

Calculation of Minnesota Macroinvertebrate IBIs- Draft

January 26, 2017

Introduction

The Index of Biotic Integrity (IBI) is one of the primary tools used by the Minnesota Pollution Control Agency (MPCA) to determine if streams are meeting their aquatic life use goals. Calculation of an IBI involves the synthesis of macroinvertebrate community information into a numerical expression of stream health. In order to apply the MPCA Macroinvertebrate IBI (MIBI) to a macroinvertebrate dataset, it is essential that all data is collected using MPCA field and laboratory protocols ([MPCA 2004](#), MPCA 2015). This document details the process for calculating the Minnesota MIBIs from raw macroinvertebrate samples.

Summary of MIBI development

To account for natural differences in macroinvertebrates communities in Minnesota, streams are assigned to different stream types. These stream types use different MIBI models and biocriteria to determine the condition of the macroinvertebrate assemblage and their attainment or nonattainment of the aquatic life beneficial use. The MPCA stratified Minnesota streams into nine macroinvertebrate stream types based on the expected natural composition of stream macroinvertebrates (Table 1). Stream type is differentiated by drainage area, geographic region, thermal regime, and gradient. These stream types are used to determine thresholds (i.e., biocriteria) that interpret the calculated MIBI as meeting or exceeding the aquatic life use goal. MIBIs were developed from five individual invertebrate stream groups, with large rivers, wadable high gradient and wadable low gradient stream types each being combined for the purposes of metric testing and evaluation. A complete description of the development of MIBIs can be found in MPCA ([2014](#)).

Table 1. List of MIBI groups, stream types, and stream type descriptions.

MIBI Group	Stream Type	Stream Type Geographic Description	Drainage Area
Large Rivers	1 - Northern Forest Rivers	Rivers in the Laurentian Mixed Forest Province	>=500 Sq. Miles
	2 - Prairie and Southern Forest Rivers	Rivers in the Eastern Broadleaf Forest, Prairie Parklands, and Tall Aspen Parklands ecological provinces	>=500 Sq. Miles
Wadable High-Gradient Streams (RR)	3 - Northern Forest Streams RR	High Gradient streams in the Laurentian Mixed Forest ecological province, excluding streams in HUC 07030005	<500 Sq. Miles
	5 - Southern Streams RR	High Gradient Streams in the Eastern Broadleaf Forest, Prairie Parklands, and Tall Aspen Parklands ecological provinces, as well as streams in HUC 07030005	<500 Sq. Miles

MIBI Group	Stream Type	Stream Type Geographic Description	Drainage Area
Wadable Low-Gradient Streams (GP)	4 - Northern Forest Streams GP	Low Gradient streams in the Laurentian Mixed Forest ecological province, excluding streams in HUC 07030005	<500 Sq. Miles
	6 - Southern Forest Streams GP	Low Gradient Streams in the Eastern Broadleaf Forest, as well as streams in HUC 07030005	<500 Sq. Miles
	7 - Prairie Streams GP	Low Gradient Streams in the Prairie Parklands, and Tall Aspen Parklands ecological provinces	<500 Sq. Miles
Northern Coldwater Streams	8 - Northern Coldwater	Coldwater Streams in northern portions of Minnesota, characterized by the Laurentian Mixed Forest ecological province. Excluding streams in HUC 07030005	N/A
Southern Coldwater Streams	9 - Southern Coldwater	Coldwater Streams in southern portions of Minnesota, characterized by the Eastern Broadleaf Forest, Prairie Parkland, and Tall Aspen Parklands ecological provinces. Including streams in HUC 07030005	N/A

Determining Stream Type

Prior to calculating an MIBI score for a given sampling location, the stream reach must be categorized into a macroinvertebrate stream type. This requires a determination of the drainage area, geographic region, thermal regime, and gradient for a stream site. Determination of each of these stream characteristics is described below and a dichotomous key for stream type determination is provided in Appendix A.

Drainage area - Drainage area must be determined for all stream reaches sampled. There is one large river MIBI applied to rivers greater than 500 square miles (although determination of the applicable biocriterion also requires determination of region membership). All other stream types apply to streams less than 500 square miles.

Region – The macroinvertebrate stream types follow a geographic framework based on the Minnesota Department of Natural Resources Ecological Classification system. The only exception is the portion of the Laurentian Mixed Forest which falls in the St. Croix River – Stillwater watershed (HUC 07030005) and is grouped with southern stream types. Figure 1 shows the geographic framework used for the purpose of assessment and biocriteria development.

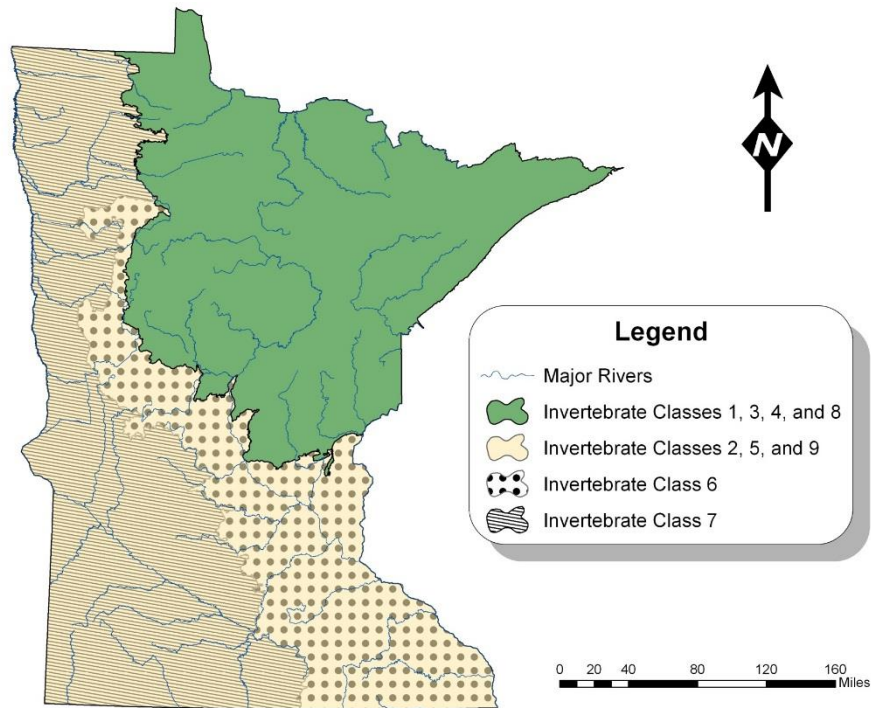


Figure 1. Map of ecological provinces associated with MPCA macroinvertebrate indices of biological integrity (MIBIs).

Temperature – For purposes of the application of stream water quality standards, the MPCA recognizes two temperature stream types: 1) warmwater/coolwater (Classes 2Bd, 2B, and 2C) and 2) coldwater (Class 2A). Similarly, temperature regime was a primary factor in the development of stream types used for MIBI development. The determination of a stream’s coldwater designation can be found in [Minn. R. 7050.0470](#).

Gradient – Two of the five MIBI stream groups are categorized using stream gradient. Gradient is determined based on flow conditions and the presence of riffles. If a stream reach includes riffles as representative habitat, and has flow adequate to create an environment supportive of riffle dwelling organisms, then a stream would be considered as high gradient, or riffle/run (RR). If these conditions are not met, then a stream is considered low gradient, or glide/pool (GP). Table 2 outlines criteria used by the MPCA to determine gradient category.

Table 2. Dichotomous key for determining stream type membership.

Riffle/Run (RR) vs. Glide Pool (GP) Designation Guidance		
Criteria	Yes	No
1. Has the sampler indicated on the stream visit form that 'riffle/run' is the 'Dominant invertebrate habitat in reach'?	RR	#2
2. In the mulithabitat sample, was any portion collected from riffles or rocky runs?	go to #3	GP
3. Was there a riffle present in the sample reach?	go to #4	GP
4. Flow over riffle perceptible?	go to #5	GP
5. # 'Riffle/run, rocky substrate' samples > 4?	RR	go to #6
6. Use a weight of evidence approach pulling in comments from macroinvertebrate visit form, habitat data from fish visit, sample reach photos, aerial photos, and geomorphology GIS layer to address the following:		
Extent of riffle in sample reach (%)	RR ≥ 5%	GP < 5%
Gradient of sample reach	> 1	≤ 1
Evidence from site photos or aerial photos of obvious high-gradient stream segments.		

Data Collection and Organization

In order to calculate a Minnesota MIBI score for a macroinvertebrate sample, data must be collected and processed using MPCA protocols ([MPCA 2004](#), MPCA 2015). In order to calculate metric values it is necessary to use the same taxonomic targets and taxonomic attributes used by the MPCA. These attributes have been assigned using a variety of external sources, as well internally calculated tolerance values (Appendix B). Attributes used in the calculation of metric values include taxonomy, functional feeding group, tolerance related to general disturbance, tolerance related to thermal regime, habitat, and longevity.

Counting taxa: In order to correctly calculate the value of richness or relative richness metrics, taxa must be counted in a consistent manner. The target taxonomic level of determination is genus for the majority of organisms that will be encountered in a typical stream sample. Appendix C includes a table with the taxonomic target for organisms used in calculating the metrics that comprise the Minnesota MIBIs. In the process of identifying a sample it is common to have organisms identified to multiple levels within a taxonomic group, i.e., distinct family, genus and species level identifications for organisms within the same family. When this happens only organisms at the highest level (typically genus) should be considered when counting distinct taxa. If species-level identifications are made, they must be grouped at the genus level for the purpose of metric calculation. Likewise, if individuals are left at the family level due to poor condition or early instar, while individuals within the family are identified to a higher level, .e.g., genus, the family-level identification should not be counted.

Calculating Metric and IBIs Scores

Metric values are the raw numeric expression of taxonomic or autecological information at either the community or individual level. Metric values are derived for each target metric group as explained in the Metric Type descriptions below. The tables in Appendix D detail the metrics for each metric group, including the information needed to calculate each metric value.

Metric Types

Richness — Richness metrics are calculated based on the taxonomic richness of the target group identified for the metric. When calculating, richness only taxa determined to be countable, as described above, are to be considered. Richness groups can be defined by taxonomy, tolerance, life habit, functional feeding group, or other meaningful autecological classifications. Example metric – Intolerant Taxa: if there are 20 countable intolerant taxa in a sample, the “Intolerant Taxa” metric value would be 20.

Relative Richness (percent taxa) – Relative richness metrics are calculated based on the taxonomic richness of the target group identified for the metric, relative to total taxonomic richness in the sample. When calculating, relative richness only taxa determined to be countable, as described above, are to be considered. The groups can be defined by taxonomy, tolerance, life habitat, functional feeding group, or other meaningful autecological classifications. Example metric – Clinger Percent Taxa: if there are 6 countable clinger taxa in a sample with 24 total countable taxa, the “Clinger % Taxa” metric value would be 25% (6/24).

Relative abundance – Relative abundance metrics are calculated based on the abundance of the target group identified for the metric, relative to total sample abundance. When calculating relative abundance, all individuals that meet the group criteria are to be tallied, not only those that are considered countable, as with richness metrics. The groups can be defined by taxonomy, tolerance, life habit, functional feeding group, or other meaningful autecological classifications. Example metric – Percent Plecoptera: if there are 50 Plecoptera individuals in a sample with 350 total individuals, the “Percent Plecoptera” metric value would be 14.3% (50/350).

Ratio – Ratio metrics represent the ratio of one group to another. The ratio can be an expression of richness or abundance. The only ratio metric calculated for a Minnesota MIBI, is the Chironomidae:Diptera ratio metric. This metric is the ratio of Chironomidae abundance to total Diptera abundance. Example metric – Chironomidae:Diptera: if there are 50 Chironomidae individuals in a sample with 65 total diptera individuals, the “Chironomidae:Diptera” metric value would be 0.77 (50/65).

Biotic Index – A biotic index is calculated by determining the abundance weighted average of the tolerance values of each taxon present in a sample that has been assigned a tolerance value. When calculating a biotic index, abundances should be summed up to the highest level to which a tolerance value is assigned, i.e, if a tolerance value is not assigned to a taxon identified to a higher taxonomic resolution it should be summed with the next lowest taxonomic group. There are two Biotic Index metrics calculated for Minnesota MIBIs, the Minnesota Hilsenhoff Biotic Index and the Minnesota Coldwater Biotic index. The tolerance values used in these calculations were derived from data collected as part of the MPCA biomonitoring effort, and supplemented with other national or regional tolerance values where necessary. The tolerance values can be found in the table in Appendix B.

