Targeted Watershed Assessment for the Stony Creek Watershed (TK05) Door/Kewaunee County, Wisconsin 2022

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Silver Creek at Jackson Road

Introduction

This Targeted Watershed Assessment aims to evaluate the water quality of streams within the Stony Creek Frontal Lake Michigan Watershed (HUC 12 040301020201) located on the southeast side of Door County and northeast Kewaunee County (Figure 1). Efforts were focused on total phosphorus concentrations, habitat condition, water temperature, and fish community. The results of the 2022 monitoring season can be compared with baseline data that was collected from 2003-2004 to determine if any changes in water quality have occurred. Additional water

quality monitoring and biological sampling was completed at some sites in 2018/2019, which is reported here to supplement the analysis.

The Stony Creek Watershed is 54 square miles and contains over 79 miles of streams and rivers. It is located within the Northern Lake Michigan Coastal Ecological Landscape and land use is dominated by agriculture (61%) and wetlands (25%). Additionally, the watershed is ranked high for nonpoint source pollution. A baseline study was conducted from 2003-2004 to assess environmental quality of the watershed. This study focused on habitat quality, fish community assemblage, macroinvertebrates, and stream flow, temperature, and dissolved oxygen. The present watershed assessment aims to revisit these sites to determine if conditions in the watershed have changed.

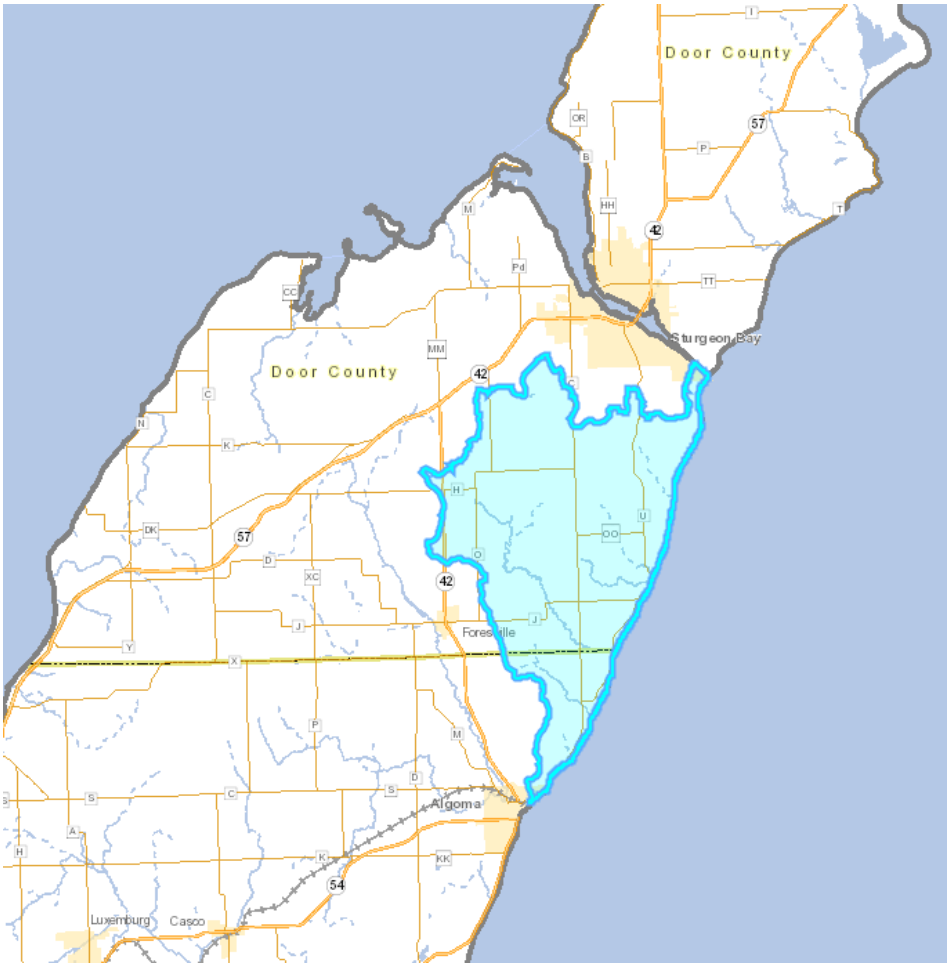

Figure 1. Location of Stony Creek Watershed, highlighted in blue, within Door County and Kewaunee County

