Technical Memo

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To: Mark Zabel, Vermillion River Watershed Joint Powers Organization
Travis Thiel, Vermillion River Watershed Joint Powers Organization

From: Jeff Madejczyk, Wenck Associates, Inc.
Tom Langer, Wenck Associates, Inc.

Date: February 1, 2019

Subject: Vermillion River Watershed 2018 Fish Community Monitoring Results Summary

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 (Wenck) has partnered 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 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 DNR and the MPCA. This technical memo provided a summary and analysis of the fish community monitoring from Year 3 of the rotation for data collected in 2018, as identified in Table 1.

Table 1: Three year rotation for all 19 monitoring sites in the watershed.

Site	Method	Year 1: 2016	Year 2: 2017	Year 3: 2018	Year 4: 2019	Year 5: 2020	Year 6: 2021
A2	Backpack		X			X	
A3	Backpack	X		X		X	
A4	Backpack			X			X
A5	Backpack	X	*	X		X	
A6	Backpack		X			X	
A7	Backpack	X		X		X	
A8	Barge		X		X		X

Site	Method	Year 1: 2016	Year 2: 2017	Year 3: 2018	Year 4: 2019	Year 5: 2020	Year 6: 2021
A9	Barge	X	*	X		X	
A12	Backpack		X		X		X
A13	Backpack		*	X			X
A14	Barge	X			X		
A15	Backpack	X			X		
13-1	Backpack		X		X		
13-2	Backpack			X			X
13-4	Backpack		X			X	
13-5	Barge			X			X
14-1	Backpack		X		X		X
14-2	Backpack	X		X		X	

Note: Sentinel sites in bold.
* Unplanned sampling by MPCA/DNR.

2018 Monitoring Sites

There were nine monitoring sites assessed in 2018 (see Figure 1) following the schedule shown in Table 1. This included seven coldwater sites (A3, A5, A7, A9, A13, 13-2, & 13-5), one warmwater headwater stream site (A4) and one warmwater stream site (14-2). Seven sites were monitored using the backpack method and two of the sites were monitored using the barge method. In 2018, five sites were monitored by the MPCA (A3, A5, A9, A13, and 14-2) and four sites were monitored by Wenck (A4, A7, 13-2, and 13-5). All sites were visited between July 26th and September 17th. Wenck acquired the required special permit for fish surveys from the MnDNR (Attachment A) prior to conducting field surveys. Summary data from the 2018 field surveys performed by Wenck were provided to the MnDNR as required under terms of the permit.

All 2018 sites were existing monitoring reaches, following survey locations from past years. All stream fish collections followed the methods outlined in the MPCA warmwater Index of Biotic Integrity (IBI) report, as well as the MPCA Standard Operating Procedures for electrofishing (Rev. Feb. 2009). Each site was fished beginning from the downstream point of the reach and proceeded in an upstream direction to the upstream end of the reach. All habitats within the channel were sampled with the electrofishing units and all fish were netted. Due to the relatively narrow width of most of the stream reaches, it was possible to effectively sample all available in-stream habitats. All fish collected were identified, sorted, counted, and released. The electrofishing method and sample dates for each reach are presented in Table 2.

Table 2: Sample reach information for the seven sites in the 2018 Vermillion River stream fish monitoring project.

Site	Sampler	Stream Classification	Reach Length (ft)	Survey Method	Sample Date	Total Species	Total Catch
A4	Wenck	Warmwater	492	Backpack	9/5/2018	6	98
14-2	MPCA	Warmwater	500	Backpack	7/26/2018	5	22
A7	Wenck	Coldwater	500	Backpack	9/17/2018	13	393
13-2	Wenck	Coldwater	525	Backpack	8/27/2018	11	165
13-5	Wenck	Coldwater	1450	Barge	8/27/2018	13	147
A3	MPCA	Coldwater	525	Backpack	7/30/2018	10	171
A5	MPCA	Coldwater	1025	Backpack	8/2/2018	11	303
A9	MPCA	Coldwater	900	Barge	7/30/2018	11	77
A13	MPCA	Coldwater	925	Backpack	8/27/2018	11	728

Monitoring Results

There were 2,104 fish collected across all sites during monitoring in 2018. Total catch ranged from a low of 22 fish at site 14-2 to a high of 728 fish at A13 (Table 2). Total species caught amongst the sites were variable, with seven of the sites having 10 or more species (Table 2), and the remaining two sites having six or less species. Sites 13-5 and A7 had the highest number of species with 13. The most numerous fish collected was fathead minnow, with 547 individuals, which equated to 26.0 percent of the total catch. Other species with a total catch of significance included 421 white suckers (20.4%) and 288 bluegills (13.7%). Largemouth bass and white sucker were species collected at all nine sites, while green sunfish and central mudminnow were collected at eight of the nine sites. There were 132 brown trout (6.3 % of total catch) collected from six sites. There were three sites where greater than 30 trout were collected from the site (A3, A13 & 13-2). These three sites accounted for 94% of all trout collected in 2018.

Fish collection data were submitted to the MPCA for 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 nine sites monitored in 2018 are from three different stream IBI categories including Southern Headwaters (site A4), Southern Streams (14-2) and Southern Coldwater Streams (remaining sites). The 2018 IBI scores are presented in Table 3.

Table 3: IBI score summary for 2018 fish community monitoring sites.