Calculating Metric Scores

Metric scores are derived from metric values. Metric scores range from 0 to 10, and their derivation is as follows:

Step 1 – Metric value transformation. Transformation is applied to correct skewed metrics. If indicated in the metric table for the relevant MIBI (Appendix D), the metric value should be transformed using the indicated transformation.

Step 2 – Drainage area correction. Drainage area correction is applied to remove a metrics relationship with drainage area. Drainage area corrected metrics are only tabulated for the Southern Coldwater MIBI. If indicated in Appendix D, Table 5 the metric value should be corrected using the drainage area for the sample location, and the slope and constant provided. The correction is calculated as follows:

$$\text{Corrected metric value} = (\text{metric value}) - (((\text{slope}) * \log_{10}(\text{drainage area})) + \text{constant})$$

Step 3 – Scaling metric values from 0 to 10 points. Each metric is scored on a continuous scale from 0 to 10. There are two ways to score a metric, depending on the metrics predicted response to disturbance (Appendix D). Metrics that respond negatively to disturbance will have metrics scores positively correlated with metric values (positive metrics). Metrics that respond positively to disturbance will have metric scores inversely related to metric values (negative metrics). In order to limit the effect of extreme values when deriving metric scoring criteria, upper and lower limits were established by determining the 5th and 95th percentiles of each metric. These limits are documented in Appendix D. For positive metrics, values less than the 5th percentile (minimum) are given a score of 0, those with values greater than the 95th percentile (maximum) are given a score of 10, and metric scores in between are interpolated linearly. For negative metrics, values less than the 5th percentile (minimum) are given a score of 10, those with values greater than the 95th percentile (maximum) are given a score of 0, and metric scores in between are interpolated linearly. The formulas for calculating metric scores are as follows:

Formula for calculating positive metric scores:	$\text{metric score} = \frac{\text{metric value} - 5\text{th percentile value}}{95\text{th percentile value} - 5\text{th percentile value}} * 10$
Formula for calculating negative metric scores:	$\text{metric score} = \frac{95\text{th percentile value} - \text{metric value}}{95\text{th percentile value} - 5\text{th percentile value}} * 10$

Calculating IBI Scores

Calculation of the MIBI score for a stream sample is done by summing the metric scores and scaling the summed scores to maximum score of 100. The formula for scaling IBI scores is as follows:

Formula for scaling summed metrics score to 100:
$$\text{IBI score} = \text{sum of metric scores} * \frac{10}{\# \text{ metrics in IBI}}$$

References

MPCA (2004). Invertebrate Sampling Procedures (wq-bsm3-08). St. Paul: Minnesota Pollution Control Agency (Available at: <https://www.pca.state.mn.us/sites/default/files/wq-bsm3-08.pdf>).

MPCA (2015). Invertebrate Sorting and QA/QC procedures. St. Paul: Minnesota Pollution Control Agency.

MPCA. (2014). Development of macroinvertebrate indices of biological integrity (MIBI) for Minnesota streams. St. Paul: Minnesota Pollution Control Agency (Available at: <https://www.pca.state.mn.us/sites/default/files/wq-bsm4-01.pdf>).

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Appendix A: Dichotomous key for determining macroinvertebrate stream type membership

- 1a. Drainage area >500 mi² Rivers 2
 1b. Drainage area <500 mi² Streams 3

Rivers

- 2a. Sampling site located in the Laurentian Mixed Forest Province **Northern Forest Rivers (1)**
 2b. Sampling site located in the Eastern Broadleaf Forest, Prairie Parklands, or Tall Aspen Parklands province **Prairie and Southern Forest Rivers (2)**

Streams

- 3a. Sampling site is in a designated coldwater stream (Class 2A) Coldwater Streams 4
 3b. Sampling site is in a designated warm/cool waters stream (Class 2Bd, 2B, 2C) Warmwater and Coolwater Streams 5

Coldwater Streams

- 4a. Sampling site is in the Laurentian Mixed Forest ecological province (excluding streams in HUC 07030005) **Northern Coldwater Streams (8)**
 4b. Sampling site is in the Eastern Broadleaf Forest, Prairie Parkland, or Tall Aspen Parklands province (including streams in HUC 07030005) **Southern Coldwater Streams (9)**

Warmwater and Coolwater Streams

- 5a. Sampling site is high gradient (riffle/run; see Table 2) High Gradient Streams 6
 5b. Sampling site is low gradient (glide/pool; see Table 2) Low Gradient Streams 7

High Gradient (RR) Streams

- 6a. Sampling site is in the Laurentian Mixed Forest ecological province (excluding streams in HUC 07030005) **Northern Forest Streams RR (3)**
 6b. Sampling site is in the Eastern Broadleaf Forest, Prairie Parkland, or Tall Aspen Parklands province (including streams in HUC 07030005) **Southern Streams RR (5)**

Low Gradient (GP) Streams

- 7a. Sampling site is in the Laurentian Mixed Forest ecological province (excluding streams in HUC 07030005) **Northern Forest Streams GP (4)**
 7b. Sampling site is in the Eastern Broadleaf Forest province (including streams in HUC 07030005) **Southern Forest Streams GP (6)**
 7c. Sampling site is in the Prairie Parkland or Tall Aspen Parklands province **Prairie Streams GP (7)**

Appendix B: Taxonomic Trait Information

TSN	Name1	Name2	FFG	Habitat	MN Tolerance	Coldwater (CW) Tolerance	LongLived
-65	Acentrella	rallatoma	cg	swim		20.96	FALSE
-64	Kloosia		cg	burr	6.00		FALSE
-63	Anafroptilum		cg	swim	4.29		FALSE
-62	Kribiodorum	perpulchra	cg	burr			FALSE
-61	Allocladius		cg	spra			FALSE
-51	Neostempellina	reissi	cf	burr			FALSE
-49	Kribiodorum	perpulchrum	cg	burr			FALSE
-48	Kribiodorum		cg	burr			FALSE
-47	Radotanytus		pr	spra			FALSE
-45	Pericoma / Telmatoscopus		cg	burr	4.00		FALSE
-36	Thienemannimyia Gr.		pr		7.90	20.07	FALSE
-20	Bezzia/Palpomyia		pr	spra	6.00	19.10	FALSE
-19	Odontomyia /Hedriodiscus		cg	clim			FALSE
-8	Phanogomphus		pr	burr	5.00		TRUE
48739	Hydrozoa		pr				FALSE
50844	Hydridae		pr		9.36	21.03	FALSE
50845	Hydra		pr		9.25	22.02	FALSE
53964	Turbellaria		pr	spra	4.00		FALSE
57577	Prostoma		pr				FALSE
59490	Nematoda		pr		5.00		FALSE
64183	Nematomorpha		pr	burr	5.00		FALSE
64357	Annelida						FALSE
68422	Oligochaeta		cg	burr	6.00		FALSE
68440	Lumbriculidae		cg	burr	6.00		FALSE
68441	Lumbriculus		cg	burr	6.00		FALSE
68450	Stylodrilus		cg	burr			FALSE
68531	Enchytraeus		cg	burr	6.00		FALSE
68541	Henlea		cg	burr			FALSE
68544	Mesenchytraeus		cg	burr	6.00		FALSE
68638	Limnodrilus		cg	burr	6.00		FALSE
68679	Aulodrilus		cg	burr	6.00		FALSE
68779	Bothrioneurum	vej dovskyanum	cg	burr			FALSE
68780	Spirosperma		cg	burr	6.00		FALSE
68794	Quistadrilus	multisetosus	cg	burr	6.00		FALSE
68839	Rhyacodrilus		cg	burr	6.00		FALSE
68854	Naididae		cg	burr	6.00		FALSE
68856	Slavina	appendiculata	cg	burr	6.00		FALSE

TSN	Name1	Name2	FFG	Habitat	MN Tolerance	Coldwater (CW) Tolerance	LongLived
68871	Stylaria		cg	burr	6.00		FALSE
68872	Stylaria	lacustris	cg	burr			FALSE
68876	Pristina		cg	burr	6.00		FALSE
68898	Dero		cg	burr	6.00		FALSE
68934	Chaetogaster		cg	burr	6.00		FALSE
68946	Nais		cg	burr	6.00		FALSE
68995	Ophidonais		cg	burr	6.00		FALSE
68996	Ophidonais	serpentina	cg	burr	6.00		FALSE
69021	Bratislavia		cg	burr	6.00		FALSE
69168	Branchiobdellida		cg	clim			FALSE
69169	Branchiobdellidae		cg	clim	9.00	21.85	FALSE
69180	Branchiobdella		cg	burr			FALSE
69290	Hirudinea		pr	swim	10.00		FALSE
69357	Glossiphoniidae		pr	clim	6.19	20.20	FALSE
69363	Placobdella		pr	clim	6.00		FALSE
69366	Placobdella	ornata	pr	clim	6.00		FALSE
69367	Placobdella	multilineata	pr	clim	6.00		FALSE
69369	Placobdella	hollensis	pr	clim	6.00		FALSE
69380	Glossiphonia		pr	clim			FALSE
69381	Glossiphonia	complanata	pr	clim			FALSE
69389	Alboglossiphonia	heteroclita	pr	clim			FALSE
69396	Helobdella		pr	clim	6.30	20.10	FALSE
69397	Helobdella	elongata	pr	clim	6.30	20.10	FALSE
69398	Helobdella	stagnalis	pr	clim	6.30	20.10	FALSE
69403	Helobdella	papillata	pr	clim	6.30	20.10	FALSE
69407	Hirudinidae		pr	swim	7.00		FALSE
69408	Haemopsis		pr	swim			FALSE
69438	Erpobdellidae		pr	swim	4.19	18.12	FALSE
69444	Erpobdella		pr	swim		19.12	FALSE
69455	Nepheleopsis		pr	swim	6.06	17.05	FALSE
69456	Nepheleopsis	obscura	pr	swim	6.06	17.05	FALSE
69459	Gastropoda		sc		7.00		FALSE
70304	Viviparidae		sc	clim	1.56	20.23	FALSE
70305	Viviparus		sc	clim	1.00		FALSE
70311	Campeloma		sc	clim	2.47	18.49	TRUE
70312	Campeloma	decisum	sc	clim	2.47	18.49	TRUE
70328	Cipangopaludina		sc	clim			FALSE
70345	Valvatidae		sc	clim	6.78	22.49	TRUE
70346	Valvata		sc	clim	6.80	22.50	TRUE

TSN	Name1	Name2	FFG	Habitat	MN Tolerance	Coldwater (CW) Tolerance	LongLived
70354	Valvata	tricarinata	sc	clim	6.80	22.50	TRUE
70359	Valvata	lewisi	sc	clim	6.80	22.50	TRUE
70493	Hydrobiidae		sc	clim	4.56	20.81	FALSE
70505	Probythinella		sc	clim			FALSE
70605	Fontigens		sc	clim			FALSE
70736	Pomatiopsis		sc	clim			FALSE
70747	Amnicola		sc	clim	2.98	21.28	FALSE
70794	Bithynia	tentaculata	sc	clim			FALSE
71541	Pleuroceridae		sc	clim	5.00		FALSE
71542	Goniobasis		sc	clim			FALSE
71549	Pleurocera		sc	clim	3.70		TRUE
71550	Pleurocera	acuta	sc	clim	3.70		TRUE
76483	Lymnaeidae		sc	clim	9.59	20.14	FALSE
76484	Lymnaea		sc	clim	7.16		FALSE
76487	Lymnaea	stagnalis	sc	clim	7.16		TRUE
76497	Fossaria		sc	clim	6.36	19.88	FALSE
76528	Pseudosuccinea		sc	clim	9.41	20.89	FALSE
76529	Pseudosuccinea	columella	sc	clim	9.41	20.89	FALSE
76532	Bulimnaea		sc	clim			FALSE
76533	Bulimnaea	megasoma	sc	clim			FALSE
76534	Stagnicola		sc	clim	10.00	19.80	FALSE
76568	Ancylidae		sc	clim	7.07	20.97	FALSE
76569	Ferrissia		sc	clim	7.07	20.97	FALSE
76577	Laevapex	fuscus	sc	clim			FALSE
76591	Planorbidae		sc	clim	8.17	20.33	FALSE
76592	Gyraulus		sc	clim	8.21	19.72	FALSE
76599	Helisoma		sc	clim	7.36	21.16	TRUE
76600	Helisoma	anceps	sc	clim	7.36	21.16	FALSE
76621	Promenetus		sc	clim	6.83	18.70	FALSE
76622	Promenetus	exacuus	sc	clim	6.83	18.70	FALSE
76625	Promenetus	umbilicatellus	sc	clim	6.83	18.70	FALSE
76626	Menetus		sc	clim	5.48		FALSE
76629	Planorbula		sc	clim	9.11	20.12	FALSE
76630	Planorbula	armigera	sc	clim	9.11	20.12	FALSE
76643	Micromenetus		sc	clim			FALSE
76654	Planorbella		sc	clim	10.00	20.84	FALSE
76658	Planorbella	campanulata	sc	clim	10.00	20.84	TRUE
76671	Planorbella	trivolis	sc	clim	10.00	20.84	FALSE
76676	Physidae		sc	clim	10.00	20.35	FALSE