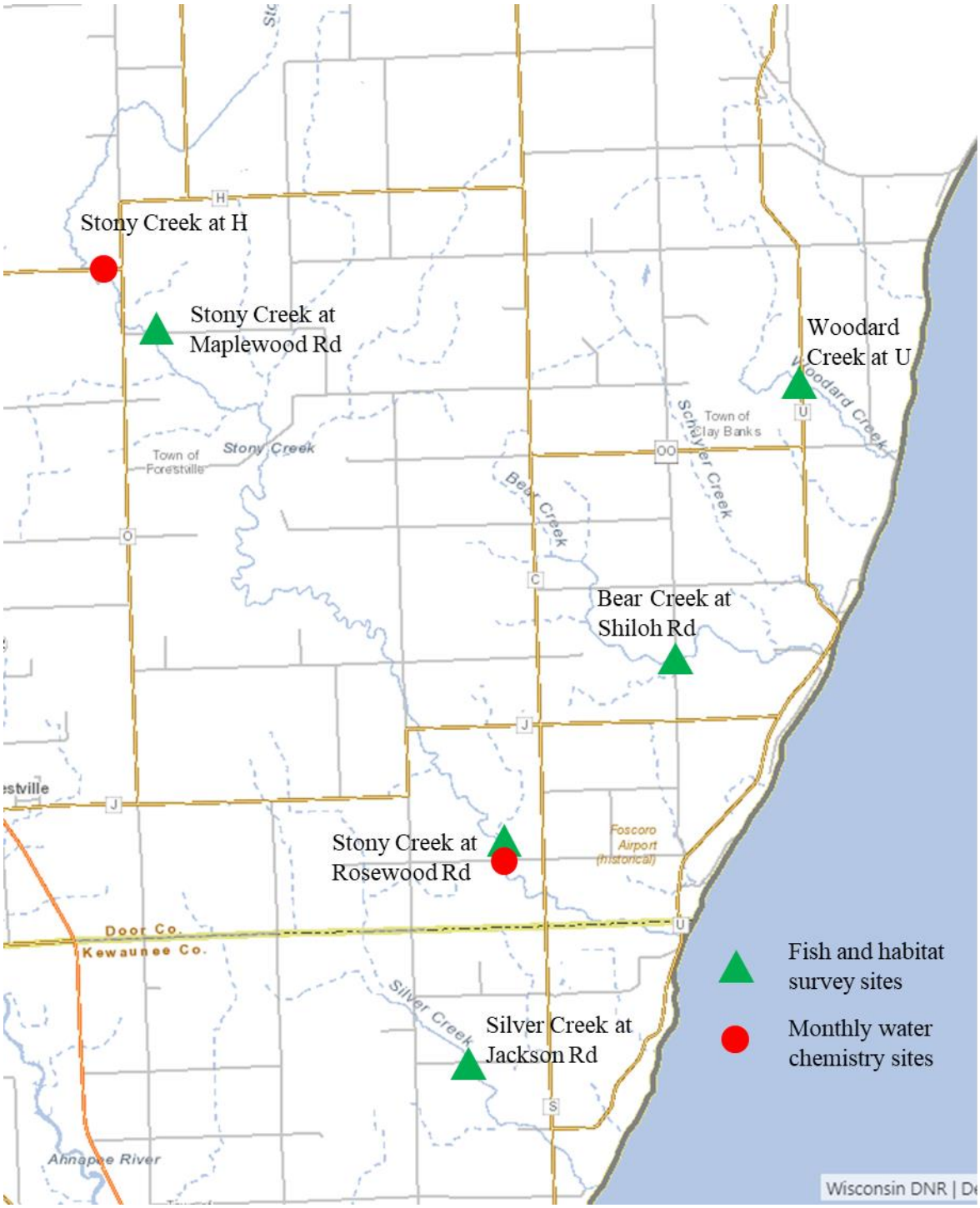

Figure 2. Stony Creek Watershed sampling locations. Red circle represents sites with monthly water chemistry monitoring. Green triangle represents sites with fish and habitat surveys

Methods

Water quality and biological monitoring was completed from May 2022 to October 2022 at 6 locations within the Stony Creek Watershed (Table 1) following standard DNR field procedures and guidelines for sample collection and preservation. Specific sampling methods are described in more detail below. Sites were selected based on previous surveys so comparisons can be made to past conditions in these streams.

Table 1. Sample locations and parameters collected

Waterbody (WBIC)	Station ID	Location	Water Chemistry	Continuous Water Temp	Fish and Habitat Survey
Stony Creek (96100)	10016036	CTH-H	X	X	
	10011691	Maplewood Rd			X
	153221	Rosewood Rd	X	X	X
Bear Creek (96400)	153242	Shiloh Rd		X	X
Woodard Creek (96600)	10010279	Hwy-U		X	X
Silver Creek (96000)	10011678	Jackson Rd		X	X

Water quality criteria thresholds for cold water and Default Fish and Aquatic Life (DFAL) uses are specified in NR 102 and WisCALM as follows:

- Total phosphorus: >75 ug/L
- Water temperature: cold water and DFAL criteria provided below in Table 2

Table 2. Temperature criteria in Fahrenheit for cold water and small warmwater streams during the growing season, from NR 102.25(2) Table 2

Month	Cold	Warm - Small (DFAL)
May	72	82
Jun	72	84
Jul	73	85
Aug	73	84
Sep	72	82
Oct	70	80

Water Chemistry
Monthly water samples were taken at 2 sites on Stony Creek from May through October following standard water sampling procedures. All samples were shipped to the Wisconsin State Laboratory of Hygiene for analysis of total phosphorus, total suspended solids, and total nitrogen, nitrate + nitrite, and ammonia.

Continuous Temperature
Thermistors (Onset HOBO) were placed at 5 locations within the Stony Creek watershed (Table 1). Loggers were set to record temperature hourly and were deployed in streams from May through October 2022.

Aquatic Macroinvertebrates
Macroinvertebrate samples were taken in 2003 and again in 2018/2019 and are included here to supplement the biological analysis of the Stony Creek Watershed. Sampling in 2018/2019 occurred at stations slightly downstream from the 2022 fish and habitat survey stations. Standard procedures for macroinvertebrate sampling were used, following WDNR Guidelines for Collecting Macroinvertebrate Samples from Wadable Streams. A D-frame net is placed on the stream bottom, and substrate is disturbed by kicking an approximate one-square foot area just upstream of the net. This disturbs the sediment to release burrowing aquatic macroinvertebrates, which are captured in the D-net. Samples are transferred to a jar and preserved with ethanol and are transferred to UW-Stevens Point Aquatic Biomonitoring Laboratory for identification and analysis. Macroinvertebrate Indices of Biological Integrity (M-IBI) are calculated for each site and scores range from poor to excellent.

Fish Assemblage
Fish surveys were completed in July at five stations (Table 1) following the WDNR Guidelines for Assessing Fish Communities of Wadable Streams protocol (WDNR 2018). A single, upstream pass was made using a backpack shocker for all sites except Stony Creek at Rosewood Rd. Stony Creek at Rosewood Rd was sampled using a stream shocker due to the wider stream width of the site. All fish were collected and counted, and game fish species were measured for total length. This allows for calculation of the Index of Biological Integrity (F-IBI), which provides an overall score of the fish community ranging from poor to excellent. Fish survey results are compared to data collected in 2003-2004 to determine if fish communities have changed.

Habitat Assessment
Qualitative habitat assessments were completed in 2022 at all five sites using the WDNR Wadable Stream Qualitative Fish Habitat Rating protocol. As part of the 2003-2004 baseline study, quantitative habitat assessments were completed, using the WDNR Wadable Stream Quantitative Fish Habitat Rating Protocol. Stream habitat condition is evaluated for its ability to support aquatic life. The assessment measures characteristics such as substrate type, streambank erosion, riparian buffer width, and cover for adult game fish. Scores range from excellent, good, fair, and poor and are used to provide a basic condition evaluation for stream health.

Results

Water Chemistry

Total Phosphorus

As specified in NR 102 of the Wisconsin Administrative Code, the total phosphorus criterion of 75 ug/L is established for the streams in the Stony Creek Watershed. The protocol for impairment decisions requires six monthly samples to be collected between May and October. The department's listing methodology for impaired waters (WDNR, 2022) lists waters where the median concentration and 80% confidence interval values exceeds 75 ug/L on wadable streams.

Stony Creek is listed as impaired for total phosphorus from its headwaters to the downstream location at Geier Rd. This segment encompasses two of the study stations: CTH-H (10016036) and Maplewood Rd (10011691).

As shown in Table 3a, total phosphorus exceeded the state water quality standard of 75 ug/L on five out of six sampling dates at both locations on Stony Creek. Total phosphorus averaged 131 ug/L at CTH H and 149 ug/L at Rosewood Rd during the 2022 sampling season.