Site	Stream Classification	MPCA IBI Category	Sample Years[1]	Avg IBI	Min	Max	2018 IBI	IBI Threshold
A4	Warmwater	Southern Headwater	5	67.2	52.2	75.0	52.2	55
14-2	Warmwater	Southern Streams	4	26.3	0.0	38.7	0.0	50
A7	Coldwater	Southern Coldwater	8	35.3	28.3	41.4	40.1	50
13-2	Coldwater	Southern Coldwater	4	58.1	44.6	71.5	44.6	50
13-5	Coldwater	Southern Coldwater	4	44.6	37.2	61.0	39.6	50
A3	Coldwater	Southern Coldwater	10	49.4	31.2	66.6	45.5	50
A5	Coldwater	Southern Coldwater	11	38.2	27.9	47.2	35.3	50
A9	Coldwater	Southern Coldwater	11	40.4	29.4	55.0	32.3	50
A13	Coldwater	Southern Coldwater	10	38	22.7	51.3	23.0	50

[1]Includes 2018 monitoring year

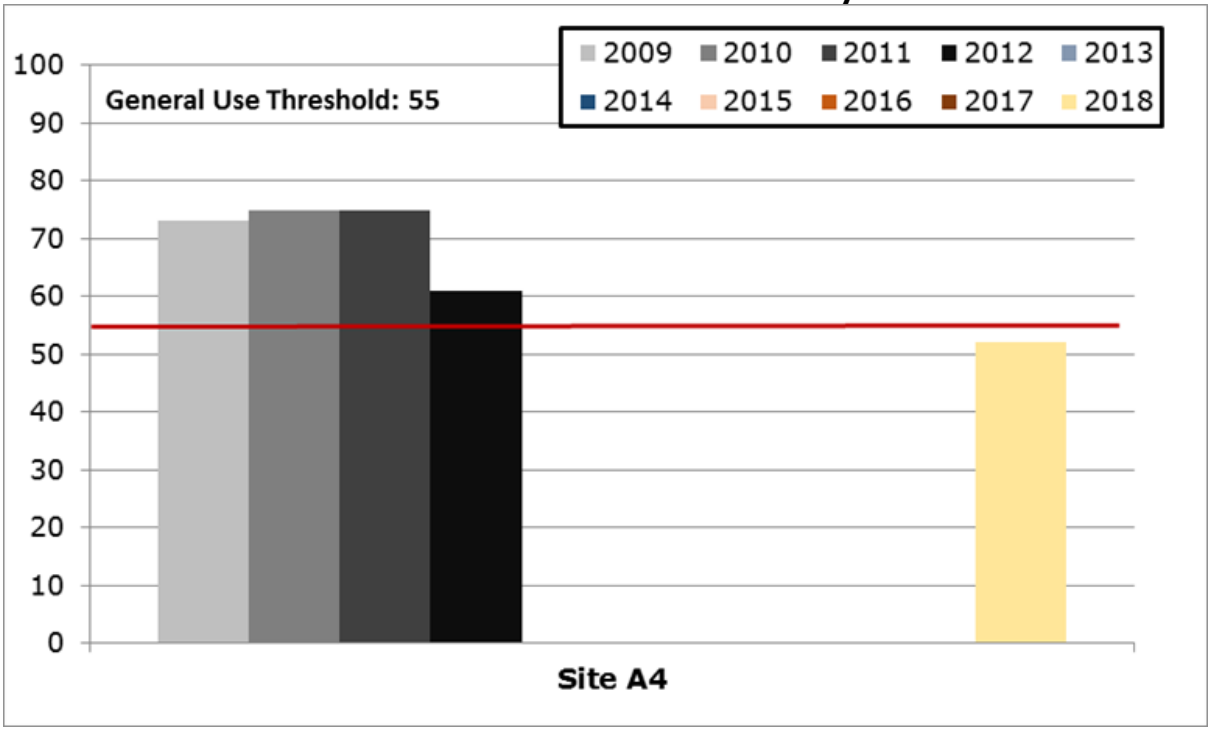
Discussion

Southern Headwaters

Site A4 is located on an unnamed tributary to the Vermillion River and is classified within the Southern Headwater IBI category. This site was established in 2009 and there are five years of monitoring data for the site, which include 2009-2012 and 2018. This headwater stream had received excellent IBI scores in the lower 60s and mid-70s, however, scored below the general use threshold for the first time in 2018 with an IBI score of 52.2 (Chart 1). The lower score in 2018 is due to high proportion of Very Tolerant Species, a limited number of Sensitive Species, and a moderate proportion of Detritivore Species. In total, only six species were observed and a total of 98 individual fish were collected. The catch included two detritivore taxa: fathead minnow (6.1% of sites catch) and white sucker (51%) and three very tolerant taxa: central mudminnow (11%), green sunfish (3%), and fathead minnow. It will remain important to continue monitoring site A4 as this was the first year below general use threshold for this reach. The total fish catch data and individual

metric score information for the Southern Headwater site for A4 are provided as Attachment B.

Chart 1: IBI Scores from Southern Headwaters scored systems.