TSN	Name1	Name2	FFG	Habitat	MN Tolerance	Coldwater (CW) Tolerance	LongLived
76677	Physa		sc	clim	10.00	20.35	FALSE
76683	Physa	integra	sc	clim	10.00	20.35	FALSE
76695	Aplexa		sc	clim			FALSE
76697	Aplexa	elongata	sc	clim			FALSE
76698	Physella		sc	clim	8.00		FALSE
79118	Bivalvia		cf		8.00		TRUE
79913	Unionidae		cf	burr	1.13		TRUE
79951	Elliptio		cf	burr	8.00		FALSE
79986	Lampsilis		cf	burr			TRUE
80170	Proptera		cf	burr			FALSE
80297	Elliptoideus		hb	burr			FALSE
81339	Dreissena	polymorpha	cf	clng			FALSE
81381	Corbiculidae		cf	burr	6.00		FALSE
81388	Pisidiidae		cf	burr	7.82	20.46	FALSE
81391	Sphaerium		cf	burr	4.70		FALSE
81400	Pisidium		cf	burr	4.60		FALSE
84195	Ostracoda		cg		8.00		FALSE
85257	Copepoda		cg				FALSE
92120	Isopoda		cg		8.00		FALSE
92657	Asellidae		cg	spra	7.69	19.42	FALSE
92658	Asellus		cg	spra	6.49	19.88	FALSE
92666	Lirceus		cg	spra	8.00		FALSE
92686	Caecidotea		cg	spra	8.23	19.19	FALSE
93294	Amphipoda		cg	spra	4.00		FALSE
93745	Gammaridae		cg		6.05	17.00	FALSE
93773	Gammarus		cg	spra	6.05	17.00	FALSE
93790	Gammarus	pseudolimnaeus	cg	spra	6.05	17.00	FALSE
94025	Hyalella		cg	spra	7.30	21.43	FALSE
94026	Hyalella	azteca	cg	spra	7.30	21.43	FALSE
95081	Crangonyx		cg	spra	5.26	19.98	FALSE
95599	Decapoda		sh		8.00		TRUE
97336	Cambaridae		cg	spra	9.85	20.66	TRUE
97337	Cambarus		cg	spra	6.00		TRUE
97338	Cambarus	diogenes	cg		6.00		TRUE
97421	Orconectes		cg	spra	9.41	20.85	TRUE
97424	Orconectes	rusticus	cg		9.41	20.85	TRUE
97425	Orconectes	virilis	cg		9.41	20.85	TRUE
97446	Orconectes	immunis	cg		9.41	20.85	TRUE
97490	Procambarus		cg	spra	6.00		TRUE

TSN	Name1	Name2	FFG	Habitat	MN Tolerance	Coldwater (CW) Tolerance	LongLived
99237	Collembola		cg				FALSE
99246	Isotomurus		cg	skat			FALSE
99643	Entomobryidae		cg	skat			FALSE
100502	Ephemeroptera		cg		4.00		FALSE
100504	Heptageniidae		sc	clng	7.63	20.78	FALSE
100507	Stenonema		sc	clng	6.94	21.06	FALSE
100516	Stenonema	femoratum	sc	clng	6.94	21.06	FALSE
100548	Stenonema	vicarium	sc	clng	6.94	21.06	FALSE
100572	Rhithrogena		pr	clng	0.00	17.61	FALSE
100602	Heptagenia		sc	clng	9.46	20.07	FALSE
100626	Epeorus		cg	clng	0.00	19.11	FALSE
100649	Epeorus	vitreus	cg	clng	0.00	19.11	FALSE
100676	Leucrocuta		sc	clng	8.46	20.67	FALSE
100692	Nixe		pr	clng	0.00		FALSE
100713	Stenacron		cg	clng	7.25	20.47	FALSE
100714	Stenacron	interpunctatum	cg	clng	7.25	20.47	FALSE
100742	Stenacron	minnetonka	cg	clng	7.25	20.47	FALSE
100744	Macdunnoa		sc	clng			FALSE
100749	Raptoheptagenia		pr	swim			FALSE
100755	Baetidae		cg	swim	7.19	19.44	FALSE
100771	Pseudocloeon		sc	swim	8.96	20.55	FALSE
100794	Heterocloeon		sc	swim	0.18		FALSE
100796	Heterocloeon	curiosum	sc	swim	0.18		FALSE
100800	Baetis		cg	swim	6.78	18.29	FALSE
100801	Acentrella		cg	swim	8.46	20.96	FALSE
100808	Baetis	intercalaris	cg	clng	6.78	18.29	FALSE
100817	Baetis	tricaudatus	cg	spra	6.78	18.29	FALSE
100825	Baetis	brunneicolor	cg	clng	6.78	18.29	FALSE
100835	Baetis	flavistriga	cg	clng	6.78	18.29	FALSE
100873	Centroptilum		cg	swim	6.06	20.64	FALSE
100899	Paracloeodes		sc	swim	5.87	22.75	FALSE
100901	Paracloeodes	minutus	sc	swim	5.87	22.75	FALSE
100903	Callibaetis		cg	swim	10.00	21.68	FALSE
100951	Siphonuridae		cg	swim	7.00		FALSE
100953	Siphonurus		cg	swim	7.00		FALSE
100987	Acanthametropus		pr	swim	1.00		FALSE
100996	Ameletus		sc	swim	0.00		FALSE
101041	Isonychia		cf	swim	8.47	21.44	FALSE
101045	Isonychia	bicolor	cf	swim	8.47	21.44	FALSE

TSN	Name1	Name2	FFG	Habitat	MN Tolerance	Coldwater (CW) Tolerance	LongLived
101057	Isonychia	rufa	cf	swim	8.47	21.44	FALSE
101062	Isonychia	sicca	cf	swim	8.47	21.44	FALSE
101078	Metretopodidae		pr	swim	1.00	19.80	FALSE
101079	Siphloplecton		cg	swim	1.00	19.80	FALSE
101084	Siphloplecton	interlineatum	cg	swim	1.00	19.80	FALSE
101095	Leptophlebiidae		cg	clng	3.27	19.91	FALSE
101096	Traverella		pr	clng			FALSE
101108	Choroterpes		cg	clng	2.00		FALSE
101122	Habrophlebiodes		sc	swim	6.00		FALSE
101148	Leptophlebia		cg	swim	3.36	20.40	FALSE
101153	Leptophlebia	cupida	cg	swim	3.36	20.40	FALSE
101183	Habrophlebia		cg	swim	1.00		FALSE
101187	Paraleptophlebia		cg	swim	3.80	19.77	FALSE
101232	Ephemerellidae		cg	clng	1.00	19.75	FALSE
101233	Ephemerella		cg	clng	0.26	18.69	FALSE
101241	Ephemerella	subvaria	cg	clng	0.26	18.69	FALSE
101255	Ephemerella	aurivillii	cg	clng	0.26	18.69	FALSE
101276	Ephemerella	excrucians	cg	clng	0.26	18.69	FALSE
101282	Ephemerella	invaria	cg	clng	0.26	18.69	FALSE
101317	Timpanoga		cg	clng	7.00		FALSE
101324	Eurylophella		cg	clng	1.34	20.68	FALSE
101326	Eurylophella	temporalis	cg	clng	1.34	20.68	FALSE
101332	Eurylophella	funeralis	cg	clng	1.34	20.68	TRUE
101334	Eurylophella	bicolor	cg	clng	1.34	20.68	FALSE
101338	Attenella		cg	spra	0.00		FALSE
101340	Attenella	attenuata	cg	clng	0.00		FALSE
101360	Dannella		cg	swim			FALSE
101395	Serratella		cg	clng	0.56	18.97	FALSE
101405	Tricorythodes		cg	spra	8.81	21.87	FALSE
101429	Leptohyphes		pr	clng	4.00		FALSE
101461	Neoephemera		cg	clng			FALSE
101466	Neoephemera	bicolor	cg	clng			FALSE
101467	Caenidae		cg	spra	8.80	21.47	FALSE
101468	Brachycercus		cg	spra	7.40		FALSE
101478	Caenis		cg	spra	8.79	21.47	FALSE
101479	Caenis	tardata	cg	spra	8.79	21.47	FALSE
101483	Caenis	diminuta	cg	spra	8.79	21.47	FALSE
101486	Caenis	hilaris	cg	burr	8.79	21.47	FALSE
101488	Caenis	latipennis	cg	spra	8.79	21.47	FALSE

TSN	Name1	Name2	FFG	Habitat	MN Tolerance	Coldwater (CW) Tolerance	LongLived
101494	Baetisca		cg	swim	7.36	20.77	FALSE
101504	Baetisca	lacustris	cg	spra	7.36	20.77	FALSE
101505	Baetisca	laurentina	cg	spra	7.36	20.77	FALSE
101525	Ephemeridae		cg	burr	9.39	21.08	FALSE
101526	Ephemera		cg	burr	3.87	20.47	TRUE
101530	Ephemera	simulans	cg	burr	3.87	20.47	TRUE
101535	Ephemera	varia	cg	burr	3.87	20.47	TRUE
101537	Hexagenia		cg	burr	9.78	21.31	FALSE
101538	Hexagenia	bilineata	cg	burr	9.78	21.31	FALSE
101552	Hexagenia	limbata	cg	burr	9.78	21.31	TRUE
101566	Litobranchia			burr			FALSE
101569	Polymitarcyidae		cg	burr	7.35	21.03	FALSE
101570	Ephoron		cg	burr	7.38	21.09	FALSE
101571	Ephoron	album	cg	burr	7.38	21.09	FALSE
101593	Odonata		pr	clim			FALSE
101594	Anisoptera		pr		6.00		FALSE
101596	Aeshnidae		pr	clim	7.38	19.64	TRUE
101597	Anax		pr	clim	8.13	21.55	TRUE
101598	Anax	junius	pr	clim	8.13	21.55	TRUE
101603	Aeshna		pr	clim	7.99	19.17	TRUE
101605	Aeshna	umbrosa	pr	clim	7.99	19.17	TRUE
101607	Aeshna	verticalis	pr	clim	7.99	19.17	TRUE
101609	Aeshna	constricta	pr	clim	7.99	19.17	TRUE
101634	Gomphaeschna		pr	clim	4.00		TRUE
101635	Gomphaeschna	furcillata	pr	clim	4.00		TRUE
101645	Boyeria		pr	clim	5.33	19.35	TRUE
101646	Boyeria	grafiana	pr	clim	5.33	19.35	TRUE
101647	Boyeria	vinosa	pr	clim	5.33	19.35	TRUE
101648	Basiaeschna		pr	clim	6.00	21.80	TRUE
101649	Basiaeschna	janata	pr	clim	6.00	21.80	TRUE
101653	Nasiaeschna		pr	clim	4.00		TRUE
101664	Gomphidae		pr	burr	3.75	20.66	TRUE
101665	Gomphus		pr	burr	7.11	21.09	TRUE
101666	Stylurus		pr	burr			TRUE
101672	Gomphus	viridifrons	pr	burr	7.11	21.09	TRUE
101685	Gomphus	lividus	pr	burr	7.11	21.09	TRUE
101700	Gomphus	graslinellus	pr	burr	7.11	21.09	TRUE
101718	Progomphus		pr	burr	1.00		TRUE
101725	Erpetogomphus		pr	burr	5.00		TRUE

