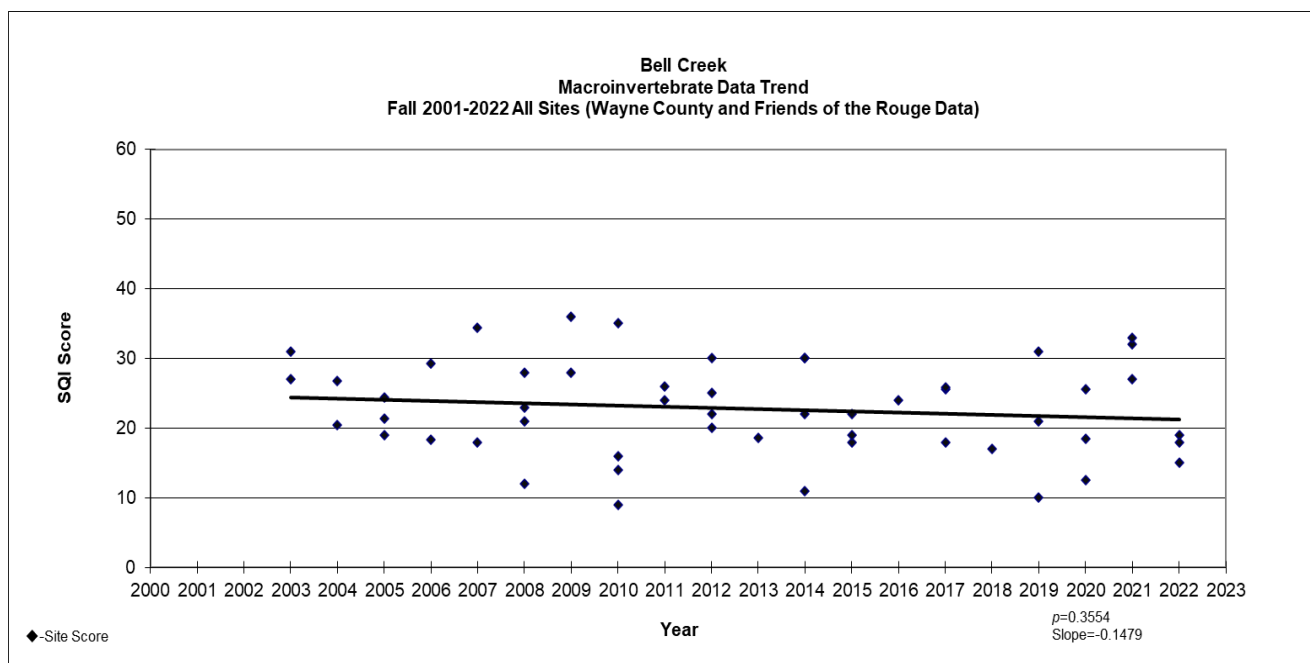
Data Trend Tables

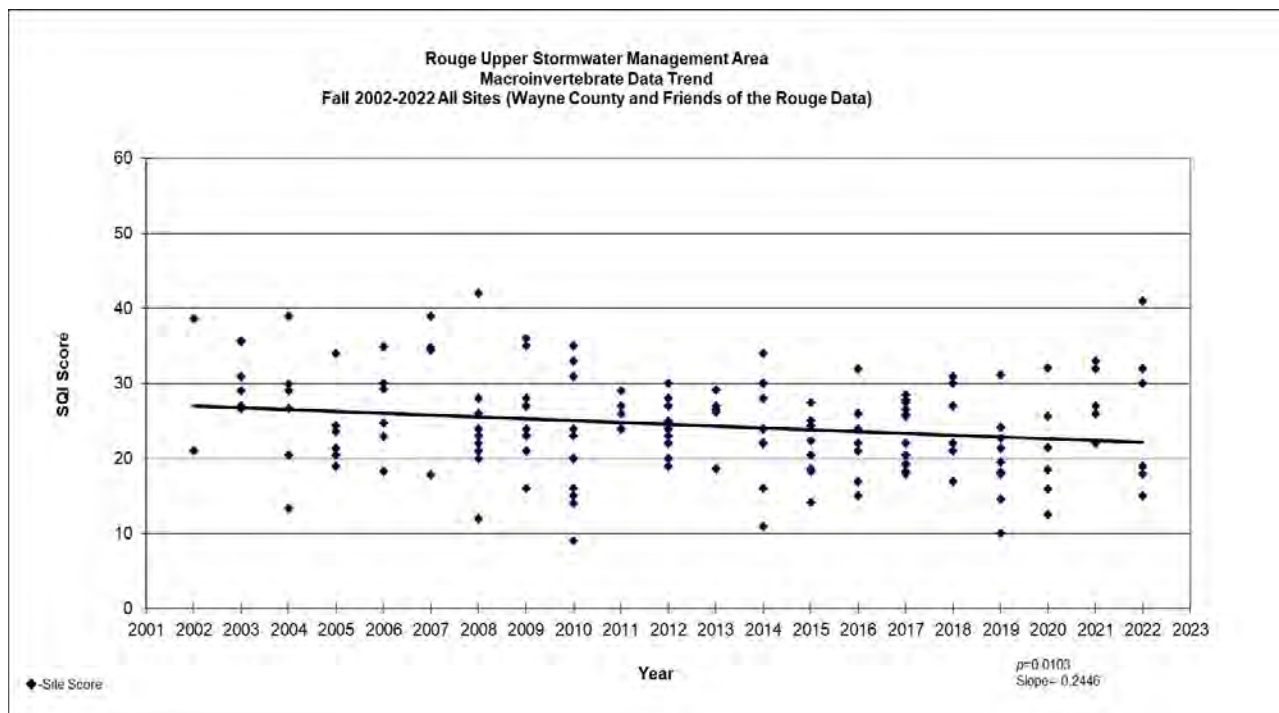
Main