Table 3a. Total phosphorus results for Stony Creek at CTH H and Rosewood Rd

Date	Total Phosphorus (ug/L)	
	Stony Creek – CTH H	Stony Creek – Rosewood Rd
5/25/22	74.6	**88.3**
6/28/22	**187**	**217**
7/18/22	**156**	**208**
8/15/22	**202**	**227**
9/29/22	**90.8**	70.2
10/27/22	**75.8**	**81.5**

*Note: bold values indicate total phosphorus levels exceeds the standard of 0.075 mg/L

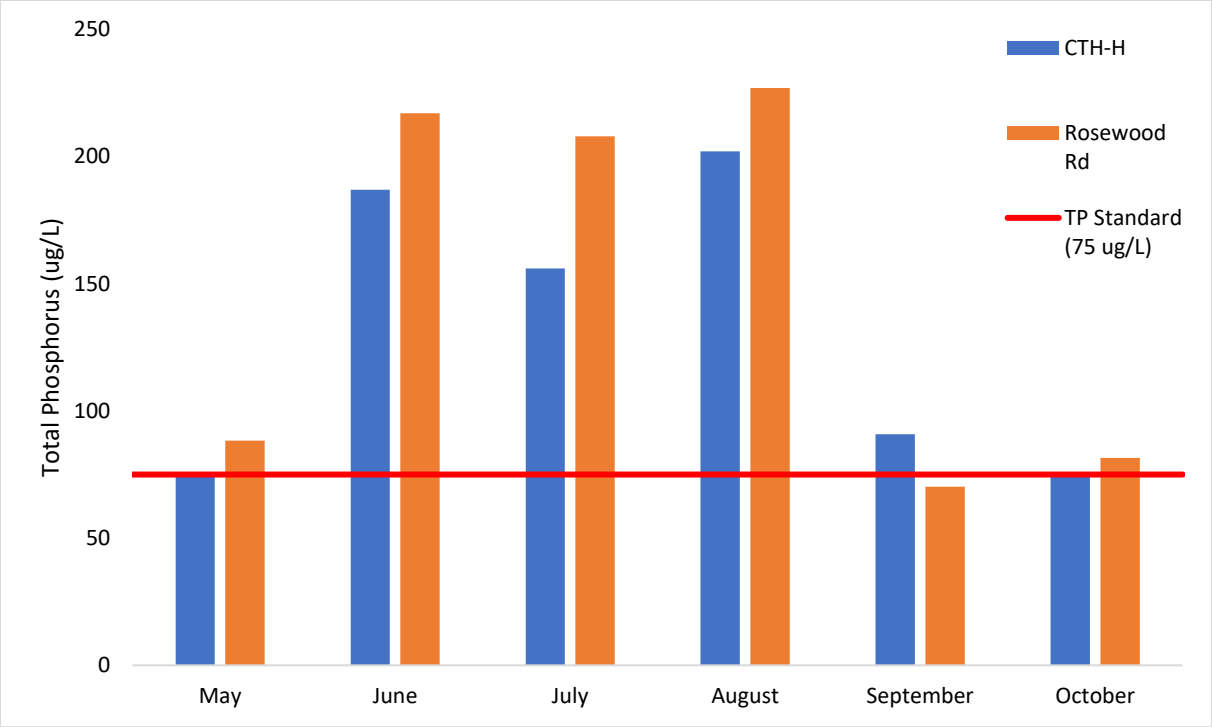

Figure 3. Total phosphorus during 2022 sampling, solid red line represents the 75 ug/L state standard

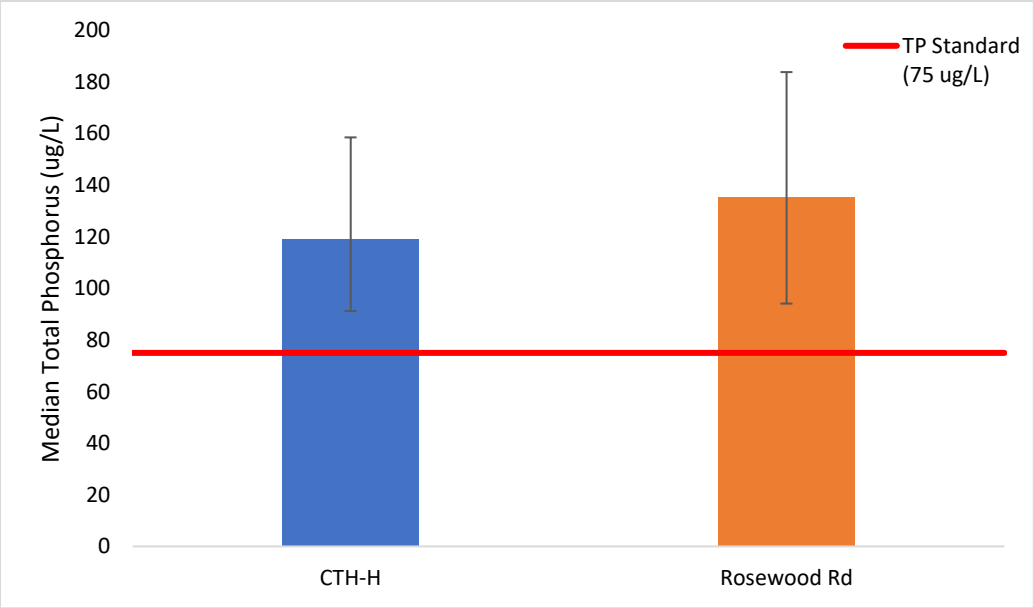

Figure 4. Median total phosphorus for Stony Creek at two sampling stations from May-October 2022. Red line indicates the phosphorus limit of 75 ug/L for surface waters. Error bars indicate upper and lower 80% confidence interval.

Total Nitrogen

There are currently no state standards for total nitrogen, however, levels can be compared to determine if they are elevated above an expected baseline. Total nitrogen can be used to determine if an organic discharge is high in nitrogen. Total nitrogen should be assessed in conjunction with ammonia and nitrate + nitrite to evaluate the overall impact.

In 2022, total nitrogen of the two samples on Stony Creek ranged between 1.28 mg/L – 2.39 mg/L, with an average of 1.75 mg/L at CTH H and 1.42 mg/L at Rosewood Rd. Overall, June had the highest total nitrogen value for both sample sites (Table 3b).

Table 3b. Total nitrogen results for Stony Creek at CTH H and Rosewood Rd

Date	Total Nitrogen (mg/L)	
	Stony Creek – CTH H	Stony Creek – Rosewood Rd
5/25/22	1.41	1.28
6/28/22	2.39	1.67
7/18/22	1.77	1.31
8/15/22	1.58	1.52
9/29/22	1.90	1.43
10/27/22	1.43	1.30

Ammonia

There are currently no state standards for ammonia in surface waters. However, ammonia toxicity can be calculated using temperature, pH, and conductivity to determine if ammonia levels may be toxic to aquatic life. In non-polluted surface waters, ammonia is typically not detected. Acute ammonia toxicity is calculated based on pH and temperature, where toxicity increases as pH and temperature increase. To determine toxicity, the unionized fraction of ammonia is calculated using temperature, pH, conductivity, and total ammonia (American Fisheries Society). This is then compared with acute ammonia values for waterbodies in Wisconsin, based on Wisconsin Administrative Code NR 105.06 Table 2. For the two sites monitored in 2022, unionized ammonia was well below values that would be toxic to aquatic life.

