

To: Travis Thiel  
Vermillion River Watershed Joint  
Powers Organization

From: Anna Varian  
Katie Kemmitt  
Dendy Lofton, PhD  
Minneapolis

Project/File: Vermillion 2022 Fish Monitoring  
227705248

Date: November 28, 2022

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**Reference: Vermillion 2022 Fish Monitoring****Background**

The Vermillion River and the tributaries within its watershed contain a diverse mix of warmwater and coldwater streams. In 2008, the Vermillion River Watershed Joint Powers Organization (VRWJPO) developed a biological monitoring plan to assess the fish and macroinvertebrate communities from coldwater and warmwater streams within the watershed. The VRWJPO has been collecting annual biological data since 2009 to support a variety of efforts within the watershed including the Watershed Restoration and Protection Strategy (WRAPS) and current Watershed Management Plan. Annual data was collected at most sites across the watershed from 2009 through 2015. Wenck Associates, now part of Stantec Consulting Services (Stantec), partnered with the VRWJPO to conduct the fish community monitoring over this time. This dataset established the baseline characteristics of the fish community within the watershed.

In 2016, Wenck (now Stantec) conducted an analysis of the fish community dataset for the VRWJPO with the intent of determining the appropriate sampling frequency for future biological monitoring efforts. The final monitoring recommendations included the development of sentinel sites throughout the watershed, which would be monitored one time every two years, and then the remaining sites in the watershed would be monitored approximately one time every three years. These criteria were used to develop a monitoring rotation for a six-year period (Table 1). The first year of the monitoring rotation was 2016. After initial development of the monitoring rotation, the VRWJPO received input from both the Minnesota Department of Natural Resources (MnDNR) and the Minnesota Pollution Control Agency (MPCA) regarding the planned monitoring schedule of each agency within the watershed. Based on this input, the monitoring rotation was updated to include the monitoring efforts to be conducted by the VRWJPO along with the monitoring efforts by the MnDNR and the MPCA. This technical memo provides a summary and analysis of the fish community monitoring from this year, Year 7 of the data collection rotation (Table 1).

Reference: Vermillion 2022 Fish Monitoring

**Table 1: Sampling rotation for all 18 monitoring sites in the watershed by year (yr).**

Site	Method	Yr 1: 2016	Yr 2: 2017	Yr 3: 2018	Yr 4: 2019	Yr 5: 2020	Yr 6: 2021	Yr 7: 2022	Yr 8: 2023	Yr 9: 2024	Yr 10: 2025
A2	Backpack		X			X			X		
<b>A3</b>	<b>Backpack</b>	<b>X</b>		<b>X</b>		<b>X</b>		<b>X</b>		<b>X</b>	
A4	Backpack			X			X			X	
<b>A5</b>	<b>Backpack</b>	<b>X</b>	*	<b>X</b>		<b>X</b>		<b>X</b>		<b>X</b>	
A6	Backpack		X			X			X		
<b>A7</b>	<b>Backpack</b>	<b>X</b>		<b>X</b>		<b>X</b>		<b>X</b>		<b>X</b>	
<b>A8</b>	<b>Barge</b>		<b>X</b>		+	*	<b>X</b>		<b>X</b>		<b>X</b>
A9	Barge	X	*	X		X			X		
<b>A12</b>	<b>Backpack</b>		<b>X</b>		<b>X</b>	*	<b>X</b>		<b>X</b>		<b>X</b>
A13	Backpack		*	X		*	X			X	
A14	Barge	X			+	X		X			X
A15	Backpack	X			X			X			X
13-1	Backpack		X		X			X			X
13-2	Backpack			X			X			X	
13-4	Backpack		X			X			X		
13-5	Barge			X			X			X	
<b>14-1</b>	<b>Backpack</b>		<b>X</b>		<b>X</b>		<b>X</b>		<b>X</b>		<b>X</b>
14-2	Backpack	X		X		X			X		

**Note:** Sentinel sites in bold.

X : Sites identified in planned rotation for the specific monitoring year

\* : DNR monitoring sites in 2020 as part of their stated monitoring every three years.

+ : *Barge sites not accessible in 2019; added to 2020 Rotation*

Reference: Vermillion 2022 Fish Monitoring

## 2022 Monitoring Sites

Six sites were monitored for fish community in 2022 (Table 2; Figure A1). Five backpack sites (A3, A5, A7, A15, 13-1) and one barge site (A14) were surveyed by Stantec between August 24<sup>th</sup> and 26<sup>th</sup> 2022. The timing of these surveys coincided with the standard sampling period from previous fish community surveys in the Vermillion River Watershed. Stantec acquired the required special permit for fish surveys from the MnDNR (Attachment A) prior to conducting field surveys. Summary data from the 2022 field surveys performed by Stantec has been provided to the MnDNR as required under terms of the permit.

Historically established site reach lengths were used for 2022 monitoring. All stream fish collections followed the methods outlined in the Minnesota Pollution Control Agency's (MPCA) warmwater Index of Biotic Integrity (IBI) report and the MPCA Standard Operating Procedures for electrofishing (Rev. Feb. 2009). Each site was fished beginning at the downstream point of the reach and proceeding in an upstream direction to the most upstream point of the reach. Due to the relatively narrow width of most of the stream reaches targeted for surveys, it was possible to effectively sample all available in-stream habitats. All fish collected were identified, sorted, counted, and released. The survey method and sample dates for each reach are presented in Table 2.

