Technical Memo

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Exceptional outcomes.

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

From: Jeff Madejczyk, Wenck Associates, Inc.

Date: January 3rd, 2020

Subject: Vermillion River Watershed 2019 Fish Community Monitoring Results Summary

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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, Inc. (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 4 of the rotation for data collected in 2019, 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	

Site	Method	Year 1: 2016	Year 2: 2017	Year 3: 2018	Year 4: 2019	Year 5: 2020	Year 6: 2021
A6	Backpack		X			X	
A7	Backpack	X		X		X	
A8	Barge		X		X		X
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.

2019 Monitoring Sites

There were six monitoring sites scheduled for assessment in 2019 (see Figure 1) following the schedule shown in Table 1. This included three coldwater sites (A8, A12, & 13-1) and three warmwater sites, including two headwater stream sites (A15 & 14-1) and one warmwater stream site (A14). Four sites were monitored using the backpack method and two of the sites were scheduled to be monitored using the barge method. Stream flow conditions throughout the watershed were well above average flows for the entire summer monitoring period from mid-June through mid-September. Due to the high water levels, the two barge sites were not accessible during the summer index period. Based on consultations with the MPCA regarding high stream flow conditions there were three options to consider:

- Partially relocate the survey reach to a section of stream that was more accessible; under this approach at least 50 percent of the relocated reach must overlap with the established reach;
- Completely relocate the survey reach; under this approach the relocated reach would need to be identified as a new unique survey reach; or
- Postpone the sampling until the following year when more favorable survey conditions are present.

Upon review of these options it was determined that the best approach was to leave the two barge survey reaches in their established locations since there are more than five previous survey events at each site. It was therefore decided that the barge surveys would be postponed until favorable field conditions are present in the following year. As a result, the two barge sites, A8 and A14, were not surveyed in 2019. These sites will be added to the survey efforts for 2020.

The four backpack sites were surveyed by Wenck, and all sites were visited between August 26th and September 11th. The timing of these surveys coincides with the standard sampling period from previous fish community surveys in the Vermillion River Watershed. Wenck acquired the required special permit for fish surveys from the MnDNR (Attachment A) prior to conducting field surveys. Summary data from the 2019 field surveys performed by Wenck will be provided to the MnDNR as required under terms of the permit.

All 2019 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 point of the reach. All habitats within the channel were sampled with the electrofishing unit 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 six sites in the 2019 Vermillion River stream fish monitoring project.

Site	Sampler	Stream Classification	Reach Length (ft)	Survey Method	Sample Date	Total Species	Total Catch
A8	Wenck	Coldwater	1,120	Barge	Not Surveyed	--	--
A12	Wenck	Coldwater	1,250	Backpack	9/11/2019	8	75
A14	Wenck	Warmwater	1,225	Barge	Not Surveyed	--	--
A15	Wenck	Warmwater	540	Backpack	08/26/2019	5	28
13-1	Wenck	Coldwater	550	Backpack	08/26/2019	8	64
14-1	Wenck	Warmwater	500	Backpack	08/26/2019	9	347

Monitoring Results

There were 514 fish collected across the four sites monitored in 2019. Total catch ranged from a low of 28 fish at site A15 to a high of 347 fish at 14-1 (Table 2). Total species caught amongst the sites was fairly consistent, with three of the sites having eight or nine species collected, while there were only five species collected at the fourth site. The most numerous fish collected was johnny darter, with 169 individuals, which equated to 32.9 percent of the total catch. Other species with a total catch of significance included 94 central mudminnows (18.3 %), 56 brook stickleback (10.9%), and 52 fathead minnows (10.1%). Central mudminnows were collected at all four sites, while green sunfish, Iowa darter, johnny

darter, and white sucker were collected at three sites. There were 20 brown trout (3.9 % of total catch) collected, with all the trout collected at A12.

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 four sites monitored in 2019 are from two different stream IBI categories including Southern Headwaters (A15 & 14-1) and Southern Coldwater Streams (A12 & 13-1). The 2019 IBI scores are presented in Table 3.

Table 3: IBI score summary for 2019 fish community monitoring sites.