Table 3c. Ammonia results for Stony Creek at CTH H and Rosewood Rd

Date	Ammonia (mg/L)	
	Stony Creek – CTH H	Stony Creek – Rosewood Rd
5/25/22	0.0121	0.0134
6/28/22	0.261	0.0309
7/18/22	0.167	0.0291
8/15/22	0.0738	0.0234
9/29/22	0.123	0.0698
10/27/22	0.0348	0.0157

Nitrate + nitrite

There are no state standards for nitrate + nitrite, but this parameter is analyzed along with ammonia and total nitrogen to provide an overall measure of inorganic nitrogen. Groundwater in agricultural areas has been observed to have higher background levels of nitrate + nitrite, which can often cause elevated levels in surface waters.

Nitrate + nitrite levels in Stony Creek were low, with an average of 0.184 mg/L at CTH H and 0.163 mg/L at Rosewood Rd.

Table 3d. Nitrate + nitrite results for Stony Creek at CTH H and Rosewood Rd

Date	Nitrate + Nitrite (mg/L)	
	Stony Creek – CTH H	Stony Creek – Rosewood Rd
5/25/22	ND	ND
6/28/22	0.140	0.0895
7/18/22	0.307	0.146
8/15/22	0.0592	0.110
9/29/22	0.280	0.201
10/27/22	0.134	0.267

Total suspended solids

There are no state standards for total suspended solids (TSS) in surface waters. This parameter provides a measure of solid particles that are present within a sample. Overall, TSS levels in Stony Creek are low, with an average of 4.09 mg/L at CTH H and 3.85 at Rosewood Rd.

Table 3e. Total suspended solids results for Stony Creek at CTH H and Rosewood Rd

Date	Total Suspended Solids (mg/L)	
	Stony Creek – CTH H	Stony Creek – Rosewood Rd
5/25/22	ND	2.80
6/28/22	4.80	3.40
7/18/22	5.00	2.60
8/15/22	3.14	6.60
9/29/22	ND	ND
10/27/22	3.40	ND

Continuous Water Temperature

Hourly water temperature at 5 monitoring sites is summarized below in Figure 5. Overall temperatures display similar trends among stations, with both Stony Creek stations having slightly higher average daily temperatures. Bear Creek, Woodard Creek, and Silver Creek all clearly met coldwater criteria for all months monitored.

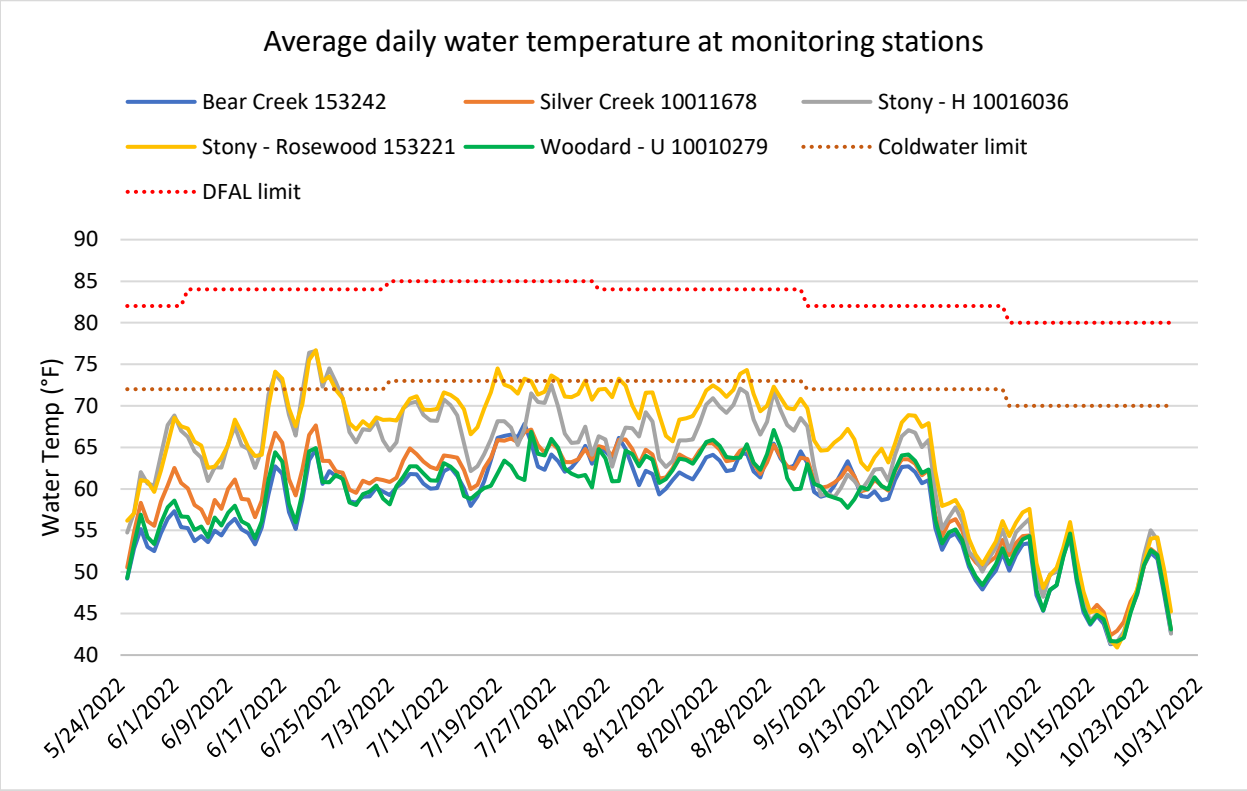

Figure 5. Average daily temperature during 2022 sampling. Dashed lines indicate the DFAL and coldwater criteria (Table 2).

Macroinvertebrates

Macroinvertebrate sampling was repeated in 2019 but was conducted downstream from the original sample site at both Stony Creek stations, the Bear Creek station, and the Woodard Creek station. Overall, M-IBI condition categories remained rated as the same as “fair” or “good” or improved from “fair” to “good”. M-IBI scores decreased for both Stony Creek stations and Woodard Creek, though the condition category remained the same.

Table 4. Macroinvertebrate IBI scores for 2003 and 2019.