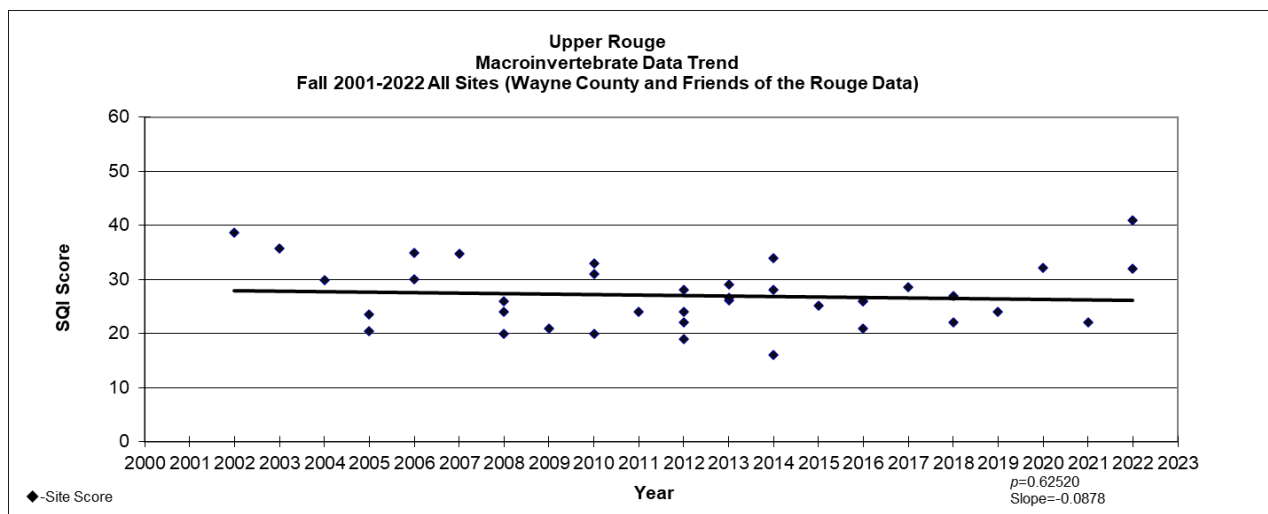


Upper

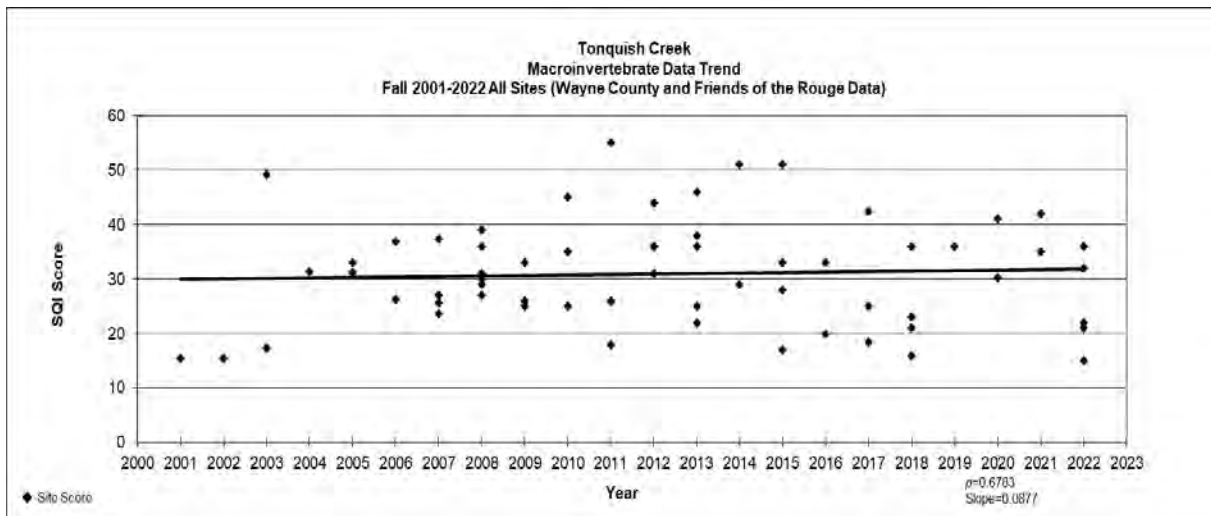
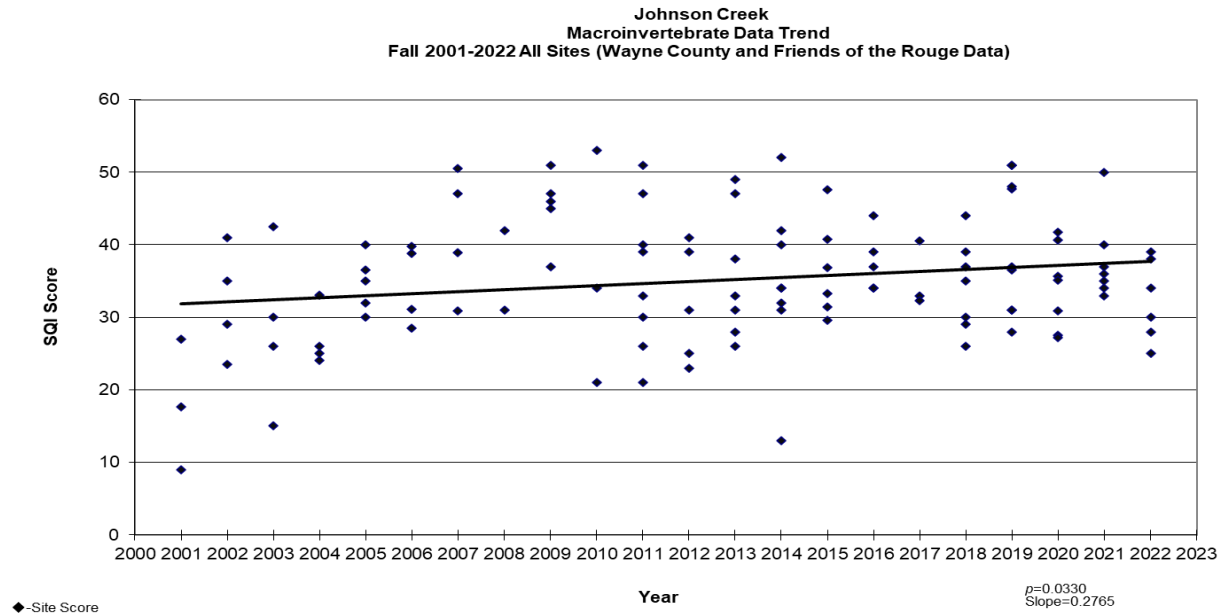