Site	Stream Classification	MPCA IBI Category	Sample Years[1]	Avg IBI	Min	Max	2019 IBI	IBI Threshold
A12	Coldwater	Southern Coldwater	9	44.1	37.6	53.5	37.6	50
A15	Warmwater	Southern Headwater	5	74.0	71.0	75.7	75.7	55
13-1	Coldwater	Southern Coldwater	5	39.2	34.0	45.0	40.5	50
14-1	Warmwater	Southern Headwater	4	53.9	43.0	60.0	55.9	55

[1]Includes 2019 monitoring year

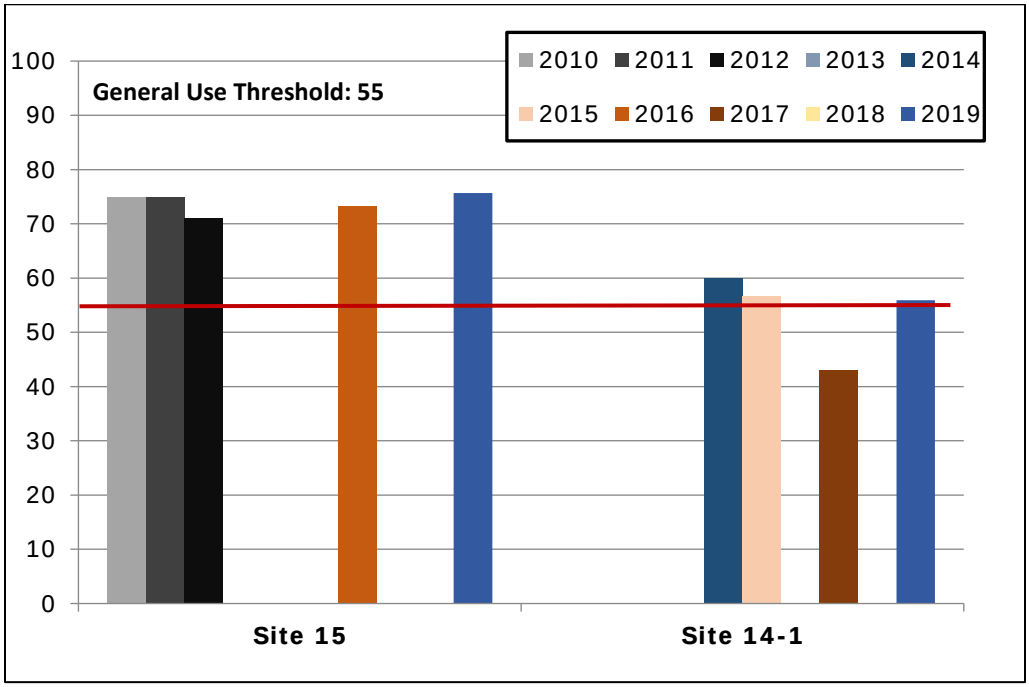
Discussion

Southern Headwaters

Two of the 2019 monitoring sites were in the Southern Headwaters category. Site A15 is located on Middle Creek downstream of Akin Avenue. This site was established in 2010 and there are five years of monitoring data. Site 14-1 is also located on Middle Creek downstream of 195th Street. This site was established in 2014 to provide a new monitoring location in the upper reaches of the Middle Creek watershed. Site 14-1 is located along a channel remeander project that was completed in 2016. There are two years of monitoring data prior to connection of the channel remeander project and two years of monitoring data collected after the channel project was completed. Site A15 has received excellent IBI scores in the lower to mid-70s for all years of monitoring including 2019 (Chart 1). IBI scores at Site 14-1 have ranged from the low 40's to 60. In 2019 the site scored 55.9 at the general use threshold for this IBI category (Chart 1).

The total catch from these two Southern Headwater reaches monitored in 2019 was quite variable with only 28 fish collected at site A15 compared to 347 fish collected at site 14-1. Site A15 received the maximum metric score for four of the seven metrics including: Percent of Detritivore Taxa, Percent of Generalist Feeder Taxa, Percent of Short Lived Individuals, and Percent of Serial Spawner Individuals. By contrast, site 14-1 scored three to six points lower for each of these individual metrics which accounts for the main difference between the IBI scores for these two sites. The total fish catch data and individual metric score information for the Southern Headwater sites are provided as Attachment B.

Chart 1: IBI Scores from Southern Headwaters Streams.