Waterbody (WBIC)	Station ID	Station Name	2003 M-IBI	2018/2019 M-IBI
Stony Creek (96100)	10011691	Maplewood Rd	4.72	--
	10051133	Geier Rd	--	4.06
	153221	Rosewood Rd	7.06	--
	10051616	CTH S	--	5.03
Bear Creek (96400)	153242	Shiloh Rd	3.91	--
	10052987	Bear Creek Rd	--	5.35
Woodard Creek (96600)	10010279	Hwy-U	6.25	--
	153240	Lake Michigan Dr	--	5.17
Silver Creek (96000)	10011678	Jackson Rd	4.22	4.73

Score/Condition Category

7.5 – 10 / Excellent
5.0 – 7.49 / Good
2.51 – 4.99 / Fair
0 – 2.5 / Poor
-- – No Data Collected

Fish Assemblage

Fish surveys were repeated at the same sites in 2022 that were sampled in 2003-2004 and total catch data are compared in Table 5. For all 2022 surveys, the small-stream (intermittent) F-IBI calculation was used, as it corresponds with the stream natural communities (Table 6). However, it is unknown which F-IBI calculations were used in the 2003-2004 surveys, so comparisons to the 2022 F-IBI may not be possible. The natural communities for each stream were verified and compared to the modeled natural community (Table 7).

Overall, fish community results for each station were similar between the two sampling periods. At Woodard Creek, juvenile rainbow trout were captured in 2022 but not in 2003 and more individuals were captured in 2022. Bear Creek had a smaller overall catch in 2022 than 2003, and no brook stickleback were captured in 2022. Silver Creek had a much lower total catch in 2022, however, the stream was sampled upstream of the 2003 sample site using a backpack electroshocker while a stream shocker was used in 2003. Stony Creek at Maplewood Rd had more species present in 2022 than 2004, with common shiner, creek chub, golden shiner, green sunfish, redside dace, and white sucker captured in 2022 but not 2004. At Rosewood Rd, total catch in 2022 was greatly increased from the 2004 survey, with large numbers of creek chub, common shiner, hornyhead chub, and western blacknose dace captured. However, no rainbow trout were captured in 2022 compared to 72 individuals captured in 2004.

Table 5. Fish inventory for 5 survey stations within the Stony Creek Watershed

Waterbody (WBIC)	Woodard Creek (96600)		Bear Creek (96400)		Stony Creek (96100)				Silver Creek (96000)	
Station ID	**10010279**		**153242**		**10011691**		**153221**		**10011678**	
Location	**Hwy-U**		**Shiloh Rd**		**Maplewood Rd**		**Rosewood Rd**		**Jackson Rd**	
Species	**2003**	**2022**	**2003**	**2022**	**2004**	**2022**	**2004**	**2022**	**2003**	**2022**
Bluegill							1	1		
Brook Stickleback	49	9	18		145				113	1
Central Mudminnow			1	2	32	92	8	6	2523	50
Common Shiner						4	9	228		
Creek Chub	27	92				50	14	265	59	4
Fathead Minnow		4					2		48	
Golden Shiner						3		3		
Green Sunfish						1				
Hornyhead Chub							9	49		
Johnny Darter					1	10	9		15	11
Longnose Dace							6			1
Mottled Sculpin			22	13			38	17	3	1
Northern Pike					6					
Pumpkinseed					2				1	
Rainbow Trout		13	3	8			72		2	4
Redside Dace						1				
Round Goby								7		
Western Blacknose Dace							6	190		
White Sucker	3					13	17	24	81	2
Total	**79**	**118**	**44**	**23**	**186**	**174**	**191**	**790**	**2845**	**74**

F-IBI scores in 2022 have improved compared to 2003 fish surveys (Table 6). In 2003, all sites were rated as “fair” with F-IBI scores ranging from 35-55, while all stations except Woodard Creek rated as “fair” or “good” in 2022. Woodard Creek was rated as “poor” with an F-IBI score of only 20. However, fish catch was similar to that in 2003, but was dominated in 2022 by creek chub, a species highly tolerant of environmental degradation. This could be the driver of the lower F-IBI score, though rainbow trout were captured in 2022 suggesting the stream can support these fish during migratory periods. The two stations on Stony Creek as well as Silver Creek all had improved F-IBI scores in 2022.

Not enough fish were collected at Bear Creek to calculate the F-IBI, only 23 individuals were collected and 25 are needed.

Table 6. F-IBI scores for 2003-2004 and 2022 surveys

Waterbody (WBIC)	Station ID	Station Name	2003-2004 F-IBI	2022 Small Stream F-IBI
Stony Creek (96100)	10011691	Maplewood Rd	35	70
	153221	Rosewood Rd	45	100
Bear Creek (96400)	153242	Shiloh Rd	45	NA
Woodard Creek (96600)	10010279	Hwy-U	40	40
Silver Creek (96000)	10011678	Jackson Rd	55	60

Score/Condition Category

91 -100 / Excellent
61 - 90 / Good
31 - 60 / Fair
0 - 30 / Poor
NA – Not enough fish to calculate IBI

Natural Community verification is conducted to determine if the thermal, size, and tolerance guilds of the fish community match the modeled natural community for a stream. Stream segments are assigned a natural community classification based on model-predicted long-term temperature and flow regime of the system, determined using watershed characteristics. Field data is then used to verify the model prediction or correct a misclassified segment. The natural community is used to determine the correct IBI to apply, so it is important to correctly classify the natural community of a stream segment. Natural Community verification forms for each station are attached in Appendix A.

The modeled natural community for Stony Creek at Maplewood Rd (10011691) is a warm headwater but verified as warm transition headwater based on the fish community. The species thermal guild fits more closely to the warm transition headwater, with a high proportion of transitional species and low proportions of both cold and warm water species. The warm headwater natural community expects a much higher proportion of warm water species, which was not the case at this site, as only 5% of individuals captured were warm water species.

The modeled natural community for Stony Creek at Rosewood Rd (153221) is warm headwater but is verified as warm transition headwater based on the fish community. The fish assemblage had a greater number of transitional species than warm water species and a small number of coldwater species, which fits the warm transition headwater thermal regime. The warm headwater natural community would expect a high amount of warm water species and low to moderate amounts of transitional species, which was not the case here. Additionally, the thermal profile of the stream remained close to the coldwater criteria (Figure 5), with a few exceedances during the summer months. Both tolerance tests were met for the natural community.

The natural community for Bear Creek (153242) was not verified as the minimum fish catch of 25 individuals was not reached. The modeled natural community for this system is cool-warm headwater. A future fish survey would be needed to verify the model. However, fish catch at the

site may indicate a natural community change to coldwater, as the fish community was comprised of mottled sculpin and rainbow trout.

The modeled natural community for Woodard Creek (10010279) is warm headwater but was verified as cold transition headwater due to the fish community. The thermal guild of the fish community fits the expected proportions of transition, warm, and coldwater species for the cold transition headwater natural community. Overall, 86% of individuals were transitional species, with 11% coldwater individuals and only 3% warm water species. The warm headwater natural community only expects up to 25% transitional species and 75%-100% warm water individuals. The fish community documented at Woodard Creek clearly does not meet the thermal guild of a warm headwater community. In addition, hourly temperature monitoring indicates the stream maintains a water temperature well below the coldwater criteria during the summer months (Figure 5). Both tolerance tests were violated, however, we do not believe that this is due to environmental degradation. There were a high proportion (89%) of tolerant species and no intolerant species present.