**Table 2: Sample reach information for the six sites in the 2022 Vermillion River stream fish monitoring project.**

Site	Sampler	Stream Classification	Reach Length (ft)	Survey Method	Sample Date	Total Species	Total Abundance
A3	Stantec	Coldwater	525	Backpack	8/24/22	6	118
A5	Stantec	Coldwater	1025	Backpack	8/25/22	7	311
A7	Stantec	Coldwater	500	Backpack	8/26/22	9	99
A14	Stantec	Warmwater	1,225	Barge	8/25/22	11	265
A15	Stantec	Warmwater	540	Backpack	8/24/22	7	36
13-1	Stantec	Coldwater	550	Backpack	8/24/22	8	205

## Monitoring Results

A total of 1,034 fish were collected across the six sites surveyed in 2022. Total catch abundance ranged from 36 fish at site A15 to 311 fish at site A5 (Table 2). The total number of species caught at each site ranged from 6-11. Six species were captured at site A3, and eleven species were captured at A14. The highest abundance of any species caught was white suckers (*Catostomus commersonii*), with 467

Reference: Vermillion 2022 Fish Monitoring

individuals (45% of total catch abundance for all sites). Other species with high survey abundance (% of total abundance in parentheses) included 157 Johnny darter (*Etheostoma nigrum*) (15%), 82 creek chub (*Semotilus atromaculatus*) (8%), and 76 bigmouth shiner (*Notropis dorsalis*) (7%). White suckers and green sunfish (*Lepomis cyanellus*) were captured at all six sites, while Johnny darters, northern pike (*Esox lucius*), and central mudminnows (*Umbra limi*) were captured at five sites.

Fish data were submitted to the MPCA for Index of Biological Integrity (IBI) score calculation. The MPCA has assisted the VRWJPO with IBI score calculation for the biological monitoring program since 2011. The stream sites in the Vermillion River Watershed are all within the southern region of the state based on the IBI protocol for Minnesota. The six sites monitored in 2022 are from three different stream IBI categories including Southern Coldwater Streams (A3, A5, A7, 13-1), Southern Streams (A14), and Southern Headwater Streams (A15). The 2022 IBI scores are presented in Table 3.

Detailed fish abundance and IBI metric scores are provided in Attachments B, C, and D.

**Table 3: IBI score summary for 2022 fish community monitoring sites.**

Site	Stream Classification	MPCA IBI Category	Sample Years <sup>1</sup>	Avg IBI	Min	Max	2022 IBI	IBI Threshold <sup>2</sup>
A3	Coldwater	Southern Coldwater	12	49.0	31.2	66.6	42.0	50
A5	Coldwater	Southern Coldwater	13	39.4	27.9	54.7	37.4	50
A7	Coldwater	Southern Coldwater	9	38.3	24.8	45.2	41.4	50
A14	Warmwater	Southern Streams	11	42.4	31.4	54.6	51.2	45
A15	Warmwater	Southern Headwaters	6	72.4	64.2	75.7	64.2	55
13-1	Coldwater	Southern Coldwater	6	39.6	34.0	45.0	41.36	50

<sup>1</sup> Includes 2022 monitoring year

<sup>2</sup> IBI scores above the threshold meet water quality standards and IBI scores below the threshold do not meet water quality standards

Reference: Vermillion 2022 Fish Monitoring

## Discussion

Central Minnesota including Dakota County and the Vermillion River watershed experienced moderate to severe drought conditions during the summer of 2022. Discharge during surveys at the nearest gage station on the Vermillion River near Empire, MN (05345000) was less than half the median discharge recorded at this station for the last 78 years. How the drought may have affected IBI scores is difficult to discern and may have affected sites differently based on watershed size, human impacts, or other factors. However, despite the drought, only one site sampled this year (A15) scored lower than its previous IBI score range.

### Southern Streams

Site A14 was the only 2022 monitoring site classified as Southern Streams. This site is located on the main stem of the Vermillion River, with the downstream end of the monitoring reach located immediately upstream of Goodwin Avenue. This site was established in 2008 and there are eleven years of monitoring data. For the second survey in a row Site A14 has exceeded the general use threshold of 45 with a score of 51.2. Of the eleven years sampled this site has exceeded the threshold four times (Figure 1). High metric scores in taxa richness of short-lived species (Slvd) and percent of early maturing individuals (MA<2Pct) contributed to a higher-than-average score. Both these metrics are negative response metrics meaning that low numbers of short-lived species and early maturing individuals resulted in high metric scores.