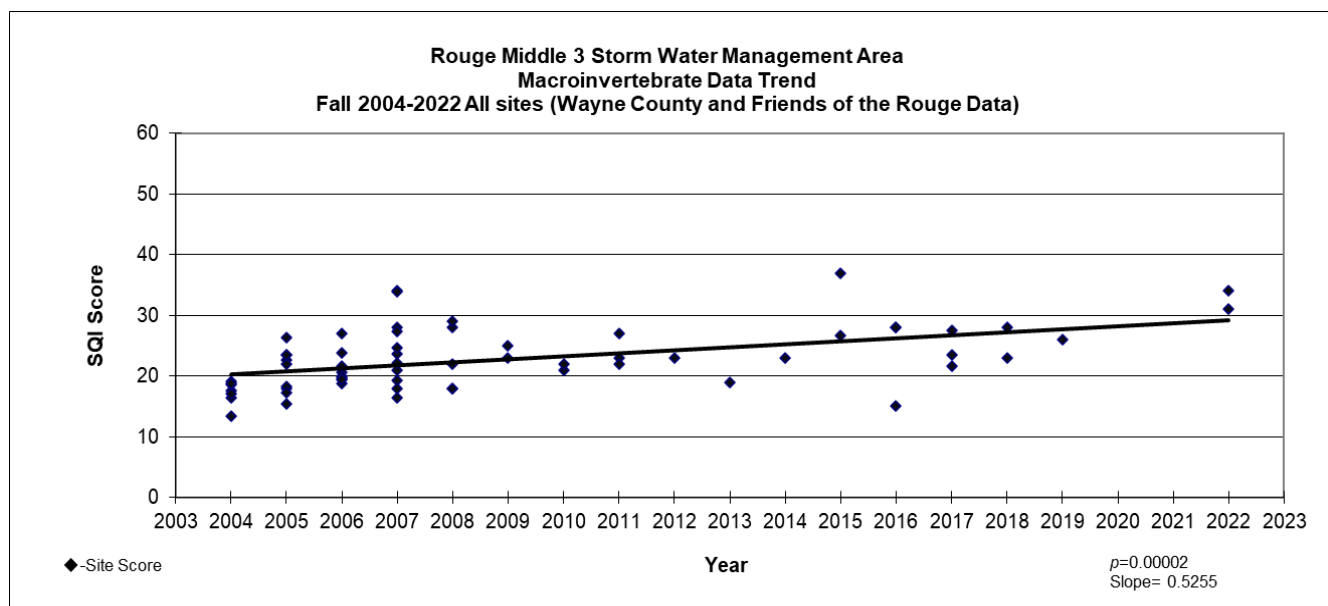
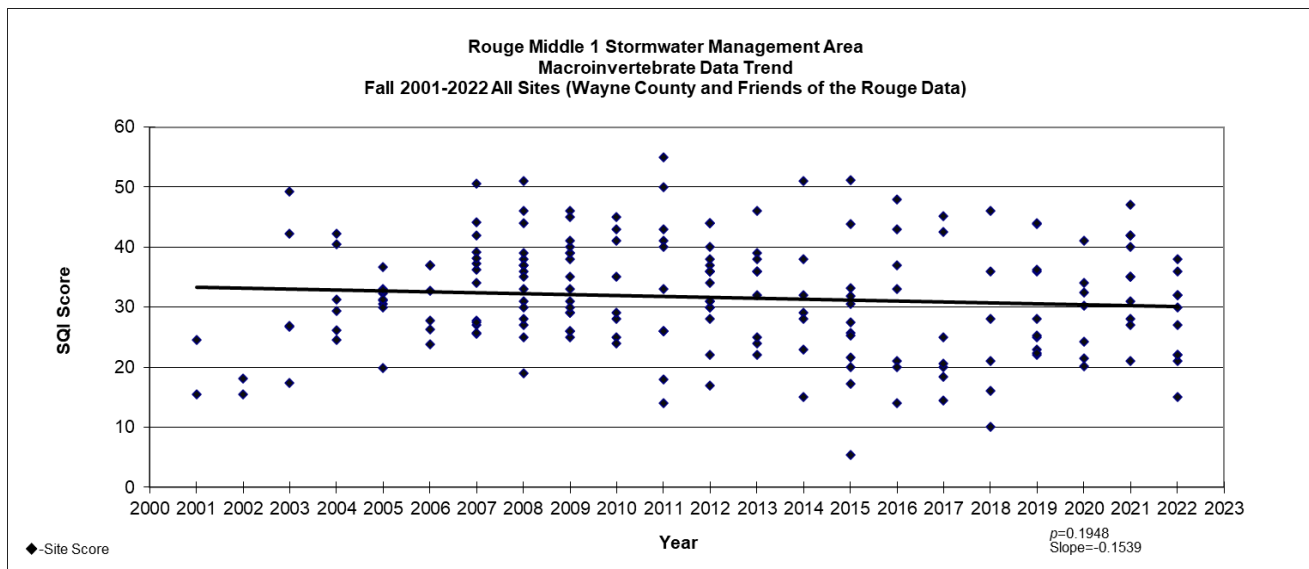


Upper with no tributaries