TSN	Name1	Name2	FFG	Habitat	MN Tolerance	Coldwater (CW) Tolerance	LongLived
101726	Erpetogomphus	designatus	pr	burr	5.00		FALSE
101730	Dromogomphus		pr	burr	3.00		TRUE
101734	Hagenius		pr	spra	1.00		TRUE
101735	Hagenius	brevistylus	pr	burr	1.00		TRUE
101738	Ophiogomphus		pr	burr	0.00	19.65	TRUE
101740	Ophiogomphus	rupinsulensis	pr	burr	0.00	19.65	TRUE
101745	Ophiogomphus	carolus	pr	burr	0.00	19.65	TRUE
101755	Ophiogomphus	colubrinus	pr	burr	0.00	19.65	TRUE
101770	Arigomphus		pr	burr	6.00		TRUE
101797	Libellulidae		pr	spra	7.17	21.38	FALSE
101803	Perithemis		pr	spra	6.85		FALSE
101808	Plathemis		pr	spra	8.00		FALSE
101809	Plathemis	lydia	pr	spra	8.00		FALSE
101851	Didymops		pr	spra	4.00		TRUE
101852	Didymops	transversa	pr	spra	4.00		TRUE
101854	Dorocordulia		pr	spra	5.00		TRUE
101856	Dorocordulia	libera	pr	spra	5.00		TRUE
101885	Leucorrhinia		pr	clim	9.00		FALSE
101893	Libellula		pr	spra	9.00		FALSE
101896	Libellula	quadrimaculata	pr	spra	9.00		FALSE
101918	Macromia		pr	spra	0.82	19.60	TRUE
101921	Macromia	illinoiensis	pr	spra	0.82	19.60	TRUE
101922	Macromia	taeniolata	pr	spra	0.82	19.60	TRUE
101934	Neurocordulia		pr	clim	3.54	19.19	TRUE
101936	Neurocordulia	molesta	pr	clim	3.54	19.19	TRUE
101937	Neurocordulia	yamaskanensis	pr	clim	3.54	19.19	TRUE
101940	Neurocordulia	xanthosoma	pr	clim	53804635004735.00	19.19	TRUE
101947	Somatochlora		pr	spra	5.14	20.46	TRUE
101955	Somatochlora	elongata	pr	spra	5.14	20.46	TRUE
101958	Somatochlora	minor	pr	spra	5.14	20.46	TRUE
101960	Somatochlora	walshii	pr	spra	5.14	20.46	TRUE
101976	Sympetrum		pr	spra	10.00		FALSE
101978	Sympetrum	corruptum	pr	spra	10.00		FALSE
101979	Sympetrum	vicinum	pr	spra	10.00		FALSE
101981	Sympetrum	obstrusum	pr	spra	10.00		FALSE
101990	Sympetrum	semicinctum	pr	spra	10.00		FALSE
102014	Cordulia		pr	spra			TRUE
102015	Cordulia	shurtleffi	pr	spra			TRUE
102020	Corduliidae		pr	clim	3.88	19.87	TRUE

TSN	Name1	Name2	FFG	Habitat	MN Tolerance	Coldwater (CW) Tolerance	LongLived
102026	Cordulegastridae		pr	burr	0.00		TRUE
102027	Cordulegaster		pr	burr	0.00		TRUE
102029	Cordulegaster	erronea	pr	burr	0.00		TRUE
102031	Cordulegaster	maculata	pr	burr	0.00		TRUE
102035	Epitheca		pr	clim	4.13		TRUE
102036	Epitheca	canis	pr	clim	4.13		TRUE
102043	Calopterygidae		pr	clim	5.85	20.60	FALSE
102048	Hetaerina		pr	clim	7.85	22.55	FALSE
102049	Hetaerina	titia	pr	clim	7.85	22.55	FALSE
102050	Hetaerina	americana	pr	clim	7.85	22.55	FALSE
102052	Calopteryx		pr	clim	5.03	20.42	TRUE
102055	Calopteryx	maculata	pr	clim	5.03	20.42	TRUE
102056	Calopteryx	aequabilis	pr	clim	5.03	20.42	TRUE
102058	Lestidae		pr	clim	9.00		FALSE
102059	Archilestes		pr	clim	7.00		FALSE
102061	Lestes		pr	clim	9.00		FALSE
102069	Lestes	inaequalis	pr	clim	9.00		FALSE
102077	Coenagrionidae		pr	clim	9.73	21.66	FALSE
102078	Ischnura		pr	clim	9.99	21.56	FALSE
102079	Ischnura	verticalis	pr	clim	9.99	21.56	FALSE
102082	Ischnura	posita	pr	clim	9.99	21.56	FALSE
102093	Amphiagrion		pr	clim	9.00		FALSE
102095	Amphiagrion	saucium	pr	clim	9.00		FALSE
102102	Enallagma		pr	clim	9.17	21.85	FALSE
102108	Enallagma	divagans	pr	clim	9.17	21.85	FALSE
102115	Enallagma	signatum	pr	clim	9.17	21.85	FALSE
102122	Enallagma	civile	pr	clim	9.17	21.85	FALSE
102124	Enallagma	cyathigerum	pr	clim	9.17	21.85	FALSE
102125	Enallagma	basidens	pr	clim	9.17	21.85	FALSE
102133	Chromagrion		pr	clim	2.12		FALSE
102134	Chromagrion	conditum	pr	clim	2.12		FALSE
102135	Nehalennia		pr	clim	7.00		FALSE
102139	Argia		pr	clim	10.00	21.30	FALSE
102140	Argia	apicalis	pr	clng	10.00	21.30	FALSE
102143	Argia	fumipennis	pr	clng	10.00	21.30	FALSE
102155	Coenagrion		pr	clim	8.00		FALSE
102467	Plecoptera		pr	clng	8.00		FALSE
102470	Pteronarcidae		sh	clng	5.83	18.98	TRUE
102471	Pteronarcys		sh	clng	5.83	18.98	TRUE

TSN	Name1	Name2	FFG	Habitat	MN Tolerance	Coldwater (CW) Tolerance	LongLived
102517	Nemouridae		sh	clng	1.00		FALSE
102540	Amphinemura		sh	spra	3.00		FALSE
102556	Soyedina		sh	spra	0.00		FALSE
102567	Malenka		sh	spra			FALSE
102643	Capniidae		sh	spra	0.15	16.30	FALSE
102788	Taeniopterygidae		sh	spra	2.52	21.05	FALSE
102789	Taeniopteryx		sh	spra	2.67	21.56	FALSE
102804	Paracapnia		sh	spra	0.33		FALSE
102840	Leuctridae		sh	clng	0.02	18.56	FALSE
102844	Leuctra		sh	spra	0.00		FALSE
102887	Paraleuctra		sh	spra	0.00		FALSE
102914	Perlidae		pr	clng	2.88	20.09	TRUE
102917	Acroneuria		pr	clng	2.40	20.07	TRUE
102918	Acroneuria	lycorias	pr	clng	2.40	20.07	TRUE
102919	Acroneuria	abnormis	pr	clng	2.40	20.07	TRUE
102922	Acroneuria	carolinensis	pr	clng	2.40	20.07	TRUE
102942	Neoperla		pr	clng	2.02		FALSE
102945	Neoperla	stewarti	pr	clng	2.02		FALSE
102954	Attaneuria		pr	clng	1.00		TRUE
102955	Attaneuria	ruralis	pr	clng	1.00		TRUE
102962	Paragnetina		pr	clng	3.29	19.56	TRUE
102968	Paragnetina	media	pr	clng	3.29	19.56	TRUE
102975	Agnetina		pr	clng	4.24	21.40	TRUE
102979	Agnetina	capitata	pr	clng	4.24	21.40	TRUE
102994	Perlodidae		pr	clng	2.68	18.75	FALSE
102995	Isoperla		pr	clng	4.17	18.90	FALSE
103124	Isogenoides		pr	clng	0.00		FALSE
103202	Chloroperlidae		pr	clng	1.00		FALSE
103203	Alloperla		pr	clng	0.00		FALSE
103212	Alloperla	usa	pr	clng	0.00		FALSE
103244	Perlinella		pr	clng	1.00		FALSE
103246	Perlinella	dryma	pr	clng	1.00		FALSE
103251	Perlesta		pr	clng	6.81	19.76	FALSE
103273	Sweltsa		pr	clng	1.00		FALSE
103359	Hemiptera		pr	clim			FALSE
103364	Corixidae		pr	swim	8.68	21.38	FALSE
103369	Sigara		hb	swim	7.74	21.00	FALSE
103382	Sigara	grossolineata	hb	swim	7.74	21.00	FALSE
103402	Sigara	lineata	hb	swim	7.74	21.00	FALSE

TSN	Name1	Name2	FFG	Habitat	MN Tolerance	Coldwater (CW) Tolerance	LongLived
103403	Sigara	trilineata	hb	swim	7.74	21.00	FALSE
103423	Trichocorixa		pr	swim	10.00	21.34	FALSE
103444	Hesperocorixa		hb	swim	4.53	21.42	FALSE
103460	Hesperocorixa	kennicotti	hb	swim	4.53	21.42	FALSE
103484	Corisella		pr	swim			FALSE
103491	Palmarcorixa		pr	swim	9.48	22.66	FALSE
103501	Cenocorixa		pr	swim	8.00		FALSE
103514	Callicorixa		pr	swim	4.33		FALSE
103517	Callicorixa	audeni	pr	swim	4.33		FALSE
103525	Cymatia		pr	swim	9.00		FALSE
103526	Cymatia	americana	pr	swim	9.00		FALSE
103557	Notonectidae		pr	swim	6.57	21.40	FALSE
103558	Notonecta		pr	swim	6.77	21.22	FALSE
103583	Buenoa		pr	swim	7.00		FALSE
103602	Pleidae		pr	swim	8.90	21.83	FALSE
103603	Neoplea		pr	swim	8.92	21.85	FALSE
103604	Neoplea	striola	pr	swim	8.92	21.85	FALSE
103665	Pelocoris		pr	clim	7.00		FALSE
103683	Belostomatidae		pr	clim	9.33	20.96	FALSE
103684	Belostoma		pr	clim	9.34	20.96	FALSE
103689	Belostoma	flumineum	pr	clim	9.34	20.96	FALSE
103699	Lethocerus		pr	clim	6.87		TRUE
103709	Lethocerus	americanus	pr	clim	6.87		TRUE
103748	Ranatra		pr	clim	10.00	21.05	FALSE
103765	Nepa		pr	clim	7.00		FALSE
103766	Nepa	apiculata	pr	clim	7.00		FALSE
103801	Gerridae		pr	skat	7.26	19.44	FALSE
103802	Rheumatobates		pr	skat	6.02	19.71	FALSE
103811	Trepobates		pr	skat	8.00		FALSE
103829	Gerris		pr	skat	6.89	20.17	FALSE
103857	Metrobates		pr	skat	6.00		FALSE
103872	Limnopus		pr	skat	5.41		FALSE
103882	Neogerris	hesione	pr	skat			FALSE
103885	Veliidae		pr	skat	5.68	20.15	FALSE
103886	Rhagovelia		pr	skat	4.79	20.92	FALSE
103900	Microvelia		pr	skat	3.90	20.31	FALSE
103939	Hydrometra		pr	skat			FALSE
103954	Mesovelia		pr	skat	9.29	20.83	FALSE
103964	Hebridae		pr	clim			FALSE

TSN	Name1	Name2	FFG	Habitat	MN Tolerance	Coldwater (CW) Tolerance	LongLived
103983	Merragata		pr	skat			FALSE
103990	Macroveliidae		pr	clim			FALSE
104063	Saldidae		pr	clim	10.00		FALSE
104140	Saldula		pr	clim			FALSE
109191	Aphididae		hb				FALSE
109216	Coleoptera		pr				FALSE
111857	Haliplidae		hb	clng	8.52	20.87	FALSE
111858	Haliphus		sh	clim	8.66	20.80	FALSE
111883	Haliphus	immaculicollis	sh	swim	8.66	20.80	FALSE
111923	Peltodytes		sh	clim	8.02	21.10	FALSE
111963	Dytiscidae		pr	swim	7.70	21.13	FALSE
111966	Agabus		pr	swim	5.15	18.68	FALSE
112072	Agabates		pr	swim			FALSE
112074	Acilius		pr	swim			FALSE
112086	Rhantus		pr	swim	5.00		FALSE
112109	Thermonectus		pr	swim	5.00		FALSE
112118	Dytiscus		pr	swim	5.00		FALSE
112145	Desmopachria		pr	swim	10.00	23.72	FALSE
112148	Desmopachria	convexa	pr	swim	10.00	23.72	FALSE
112165	Graphoderus		pr	swim			FALSE
112172	Hydaticus		pr	swim	5.00		FALSE
112181	Ilybius		pr	swim	5.08	18.79	FALSE
112200	Hygrotus		pr	swim	10.00	21.71	FALSE
112278	Laccophilus		pr	swim	8.88	24.08	FALSE
112314	Oreodytes		sh	swim	5.00		FALSE
112364	Cybister		pr	swim			FALSE
112371	Coptotomus		pr	swim	7.40	20.07	FALSE
112379	Colymbetes		pr	swim	5.00		FALSE
112390	Hydroporus		pr	swim	7.56	19.82	FALSE
112561	Copelatus		pr	swim	5.00		FALSE
112575	Uvarus		pr	swim	7.21		FALSE
112580	Liodessus		pr	swim	6.18	21.34	FALSE
112653	Gyrinidae		pr	swim	5.28	20.17	FALSE
112654	Gyrinus		pr	swim	5.31	19.98	FALSE
112711	Dineutus		pr	swim	5.00		FALSE
112756	Hydraenidae		pr	clng	5.06	20.15	FALSE
112757	Hydraena		pr	clng	4.41	20.03	FALSE
112777	Ochthebius		sc	clng	9.79	20.39	FALSE
112811	Hydrophilidae		pr	swim	8.50	20.62	FALSE