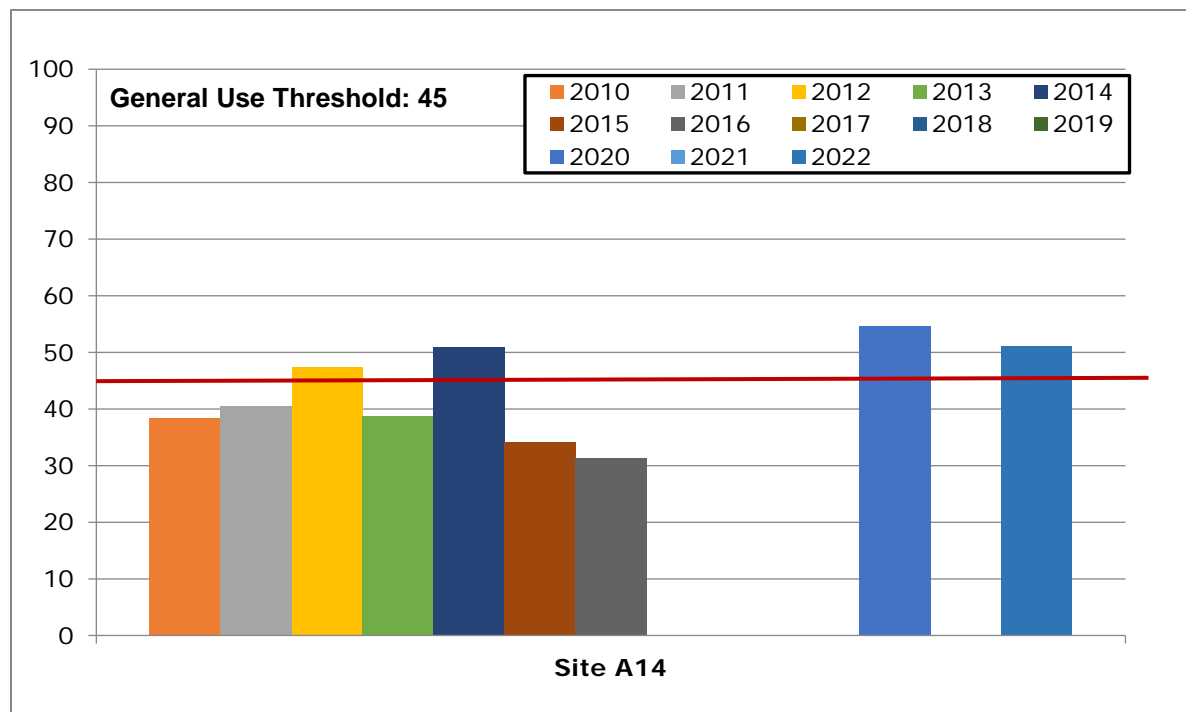


Figure 1: IBI Scores for Southern Streams.

Reference: Vermillion 2022 Fish Monitoring

### Southern Headwater Streams

One of the 2022 monitoring sites is classified as Southern Headwater Streams. Site A-15 is on Middle Creek to the east of Akin Road. This site was established in 2010 and there are six years of monitoring data. Site A-15 has historically had IBI scores in the low to mid 70s; this year's score was 64.2 which is still above the general use threshold of 55 but it is the lowest IBI score since 2010 (Figure 2). No individual metric score contributed significantly to the lower score, all metric scores except one were lower in 2022 than those from the most recent survey in 2019. Total abundance in 2019 was 28 fish of 5 different species and 36 fish of 7 different species in 2022. White suckers and brook stickleback were sampled in 2022 but not in 2019, both these species are considered tolerant and likely contributed to the decreased score.