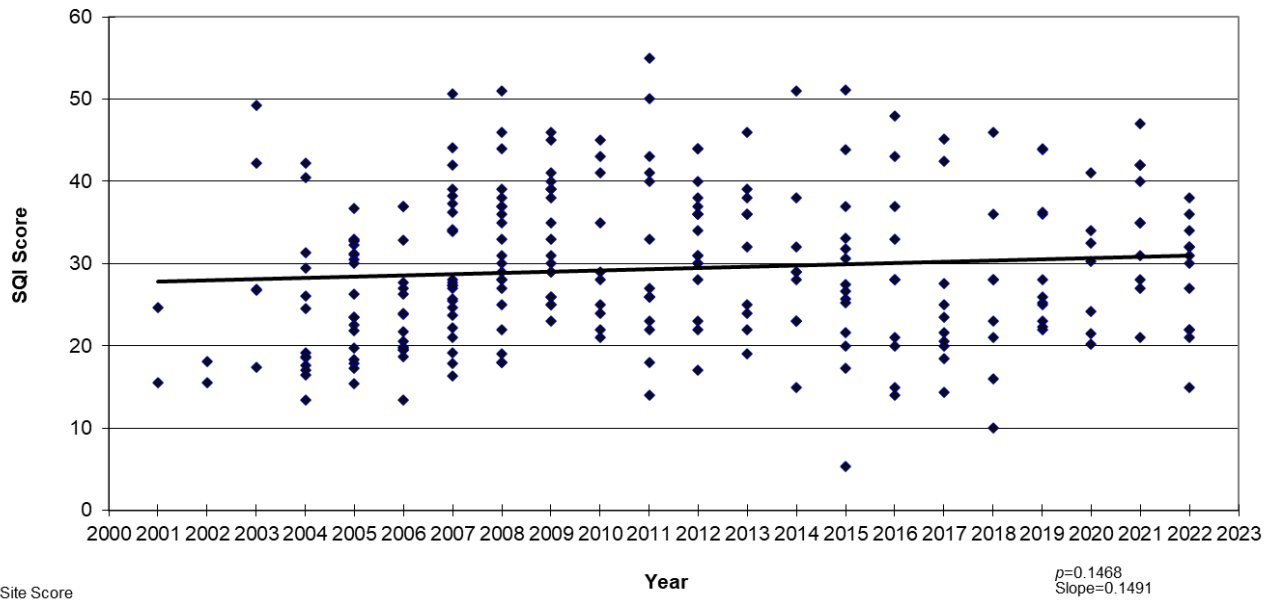


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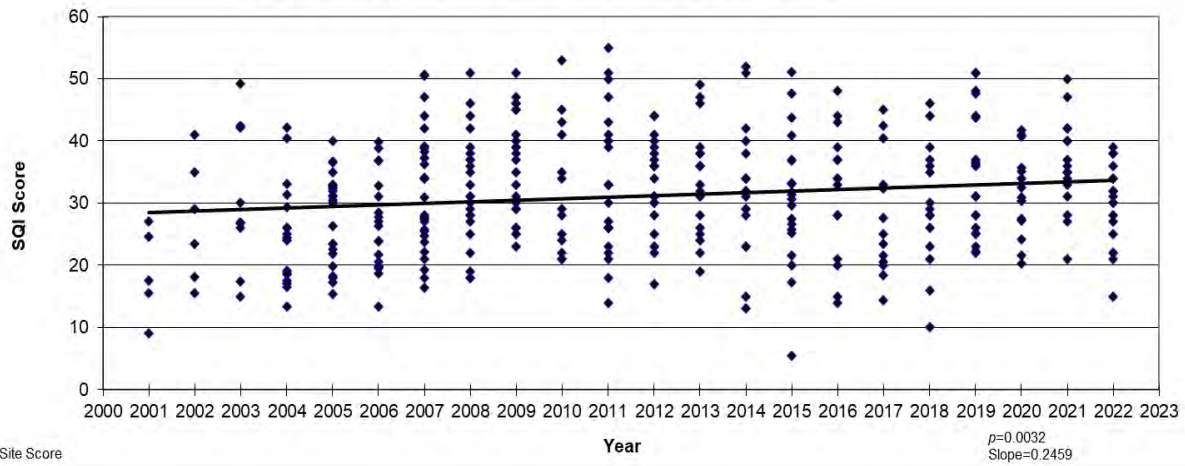