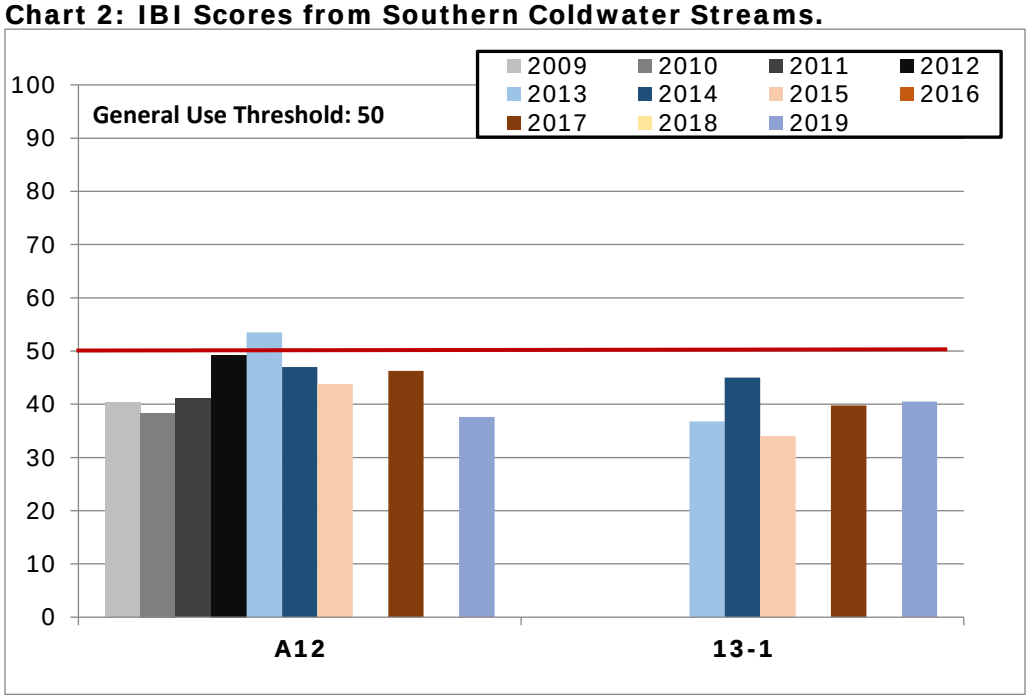
Coldwater Streams

There were two coldwater sites monitored in 2019. Site A12 is located on the South Branch of the Vermillion River, downstream of Darsow Avenue. The site was established in 2009 and there are nine years of monitoring data. Site 13-1 is located on the main stem of the Vermillion River on the Bachman's Nursery property, located down steam of a dirt road on the property that aligns with Flagstaff Avenue. The site was established in 2013 as a new survey reach in on the upper portions of the Vermillion River to replace site A1 which had become inaccessible in many areas and was no longer considered a good representative of the Vermillion River channel. There are five years of monitoring data at site 13-1. Site A12 produced the lowest IBI score in 2019 out of the nine years of monitoring data, while the IBI score at site 13-1 was near the average score for this site from five years of monitoring data. The coldwater sites within the Vermillion River Watershed have mainly received IBI scores below the general use threshold of 50 (see Chart 2). Site A12 has only had one year with an IBI score over 50, and site 13-1 has never had an IBI score over the general use threshold of 50. 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 higher 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.

Chart 2: IBI Scores from Southern Coldwater Streams.



In 2019, both coldwater sites monitored had a similar total catch and the same total amount of species collected with eight species at each site (see Table 2). Brown trout were only collected at one site, A12, and accounted for 28% of the total catch. Three IBI metrics did not demonstrate any variability at the two sites in 2019, including Percent Herbivore Individuals, Percent Native Coldwater Individuals, Percent Native Coldwater Taxa. These same metrics have rarely exhibited variation for the coldwater sites across all previous 11 monitoring years. This indicates that these three metrics have minimal impact on observed community differences across sites or years, and therefore minimal to no influence on the IBI scores. Metrics that did demonstrate the most significant variability among sites in 2019 were metrics related to sensitive species, tolerant taxa, and pioneer species. Specifically, Coldwater Sensitive individuals comprised 0 – 26.9%, Pioneer individuals comprised 27-45% of the total catch, and Tolerant Coldwater taxa ranged from two to three of a given sites taxa. These differences in community composition are the main factors that influenced the differences in IBI scores for the two sites in 2019. 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 two coldwater sites from 2019 is provided as Attachment C.

In 2019, site 13-1 scored 40.5, in the middle of its range for IBI scores (see Chart 2). This site is in the upper portions of the watershed on the main stem of the Vermillion River. There have been no brown trout collected from this location or this area of the watershed which limits the potential for this site to receive a higher metric score on Sensitive Coldwater Individuals metric. This site also appears to receive some influence from

warmwater tributaries (or ponds) in the area which results in the presence of warmwater species in the total catch and the corresponding influence on metric scores of these species.