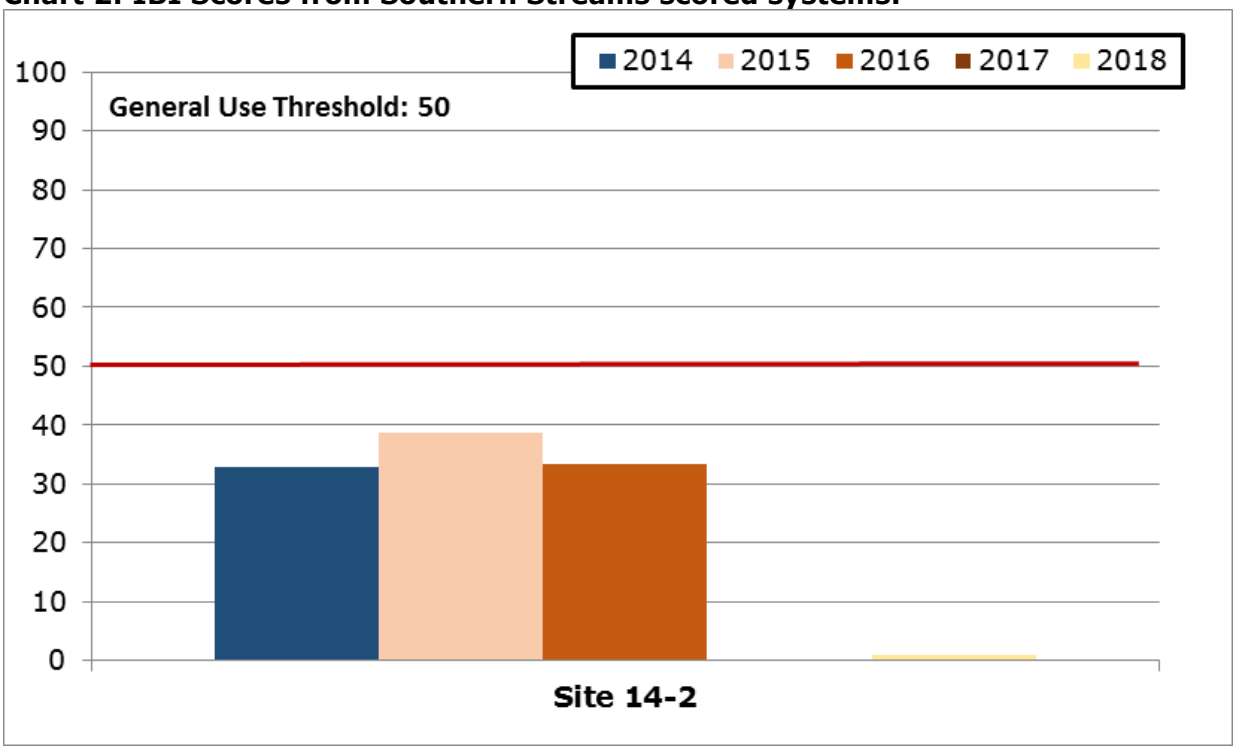
Southern Streams

Site 14-2 is located on North Creek and is classified within the Southern Streams IBI category. This site was established in 2014 and there are four years of monitoring data for the site which include 2014-16 and 2018. This southern stream had received poor IBI scores in the lower 30s in previous years, however, scored a 0.0 in 2018 (Chart 1). The poor scores from prior monitoring years within the southern streams are associated to a relatively high proportion of Tolerant, Detritivore, Short-lived, Early Maturing species, and/or low to nonexistent abundance of Sensitive Species and Benthic Insectivores. In 2018 only five species were observed and a total of 22 individual fish were collected. The catch included three Early Maturing taxa: brook stickleback (9% of sites catch), central mudminnow (5%), and Iowa darter (14%) and three tolerant taxa: white sucker (41%), brook stickleback, and central mudminnow.

The MPCA considers very low catch rates, either in terms of number of individuals or number of taxa, are generally indicators of severe degradation in permanent, warm and coolwater Minnesota streams. In some cases, the presence of a few individuals may artificially inflate the IBI score and possibly mask a serious impairment. To address this issue, the MPCA utilizes "low end scoring" criteria, under which individual percentage metrics in non-coldwater IBIs receive a score of 0 when fewer than 25 individuals were captured, and taxa richness and taxa percentage receive a score of 0 when fewer than 6 taxa were captured. As a result, the limited number of total taxa and total individuals captured is the reason site 14-2 received a 0.0 IBI score in 2018. However, review of the previous survey efforts at this site have indicated relatively low taxa and individuals, therefore, 2018 taxa and individuals were likely similar but just under the scoreable criteria of the IBI. We do not view this occurrence as a sudden change to extreme degradation at

the site. It will remain important to continue monitoring site 14-2 to confirm that 2018 was an anomalous score and the site is not experiencing a shift to extreme degradation. This was also the first time an IBI score of 0.0 has been observed at any of the monitoring sites over the course of the VRWJPO monitoring program. The total fish catch data and individual metric score information for the Warmwater Stream sites are provided as Attachment C.

Chart 2: IBI Scores from Southern Streams scored systems.



Coldwater Streams

There were seven coldwater sites monitored in 2018. The total number of years of monitoring data varies across these sites (Table 3). All the IBI scores in 2018 for the coldwater sites fell within the lower range of previously observed scores, except site 13-2, which recorded the lowest IBI score over the course of the monitoring project. Site A7 was the only site that scored above its site average IBI score, while all other coldwater sites fell below site average IBI score. The coldwater sites within the Vermillion River Watershed have mainly received IBI scores below the general use threshold of 50 (see Chart 3). Of the sites monitored in 2018, sites A3, A9, and 13-2 have had multiple years with IBI scores over 50, however, all monitored sites in 2018 were below the general use threshold. There are no native coldwater species within the Vermillion River Watershed and as a result, all coldwater sites receive low metric scores for the two metrics linked to native coldwater species (Percent Native Coldwater Taxa and Percent Native Coldwater Individuals). Low to zero scores for these two native coldwater species metrics are one of the factors limiting the potential for high IBI scores at the Vermillion River coldwater monitoring sites.