TSN	Name1	Name2	FFG	Habitat	MN Tolerance	Coldwater (CW) Tolerance	LongLived
112812	Berosus		hb	swim	5.03	21.32	FALSE
112858	Laccobius		hb		3.88	20.32	FALSE
112878	Anacaena			burr	6.02	20.11	FALSE
112909	Paracymus		pr	clng	8.16	20.78	FALSE
112931	Sperchopsis		cg	clng	5.00		FALSE
112932	Sperchopsis	tessellata	cg	clng	6.00		FALSE
112938	Tropisternus		pr	clim	9.42	20.98	FALSE
112973	Enochrus		cg	burr	10.00	21.19	FALSE
113017	Cymbiodyta		cg	burr	5.00		FALSE
113106	Helophorus		sh	swim	10.00	19.93	FALSE
113148	Helocombus		cg	clng			FALSE
113150	Helochares		cg				FALSE
113166	Hydrochus		sh	clim	9.25	21.91	FALSE
113190	Hydrochara		cg	swim			FALSE
113196	Hydrobius		pr	clim	5.94	20.56	FALSE
113204	Hydrophilus		pr	swim			FALSE
113220	Crenitis		pr	burr	4.34	19.37	FALSE
113265	Staphylinidae		pr	clng	8.00		FALSE
113576	Stenus		pr	skat	8.00		FALSE
113835	Lampyridae				0.00		FALSE
113924	Scirtidae		sc	clim	8.52	21.66	FALSE
113929	Scirtes		sh	clim	8.22	21.44	FALSE
113948	Cyphon		sc	clim	9.97	21.63	FALSE
113999	Dryopidae		sc	clng	7.38	18.52	TRUE
114006	Helichus		sh	clng	7.38	18.53	TRUE
114069	Psephenidae		sc	clng	0.00	20.25	TRUE
114087	Ectopria		sc	clng	0.00	20.25	TRUE
114093	Elmidae		cg	clng	8.16	20.93	TRUE
114095	Stenelmis		sc	clng	8.30	21.83	TRUE
114102	Stenelmis	crenata	cg	clng	8.30	21.83	TRUE
114126	Dubiraphia		cg	clng	9.26	21.06	TRUE
114146	Microcylloepus		cg	clng	3.00		TRUE
114147	Microcylloepus	pusillus	cg	clng	3.00		TRUE
114177	Optioservus		sc	clng	3.08	19.22	TRUE
114190	Optioservus	fastiditus	sc	clng	3.08	19.22	TRUE
114194	Ancyronyx	variegatus	cg	clng	5.01	20.48	TRUE
114212	Macronychus		cg	clng	7.21	20.80	TRUE
114213	Macronychus	glabratus	cg	clng	7.21	20.80	TRUE
114509	Chrysomelidae		sh	clng	6.00		FALSE

TSN	Name1	Name2	FFG	Habitat	MN Tolerance	Coldwater (CW) Tolerance	LongLived
114666	Curculionidae		sh	clng	6.00		FALSE
114690	Listronotus		sh	clng			FALSE
114838	Lixus		sh	clng			FALSE
114999	Neuroptera		pr				FALSE
115001	Sialidae		pr	burr	5.65	19.72	TRUE
115002	Sialis		pr	burr	5.65	19.72	TRUE
115023	Corydalidae		pr	clng	2.92	19.90	TRUE
115024	Chauliodes		pr	clng	5.80	20.11	TRUE
115028	Nigronia		pr	clng	0.41	19.47	TRUE
115033	Corydalus		pr	clng	6.00		TRUE
115085	Sisyridae		pr	clim	5.00		FALSE
115086	Climacia		pr	clim	8.00		FALSE
115087	Climacia	areolaris	pr		8.00		FALSE
115090	Sisyra		pr	clim			FALSE
115095	Trichoptera		un				FALSE
115097	Rhyacophila		pr	clng	0.00	16.70	FALSE
115099	Rhyacophila	angelita	pr		0.00	16.70	FALSE
115133	Rhyacophila	fuscula	cg	clng	0.00	16.70	FALSE
115147	Rhyacophila	minor	pr	clng	0.00	16.70	FALSE
115150	Rhyacophila	invaria	pr	clng	0.00	16.70	FALSE
115221	Protoptila		pr	clng	1.40	21.56	FALSE
115257	Philopotamidae		cf	clng	0.00	20.01	FALSE
115273	Chimarra		cf	clng	0.00	20.31	FALSE
115276	Chimarra	obscura	cf	clng	0.00	20.31	FALSE
115278	Chimarra	aterrima	cf	clng	0.00	20.31	FALSE
115279	Chimarra	socia	cf	clng	0.00	20.31	FALSE
115319	Dolophilodes		cf	clng	0.00	17.40	FALSE
115322	Dolophilodes	distinctus	cf	clng	0.00	17.40	FALSE
115334	Psychomyiidae		cg	clng	3.90	19.53	FALSE
115335	Psychomyia		cg	clng	4.14	20.33	FALSE
115341	Psychomyia	flavida	cg	clng	4.14	20.33	FALSE
115361	Phylocentropus		cf	clng	1.24		FALSE
115364	Phylocentropus	placidus	cf	clng	1.24		FALSE
115373	Cernotina		pr	clng	1.04	17.98	FALSE
115391	Lype		sc	burr	3.10	18.51	FALSE
115392	Lype	diversa	sc	spra	3.10	18.51	FALSE
115398	Hydropsychidae		cf	clng	7.55	20.26	FALSE
115399	Diplectrona		cf	clng	0.00		FALSE
115402	Diplectrona	modesta	cf	clng	0.00		FALSE

TSN	Name1	Name2	FFG	Habitat	MN Tolerance	Coldwater (CW) Tolerance	LongLived
115408	Cheumatopsyche		cf	clng	8.05	20.59	FALSE
115453	Hydropsyche		cf	clng	7.81	21.21	FALSE
115454	Hydropsyche	betteni	cf	clng	7.81	21.21	FALSE
115458	Hydropsyche	bidens	cf	clng	7.81	21.21	FALSE
115461	Hydropsyche	cuanis	cf	clng	7.81	21.21	FALSE
115465	Hydropsyche	dicantha	cf	clng	7.81	21.21	FALSE
115468	Hydropsyche	frisoni	cf	clng	7.81	21.21	FALSE
115469	Hydropsyche	hageni	cf	clng	7.81	21.21	FALSE
115471	Hydropsyche	incommoda	cf	clng	7.81	21.21	FALSE
115477	Hydropsyche	phalerata	cf	clng	7.81	21.21	FALSE
115480	Hydropsyche	scalaris	cf	clng	7.81	21.21	FALSE
115481	Hydropsyche	simulans	cf	clng	7.81	21.21	FALSE
115482	Hydropsyche	valanis	cf	clng	7.81	21.21	FALSE
115487	Hydropsyche	placoda	cf	clng	7.81	21.21	FALSE
115551	Potamyia		cf	clng	8.53	22.07	FALSE
115552	Potamyia	flava	cf	clng	8.53	22.07	FALSE
115556	Parapsyche		cf	clng	1.00		FALSE
115557	Parapsyche	apicalis		clng			FALSE
115570	Ceratopsyche		cf	clng	6.61	19.32	FALSE
115571	Ceratopsyche	alternans	cf	clng	6.61	19.32	FALSE
115575	Ceratopsyche	vexa		clng	6.61	19.32	FALSE
115577	Ceratopsyche	bronta	cf	clng	6.61	19.32	FALSE
115580	Ceratopsyche	morosa	cf	clng	6.61	19.32	FALSE
115586	Ceratopsyche	slossonae	cf	clng	6.61	19.32	FALSE
115589	Ceratopsyche	sparna	cf	clng	6.61	19.32	FALSE
115592	Ceratopsyche	walkeri	cf	clng	6.61	19.32	FALSE
115596	Ceratopsyche	alhedra	cf	clng	6.61	19.32	FALSE
115603	Macrostemum		cf	clng	0.35	23.17	FALSE
115606	Macrostemum	zebratum	cf	clng	0.35	23.17	FALSE
115629	Hydroptilidae		hb	clim	6.47	20.69	FALSE
115630	Leucotrichia		sc	clng	0.75	21.48	FALSE
115631	Leucotrichia	pictipes	sc	clng	0.75	21.48	FALSE
115635	Agraylea		cf	clim	8.00		FALSE
115641	Hydroptila		hb	clng	7.58	20.65	FALSE
115714	Ochrotrichia		cg	clng	10.00	23.88	FALSE
115779	Oxyethira		cg	clim	1.37	20.50	FALSE
115811	Mayatrichia		sc	clng	7.97	22.89	FALSE
115812	Mayatrichia	ayama	sc	clng	7.97	22.89	FALSE
115817	Stactobiella		sh	clim	2.00		FALSE

TSN	Name1	Name2	FFG	Habitat	MN Tolerance	Coldwater (CW) Tolerance	LongLived
115823	Ithytrichia		pr	clng			FALSE
115824	Ithytrichia	clavata	sc	clng			FALSE
115826	Dibusa		pr	clng	6.00		FALSE
115828	Orthotrichia		hb	clng	6.00		FALSE
115833	Neotrichia		sc	clng	9.00		FALSE
115867	Phryganeidae		sh	clim	3.93	19.98	FALSE
115868	Ptilostomis		sh	clng	4.40	19.50	FALSE
115882	Agrypnia		sh	clim			FALSE
115888	Fabria	inornatus					FALSE
115892	Phryganea		sh	clim	1.61	22.02	FALSE
115900	Oligostomis		pr	clim	2.00		FALSE
115911	Banksiola		sh	clim			FALSE
115933	Limnephilidae		sh	clim	3.45	19.19	FALSE
115934	Goeridae		sc	clng		17.03	FALSE
115935	Apatania		pr	clng	1.00		FALSE
115956	Anabolia		sh	spra			FALSE
115974	Psychoglypha		sh	spra	1.00		FALSE
115981	Psychoglypha	subborealis	cg	spra	2.00		FALSE
115989	Pseudostenophylax		sh	spra			FALSE
115995	Hydatophylax		sh	spra	2.63	19.44	FALSE
115997	Hydatophylax	argus	sh	spra	2.63	19.44	FALSE
116001	Hesperophylax		sh	spra	2.67	13.03	FALSE
116008	Hesperophylax	designatus		spra	2.67	13.03	FALSE
116030	Glyphopsyche		sh	clng	3.31	18.53	FALSE
116031	Glyphopsyche	irrorata		clng	3.31	18.53	FALSE
116046	Neophylax		sc	clng	3.15	19.76	FALSE
116047	Neophylax	concinus	sc	clng	3.15	19.76	FALSE
116049	Neophylax	fuscus	sc	clng	3.15	19.76	FALSE
116050	Neophylax	mittchelli	sc	clng	3.15	19.76	FALSE
116053	Neophylax	aniqua	sc	clng	3.15	19.76	FALSE
116057	Neophylax	oligius	sc	clng	3.15	19.76	FALSE
116069	Limnephilus		sh	spra	3.71	17.32	FALSE
116221	Asynarchus			clim			FALSE
116304	Frenesia	missa					FALSE
116407	Platycentropus		sh	clim			FALSE
116409	Pycnopsyche		sh	spra	4.55	21.70	FALSE
116423	Goera		sc	clng	0.00		FALSE
116426	Goera	stylata	sc	clng	0.00		FALSE
116432	Nemotaulius		sh	spra	5.50	22.41	FALSE