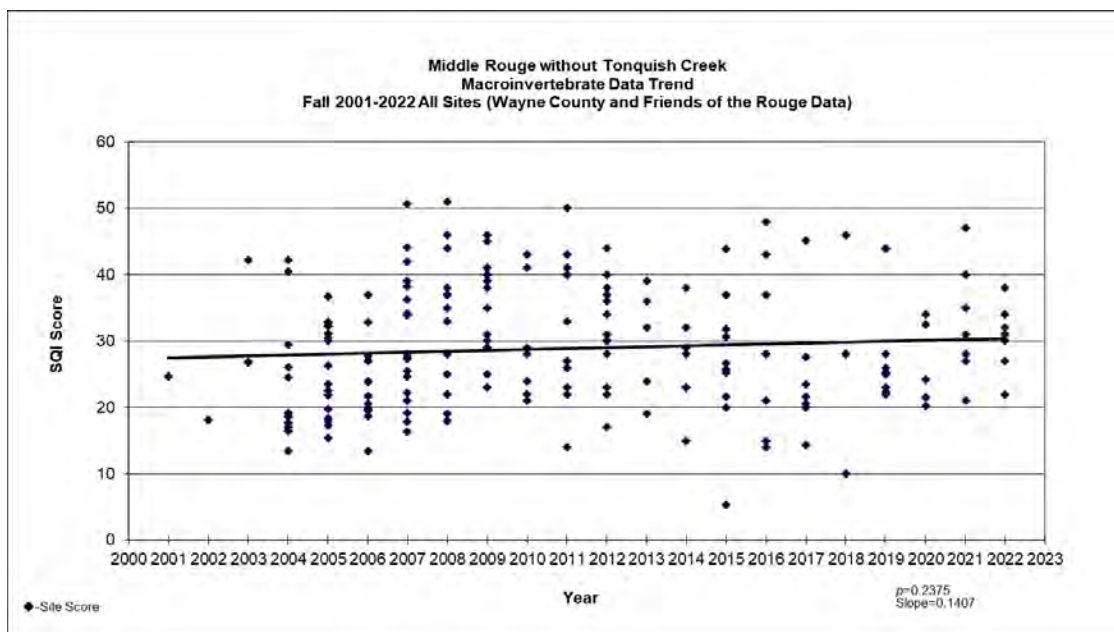


**Rouge Middle Branch
Macroinvertebrate Data Trend