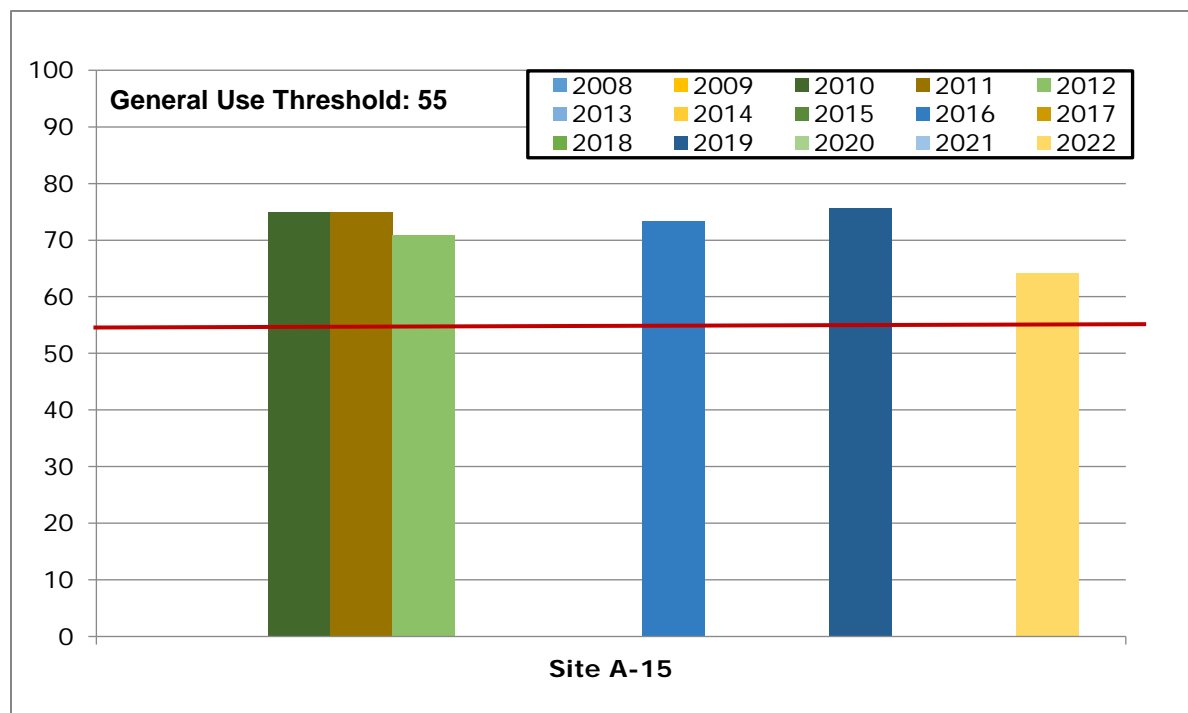
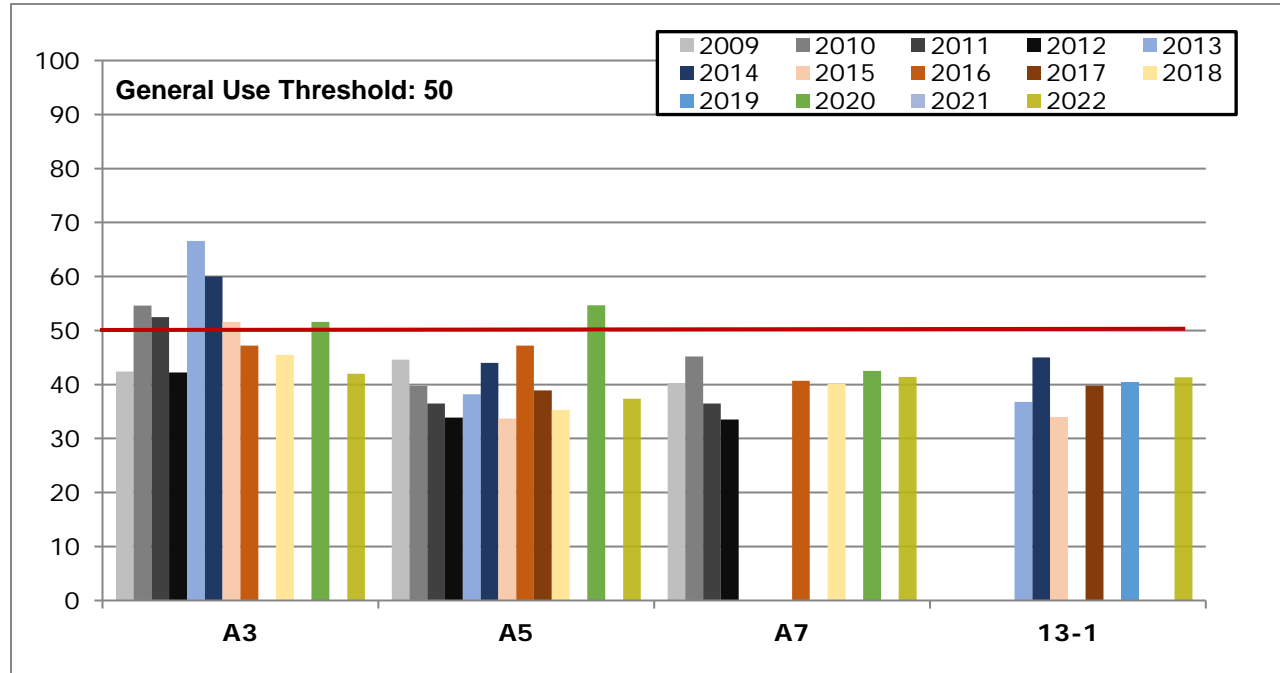


Figure 2: IBI Scores for Southern Headwater Streams.

Reference: Vermillion 2022 Fish Monitoring

### Southern Coldwater Streams

Four of the 2022 monitoring sites (A3, A5, A7, 13-1) are classified as Southern Coldwater Streams by MPCA for IBI scoring. A comparison of IBI scores across monitoring years for the Coldwater sites monitored in 2022 are provided in Figure 3.



**Figure 3: IBI Scores for Southern Coldwater Streams.**

Site A3 is located on South Creek east of Flagstaff Avenue and has been surveyed 12 times since 2008. IBI scores for site A3 have been variable throughout the years, the scores for 2022 are the second lowest since 2008 (Figure 3). The site has exceeded the general use threshold in 2010, 2011, 2013, 2014, and 2015. The low score for 2022 is primarily due to low scores in the percent of sensitive individuals specific to coldwater (CWSensitivePct\_10DrgArea) and percent of taxa that consume detritus (SdetTxPct\_10DrgArea) metrics. Brown trout (*Salmo trutta*) were sampled at this site with the largest being 14.6 inches.

Site A5 is located on the Vermillion River south of 220<sup>th</sup> Street West and has been surveyed 13 times since 2008. In 2020, this site exceeded the general use threshold for the first time; however, in 2022 the IBI score dropped back down to slightly below average. Metric scores for percent of sensitive individuals specific to coldwater (CWSensitivePct\_10DrgArea), coldwater tolerant species (CWTol\_10DrgArea), abundance of pioneer species (PioneerPct), and percent of taxa that consume detritus (SdetTxPct\_10DrgArea) were all lower in 2022 than in 2020.