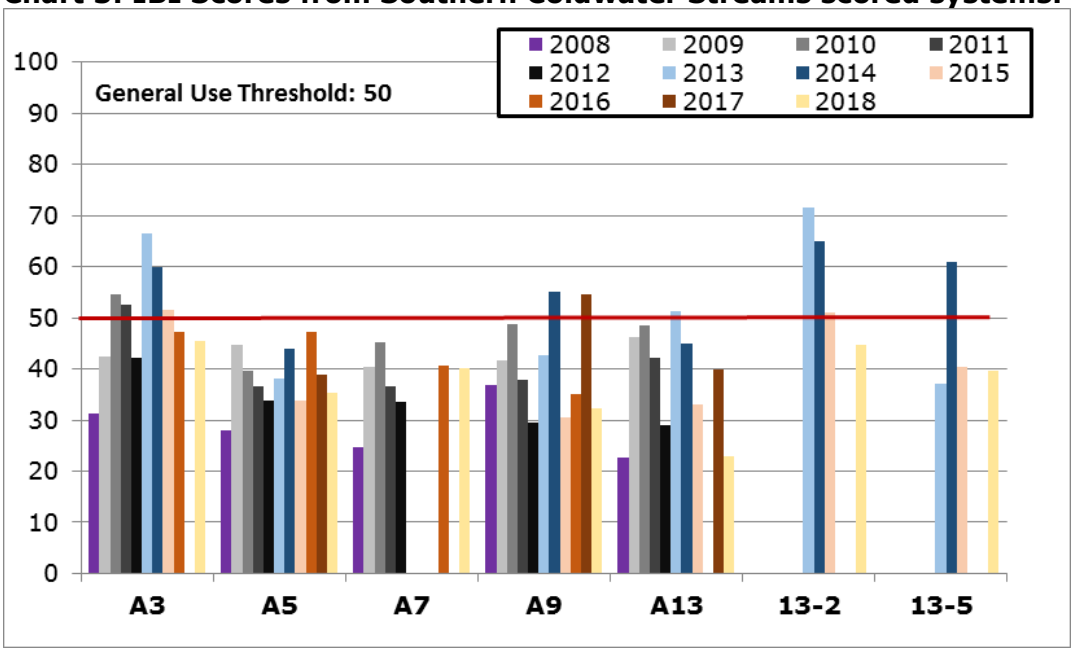
The coldwater metrics that have resulted in moderate to high metric scores for coldwater sites in the Vermillion River Watershed to date include: Percent Herbivore Individuals, Percent Detritivore Taxa, and Tolerant Coldwater Taxa Richness. These metrics have a negative response relationship, meaning that low numbers of these species or individuals collected as part of the total catch at a site results in higher metric scores. As the presence

of these taxa or individuals increases within the total catch, the metric score decreases. Coldwater sites in the Vermillion River Watershed have generally had a low number of the species and individuals counted by these metrics, which has resulted in high scores for these metrics. Some coldwater sites have also received occasional high metric scores for the Percent Sensitive Coldwater Individuals metric. For Vermillion River Watershed sites, high scores for this metric are tied to a high percentage of brown trout in the total catch. While brown trout are not a native coldwater species, they are a sensitive coldwater species, and when brown trout comprise a large portion of the total catch it results in high scores for the Percent Sensitive Coldwater Individuals metric.

In 2018, Coldwater sites were observed to have 10 to 13 species and 77 to 728 individuals captured per site. In total, 21 different species were observed among the seven sites with white sucker, largemouth bass, green sunfish, and bluegill being observed all sites. The various combinations of species and their abundances resulted in IBI scores ranging from 23 to 45.5 in 2018. Three IBI metrics did not demonstrate any variability across sites in 2018 (exception at one site that noted fish deformities) suggesting they had little to no impact on observed community difference and therefore no influence on the IBI scores. Metrics that did demonstrate the most significant variability among sites were metrics related to coldwater species, as well as pioneer species, and detritivorous taxa. Specifically, Coldwater Sensitive individuals comprised 0 – 26.9%, Coldwater Tolerant taxa richness ranged from 3 – 5 taxa, Pioneer individuals comprised 11.0 – 67.0% of the total catch, and Detritivores taxa comprised 18.2 – 36.4% of a given sites taxa. These significant differences in community composition are what drove differences in IBI scores across sites in 2018. Some species (i.e. Fathead Minnow) influenced multiple metrics suggesting their presence have increased impacts on reducing IBI scores.

The total fish catch data and individual metric score information for the seven coldwater sites from 2018 is provided as Attachment D.

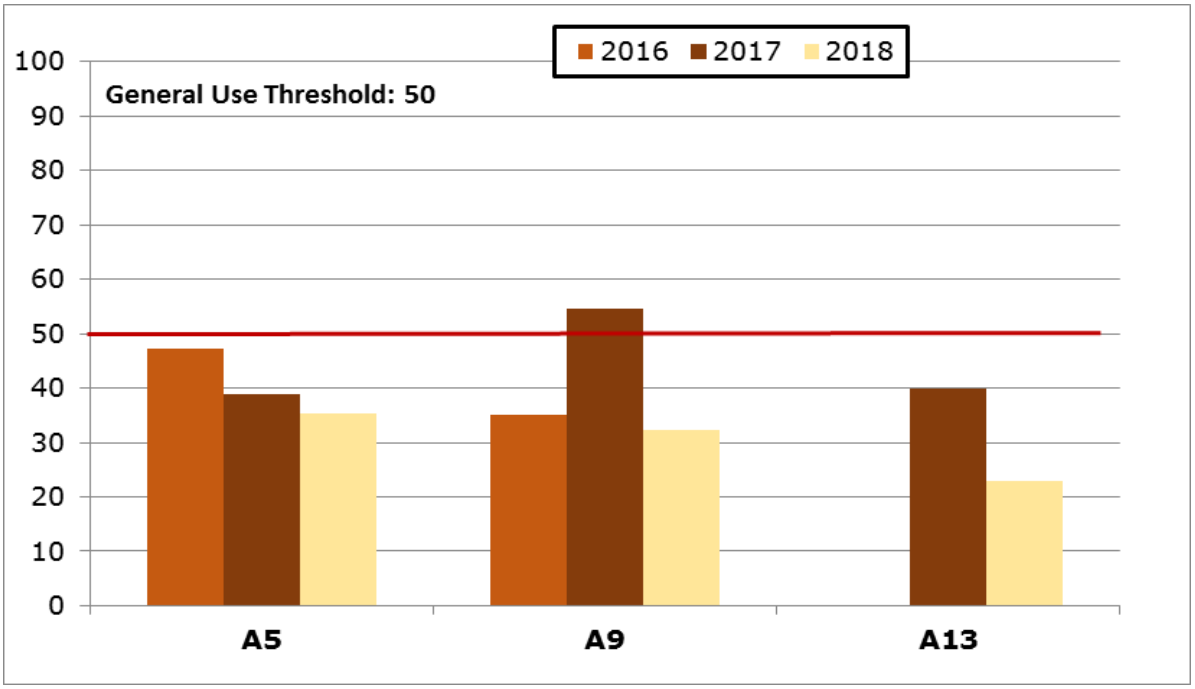
Chart 3: IBI Scores from Southern Coldwater Streams scored systems.