Site A12 had the lowest IBI score (37.6) in 2019 compared across the nine monitoring years. The score was similar to the scores observed in 2009 (40.4) and 2010 (38.3). Site A12 is located on the South Branch of the Vermillion River, and there is a significant population of reproducing brown trout in this tributary. There were 20 brown trout collected from site A12 in 2019, which was 27% of the total catch. There were also 20 brown trout collected from site A12 in 2017, however this accounted for 33% of the total catch that year and therefore resulted in a higher metric score for the Sensitive Coldwater Individuals metric. A comparison of the species collected, total catch, IBI score, and metric scores for the last three monitoring years (2015, 2017, and 2019) at site A12 are presented in Tables 4 and 5.

Table 4: Fish community summary info from the three previous monitoring efforts at Site A12 on South Branch of the Vermillion River.

Species	2015	2017	2019
Brown Trout	56	20	20
Central Mudminnow	0	0	1
Fathead Minnow	0	0	1
Green Sunfish	83	15	3
Iowa Darter	2	0	0
Johnny Darter	68	0	30
Largemouth Bass	1	0	0
Northern Pike	5	0	1
Rainbow Trout	0	0	1
White Sucker	89	25	18
Total Species	**7**	**3**	**8**
Total Catch	**301**	**60**	**75**
IBI Score	**43.8**	**46.3**	**37.6**

Table 5: IBI metric score comparison from the three previous monitoring efforts at Site A12 on South Branch of the Vermillion River.

Coldwater Metric	2015	2017	2019
Percent Sensitive Individuals (specific to coldwater streams)	3.0	5.4	4.6
Tolerant Taxa Richness (specific to coldwater streams)	10.9	10.9	5.5
Percent of Individuals with Deformities, Eroded Fins, Lesions, or Tumors	0	0	0
Percent Herbivorous Individuals	14.3	14.3	14.3
Percent Native Coldwater Individuals	0	0	0
Percent Native Coldwater Taxa	3.3	3.3	3.3
Percent Pioneer Individuals	1.3	7.8	2.5
Percent Detritivore Taxa	10.9	4.5	7.3
IBI Score	**43.8**	**46.3**	**37.6**

Reviewing the information in Table 5, the two biggest differences across the three monitoring years at site A12 occurred within three metrics: Tolerant Taxa Richness, Percent Pioneer Individuals, and Percent Detritivore Taxa. The 2019 results display how the presence of one or two additional tolerant taxa can negatively impact the score for this metric. In 2019, there was only one central mudminnow individual and one fathead minnow individual collected (see Table 4). These species have been frequently found in the Vermillion River Watershed but were not collected at site A12 in 2015 or 2017. Since the tolerant species is a taxa based metric, the presence of only these two individual fish caused an approximately 50% decrease in the Tolerant Taxa Richness metric score for the site in 2019.

For the Percent Pioneer Individuals metric, there was only one species collected in 2017 that contributed to this metric, which was green sunfish and accounted for 25% of the total catch. In 2015 and 2019, there were more pioneer species collected (green sunfish, johnny darter, and fathead minnow) and the pioneer individuals accounted for 50% and 45% of the total catch respectively. The lower percent of pioneer individuals in 2017 resulted in a metric score approximately 3.5 times greater in that year compared to 2015 and 2019. For the Percent Detritivore Taxa metric, the limited number of total taxa collected resulted in a lower score for this metric in 2017 compared to the other two years. There were only three taxa collected in 2017, and one (white sucker) contributes to the Detritivore Taxa, accounting for 33% of the taxa observed. In 2015, there was only one Detritivore Taxa collected (white sucker) and in 2019 there were two Detritivore Taxa collected (white sucker and fathead minnow). As a result, the metric scores for Percent Detritivore Taxa were 1.5 – 2 times greater in 2015 and 2019 as compared to 2017.

The coldwater fish communities in the Vermillion River are also comprised of species that do not exhibit metric specific characteristics (i.e. coldwater tolerance), therefore, do not directly impact individual metrics. 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. In 2019, there was one species with one individual (northern pike) at site A12 and there were four species with 16 total individuals at site 13-1 that had an indirect impact on metric scores. Therefore, the presence of indirect species and individuals was a bigger influencing factor on IBI metrics and total score at site 13-1 as compared to site A12 where indirect species had very limited influence on the 2019 IBI score.

In general, four coldwater metrics have been observed to deviate among the years within a given site or between sites during a sampling year. These metrics include Percent Coldwater Sensitive Individuals, Coldwater Tolerant Taxa Richness, Percent Detritivore Taxa, and Percent Pioneer Individuals. Greater presence of pioneer species can be 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 indicate complex temperature and oxygen changes over short or seasonal timeframes.