Reference: Vermillion 2022 Fish Monitoring

Site A7 is located on North Creek west of Chippendale Ave (State Hwy 3) and has been surveyed nine times since 2008. The 2022 IBI score was above average and similar to the scores of the last three surveys. This site had the most diversity of the 2022 coldwater sites with nine species captured. Of all six sites sampled this year, black bullhead (*Ameiurus melas*) and largemouth bass (*Micropterus salmoides*) were only found at this site.

Site 13-1 is on the Vermillion River between Cedar Avenue and 225<sup>th</sup> Street West and has been surveyed six times since 2013. The 2022 IBI score was above average and just slightly higher than the last survey in 2019. IBI scores at Site 13-1 have been relatively stable over the years. The site is one of the least variable with only an eleven point difference between the lowest and highest score.

Similar to previous years, metrics that scored high for coldwater sites were percent herbivorous individuals (HerbvPct), percent detritivorous taxa (SdetTxPct\_10DrgArea), and tolerant taxa richness (specific to coldwater streams, CWTol\_10DrgArea). These metrics have a negative response relationship, meaning that a low number of these species or individuals collected as part of the total abundance caught at a site result in higher metric scores.

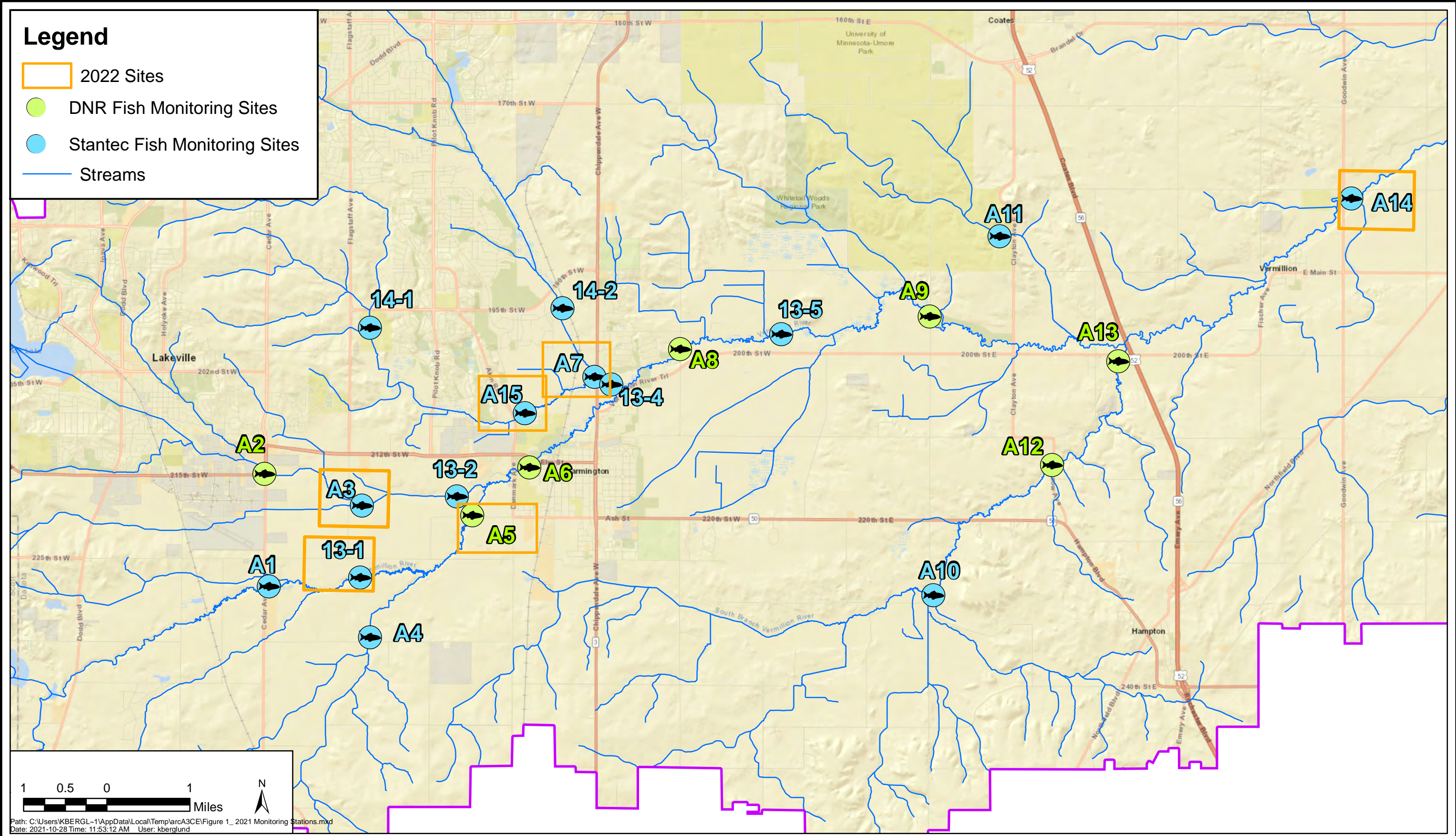
The coldwater sites within the Vermillion River watershed have usually received IBI scores below the general use threshold of 50. None of the four sites sampled this year reached the general use threshold. As with IBI scores in the past at these Southern Coldwater Stream sites, an absence of native coldwater fish species is the primary factor limiting the potential for higher IBI scores. Brown trout were the only trout species sampled in 2022 and were found only at one of the four coldwater sites (A3). Brown trout are not native to North America, but they are a sensitive coldwater species and have been stocked in coldwater streams across the Midwest for angling opportunities. The lack of native brook trout (*Salvelinus fontinalis*) and sculpin (*Cottus sps*) will always limit the IBI scores. Rainbow trout (*Oncorhynchus mykiss*) have been sampled at several coldwater sites in the past, but none were captured at coldwater sites this year.