Fall 2001-2022 All Sites (Wayne County and Friends of the Rouge Data)**

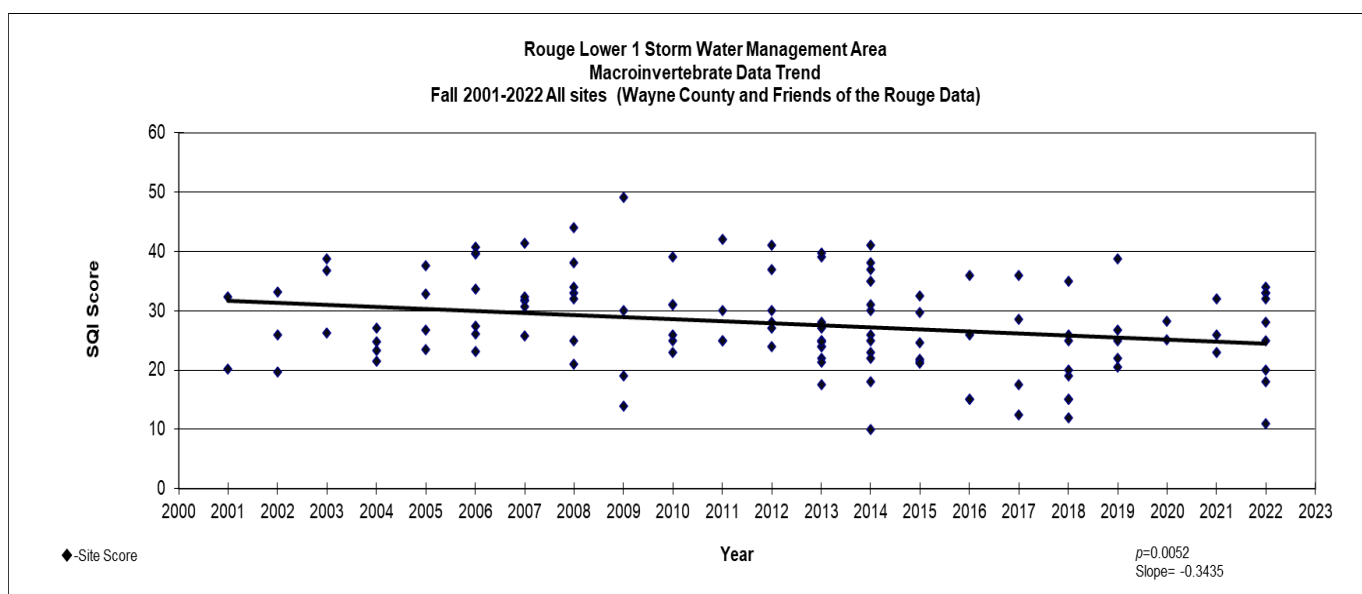