Fish Monitoring Stations

Legend

- DNR Fish Monitoring Sites
- Wenck Fish Monitoring Sites
- 2019 Sites
- Streams

A14
A11
A9
A13
A8
13-5
14-1
14-2
A7
13-4
A15
A2
A3
13-2
A6
A5
A12
13-1
A1
A10
A4

1 0.5 0 1 Miles

N

Path: L:\1305\18\Figure 1_ 2019 Monitoring Stations.mxd
Date: 1/3/2020 Time: 9:18:53 AM User: BerKA1064

Sources: Esri, HERE, Garmin, USGS, Inter
Esri (Thailand), NGCC, (c) OpenStreetMap

VERMILLION RIVER WATERSHED JOINT POWERS ORGANIZATION	JAN 2020
2019 Biological Monitoring Sites	Figure 1

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Responsive partner. Exceptional outcomes.

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. 29255
(Fisheries Research)
Date: 5 June 2019

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

to collect fish by backpack and barge electrofishing from the Vermillion River and its tributaries (including North Creek and South Creek) in Dakota County **August – September 2019** (up to 5 sampling days total) for the purpose of fish community monitoring. 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 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 with species present is available at MN Infested Waters List (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). This is a self-issue permit.

Condition #3 - Applies to Collection 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).
- ***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).

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 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 2019**, 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
Tom Langer	Biologist	6/12/19

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)
Brian Nerbonne, Regional Fisheries Manager, St. Paul
(e-mail 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; phone 651-259-5838)

Warmwater Headwater Sites – Fish Data and IBI Metric Comparisons

Species	A15	14-1
Bluegill	0	2
Brook Stickleback	0	56
Central Mudminnow	19	53
Creek Chub	0	12
Fathead Minnow	0	51
Green Sunfish	6	6
Hybrid Sunfish	1	0
Iowa Darter	1	35
Johnny Darter	0	122
Northern Pike	1	0
White Sucker	0	10
Total Catch	**28**	**347**
Species Total	**5**	**9**

Metrics	Description	A15	14-1
DetNWQTxPct	Percent Detritivorous Taxa	16.7	9.3
FishDELTPct	Percent of Individuals with Deformities, Eroded Fins, Lesions, or Tumors	0	0
GeneralTxPct	Percent Generalist Feeder Taxa	16.7	12.0
Sensitive	Number of Sensitive Taxa	4.2	4.2
SLvdPct	Percent Short-lived Taxa	16.1	9.8
SSpnPct	Percent Serial Spawner Individuals	16.7	13.4
VtolTxPct	Percent Very Tolerant Taxa	5.3	7.2
	Total IBI Score	**75.7**	**55.9**
	General Use IBI Threshold	**55.0**	**55.0**

Coldwater Sites – Fish Data and IBI Metric Comparisons

Species	A12	13-1
Black Bullhead	0	2
Bluegill	0	8
Brown Trout	20	0
Central Mudminnow	1	21
Fathead Minnow	1	0
Green Sunfish	3	0
Iowa Darter	0	5
Johnny Darter	30	17
Northern Pike	1	2
Rainbow Trout	1	0
White Sucker	18	8
Yellow Perch	0	1
Total Catch	**75**	**64**
Species Total	**8**	**8**
Coldwater Sensitive Fish Count	21	0
Coldwater Sensitive Percent	28%	0
Cold Tolerant Taxa Richness Count	3	2
Detritivore Taxa Count	2	2
Detritivore Taxa Percent	25%	25%
Pioneer Count	34	17
Pioneer Percent	45%	27%
Indirect Impact Individuals	1	16
Indirect Impact Individuals %	1%	25%
Indirect Impact Taxa	1	4
Indirect Impact Taxa %	13%	50%

Metrics	Description	A12	13-1
CWSensitivePct_10DrgArea	Percent Sensitive Individuals (specific to coldwater streams)	4.6	0.3
CWTol_10DrgArea	Tolerant Taxa Richness (specific to coldwater streams)	5.5	8.1
FishDELTPct	Percent of Individuals with Deformities, Eroded Fins, Lesions, or Tumors	0	0
HerbvPct	Percent Herbivorous Individuals	14.3	14.3
NativeColdPct	Percent Native Coldwater Individuals	0	0
NativeColdTXPct_10DrgArea	Percent Native Coldwater Taxa	3.3	3.3
PioneerPct	Percent Pioneer Individuals	2.5	7.4
SdetTxPct_10DrgArea	Percent Detritivore Taxa	7.3	7.2
	Total IBI Score	**37.6**	**40.5**
	General Use IBI Threshold	**50**	**50**