The modeled natural community for Silver Creek (10011678) is warm headwater but is verified as cold transition headwater due to the fish community. The warm headwater community predicts a high proportion of warm water species with moderate levels of transitional species and low coldwater species. However, the fish community present at Silver Creek was comprised of 95% transitional species, 5% coldwater species, and no warm water species were present. This more closely fits the cold transition headwater community. In addition, temperature monitoring indicates that stream temperature remains well below the coldwater criteria throughout the entire growing season (Figure 5). There were a high number of tolerant individuals, but the 77% is just exceeding the 75% expected value for tolerant species. This is likely not indicative of environmental degradation.

Table 7. Modeled and verified natural community for each stream, based on 2022 fish surveys.

Waterbody (WBIC)	Station ID	Station Name	Modeled Natural Community	Verified Natural Community
Stony Creek (96100)	10011691	Maplewood Rd	Warm Headwater	Warm transition headwater
	153221	Rosewood Rd	Warm Headwater	Warm transition headwater
Bear Creek (96400)	153242	Shiloh Rd	Cool-Warm Headwater	Not verified
Woodard Creek (96600)	10010279	Hwy-U	Warm Headwater	Cold transition headwater
Silver Creek (96000)	10011678	Jackson Rd	Warm Headwater	Cold transition headwater

Juvenile rainbow trout collected at Woodard Creek, 2022

Habitat Assessment

Habitat condition scores ranged from fair to good (48-72) in 2022, with four out of five stations within the good category (Table 8). Only Stony Creek at Maplewood Rd scored fair, and the score of 48 is in the upper range of this category. Compared to habitat condition scores in 2003, habitat condition categories remained the same for three stations. Stony Creek at Maplewood Rd decreased from good to fair while Bear Creek decreased from excellent to good. Overall, the habitat condition scores in the Stony Creek Watershed indicate that physical habitat of these streams are providing sufficient habitat for aquatic life.

Table 8. Habitat condition scores from 2022

Waterbody Name (WBIC)	Station ID	Station Name	2003 Habitat Condition Score	2022 Habitat Condition Score
Stony Creek (96100)	10011691	Maplewood Rd	63	48
	153221	Rosewood Rd	57	72
Bear Creek (96400)	153242	Shiloh Rd	75	68
Woodard Creek (96600)	10010279	Hwy-U	58	70
Silver Creek (96000)	10011678	Jackson Rd	72	62

Score/Condition Category

>75 / Excellent

50-74 / Good

25-49 / Fair

<25 / Poor

Woodard Creek at Hwy-U fish survey station

Conclusion and Recommendations

This study assessed the conditions in the Stony Creek Watershed during the 2022 sampling season to compare with previous water quality assessments. Combined with data collected previously, this provides a snapshot of current conditions within the watershed and changes that have occurred since initial baseline sampling in 2003. Overall conclusions and recommendations include:

- Both the lower section (mouth up to Geier Road-assessment unit 10219) and the upper section (Geier Road to headwater-assessment unit 10220) of Stony Creek had elevated phosphorus levels in 2022. The upper section is currently on the impaired waters list for phosphorus. I recommend adding the lower section to the impaired waters lists for phosphorus also.
- An additional fish survey should be conducted on Bear Creek (Station ID 153242) to calculate F-IBI and verify the fish natural community.
- The natural community of both Stony Creek sites (Station ID 10011691 and 153221) should be updated to reflect the current fish community structure of warm transition headwater.

- The natural community of Woodard Creek (Station ID 10010279) should be updated to reflect the current fish community structure of cold transition headwater.
- The natural community of Silver Creek (Station ID 10011678) should be updated to reflect the current fish community structure of cold transition headwater.
- Overall, the habitat condition scores in the Stony Creek Watershed indicate that physical habitat of these streams are providing sufficient habitat for aquatic life.
- Overall water temperatures display similar trends among all five stations monitored, with both Stony Creek stations having slightly higher average daily temperatures. Silver Creek, Bear Creek, and Woodard Creek all had water temperatures well below the cold water temperature criteria.
- Macroinvertebrate condition categories have remained stable or slightly improved for all stations, with M-IBI ratings ranging from "fair" to "good."

References

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Appendix A

Natural Community Verification Reports

Stony Creek – Maplewood Rd

Natural Community Verification Report

Waterbody Name (WBIC): STONY CREEK (96100)

Swims Station ID: 10011691

Survey Sequence Number: 515098164

This NC Verification Report was run on STONY CREEK - MAPLEWOOD RD., (10011691), located in DOOR County with fish Survey Sequence Number 515098164 sampled on July 15, 2022. The Natural Community for this station was verified by Claire Hetzel on March 22, 2023.

The Natural Community was modeled *Warm Headwater* and is now Verified as *Warm Transition Headwater* .

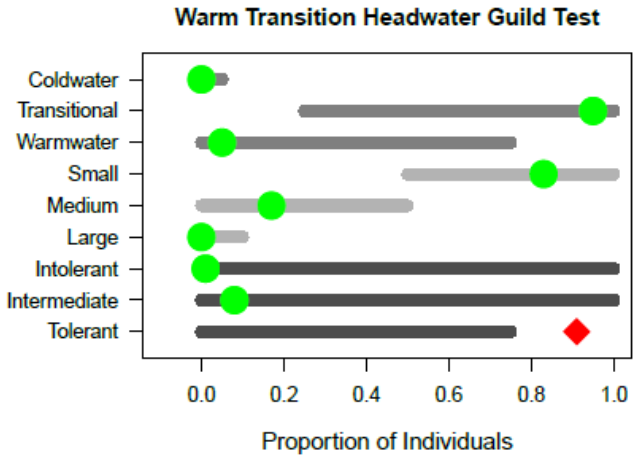
Survey location

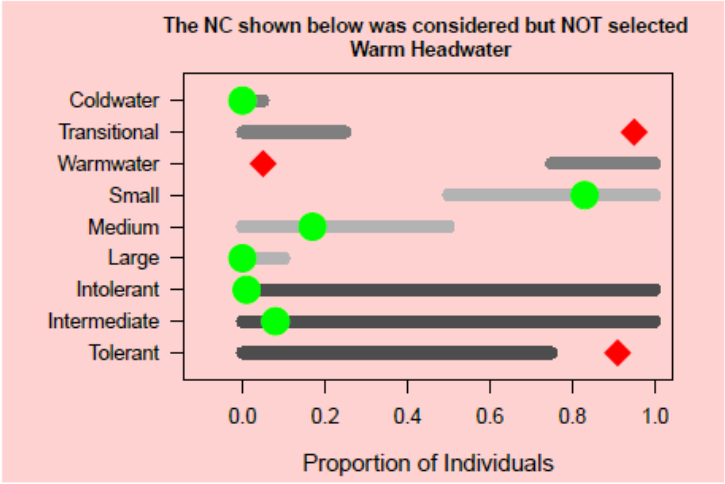
Fish captured

Species	Count
CENTRAL MUDMINNOW	92
COMMON SHINER	4
CREEK CHUB	50
GOLDEN SHINER	3
GREEN SUNFISH	1
JOHNNY DARTER	10
REDSIDE DACE	1
WHITE SUCKER	13