Attachments: Figure A1. 2022 Fish Monitoring Stations  
Attachment A. DNR Special Survey Permit  
Attachment B. Southern Stream Sites – Fish Abundance Data and IBI Metric Comparisons  
Attachment C. Southern Headwater Stream Sites – Fish Abundance Data and IBI Metric Comparisons  
Attachment D. Southern Coldwater Stream Sites – Fish Abundance Data and IBI Metric Comparisons



# Legend

- 2022 Sites
- DNR Fish Monitoring Sites
- Stantec Fish Monitoring Sites
- Streams



Path: C:\Users\KBERGL-1\AppData\Local\Temp\larcA3CE\Figure 1\_ 2021 Monitoring Stations.mxd  
Date: 2021-10-28 Time: 11:53:12 AM User: kberglund

VERMILLION RIVER WATERSHED JOINT POWERS ORGANIZATION

2022 Biological Monitoring Sites



OCT 2022

Figure A1

## Attachment A: DNR Special Survey Permit

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Permittees should not assume that DNR issuing a permit allows them to conduct their work. Issuance of this permit does not exempt you from compliance with pertinent laws, ordinances, and regulations, including Executive Orders that limit public activities.



STATE OF MINNESOTA  
DEPARTMENT OF NATURAL RESOURCES  
Division of Fish and Wildlife – Section of Fisheries  
500 Lafayette Road  
St. Paul, MN 55155-4020  
PH: (651) 259-5236  
e-mail: [fisheries.permits@state.mn.us](mailto:fisheries.permits@state.mn.us)

**SPECIAL PERMIT NO. 34760**  
**(Fisheries Research)**  
**Date: 27 July 2022**

TO WHOM IT MAY CONCERN:  
Permission is hereby granted to:

Dendy Lofton and Katie Kemmitt or designee  
Stantec Consulting Services, Inc.  
733 South Marquette Avenue, Suite 1000  
Minneapolis, MN 55402

to collect fish by backpack and barge electrofishing from the Vermillion River and its tributaries in Dakota County, particularly near Farnington, MN, **August – September 2022** for the purpose of fish community monitoring. See attached map for specific site locations. Work performed under this permit will be coordinated with the area fisheries office.

**All equipment should be thoroughly decontaminated before and after being used in other waterbodies.**

Fish may be held temporarily in aerated holding tanks, identified, weighed, and measured prior to release at the site of collection. A minimal number of fish may be preserved on site, transported and possessed as voucher specimens. Any dead or moribund fish shall be removed from the water and disposed of properly.

Fish may not be sold, bartered, or converted to private use. No endangered or threatened species may be collected without a separate permit from the DNR's Endangered Species Coordinator ([List of Endangered and Threatened Species](https://www.dnr.state.mn.us/ets/index.html) <https://www.dnr.state.mn.us/ets/index.html>).

A copy of this permit shall be carried while sampling.

### **Condition #1 - Applies to All Permits for Work in Any State Water**

- Always use caution so you do not introduce aquatic invasive species into any water body. A list of known Infested Waters with species present is available at [MN Infested Waters List](http://www.dnr.state.mn.us/invasives/ais/infested.html) (<http://www.dnr.state.mn.us/invasives/ais/infested.html>).
- **Before starting** work under this permit, you should decontaminate all equipment that has been used in any other waters in Minnesota or other locations (see Decontamination Protocols described in Condition #4 below for equipment used in infested waters).
- **Before leaving** the water access, you must:
  - **Clean** off all aquatic plants and animals
  - **Drain** water from equipment, including watercraft and livewells, and transport equipment with drain plugs open or removed.

### **Condition #2 - Applies to All Permits for Live Transport**

- Live specimens may be transported only if your permit allows and only in tap, bottled, or ground water that you bring to the collection site. Do not use surface water.
- If it is critical to transport small amounts of surface water, then you must obtain a separate [Water Transport Permit](https://www.dnr.state.mn.us/invasives/ais_watersampling.html) ([https://www.dnr.state.mn.us/invasives/ais\\_watersampling.html](https://www.dnr.state.mn.us/invasives/ais_watersampling.html)). This is a self-issue permit.