TSN	Name1	Name2	FFG	Habitat	MN Tolerance	Coldwater (CW) Tolerance	LongLived
116434	Nemotaulius	hostilis	sh	spra	5.50	22.41	FALSE
116473	Molannidae		sc	spra	1.81	20.04	FALSE
116474	Molanna		sc	spra	2.40	20.18	FALSE
116496	Odontoceridae		sc	spra	0.00		FALSE
116503	Psilotreta	indecisa					FALSE
116547	Leptoceridae		cg	clim	6.78	21.43	FALSE
116548	Setodes		cg	spra	0.13		FALSE
116565	Triaenodes		sh	swim	5.61	22.17	FALSE
116598	Mystacides		cg	spra	3.08	20.97	FALSE
116607	Oecetis		pr	clng	4.31	20.78	FALSE
116608	Oecetis	avara	pr	clng	4.31	20.78	FALSE
116609	Oecetis	cinerascens	pr		4.31	20.78	FALSE
116631	Oecetis	nocturna	pr	spra	4.31	20.78	FALSE
116636	Oecetis	persimilis	pr	swim	4.31	20.78	FALSE
116644	Oecetis	immobilis	pr		4.31	20.78	FALSE
116651	Nectopsyche		sh	clim	9.93	21.99	FALSE
116659	Nectopsyche	exquisita	sh	clim	9.93	21.99	FALSE
116661	Nectopsyche	candida	sh	clim	9.93	21.99	FALSE
116663	Nectopsyche	diarina	sh	clim	9.93	21.99	FALSE
116677	Leptocerus		sh	swim	4.00		FALSE
116678	Leptocerus	americanus	sh	swim	4.00		FALSE
116684	Ceraclea		cg	clng	2.45	20.30	FALSE
116793	Lepidostomatidae		sh	clim	0.12	18.43	FALSE
116794	Lepidostoma		sh	clim	0.12	18.42	FALSE
116905	Brachycentridae		cf	clng	4.68	18.04	FALSE
116906	Brachycentrus		cf	clng	5.14	17.78	FALSE
116910	Brachycentrus	numerosus	cf	clng	5.14	17.78	FALSE
116912	Brachycentrus	americanus	cf	clng	5.14	17.78	FALSE
116918	Brachycentrus	occidentalis	cf		5.14	17.78	FALSE
116958	Micrasema		sh	clng	0.67	18.83	FALSE
116961	Micrasema	rusticum	cg	clng	0.67	18.83	FALSE
116964	Micrasema	sprulesi	sh	clng	0.67	18.83	FALSE
116965	Micrasema	rickeri	cg	clng	0.67	18.83	FALSE
116969	Micrasema	gelidum	sh	clng	0.67	18.83	FALSE
116982	Sericostomatidae		sh	spra	0.00	20.50	FALSE
116983	Agarodes		sh	spra	0.00	19.73	FALSE
116984	Agarodes	distinctus	sh	spra	0.00	19.73	FALSE
117015	Helicopsyichidae		sc	clng	2.69	20.78	FALSE
117016	Helicopsyche		sc	clng	2.61	20.78	FALSE

TSN	Name1	Name2	FFG	Habitat	MN Tolerance	Coldwater (CW) Tolerance	LongLived
117020	Helicopsyche	borealis	sc	clng	2.61	20.78	FALSE
117043	Polycentropodidae		cf	clng	3.01	20.30	FALSE
117044	Polycentropus		pr	clng	3.20	20.45	FALSE
117091	Cyrnellus		cf	clng	8.00		FALSE
117092	Cyrnellus	fraternus	cf	clng	8.00		FALSE
117095	Neureclipsis		cf	clng	1.13	20.21	FALSE
117104	Nyctiophylax		pr	clng	4.38	21.53	FALSE
117120	Glossosomatidae		sc	clng	1.29	17.12	FALSE
117121	Agapetus		sc	clng	0.00		FALSE
117159	Glossosoma		sc	clng	1.14	17.12	FALSE
117162	Glossosoma	intermedium	sc	clng	1.14	17.12	FALSE
117164	Glossosoma	nigrior		clng	1.14	17.12	FALSE
117196	Glossosoma	lividum	sc	clng	1.14	17.12	FALSE
117232	Lepidoptera		sh		6.00		FALSE
117297	Arctiidae		sh		5.00		FALSE
117318	Noctuidae		sh	burr	6.00		FALSE
117641	Pyalidae		sh	spra	7.69	21.06	FALSE
117642	Paraponyx		sh	clng	1.54	20.51	FALSE
117654	Synclita		sh	clim			FALSE
117659	Nymphula		sh	clim			FALSE
117665	Elophila		sh				FALSE
117672	Munroessa		sh	clim	2.30		FALSE
117682	Petrophila		sc	clim	2.23	21.66	FALSE
117714	Parapoynx		sh	clim			FALSE
117741	Acentria		sh	clim	1.00		FALSE
118746	Nepticula		sh	burr			FALSE
118831	Diptera		un		7.00		FALSE
118840	Tipulidae		sh	burr	5.80	19.05	FALSE
118890	Holorusia		sh	burr			FALSE
119008	Prionocera		sh	burr	3.00		FALSE
119037	Tipula		sh	burr	6.29	20.09	FALSE
119654	Limoniinae		cg		5.00		FALSE
119656	Antocha		cg	clng	4.07	18.13	FALSE
119690	Helius		cg	burr	4.00		FALSE
119704	Limonia		sh	burr	6.87	18.27	FALSE
120094	Hexatoma		pr	burr	8.07	20.49	FALSE
120164	Limnophila		pr	burr	7.30	17.07	FALSE
120335	Pilaria		pr	burr	5.31	17.90	FALSE
120365	Pseudolimnophila		pr	burr	2.00		FALSE

TSN	Name1	Name2	FFG	Habitat	MN Tolerance	Coldwater (CW) Tolerance	LongLived
120387	Ulomorpha			burr			FALSE
120488	Cryptolabis		sh	burr	3.00		FALSE
120503	Erioptera		cg	burr	5.08	17.74	FALSE
120640	Gonomyia		cg	burr	3.00		FALSE
120732	Hesperoconopa		cg	burr	1.00		FALSE
120830	Ormosia		cg	burr	6.50		FALSE
121027	Dicranota		pr	burr	3.98	18.31	FALSE
125351	Psychodidae		cg	burr	9.06	18.97	FALSE
125468	Psychoda		cg	burr	8.41	19.19	FALSE
125514	Pericoma		cg	burr	7.59	19.26	FALSE
125763	Ptychopteridae		cg	burr	4.51		FALSE
125765	Bittacomorpha		cg	burr	7.00		FALSE
125786	Ptychoptera		cg	burr	4.51		FALSE
125799	Tanyderidae		cg	spra	5.00		FALSE
125809	Dixidae		cg	swim	4.51	19.03	FALSE
125810	Dixa		cg	clim	5.20	17.82	FALSE
125854	Dixella		cg	swim	4.27	19.47	FALSE
125886	Chaoboridae		pr	spra	8.22	19.41	FALSE
125888	Eucorethra		pr	swim	7.00		FALSE
125893	Mochlonyx		pr				FALSE
125904	Chaoborus		pr	spra	8.45	19.37	FALSE
125930	Culicidae		cg	swim	7.96	20.69	FALSE
125956	Anopheles		cf	swim	8.06	20.57	FALSE
126234	Aedes		cf	swim	6.39	20.67	FALSE
126424	Coquillettidia		cf				FALSE
126429	Culiseta		cg	swim			FALSE
126455	Culex		cf	swim	8.22	22.23	FALSE
126575	Uranotaenia		cf	swim			FALSE
126580	Uranotaenia	sapphirina	cf				FALSE
126621	Ochlerotatus		cf				FALSE
126640	Simuliidae		cf	clng	6.38	18.79	FALSE
126648	Prosimuliini						FALSE
126774	Simulium		cf	clng	6.37	18.76	FALSE
126838	Simulium	luggeri	cf	clng	6.37	18.76	FALSE
126903	Simulium	vittatum	cf	clng	6.37	18.76	FALSE
127076	Ceratopogonidae		pr	spra	5.68	20.33	FALSE
127112	Forcipomyiinae		pr	spra	6.00	22.00	FALSE
127113	Atrichopogon		cg	clng	7.76	20.82	FALSE
127152	Forcipomyia		sc	burr	7.12	21.35	FALSE

TSN	Name1	Name2	FFG	Habitat	MN Tolerance	Coldwater (CW) Tolerance	LongLived
127278	Dasyhelea		cg	spra	5.68	20.85	FALSE
127338	Ceratopogoninae		pr	burr	6.00	20.00	FALSE
127340	Culicoides		pr	burr	5.68	20.53	FALSE
127533	Alluaudomyia		pr	burr	6.00		FALSE
127564	Ceratopogon		pr	burr	6.12	18.35	FALSE
127575	Monohalea		pr	burr			FALSE
127614	Serromyia		pr	burr	5.90	20.50	FALSE
127619	Stilobezzia		pr	spra			FALSE
127649	Clinohalea		pr	burr			FALSE
127702	Mallochohelea		pr	burr	6.62	21.94	FALSE
127720	Nilobezzia		pr	burr	6.00		FALSE
127729	Probezia		pr	burr	2.53	20.07	FALSE
127761	Sphaeromyia		pr	burr	3.78	19.26	FALSE
127778	Bezzia		pr	spra	5.21	20.36	FALSE
127859	Palpomyia		pr	burr	6.00		FALSE
127917	Chironomidae		cg		7.80	20.14	FALSE
127962	Lasiodiamesa		cg,sc	spra			FALSE
127994	Tanypodinae		pr	burr	6.00	21.00	FALSE
127996	Clinotanytus		pr	burr	3.30	20.95	FALSE
128021	Apsectrotanytus		pr	burr	2.00		FALSE
128034	Macropelopia		pr	spra	7.00		FALSE
128037	Macropelopia	decedens	pr	spra	7.00		FALSE
128048	Psectrotanytus		pr	spra	8.10		FALSE
128070	Natarsia		pr	spra	2.84	19.91	FALSE
128079	Ablabesmyia		pr	spra	7.38	20.72	FALSE
128130	Conchapelopia		pr	spra	8.67	19.36	FALSE
128131	Helopelopia		pr	spra			FALSE
128161	Guttipelopia		pr	spra	2.94	18.01	FALSE
128170	Krenopelopia		pr	spra			FALSE
128173	Labrundinia		pr	spra	9.88	20.37	FALSE
128174	Labrundinia	becki	pr	spra	9.88	20.37	FALSE
128183	Larsia		pr	spra	7.69	21.98	FALSE
128202	Nilotanytus		pr	spra	5.63	20.98	FALSE
128207	Paramerina		pr	spra	7.35	19.21	FALSE
128215	Pentaneura		pr	spra	4.61	21.96	FALSE
128226	Rheopelopia		pr	spra	3.00		FALSE
128234	Telopelopia	okoboji	pr	burr			FALSE
128236	Thienemannimyia		pr	spra	5.91		FALSE
128245	Thienemannimyia	senata	pr	spra	5.91		FALSE

TSN	Name1	Name2	FFG	Habitat	MN Tolerance	Coldwater (CW) Tolerance	LongLived
128249	Hayesomyia	sonata	pr	spra			FALSE
128251	Trissopelopia		pr	spra	0.19	17.10	FALSE
128252	Trissopelopia	ogemawi	pr	spra	0.19	17.10	FALSE
128259	Zavreliomyia		pr	spra	8.02	18.33	FALSE
128271	Djalmabatista		pr	spra	9.00		FALSE
128277	Procladius		pr	spra	7.49	20.66	FALSE
128324	Tanypus		pr	spra	10.00	23.83	FALSE
128341	Diamesinae		cg	spra	5.00		FALSE
128355	Diamesa		cg	spra	5.00		FALSE
128401	Pagastia		cg	spra	5.14	14.05	FALSE
128408	Potthastia		cg	spra	5.12	20.09	FALSE
128416	Pseudodiamesa		cg	spra			FALSE
128440	Monodiamesa		cg				FALSE
128446	Odontomesa		cg	spra	6.51	17.01	FALSE
128452	Prodiamesa		cg	spra	5.76	14.74	FALSE
128457	Orthocladiinae		cg	burr	5.00	20.00	FALSE
128463	Acricotopus		cg	spra	4.05	20.16	FALSE
128477	Brillia		sh	burr	8.01	18.62	FALSE
128511	Cardiocladius		pr	burr	2.69	22.12	FALSE
128520	Chaetocladius		cg	spra	6.00		FALSE
128563	Corynoneura		cg	spra	6.70	19.42	FALSE
128575	Cricotopus		sh	clng	8.52	20.11	FALSE
128583	Cricotopus	bicinctus	cg	burr	8.52	20.11	FALSE
128670	Diplocladius		cg	spra	8.87	22.89	FALSE
128671	Diplocladius	cultriger	cg	spra	8.87	22.89	FALSE
128680	Doncricotopus		cg	spra		17.78	FALSE
128681	Doncricotopus	bicaudatus	cg	spra		17.78	FALSE
128682	Epoicocladius		cg		9.87	24.35	FALSE
128689	Eukiefferiella		cg	spra	5.13	16.02	FALSE
128695	Eukiefferiella	devonica	cg	spra	5.13	16.02	FALSE
128707	Euryhopsis						FALSE
128718	Gymnometriocnemus		cg	burr			FALSE
128730	Heleniella		pr	spra	0.00	17.65	FALSE
128737	Heterotrissocladius		cg	spra	5.46	15.28	FALSE
128750	Hydrobaenus		sc	spra	8.98	20.69	FALSE
128771	Krenosmittia		cg	spra	0.00		FALSE
128776	Limnophyes		cg	spra	8.38	18.52	FALSE
128811	Lopescladius		cg	burr	0.00	20.12	FALSE
128821	Metriocnemus		cg	spra	4.52		FALSE