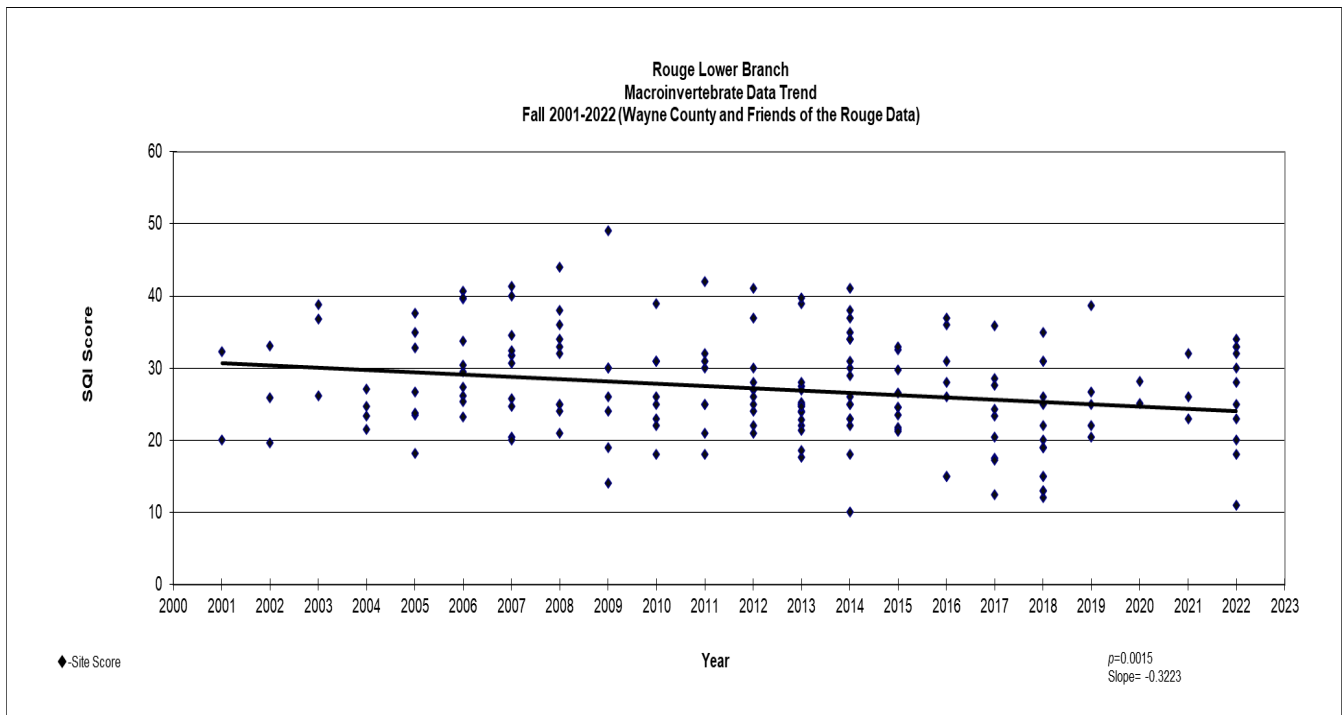
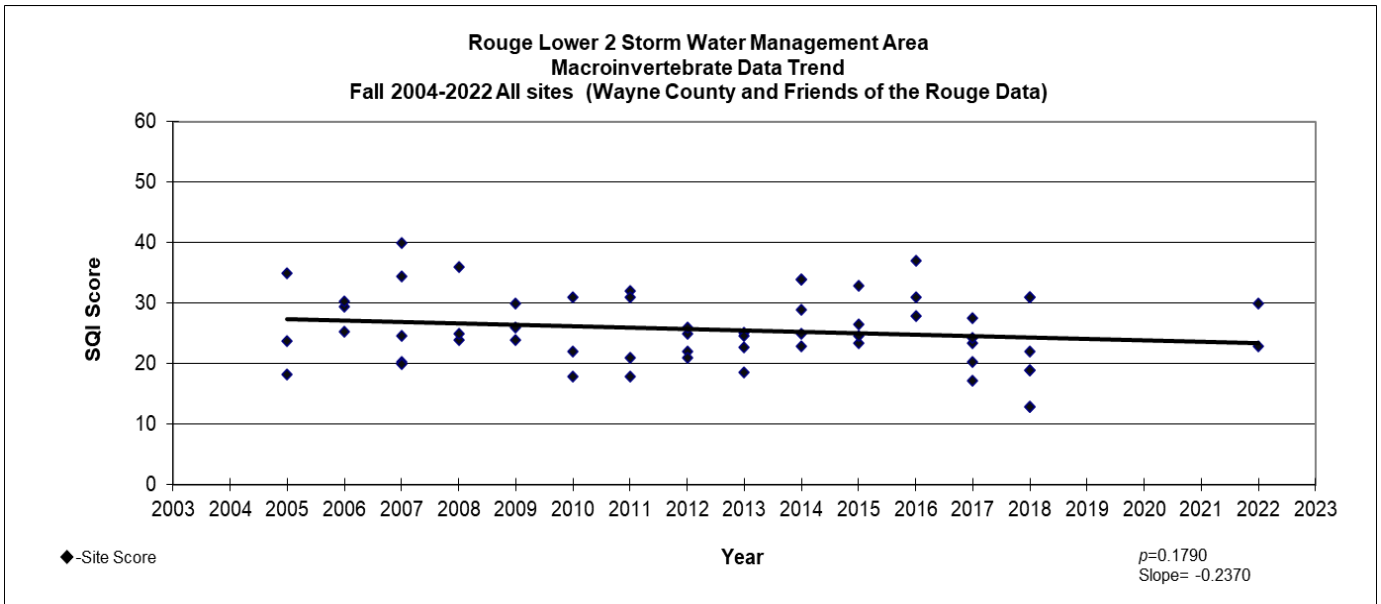
**Rouge Middle Branch and Johnson Creek
Macroinvertebrate Data Trend
Fall 2001-2022 All Sites (Wayne County and Friends of the Rouge Data)**





Lower





All Sites