**Condition #3 - Applies to Collection or Possession of Prohibited Invasive Species**

- State laws and rules prohibit the possession and transportation of prohibited invasive species without an additional permit. Lists of prohibited and regulated invasive species, and permit application information can be found at: [Prohibited and Regulated Invasive Species](https://www.dnr.state.mn.us/permits/invasive_species/prohibited_regulated.html) ([https://www.dnr.state.mn.us/permits/invasive\\_species/prohibited\\_regulated.html](https://www.dnr.state.mn.us/permits/invasive_species/prohibited_regulated.html)).
- **If you find a new infestation** of an aquatic invasive species, note the location and take a photo or keep the specimen in a sealed container, and call the [DNR Aquatic Invasive Species Specialist](#) for your region ([https://www.dnr.state.mn.us/permits/invasive\\_species/prohibited\\_regulated.html](https://www.dnr.state.mn.us/permits/invasive_species/prohibited_regulated.html)).

**Condition #4 - Applies to Cleaning Equipment When Working in Infested Waters**

- Waders, hip boots, other footwear, hook and line (angling), trot lines, hand-held dip nets, backpack electrofishing, and scuba equipment used in infested waters must be cleaned and decontaminated before they are used in any other water body. Tags are not required on this equipment.
- All other traps, nets, and gear used in infested waters **must be tagged** with *Infested Waters Only* tags supplied by DNR and not used in uninfested waters. Tags must be attached to equipment in a manner that prohibits their removal without cutting the tag.
- Watercraft do not need to be tagged, but must be fully decontaminated after work is completed in infested waters, and must not be left in infested waters overnight.
- You must decontaminate tagged equipment using methods specific to the aquatic invasive species present in the water body. Always use caution so you do not introduce additional aquatic invasive species into any water body. The following procedures are required before the tagged equipment may be used in uninfested waters or other types of infested waters:
  - **zebra mussel** – rinse with 140 degree F water at the point of contact for at least 10 seconds, or 120 degrees F for at least 2 minutes, or freeze for at least 48 hours;
  - **faucet snail** – rinse with 140 degree F hot water for at least one minute;
  - **spiny waterflea** – equipment must be thoroughly dry for at least 24 hours;
  - **New Zealand mudsnail** - rinse with 120 degree F hot water for at least one minute; and
  - **Eurasian watermilfoil, flowering rush, starry stonewort, brittle naiad** – remove all plant parts.
- All tagged gear must also be decontaminated after completion of each field season.

**Condition #5 - Applies to Work in Both Infested and Uninfested Waters**

**Option 1**

- The permittee may use one set of gear provided:
  - Gear used under this permit shall be used first in uninfested waters, then tagged and used in infested waters; and
  - Gear is decontaminated before moving from one type of infested water to another; and
  - Gear is decontaminated upon final use in infested waters.

**Option 2**

- The permittee working alternately in infested and uninfested waters shall have two sets of gear – one for infested waters that must be tagged as described above in Condition #4 and one for uninfested waters. Gear that is not required to be tagged for use in infested waters (such as waders and scuba equipment) must be decontaminated completely before being used in an uninfested water body.
- Gear tagged for use in infested waters and gear used in infested waters that has not yet been completely decontaminated must be transported or stored in a way that ensures physical separation from gear for use in uninfested waters. If infested and uninfested gear are carried in the same compartment of a vehicle, then at least one of the types of gear should be contained in such a way that prohibits physical contact between the sets of gear (for example, using a plastic drum or tub). Permittees should take care to wipe up any excess water that drips off infested waters gear. When working at the access of an uninfested water body, equipment used in infested waters must remain secured in the vehicle. Note that this does not permit tags to be removed and the previously tagged gear used in any uninfested waters.

This permit is only for sampling on State property and waters, unless the permittee has explicit permission from the land owners, including the National Park Service, U.S. Fish and Wildlife Service, or County. A separate permit is needed from the Division of Parks and Trails to collect within a State Park. On Minnesota border waters, this permit applies only to the territorial waters of the State of Minnesota. A copy of this permit shall be carried while sampling.

**The Area Fisheries Supervisor and Regional Enforcement Manager must be notified by e-mail, preferably 7-10 days in advance of sampling (see e-mail addresses in red below). A hard copy of the notifications shall be attached to the year-end activity report. Your letter of application does not constitute advance notification of your intent to sample.**

A report detailing collection activities (species, numbers, and collection sites) will be submitted to MN DNR - Fisheries by **31 January of each year**. A copy of any report or publication resulting from this research will be provided to the Division of Fish and Wildlife upon its completion.

This permit is valid from date of issuance through **31 December 2022**, but may be revoked at any time.