TSN	Name1	Name2	FFG	Habitat	MN Tolerance	Coldwater (CW) Tolerance	LongLived
128844	Nanocladius		cg	spra	7.77	20.33	FALSE
128874	Orthocladius		cg	spra	7.31	19.13	FALSE
128877	Symposiocladius		pr	spra	6.00		FALSE
128878	Orthocladius	annectens	cg	spra	7.31	19.13	FALSE
128951	Parachaetocladius		cg	spra	7.00		FALSE
128956	Paracladius		cg	spra			FALSE
128962	Paracricotopus		cg	spra	10.00		FALSE
128968	Parakiefferiella		cg	spra	10.00	19.66	FALSE
128978	Parametriocnemus		cg	spra	5.15	18.38	FALSE
128989	Paraphaenocladius		cg	spra	9.34	18.57	FALSE
129018	Psectrocladius		cg	spra	2.60	19.59	FALSE
129052	Pseudorthocladius		cg	spra	0.00		FALSE
129071	Pseudosmittia		cg	spra	7.48	19.98	FALSE
129083	Psilometriocnemus		cg	spra			FALSE
129086	Rheocricotopus		cg	spra	6.64	20.35	FALSE
129107	Rheosmittia		cg	burr	0.00		FALSE
129110	Smittia		cg	burr	2.00		FALSE
129152	Stilocladius		cg	spra	4.72	20.55	FALSE
129161	Synorthocladius		cg	spra	0.29	20.32	FALSE
129182	Thienemanniella		cg	spra	7.95	19.60	FALSE
129197	Tvetenia		cg	spra	4.98	17.54	FALSE
129206	Unniella		cg	burr	0.66		FALSE
129209	Xylotopus	par	cg	burr	2.21	19.37	FALSE
129213	Zalutschia		sh	spra	7.00		FALSE
129228	Chironominae		cg	burr	7.00		FALSE
129229	Chironomini		cg	burr	6.00	21.00	FALSE
129236	Axarus		cg	spra	2.00		FALSE
129249	Chernovskia		cg	spra	6.00		FALSE
129254	Chironomus		cg	burr	8.64	18.97	FALSE
129350	Cladopelma		cg	burr	7.08	22.80	FALSE
129368	Cryptochironomus		pr	spra	9.13	20.13	FALSE
129394	Cryptotendipes		cg	burr	8.01	20.76	FALSE
129421	Demicrochironomus		cg	burr	1.96	19.01	FALSE
129428	Dicrotendipes		cg	burr	8.19	20.08	FALSE
129459	Einfeldia		cg	burr	9.00		FALSE
129470	Endochironomus		sh	clng	8.52	22.08	FALSE
129483	Glyptotendipes		sh	burr	9.07	23.13	FALSE
129516	Kloosia/Harnischia		cg	burr	8.00		FALSE
129520	Hyporhygma		cg	burr	0.00		FALSE

TSN	Name1	Name2	FFG	Habitat	MN Tolerance	Coldwater (CW) Tolerance	LongLived
129521	Hyporhygma	quadripunctatus	cg	burr	0.00		FALSE
129522	Kiefferulus		cg	burr	10.00		FALSE
129525	Lauterborniella		cg	clng	0.00	20.67	FALSE
129526	Lauterborniella	agrayloides	cg	clng	0.00	20.67	FALSE
129532	Microchironomus		cg	burr	0.00		FALSE
129535	Microtendipes		cf	clng	4.70	19.71	FALSE
129548	Nilothauma		cg	burr	0.63	22.05	FALSE
129556	Omisus		cg		4.00		FALSE
129561	Pagastiella		cg	spra	0.00		FALSE
129564	Parachironomus		pr	spra	9.40	21.26	FALSE
129597	Paracladopelma		cg	spra	7.29	19.61	FALSE
129616	Paralauterborniella		cg	burr	7.62	19.10	FALSE
129619	Paralauterborniella	nigrohalterale	cg	burr	7.62	19.10	FALSE
129623	Paratendipes		cg	burr	8.47	20.02	FALSE
129637	Phaenopsectra		sc	clng	6.46	19.74	FALSE
129657	Polypedilum		sh	clim	8.57	20.78	FALSE
129730	Robackia		cg	burr	6.31		FALSE
129735	Saetheria		cg	burr	10.00	20.27	FALSE
129746	Stenochironomus		cg	burr	6.49	21.02	FALSE
129785	Stictochironomus		cg	burr	10.00	19.41	FALSE
129820	Tribelos		cg	burr	2.45	19.88	FALSE
129837	Xenochironomus		pr	burr	4.26	20.34	FALSE
129838	Xenochironomus	xenolabis	pr	burr		20.34	FALSE
129850	Pseudochironomini		cg				FALSE
129851	Pseudochironomus		cg	burr	3.10	21.54	FALSE
129872	Tanytarsini		cf	burr	6.00	20.00	FALSE
129873	Cladotanytarsus		cg	clim	8.04	20.99	FALSE
129884	Constempellina		cg	clim	5.51		FALSE
129890	Micropsectra		cg	clim	7.75	17.99	FALSE
129935	Paratanytarsus		cg	clng	8.98	20.55	FALSE
129952	Rheotanytarsus		cf	clng	6.21	20.22	FALSE
129962	Stempellina		cg	clim	0.35	18.90	FALSE
129969	Stempellinella		cg	clim	2.24	20.07	FALSE
129975	Sublettea		cg	spra	6.98	19.74	FALSE
129976	Sublettea	coffmani	cg	spra	6.98	19.74	FALSE
129978	Tanytarsus		cf	clng	5.04	20.30	FALSE
130038	Zavrelia		cg	swim	6.00		FALSE
130040	Zavreliella		cg	burr	5.45	25.21	FALSE
130042	Neozavrelia						FALSE

TSN	Name1	Name2	FFG	Habitat	MN Tolerance	Coldwater (CW) Tolerance	LongLived
130046	Endotribelos		cg	burr	2.84	21.24	FALSE
130150	Stratiomyidae		cg	spra	10.00	21.47	FALSE
130160	Allognosta		cg	spra			FALSE
130409	Caloparyphus		cg	spra	7.00		FALSE
130436	Euparyphus		cg	spra	8.00		FALSE
130461	Oxycera		sc	spra			FALSE
130573	Odontomyia		cg	spra	10.00	21.75	FALSE
130627	Stratiomys		cg	spra			FALSE
130694	Nemotelus		cg	spra	4.00		FALSE
130929	Atherix		pr	spra	3.73	20.33	FALSE
130932	Atherix	variegata	pr	spra	3.73	20.33	FALSE
130934	Tabanidae		pr	spra	5.91	19.95	FALSE
131078	Chrysops		pr	spra	5.15	19.76	FALSE
131321	Hybomitra		pr	spra	7.00		FALSE
131527	Tabanus		pr	spra	5.00		FALSE
135830	Empididae		pr	spra	5.61	20.25	FALSE
135844	Clinocerinae		pr	clng			FALSE
135849	Clinocera		pr	clng	2.99		FALSE
135871	Dolichocephala		pr	clng			FALSE
135893	Roederiodes		pr	clng			FALSE
135903	Trichoclinocera		pr	clng			FALSE
135920	Wiedemannia		pr	clng			FALSE
136290	Hemerodromiinae		pr	spra			FALSE
136305	Chelifera		cg	spra	6.67	17.75	FALSE
136327	Hemerodromia		pr	spra	5.38	20.53	FALSE
136352	Neoplasta		pr	spra	7.11	18.95	FALSE
136377	Oreogeton		pr	spra			FALSE
136824	Dolichopodidae		pr	burr	1.04	21.30	FALSE
138921	Phoridae		cg	burr	6.00		FALSE
139621	Syrphidae		cg	burr	10.00		FALSE
140904	Eristalis		cg	burr	10.00		FALSE
144653	Sciomyzidae		pr	burr	9.85	19.66	FALSE
144898	Sepedon		pr	burr			FALSE
146893	Ephydriidae		cg	burr	9.46	19.84	FALSE
147117	Hydrellia		cg	burr			FALSE
150025	Muscidae		pr	spra	7.72	22.13	FALSE
150730	Limnophora		pr	burr	6.00		FALSE
152741	Hymenoptera		pr		8.00		FALSE
185976	Serratella	serrata	cg	clng	0.56	18.97	FALSE

TSN	Name1	Name2	FFG	Habitat	MN Tolerance	Coldwater (CW) Tolerance	LongLived
185979	Aeshna	interrupta	pr	clim	7.99	19.17	TRUE
185987	Epithea	spinigera	pr	clim			TRUE
186372	Deronectes	griseostriatus	pr				FALSE
189328	Zavreliella	marmorata	cg	burr		25.21	FALSE
193637	Gymnochthebius				2.98	21.34	FALSE
204785	Fridericia		cg	burr	6.00		FALSE
206620	Acerpenna	pygmaea	cg	swim	2.68	20.86	FALSE
206622	Procloeon		cg	swim	3.80	21.09	FALSE
206655	Apedilum		cg		6.00		FALSE
563956	Nemata						FALSE
568515	Cricotopus (Isocladius)		sh	clng	7.00		FALSE
568523	Orthocladius (Symposiocladius)		cg	spra			FALSE
568545	Leptohyphidae		cg				FALSE
568546	Acerpenna		cg	swim	2.68	20.86	FALSE
568550	Dipheter		cg	clim			FALSE
568551	Fallceon		sh	swim	10.00	22.54	FALSE
568552	Labiobaetis		cg	swim	6.00		FALSE
568553	Plauditus			swim	4.67	21.50	FALSE
568554	Pseudocentropiloides		cg	clng			FALSE
568556	Cercobrachys		cg	spra			FALSE
568559	Anthopotamus		cg	burr	8.95	22.27	FALSE
568560	Barbaetis		cg	clng	7.47		FALSE
568574	Acentrella	turbida	cg	swim		20.96	FALSE
568598	Dipheter	hageni	cg	clim			FALSE
568601	Fallceon	quilleri	sh	swim		22.54	FALSE
568604	Labiobaetis	dardanus	cg	swim	6.00		FALSE
568605	Labiobaetis	propinquus	cg	swim	6.00		FALSE
568623	Amercaenis	ridens	cg	spra			FALSE
568627	Caenis	youngi	cg	spra		21.47	FALSE
568668	Labiobaetis	frondalis	cg	swim	6.00		FALSE
568671	Acerpenna	macdunnoughi	sh	swim	2.68	20.86	FALSE
568680	Pseudocloeon	dardanus	sc	swim		20.55	FALSE
568681	Pseudocloeon	propinquum	sc	swim		20.55	FALSE
568685	Leptophlebia	bradleyi	cg	swim		20.40	FALSE
568757	Uenoidae		sc	clng	0.00		FALSE
568817	Ceratopsyche	ventura	cf	clng	6.61	19.32	FALSE
568826	Stictotarsus		pr				FALSE
568954	Desserobdella	picta	pr	clim			FALSE