The IBI scores from Southern Coldwater Streams of 2018 appeared to have a noticeable decrease in IBI scores from 2017 and on the lower end of observed sites' scores across the monitoring program (Chart 3). The IBI scores, metrics scores, and fish catch data were reviewed to determine what characteristics changed resulting in reduced scores. Specifically, three sites were examined in greater detail including two sites (A5 and A9), which had been sampled from 2016-2018, and one site (A13) which was sampled in 2017-2018 (Chart 4).

In 2016-2017 stream habitat restoration efforts were pursued at site A3. The 2018 sampling effort was the first fish sampling to occur post restoration activities and did not appear to result in a community health improvement using the IBI. With only a single data point post restoration, conclusive statements are cautioned until more monitoring efforts can be pursued. However, speculation as to the lack of improvement is warranted before concluding that stream habitat restoration efforts are not worthwhile in the watershed. One explanation to non-improved scores is that the IBI metrics that are currently being used may not be sensitive enough to reflect habitat improvements and are inappropriate for the Vermillion River watershed. Previous years' reports highlighted concerns about the current coldwater IBI used within the Vermillion River watershed and its possible limitations in achieving passing scores, therefore, we will not go into detail here, but rather felt it was necessarily to remind managers of that concern. Another explanation may be that the current stressor(s) on the fish community is stronger than structural habitat improvements in the stream and are preventing the habitat restoration from reaching its full potential. It would be beneficial if the MPCA reviewed the coldwater IBI used in the Vermillion River watershed in context of recent stream restoration efforts and weather IBI metrics are appropriate or whether other stressors need to be prioritized from WRAPS/TMDLs recommended actions to improve biotic health within the watershed.

Chart 4: IBI Scores from Southern Coldwater Streams scored systems from 2016 to 2018.

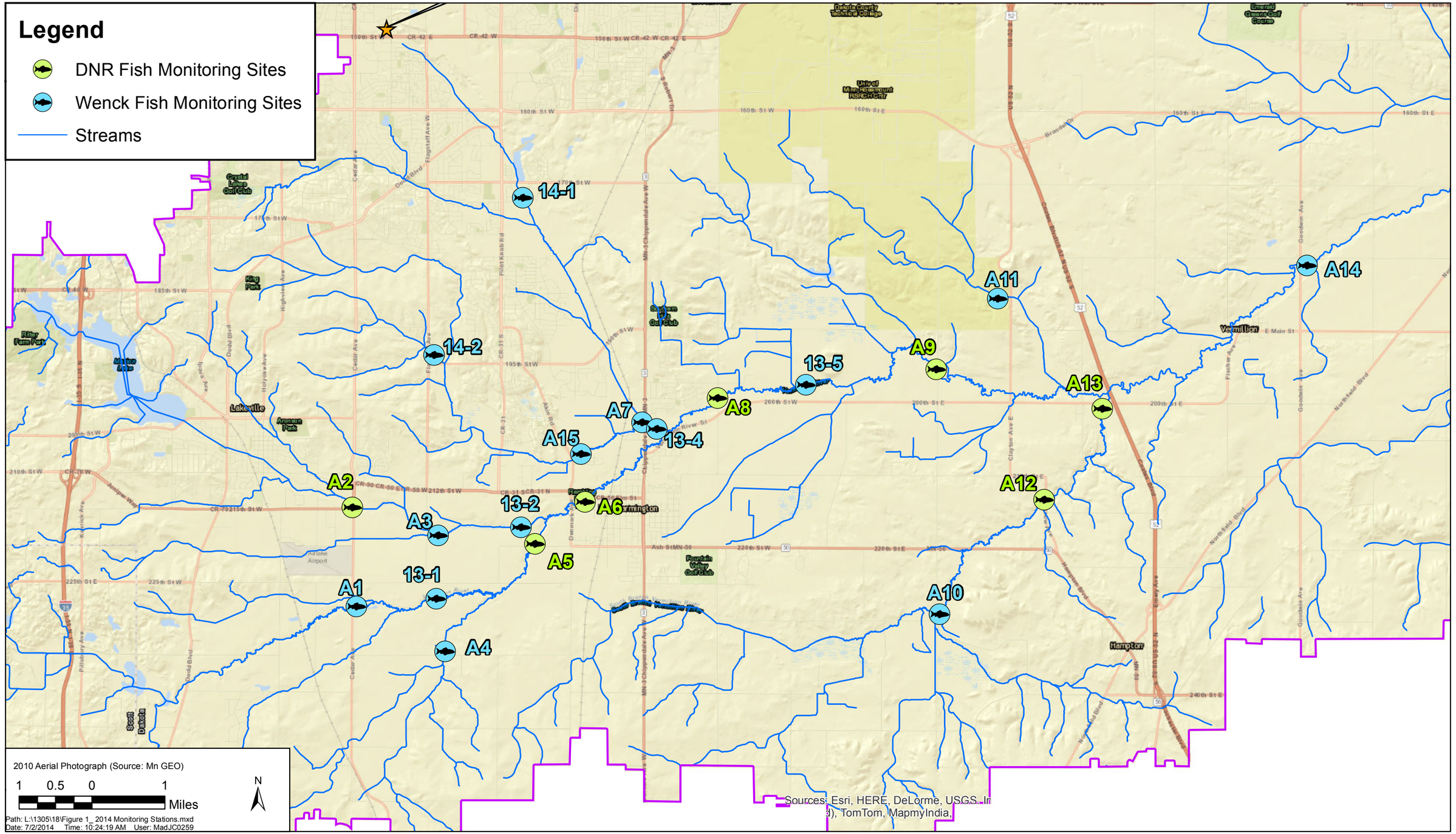


Of the 13 species observed across A5, A9, and A13 in 2018, nine species had direct impacts on one or more IBI metrics. Comparing these nine direct impact species to previous years' catch summaries, there appeared to be significant changes in Fathead Minnow, Johnny Darter, White Sucker, Common Carp, Green Sunfish, and Central Mudminnow presence and abundances that resulted in the significant impact to IBI scores.