Guild percentages

Thermal	Percent.Indiv.	Size	Percent.Indiv.	Tolerance	Percent.Indiv.
Coldwater	0	Small	83	Intolerant	1
Transitional	95	Medium	17	Intermediate	8
Warmwater	5	Large	0	Tolerant	91





Comments from WR Biologist:

Species thermal guild more closely fits warm transition natural community, with a high proportion of transitional species and low proportions of cold and warm water species. No extreme weather occurred during the sample period.

Stony Creek – Rosewood Rd

Natural Community Verification Report

Waterbody Name (WBIC): STONY CREEK (96100)

Swims Station ID: 153221

Survey Sequence Number: 515098252

This NC Verification Report was run on Stony Creek at Rosewood Rd, (153221), located in DOOR County with fish Survey Sequence Number 515098252 sampled on August 4, 2022. The Natural Community for this station was verified by Claire Hetzel on March 22, 2023.

The Natural Community was modeled *Warm Headwater* and is now Verified as *Warm Transition Headwater* .

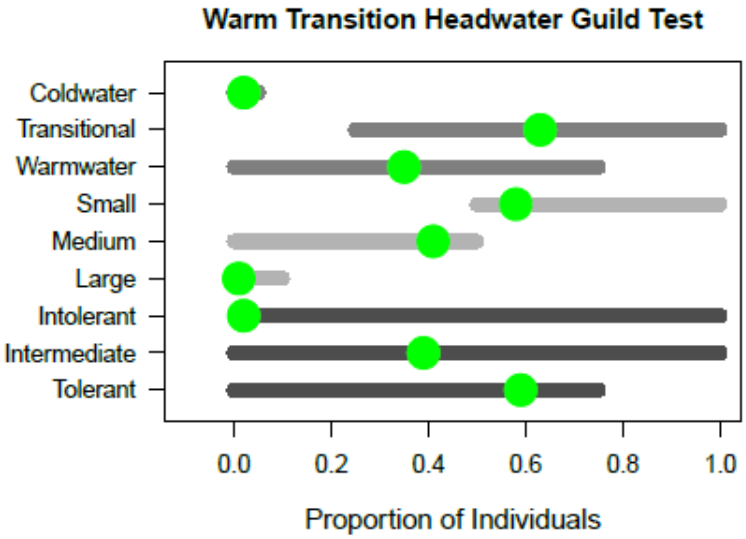
Fish captured

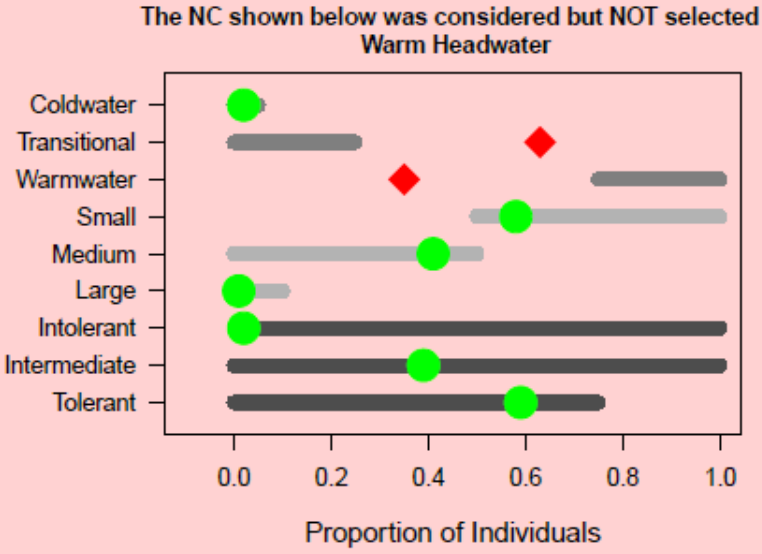
Species	Count
BLUEGILL	1
CENTRAL MUDMINNOW	6
COMMON SHINER	228
CREEK CHUB	265
GOLDEN SHINER	3
HORNYHEAD CHUB	49
JOHNNY DARTER	31
MOTTLED SCULPIN	17
NORTHERN PIKE	3
PEARL DACE	1
ROUND GOBY	7
WESTERN BLACKNOSE DACE	190
WHITE SUCKER	24

Survey location

Guild percentages

Thermal	Percent.Indiv.	Size	Percent.Indiv.	Tolerance	Percent.Indiv.
Coldwater	2	Small	58	Intolerant	2
Transitional	63	Medium	41	Intermediate	39
Warmwater	35	Large	1	Tolerant	59





Comments from WR Biologist:

Species thermal guild more closely fits warm transition natural community, with a greater proportion of transitional species than warm water species, but with a moderate level of warm water species and a low proportion of cold water species. Temperature monitoring of the stream during the growing period indicates that temperatures remain below the cold water criteria, but were exceeded on a few days during the summer months. Additionally, both tolerance tests are met and no extreme weather occurred during the sample period.

Woodard Creek – Hwy U

Natural Community Verification Report

Waterbody Name (WBIC): WOODARD CREEK (96600)

Swims Station ID: 10010279

Survey Sequence Number: 515098199

This NC Verification Report was run on WOODARD CREEK - WOODWARD CREEK AT HIGHWAY U, (10010279), located in DOOR County with fish Survey Sequence Number 515098199 sampled on July 15, 2022. The Natural Community for this station was verified by Claire Hetzel on March 23, 2023.

The Natural Community was modeled *Warm Headwater* and is now Verified as *Cold Transition Headwater* .