MELISSA TREML  
Fisheries Research Manager



*I hereby certify that I have read and understand the provisions of this permit and understand that this permit is not valid unless it is signed by me.*

Permittee Signature	Title	Date
<i>Katie Kemmitt</i>	Environmental Scientist	8/2/22

**cc: Division of Fish and Wildlife**

TJ DeBates, East Metro Area Fisheries Supervisor, St. Paul  
(e-mail [timothy.debates@state.mn.us](mailto:timothy.debates@state.mn.us); phone 651-259-5770)  
Kevin Stauffer, Area Fisheries Supervisor, Lake City  
(e-mail [kevin.stauffer@state.mn.us](mailto:kevin.stauffer@state.mn.us); phone 651-299-4032)  
Brian Nerbonne, Regional Fisheries Manager, St. Paul  
(e-mail [brian.nerbonne@state.mn.us](mailto:brian.nerbonne@state.mn.us); phone 651-259-5789)

**Division of Enforcement**

Capt. Jason Peterson, Regional Enforcement Manager, St. Paul  
(e-mail [jason.r.peterson@state.mn.us](mailto:jason.r.peterson@state.mn.us); phone 651-259-5838)

## Attachment B: Southern Stream Sites – Fish Abundance Data and IBI Metric Comparisons

Species	Abundance
	A14
Bigmouth Shiner	12
Black Crappie	1
Blacknose Dace	1
Bluegill Sunfish	2
Brown Trout	5
Central Mudminnow	1
Green Sunfish	24
Johnny Darter	51
Northern Pike	14
Rainbow Trout	4
White Sucker	150
Total Catch	265
Species Total	11

Metric Name	Metric Description	Score
		A14
BenInsect-TolTxPct	Percent Benthic Insectivore Taxa (excludes tolerant species)	2.8
DetNWQTxPct	Percent Detritivorous Taxa	12.5
DomTwoPct	Combined Relative Abundance of the Two Most Abundant Taxa	0.0
FishDELTPct <sup>1</sup>	Percent of Individuals with Deformities, Eroded Fins, Lesions, or Tumors	0.0
SrtLvd	Number of Short-lived Taxa	10.7
ToltxPct	Percent Tolerant taxa	5.0
MatureAge<_2Pct	Percent of Early Maturing Individuals	10.4
TolPct	Percent of Tolerant Individuals	1.1
Senstv_TxPct	Percent of Sensitive Taxa	8.7
Total IBI Score		51.20
General Use IBI Threshold		45

<sup>1</sup> Metric is a negative adjustment applied (if applicable) after calculating the composite score

## Attachment C: Southern Headwater Stream Sites – Fish Abundance Data and IBI Metric Comparisons

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Species	Abundance
	A15
Brook Stickleback	5
Central Mudminnow	7
Creek Chub	3
Green Sunfish	1
Johnny Darter	2
Northern Pike	1
White Sucker	17
Total Catch	36
Species Total	7

Metric Name	Metric Description	Score
		A15
DetNWQTxPct	Relative Abundance of Detritivorous Species	11.9
FishDELPct <sup>1</sup>	Percent of Individuals with Deformities, Eroded Fins, Lesions, or Tumors	0.0
GeneralTxPct	Relative Abundance of Trophic Generalist Species	12.6
Sensitive	Taxa Richness of Sensitive Species	0.0
SLvdPct	Relative Abundance of Short-lived Individuals	14.4
SSpnPct	Relative Abundance of Serial Spawning Individuals	16.7
VtolTxPct	Relative Abundance of Very Tolerant Species	8.6
Total IBI Score		64.18
General Use IBI Threshold		55

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<sup>1</sup> Metric is a negative adjustment applied (if applicable) after calculating the composite score

Attachment D: Southern Coldwater Stream Sites – Fish Abundance Data and IBI Metric Comparisons

Species	Abundance			
	A3	A5	A7	13-1
Bigmouth Shiner		64		
Black Bullhead			8	
Blacknose Dace				12
Bluegill Sunfish	13		21	2
Bluntnose Minnow	1			
Brook Stickleback	11			
Brown Trout	31			
Central Mudminnow		5	32	2
Creek Chub		21	3	55
Green Sunfish	19	1	10	9
Johnny Darter		79	8	17
Largemouth Bass			1	
Northern Pike		2	5	1
White Sucker	43	139	11	107
<b>Total Catch</b>	118	311	99	205
<b>Species Total</b>	6	7	9	8

Metric Name	Metric Description	Score			
		A3	A5	A7	13-1
CWSensitivePct_10DrgArea <sup>1</sup>	Percent Sensitive Individuals (specific to coldwater streams)	3.8	0.8	0.5	0.3
CWTol_10DrgArea	Tolerant Taxa Richness (specific to coldwater streams)	7.8	5.8	5.6	8.1
FishDELTpct <sup>2</sup>	Percent of Individuals with Deformities, Eroded Fins, Lesions, or Tumors	0.0	0.0	0.0	0.0
HerbvPct <sup>3</sup>	Percent Herbivorous Individuals	14.3	14.3	14.3	14.3
NativeColdPct <sup>4</sup>	Percent Native Coldwater Individuals	0.0	0.0	0.0	0.0
NativeColdTXPct_10DrgArea	Percent Native Coldwater Taxa	2.5	3.9	3.6	3.2
PioneerPct	Percent Pioneer Individuals	9.9	5.9	8.8	4.0
SdetTxPct_10DrgArea	Percent Detritivore Taxa	3.7	6.7	8.5	11.4
Total IBI Score		41.99	37.35	41.40	41.36
General Use IBI Threshold		50	50	50	50

<sup>1</sup> Metric scoring adjusted for watershed area

<sup>2</sup> Metric is a negative adjustment applied (if applicable) after calculating the composite score

<sup>3</sup> Metric scored discretely

<sup>4</sup> Metric value transformed ( $\log_{10}+1$ )