The communities were also comprised of species that did not exhibit metric specific characteristics (i.e. coldwater tolerance), therefore, did not directly impact any metric. However, because the IBI metrics are community percentage based (i.e. % of the community individuals or % of the community taxa), these species do have an indirect influence on metric scores and make up part of the total community percentage. Indirect taxa or individuals buffer the extremes of a metric score by reducing a positive metric's ability to score higher or by enhancing a negative metric's to score higher. The more indirect individuals or taxa at a given site, the more buffering that occurs. There was a total of 10 species that had an indirect impact on metric scores across sites A5, A9 and A13 from 2016-2018. Across the three sites, the composition of these ten species ranged from 3 - 5 species, 7 - 44 individuals, and comprised 2 - 30% of the total catch per site. Therefore, sites were experiencing changes both direct and indirect species compositions to varying degrees.

In general, three metrics were observed to deviate among the years within a given site. Coldwater Tolerant Taxa Richness and Percent Detritivore Taxa were two metrics that deviated annually for all three sites, while Percent Pioneer Individuals deviated at A5 and A9 and Percent Coldwater Sensitive Individuals deviated at site A13 (Appendix E). Greater presence of pioneer species is often associated with unstable habitat conditions or habitat conditions that recently shifted and are in the midst of being recolonized. Detritivores may be an indicator that organics and organic sediments are common, or frequently pass through the system. Changes in coldwater sensitive individuals may allude complex temperature and oxygen changes over short or seasonal timeframes. The five remaining IBI metrics did not deviate or deviated <1.0 metric point (exception, A9 observed Fish DELTs and a 5pt deduction) suggesting that the conditions that impact these aspects of the community are relatively stable or so stressful that there is such great degradation to the community that subtle community changes aren't portrayed as enhancements in the overall community.

Fish Monitoring Stations



VERMILLION RIVER WATERSHED JOINT POWERS ORGANIZATION

2014 Biological Monitoring Sites

Wenck
Engineers - Scientists
Business Professionals
www.wenck.com
1800 Pioneer Creek Center
Maple Plain, MN 55359-0429
1-800-472-2232

JULY 2014

Figure 1

DNR Special Survey Permit

DEPARTMENT OF
NATURAL RESOURCES

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

SPECIAL PERMIT NO. 23858
(Fisheries Research)
Date: 15 May 2018

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

Tom Langer or designee Wenck Associates, Inc. 7500 Olson Memorial Hwy, Suite 300 Golden Valley, MN 55427 Maple Plain, MN 55359-0249	and	Patrick Ceas, Ph.D. Dept. of Biology St. Olaf College 1520 St. Olaf Ave. Northfield, MN 55057

to collect fish by backpack and barge electrofishing from the Vermillion River and its tributaries in Dakota County for the purpose of fish community monitoring. Work performed under this permit will be coordinated with the area fisheries office.

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 disposed of by incineration or burial in a landfill.

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.

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 and infesting species present may be obtained at http://www.dnr.state.mn.us/invasives/ais/infested.html .
- Before starting work under this permit, you must decontaminate all equipment that has been used in infested waters in Minnesota or other locations (see Decontamination protocols described in Condition # 4 below).
- 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 brought to the collection site. Do not use surface water.
- If it is critical to transport aquatic species in infested water, then you must obtain an *Infested Waters Appropriation Permit* (see attached permit application information).

Condition #3 - Applies to Collection of Prohibited Invasive Species

- If you find a new infestation of an aquatic invasive species, note the location and take a photo or keep the specimen and call the DNR aquatic invasive species specialist for your region. Regional specialists and their contact information can be found here: http://www.dnr.state.mn.us/invasives/ais/contacts.html
- You may not otherwise collect or transport any invasive species without a *Prohibited Invasive Species Permit* (see attachment for list and permit application information).

Condition #4 - Applies to Cleaning Equipment When Working Exclusively 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** – 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 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 2018**, but may be revoked at any time.