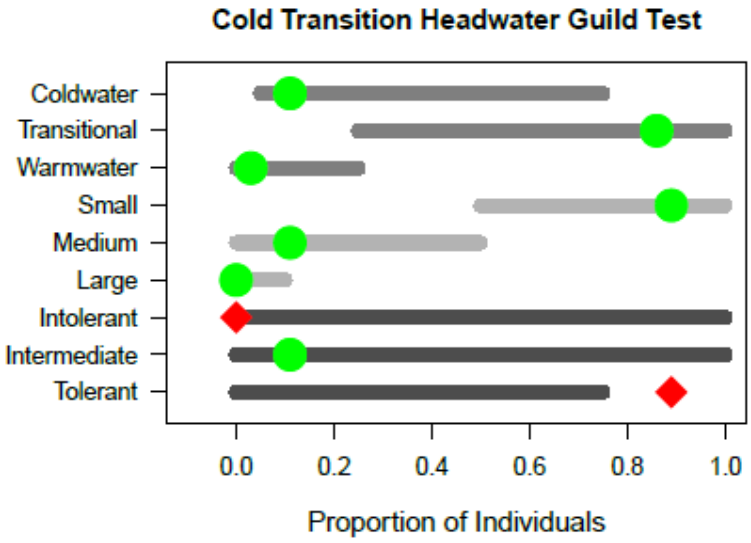
Survey location

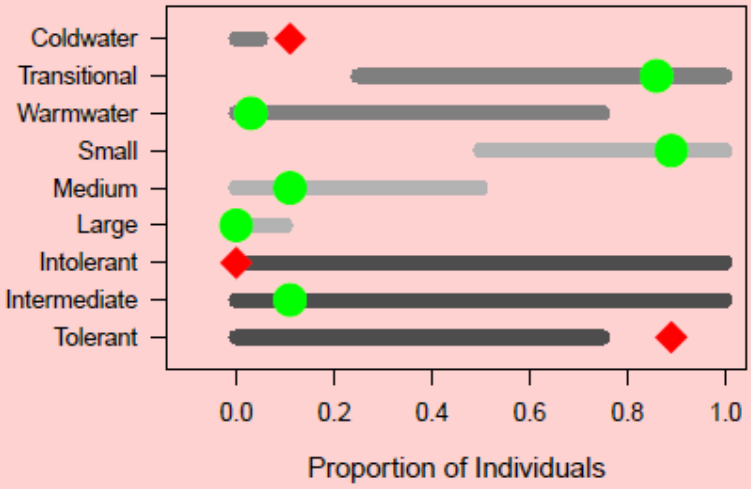
Fish captured

Species	Count
BROOK STICKLEBACK	9
CREEK CHUB	92
FATHEAD MINNOW	4
RAINBOW TROUT	13

Guild percentages

Thermal	Percent.Indiv.	Size	Percent.Indiv.	Tolerance	Percent.Indiv.
Coldwater	11	Small	89	Intolerant	0
Transitional	86	Medium	11	Intermediate	11
Warmwater	3	Large	0	Tolerant	89





Comments from WR Biologist:

Species thermal guild more closely fits a cold transition headwaters natural community, due to a high proportion of transitional species, a moderate proportion of cold water species, and a very low proportion of warm water species. Hourly temperature monitoring of the stream indicates that temperatures remain well below the cold water criteria during the entire summer. No extreme weather occurred during the sampling period. Though both tolerance tests failed, we do not believe that is due to environmental degradation.

Silver Creek – Jackson Rd

Natural Community Verification Report

Waterbody Name (WBIC): SILVER CREEK (96000)

Swims Station ID: 10011678

Survey Sequence Number: 515098063

This NC Verification Report was run on SILVER CREEK AT JACKSON RD, (10011678), located in KEWAUNEE County with fish Survey Sequence Number 515098063 sampled on July 25, 2022. The Natural Community for this station was verified by Claire Hetzel on March 22, 2023.

The Natural Community was modeled *Warm Headwater* and is now Verified as *Cold Transition Headwater* .

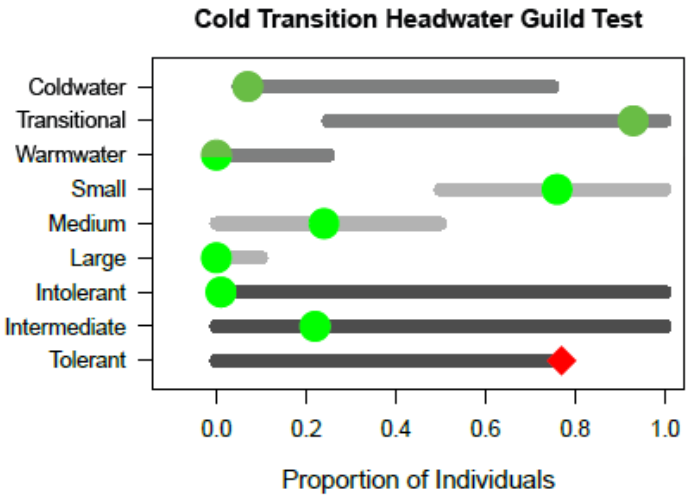
Survey location

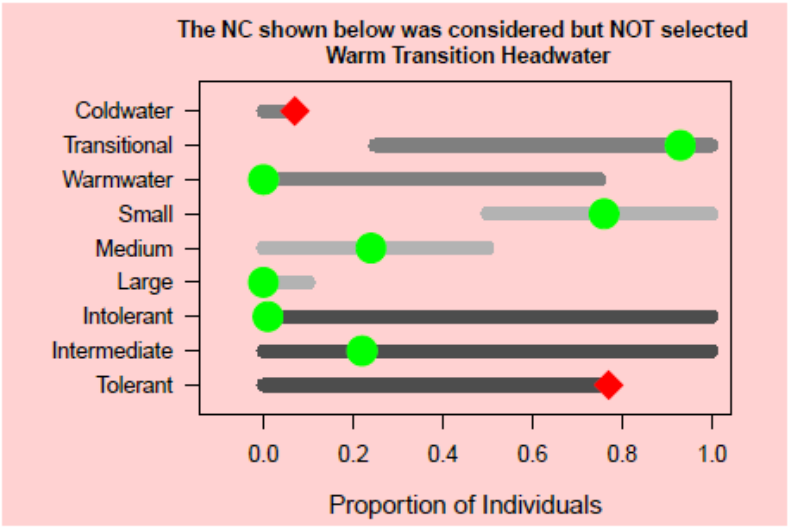
Fish captured

Species	Count
BROOK STICKLEBACK	1
CENTRAL MUDMINNOW	50
CREEK CHUB	4
JOHNNY DARTER	11
LONGNOSE DACE	1
MOTTLED SCULPIN	1
RAINBOW TROUT	4
WHITE SUCKER	2

Guild percentages

Thermal	Percent.Indiv.	Size	Percent.Indiv.	Tolerance	Percent.Indiv.
Coldwater	7	Small	76	Intolerant	1
Transitional	93	Medium	24	Intermediate	22
Warmwater	0	Large	0	Tolerant	77





Comments from WR Biologist:

Species thermal guild more closely fits the cold transition natural community, with high amount of transitional species and some cold water species. Though cold water species were relatively low, no warm water species were found at all. Temperature monitoring of the stream indicates that temperatures remain well below the cold water criteria during the entire growing season. Though the amount of tolerant species is slightly greater than expected for this natural community, we do not believe it is due to environmental degradation. No extreme weather occurred during the sample period.