TSN	Name1	Name2	FFG	Habitat	MN Tolerance	Coldwater (CW) Tolerance	LongLived
591727			pr	spra			TRUE
592856	Gomphus	fraternus	pr	burr	6.00	21.09	TRUE
598162	Limnephiloidea						FALSE
598372	Ylodes		sh	swim			FALSE
603100	Oecetis	furva	pr		4.31	20.78	FALSE
603269	Oecetis	testacea	pr		4.31	20.78	FALSE
609530	Acentrella	parvula	cg	swim		20.96	FALSE
609583	Pseudocentropiloides	usa	cg	clng			FALSE
609591	Cercobrachys	etowah	cg	spra			FALSE
609660	Anthopotamus	myops	cf	burr	8.95	22.27	FALSE
609662	Anthopotamus	verticis	cf	burr	8.95	22.27	FALSE
678385	Sphaeriusidae		hb				FALSE
678801	Donaciinae		sh	clng	6.00		FALSE
678851	Dytiscinae		pr	swim			FALSE
693963	Crambidae		sh		6.87	23.47	FALSE
697957	Maccaffertium		sc	clng	6.77	21.48	FALSE
698057	Labiobaetis	longipalpus	cg	swim	6.00		FALSE
698216	Maccaffertium	exiguum	sc	clng	6.77	21.48	FALSE
698222	Maccaffertium	luteum	sc	clng	6.77	21.48	FALSE
698232	Maccaffertium	modestum	sc	clng	6.77	21.48	FALSE
698241	Maccaffertium	pulchellum	sc	clng	6.77	21.48	FALSE
698255	Maccaffertium	vicarium	sc	clng	6.77	21.48	FALSE
698469	Maccaffertium	mediopunctatum	sc	clng	6.77	21.48	FALSE
698470	Maccaffertium	mexicanum	sc	clng	6.77	21.48	FALSE
698471	Maccaffertium	terminatum	sc	clng	6.77	21.48	FALSE
698515	Maccaffertium	integrum	sc	clng	6.77	21.48	FALSE
717547	Aquarius		pr	skat			FALSE
722295	Sperchopsis	tessellata					FALSE
728212	Agabinae		pr	swim			FALSE
728241	Platambus		pr	swim			FALSE
728249	Heterosternuta		pr	swim	7.82	20.13	FALSE
728251	Nebrioporus		pr	swim			FALSE
728252	Neoporus		pr	swim	10.00	20.50	FALSE
728253	Sanfilippodytes		pr	swim			FALSE
733321	Acari		pr	clng	7.00		FALSE
776922	Sparbarus		cg	spra			FALSE
776928	Iswaeon					21.29	FALSE
776935	Acentrella	nadineae	cg	swim		20.96	FALSE
776969	Sparbarus	maculatus	cg	spra			FALSE

TSN	Name1	Name2	FFG	Habitat	MN Tolerance	Coldwater (CW) Tolerance	LongLived
776981	Teloganopsis	deficiens	cg	clng	3.00		FALSE
914204	Trepaxonemata						FALSE
974284	Naidinae		cg	burr	6.00		FALSE
974289	Tubificinae		cg	burr			FALSE

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Appendix C: Taxonomic Targets

Classification Group	Order	IBI Taxonomic Target	Current Taxonomic Target
Bivalvia		Genus	Genus
Gastropoda		Genus	Genus
Hydrozoa		Class	Class
Oligochaeta		Class	Family
Crustacea	Amphipoda	Genus	Genus
Branchiobdellida	Branchiobdellida	Order	Order
Coleoptera	Coleoptera	Genus	Genus
Crustacea	Decapoda	Genus	Genus
Insecta	Diptera	Genus	Genus
Insecta	Ephemeroptera	Genus	Species
Insecta	Hemiptera	Genus	Genus
Insecta	Hymenoptera	Genus	Genus
Isopoda	Isopoda	Genus	Genus
Insecta	Lepidoptera	Genus	Genus
Insecta	Neuroptera	Genus	Genus
Insecta	Odonata	Genus	Species
Insecta	Plecoptera	Genus	Species
Insecta	Trichoptera	Genus	Species
Nematoda		Phylum	Phylum
Nematomorpha		Phylum	Phylum
Acari		Subclass	Subclass
Hirudinea		Genus	Genus
Trepaxonemata		Class	Class

Appendix D: MIBI Metric Information

Table A1 – Metric information for Large River MIBI, stream types 1 and 2.

Metric Name	Metric Type	Target Group	Metric Calculation Description	Response	Transformation	Drainage Correction	Ceiling	Floor
Percent (%) Dominant Five Taxa	Relative Abundance	5 most abundant taxa	Relative abundance (%) of dominant five taxa in subsample (Chironomid genera treated individually)	increase	none	none	41.7	82.3
Hilsenhoff Biotic Index, MN TVs	Biotic Index	MN Tolerance, All Taxa	Abundance weighted average of each taxon using MN derived tolerance values.	increase	none	none	5.5	8.3
Intolerant Taxa	Richness	MN Tolerance <=4	Taxa richness of countable macroinvertebrates with tolerance values less than or equal to 4, using MN derived tolerance values	decrease	none	none	18.2	0
Odonata Taxa	Richness	Odonata Taxa	Taxa richness of countable Odonata taxa	decrease	none	none	5	0
Predator Taxa	Richness	FFG = Predator	Taxa richness of countable predator taxa	decrease	none	none	18.3	3.5
Total Taxa	Richness	All Taxa	Total taxa richness of all countable macroinvertebrates	decrease	none	none	57.6	24
Percent (%) Trichoptera-Hydropsychidae	Relative Abundance	Trichoptera, excluding Hydropsychidae	Relative abundance (%) of non-Hydropsychidae Trichoptera individuals in subsample	decrease	log10(x+1)	none	22.8	0
Percent (%) VeryTolerant	Relative Abundance	MN Tolerance >=8	Relative abundance (%) of macroinvertebrate individuals in subsample with tolerance values equal to or greater than 8, using MN derived tolerance values	increase	none	none	12.8	78.7

Table A2 – Metric Information for High Gradient Stream MIBI, stream types 3 and 5.

Metric Name	Metric Type	Target Group	Metric Calculation Description	Response	Transformation	Drainage		
						Correction	Ceiling	Floor
Climber Taxa	Richness	Habit = Climber	Taxa richness of countable climber taxa	decrease	none	none	12.0	2.7
Clinger Taxa %	Relative Richness	Habit = Clinger	Relative richness of countable taxa adapted to cling to substrates in swift flowing water	decrease	none	none	46.0	20.0
Percent (%) Dominant Five Taxa	Relative Abundance	5 most abundant taxa	Relative abundance (%) of dominant five taxa in subsample (chironomid genera treated individually)	increase	none	none	38.2	78.2
Hilsenhoff Biotic Index, MN TVs	Biotic Index	MN Tolerance, All Taxa	Abundance weighted average of each taxon using MN derived tolerance values.	increase	none	none	4.9	8.3
Insect Taxa %	Relative Richness	Insect Taxa	Relative richness of countable insect taxa	decrease	arcsin(sqrt(x))	none	93.6	72.5
Odonata Taxa	Richness	Odonata Taxa	Taxa richness of countable Odonata taxa	decrease	log10(x+1)	none	5.0	0.0
Plecoptera Taxa	Richness	Plecoptera Taxa	Taxa richness of countable Plecoptera taxa	decrease	log10(x+1)	none	3.0	0.0
Predator Taxa	Richness	FFG = Predator	Taxa richness of countable predator taxa	decrease	none	none	16.0	3.0
Tolerant %	Relative Richness	MN Tolerance >=6	Relative richness (%) of macroinvertebrate individuals in subsample with tolerance values equal to or greater than 6, using MN derived tolerance values	increase	none	none	93.7	47.1
Trichoptera Taxa	Richness	Trichoptera Taxa	Taxa richness of countable Trichoptera taxa	decrease	noen	none	12.0	2.0

Table A3 – Metric information for Low Gradient Stream MIBI, stream types 4, 6, and 7.

Metric Name	Metric Type	Target Group	Metric Calculation Description	Response	Transformation	Drainage Correction	Ceiling	Floor
Climber Taxa	Richness	Habit = Climber	Taxa richness of countable climber taxa	Decrease	none	none	17.0	2.0
Percent (%) Collector-filterers	Relative Abundance	FFG = Filterer	Relative abundance (%) of collector-filterer individuals	Decrease	none	none	37.9	0.3
Percent (%) Dominant Five Taxa	Relative Abundance	5 most abundant taxa	Relative abundance (%) of dominant five taxa in subsample (chironomid genera treated individually)	Increase	none	none	43.2	90.8
Hilsenhoff Biotic Index, MN TVs	Biotic Index	MN Tolerance, all taxa	Abundance weighted average of each taxon using MN derived tolerance values.	Increase	none	none	5.8	8.8
Very Intolerant Taxa Richness	Richness	MN Tolerance <=2	Taxa richness of countable macroinvertebrates with tolerance values less than or equal to 2, using MN TVs	Decrease	log10(x+1)	none	3.0	0.0
POET Taxa	Richness	Plecoptera, Odonata, Ephemeroptera, and Trichoptera	Combined richness of countable taxa within the orders Plecoptera, Odonata, Ephemeroptera, & Trichoptera, with all Baetidae taxa treated at the family level	Decrease	none	none	16.0	2.0
Predator Taxa	Richness	FFG = Predator	Taxa richness of countable predator taxa	Decrease	none	none	18.0	4.0
Total Taxa	Richness	All taxa	Total taxa richness of all countable macroinvertebrates	Decrease	none	none	53.0	19.0
Trichoptera %	Relative Richness	Trichoptera Taxa	Relative richness of countable Trichoptera taxa	Decrease	none	none	16.4	0.0
Percent (%) Trichoptera-Hydropsy	Relative Abundance	Trichoptera, excluding Hydropsychidae	Relative abundance (%) of non-Hydropsychidae Trichoptera individuals in subsample	Decrease	log10(x+1)	none	10.8	2.0

Table A4 – Metric Information for Northern Coldwater Stream MIBI, stream type 8

Metric Name	Metric Type	Target Group	Metric Description	Response	Transformation	Drainage Correction	Ceiling	Floor
Collector-Gatherer Taxa %	Relative Richness	FFG = Gatherer	Relative richness of countable collector-gatherer taxa	Increase	none	none	22.1	41.90
Hilsenhoff Biotic Index, MN TVs	Biotic Index	MN Tolerance, all taxa	Abundance weighted average of each taxon using MN derived tolerance values.	Increase	none	none	4.22	7.03
Very Intolerant Taxa Richness	Richness	MN Tolerance <=2	Taxa richness of countable macroinvertebrates with tolerance values less than or equal to 2, Using MN TVs	Decrease	none	none	12	0.00
Long-lived Taxa %	Relative Richness	LongLived = True	Relative richness of countable long-lived taxa	Decrease	none	none	26	6.00
Non-insect Taxa %	Relative Richness	Non-insect taxa	Relative richness of countable non-insect taxa	Increase	none	none	2.47	20.79
Odonata Taxa %	Relative Richness	Odonata Taxa	Relative richness of countable odonata taxa	Decrease	none	none	9.5	0.00
POET Taxa	Richness	Plecoptera, Odonata, Ephemeroptera, and Trichoptera	Combined richness of countable taxa within the orders Plecoptera, Odonata, Ephemeroptera, & Trichoptera, with all Baetidae taxa treated at the family level	Decrease	none	none	29	8.00
Predator Taxa Richness (excludes genus level Chironomidae)	Richness	FFG = Predator	Taxa richness of countable predator taxa (excluding Chironomidae predator taxa at the genus level)	Decrease	none	none	16	5.00
Very Tolerant Taxa %	Relative Richness	MN Tolerance >=8	Relative richness of countable taxa with tolerance values equal to or greater than 8, using MN TVs.	Increase	none	none	9.2	32.50

Table A5 – Metric Information for Southern Coldwater Stream MIBI, stream type 9

Metric Name	Metric Type	Target Group	Metric Description	Response	Transformation	Drainage Correction	Ceiling	Floor
Coldwater Biotic Index	Biotic Index	CW Tolerance	Coldwater Biotic Index score based on coldwater tolerance values derived from Minnesota taxa/temperature data.	increase	none	slope = 0.579 constant = 17.923	-0.69	1.41
Chiro:Diptera	Ratio	Diptera taxa	Ratio of Chironomidae abundance to total Dipteran abundance.	increase	none	slope = 9.428 constant = 45.12	-40.33	37.59
Percent (%) Collector – Filterers	Relative Abundance	FFG = filterers	Relative abundance (%) of collector-filterer individuals in a subsample	decrease	none	none	53.41	7.36
Hilsenhoff Biotic Index, MN TVs	Biotic Index	MN Tolerance, all taxa	Abundance weighted average of each taxon using MN derived tolerance values.	increase	none	slope = 0.375 constant = 6.046	-0.58	1.04
Very intolerant Taxa Richness	Richness	MN Tolerance <=2	Taxa richness of macroinvertebrates with tolerance values less than or equal to 2, using MN TVs	decrease	none	none	3	0.00
Trichoptera Taxa %	Relative Richness	Trichoptera Taxa	Relative richness of countable trichoptera taxa	Decrease	none	none	23.74	6.27
Percent (%) Very Tolerant	Relative Abundance	MN Tolerance >=8	Relative abundance (%) of macroinvertebrate individuals in subsample with tolerance values equal to or greater than 8, using MN TVs.	increase	none	slope = 4.239 constant = 7.249	-10.28	35.77