CHARLES ANDERSON
Fisheries Research Supervisor

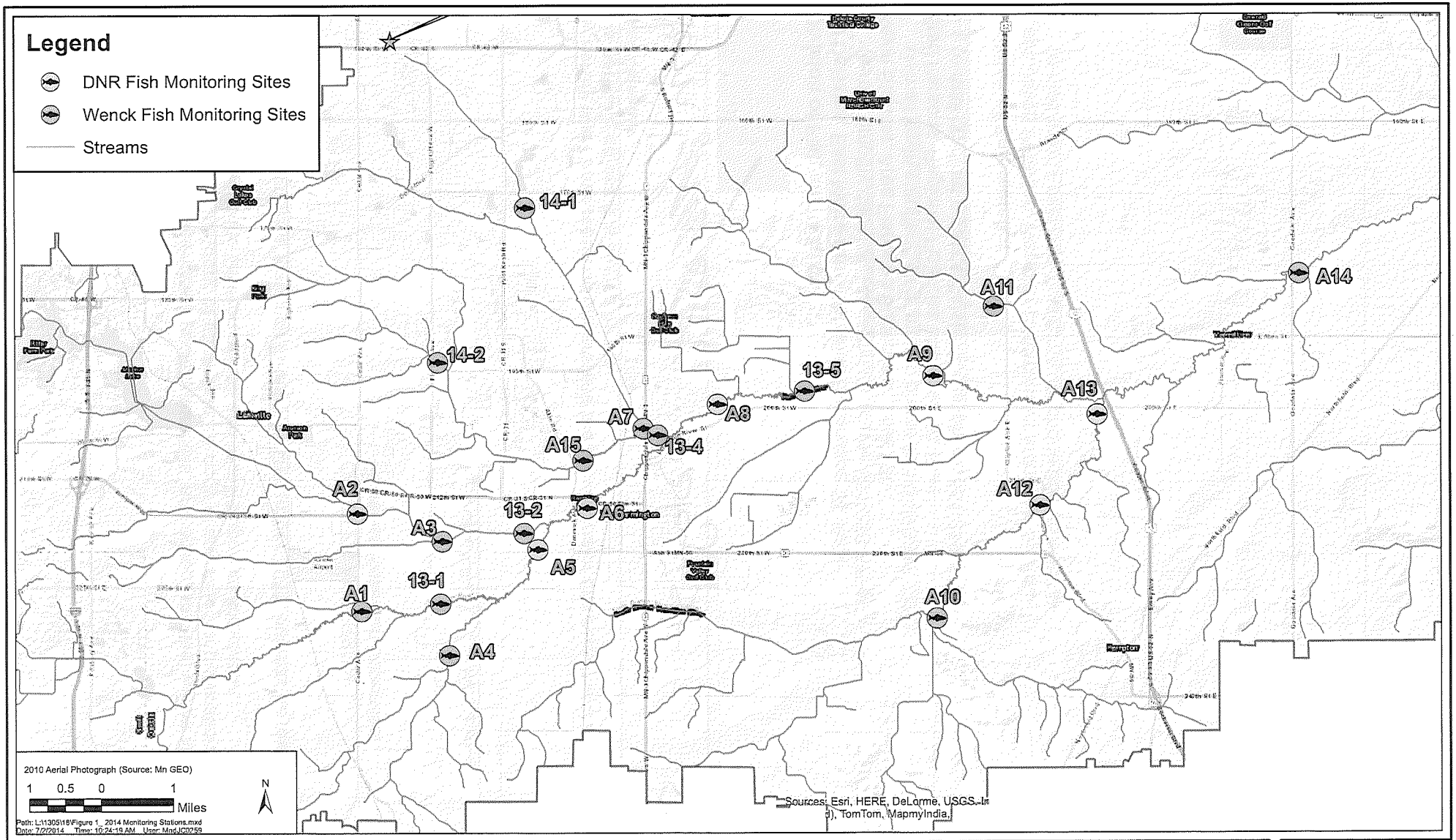
Charles Anderson

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
Tom Langer	Biologist	5/21/18

cc: **Division of Fish and Wildlife**
TJ DeBates, East Metro Area Fisheries Supervisor, St. Paul
(e-mail timothy.debates@state.mn.us, phone 651-259-5770)
Kevin Stauffer, Area Fisheries Supervisor, Lake City
(e-mail kevin.stauffer@state.mn.us; phone 651-345-3365 x229)
Brad Parsons, Regional Fisheries Manager, St. Paul
(e-mail bradford.parsons@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; phone 651-259-5838)



VERMILLION RIVER WATERSHED JOINT POWERS ORGANIZATION

2014 Biological Monitoring Sites

Wenck
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1800 Pioneer Creek Center
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Figure 1

Warmwater Headwater Sites – Fish Data and IBI Metric Comparisons

Species	A4
Central Mudminnow	11
Fathead Minnow	6
Green Sunfish	3
Iowa Darter	6
Largemouth Bass	22
White Sucker	50
Total Catch	**98**
Species Total	**6**

Metrics	Description	A4
DetNWQTxPct	Percent Detritivorous Taxa	5.6
FishDELTPct	Percent of Individuals with Deformities, Eroded Fins, Lesions, or Tumers	0.0
GeneralTxPct	Percent Generalist Feeder Taxa	9.9
Sensitive	Number of Sensitive Taxa	4.2
SLvdPct	Percent Short-lived Taxa	14.6
SSpnPct	Percent Serial Spawner Individuals	15.4
VtolTxPct	Percent Very Tolerant Taxa	2.5
Total IBI Score		**52.2**
General Use IBI Threshold		**55.0**

Warmwater Stream Sites – Fish Data and IBI Metric Comparisons

Species	A4
Brook Stickleback	2
Central Mudminnow	1
Iowa Darter	3
Largemouth Bass	7
White Sucker	9
Total Catch	**22**
Species Total	**5**

Metrics	Description	A4
DetNWQTxPct	Percent Detritivorous Taxa	0.0
FishDELTPct	Percent of Individuals with Deformities, Eroded Fins, Lesions, or Tumers	0.0
BenInsect-TolTxPct	Percent Benthic Insectivores Feeder Taxa	0.0
SensitiveTxPct	Number of Sensitive Taxa	0.0
DomTwoPct	Percent of Dominant Two Taxa	0.0
MA<2Pct	Percent Early-Maturing Individuals	0.0
SLvd	Percent Short-lived Taxa	0.0
TolPct	Percent Tolerant Individuals	0.0
TolTxPct	Percent Tolerant Taxa	0.0
Total IBI Score		**0.0**
General Use IBI Threshold		**50.0**

Attachment D

Coldwater Sites – Fish Data and IBI Metric Comparisons

Species	A3	A4	A5	A7	A9	A13	14-2	13-2	13-5
Bigmouth Shiner					2				1
Black Bullhead				81	3	1			1
Black Crappie				2					1
Bluegill Sunfish	54		7	181	7	1		26	13
Brassy Minnow						1			
Brook Stickleback			1				2	1	
Brown Trout	46		5	1		37		41	2
Central Mudminnow	9	11	30	17	5	1	1	5	7
Common Carp				1	14				
Creek Chub					1				
Fathead Minnow	1	6	67			454		19	
Golden Shiner	1			1				1	
Green Sunfish	17	3	13	55	11	25		8	19
Iowa Darter	1	6	2	3		4	3	2	2
Johnny Darter			92	3	18	10			31
Largemouth Bass	29	22	29	20	4	6	7	24	12
Northern Pike			2	5	3				9
Sand Shiner									2
White Sucker	12	50	55	23	9	188	9	37	47
Yellow Perch								1	
Total Catch	**170**	**98**	**303**	**393**	**77**	**728**	**22**	**165**	**147**
Species Total	**9**	**6**	**11**	**13**	**11**	**11**	**5**	**11**	**13**
Coldwater Sensitive Fish Count	46		5	1		37		41	2
Coldwater Sensitive Percent	27 %		2%	0%		5%		25 %	1%
Cold Tolerant Taxa Richness Count	3	3	3	4	5	5	1	3	5
Detritivore Taxa Count	2	2	2	3	4	4	1	2	4
Detritivore Taxa Percent	22 %	33 %	18 %	23 %	36 %	36 %	20 %	18 %	31 %
Pioneer Count	18	9	172	58	30	489		27	50
Pioneer Percent	11 %	9%	57 %	15 %	39 %	67 %		16 %	34 %
Indirect Impact Individuals	85	28	41	212	14	11	12	55	37
Indirect Impact Individuals %	50 %	29 %	14 %	54 %	18 %	2%	55 %	33 %	25 %
Indirect Impact Taxa	4	2	5	6	3	3	3	6	5
Indirect Impact Taxa %	44 %	33 %	45 %	46 %	27 %	27 %	60 %	55 %	38 %

Metrics	Description	A9	A13	A5	A3	A7	13-2	13-5
CWSensitivePct_10DrgArea	Percent Sensitive Individuals (specific to coldwater streams)	3.0	1.3	1.0	3.9	0.6	3.6	3.0
CWTol_10DrgArea	Tolerant Taxa Richness (specific to coldwater streams)	1.9	0.2	5.8	5.1	2.9	5.1	1.8
FishDELTPct	Percent of Individuals with Deformities, Eroded Fins, Lesions, or Tumers	-5.0	0.0	0.0	0.0	0.0	0.0	0.0
HerbvPct	Percent Herbivorous Individuals	14.3	14.3	14.3	14.3	14.3	14.3	14.3
NativeColdPct	Percent Native Coldwater Individuals	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NativeColdTXPct_10DrgArea	Percent Native Coldwater Taxa	6.9	3.5	3.9	2.5	3.6	2.6	6.6
PioneerPct	Percent Pioneer Individuals	4.2	0.0	0.0	11.6	10.5	10.0	5.5
SdetTxPct_10DrgArea	Percent Detritivore Taxa	7.0	3.7	10.2	8.2	8.2	8.9	8.5
Total IBI Score		**32.3**	**23.0**	**35.2**	**45.5**	**40.1**	**44.6**	**39.6**
General Use IBI Threshold		**50**	**50**	**50**	**50**	**50**	**50**	**50**

Coldwater Sites : 2016 - 2018 Comparisons

Table: Metric score comparison. Note: Highlight cells deviated >1.0 pts.

Description	2016	2017	2018	2016	2017	2018	2017	2018
	A5			A9			A13	
Percent Sensitive Individuals	0.8	1.3	1	3.7	3.1	3	3.4	1.3
Tolerant Taxa Richness	8.5	3.1	5.8	1.9	7.3	1.9	8.3	0.2
Percent of Individuals with DEFLT	0	0	0	0	0	-5	0	0
Percent Herbivorous Individuals	14.3	14.3	14.3	14.3	14.3	14.3	14.3	14.3
Percent Native Coldwater Individuals	0	0	0	0	0	0	0	0
Percent Native Coldwater Taxa	3.9	3.9	3.9	6.9	6.9	6.9	3.5	3.5
Percent Pioneer Individuals	7.1	7.2	0	1.3	9.8	4.2	0	0
Percent Detritivore Taxa	12.6	9.1	10.2	7.0	13.1	7.0	10.3	3.7
Total IBI Score	**47.2**	**38.9**	**35.2**	**35.1**	**54.6**	**32.3**	**39.8**	**23**
Metric	**Percent of Catch**							
Coldwater Sensitive Individuals	0%	1%	2%	4%	1%	0%	19%	5%
Cold Tolerant Taxa	2	4	3	5	3	5	2	4
Detritivore Taxa	11%	14%	9%	36%	18%	36%	17%	27%
Pioneer Taxa	28%	27%	57%	50%	17%	39%	62%	67%

Table: Coldwater percentage of total catch.

Metric	Species	2016	2017	2018	2016	2017	2018	2017	2018
		A5			A9			A13	
Coldwater Sensitive	Brown Trout		4%	2%	5%	1%		19%	5%
Cold Tolerant	Central Mudminnow	7%	12%	10%	3%	2%	6%	2%	<1%
	Hybrid Sunfish		1%						
Detritivore	Bigmouth Shiner						3%		
	Black Bullhead						4%		<1%
	Brassy Minnow								<1%
	White Sucker	36%		18%	16%	16%	12%	13%	26%
	Sand Shiner		45%		2%				
Detritivore, Coldwater Tolerant, Pioneer	Bluntnose Minnow		6%		1%				
Pioneer	Creek Chub				5%		1%		
	Johnny Darter	21%	8%	30%	3%	2%	23%	1%	1%
Detritivore, Cold Tolerant	Common Carp				21%	59%	18%		
Coldwater Tolerant, Pioneer	Green Sunfish	6%	14%	4%	41%	16%	14%	61%	3%
	Fathead Minnow			22%					62%
Indirect	Black Crappie		1%			1%		3%	
	Blacknose Dace				1%	1%			
	Bluegill	3%	4%	2%		2%	9%		<1%
	Brook Stickleback	3%		<1%				<1%	
	Golden Shiner					1%			
	Pumpkinseed Sunfish		1%						
	Suckermouth Minnow		1%						
	Iowa Darter	15%	1%	1%	1%				1%
	Largemouth Bass	4%	3%	10%			5%		1%
	Northern Pike	5%	2%	1%		2%	4%		
	Total Catch	149	190	303	86	122	77	126	728
	Species Total	9	14	11	11	11	11	6	11