# The Condition of Rivers and Streams in Minnesota

Based on Probabilistic Surveys, 1995-2011

Minnesota Pollution Control Agency

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# Executive summary

Environmental monitoring is essential for investigating the quality, quantity, and overall health of Minnesota's aquatic resources. The Minnesota Pollution Control Agency's (MPCA) biological monitoring program implements a comprehensive monitoring approach on rivers and streams that includes measures of the fish and aquatic macroinvertebrate communities, water chemistry, and in-stream habitat. Since 1996 the MPCA has employed these measures in probabilistic surveys that enable researchers to monitor a relatively few number of sites to characterize the condition of rivers and streams throughout the entire state of Minnesota. From 1996-2005, and again in 2010-2011, the MPCA conducted two extensive statewide probabilistic stream surveys. The data from these two surveys provide valuable insight on current stream and river conditions and on the in-stream and watershed level environmental variables that influence aquatic communities (i.e. fish and macroinvertebrates). To investigate regional patterns we divided the state into three geographic regions (Omernik's level II ecoregions); a northern ecoregion known as the Mixed Wood Shield; a central ecoregion known as the Mixed Wood Plains; and a southern ecoregion called the Temperate Prairies. Each ecoregion is distinct from one another due to differences in soils, vegetation, topography and land use. The regional subpopulations allowed us to take a closer look at how each ecoregion compares to each other and to the state as a whole. The survey design also allowed for a direct comparison of the biological data with other watershed and site level variables. Therefore a secondary objective was to evaluate how the chemical and physical properties of the stream and its watershed influence biological conditions.

The most recent survey results from 2010-2011 indicate that the condition of Minnesota's rivers and streams range widely from very good to poor in a north and east to a south and west pattern consistent with the three ecoregions. One of the most pronounced ecoregional differences is the amount of land in each watershed that is devoted to agricultural land use practices. The fertile soils and gentle topography of the Temperate Prairies and Mixed Wood Plains ecoregions of Minnesota are well suited for agriculture, making this form of land use by far the most prevalent of any land use type. Consequently, over 80% of a typical watershed in the Temperate Prairies and 50% of a typical watershed in the Mixed Wood Plains ecoregion are used for some form of agriculture. In contrast, other forms of watershed disturbance such as urbanization and mining comprise a much smaller amount of the overall watershed area throughout the state.

One of the most direct and seemingly consequential aspects of modern agricultural land use is the need for efficient overland drainage. Stream channelization to promote drainage is conducted for many reasons, including facilitating urban development, but the overwhelming dominance of agricultural land use throughout the watersheds of the Temperate Prairies and Mixed Wood Plains ecoregions means that streams in these regions are often disproportionately impacted by drainage practices. Statewide, the 2010 survey indicated that relatively high percentages (44%) of streams in Minnesota have been altered to promote drainage with fewer (17%) channelized streams in the Mixed Wood Shield ecoregion and higher percentages (65%) in the Temperate Prairies ecoregion. Stream channelization, while benefiting agriculture, directly compromises habitat by altering the sinuosity, riffle/run/pool sequences, substrate composition, and many other components of stream habitat. These direct physical changes to the stream combined with the watershed wide hydrologic changes that occur with drainage can impact habitat for aquatic macroinvertebrates and fish. The Minnesota Stream Habitat Assessment (MSHA), a habitat rating system used by the MPCA to gage habitat quality for fish and macroinvertebrates, was used to assign ratings of Good, Fair, and Poor for all sampled streams. The most recent survey indicated that approximately 30% of streams in the state have poor habitat and that the percentages are dramatically different by ecoregion with 6% of the streams in the Mixed Wood Shield having poor habitat and over 50% of streams in the Temperate Prairies having poor habitat. Nutrient concentrations in Minnesota streams mirror the results of the physical habitat percentages. Nitrogen ($NO_2+NO_3$)

concentrations are estimated to never exceed the proposed draft standards in the Mixed Wood Shield but are estimated to exceed the draft standards in about half (49%) of the streams in the Temperate Prairies ecoregion. Similarly, about 8% of the streams exceed the draft phosphorus standards in the Mixed Wood Shield ecoregion compared to 46% in the Temperate Prairies ecoregion.

The physical and chemical differences in stream quality also appear to influence the composition of aquatic communities that reside in Minnesota streams. Statewide, fish communities are estimated to be in good condition in 50% of stream miles while macroinvertebrate communities' fare slightly worse with only 41.5% of these communities in good condition. Fish communities that are in good condition range from 66% of streams in the Mixed Wood Shield to 37% in the Temperate Prairies ecoregion while macroinvertebrate communities that are in good condition range from 52% in the Mixed Wood Shield to 30% in the Temperate Prairies ecoregion.

Differences in stream condition between the first statewide survey conducted during a 10 year span from 1996 -2005 and the second survey statewide survey in 2010 – 2011 were difficult to detect. The designs of these surveys were similar in that they both used the probabilistic site selection process, but they differed both in time span and the spatial intensity of the sampling effort. Overall the results were noticeably mixed. The only habitat parameter that was consistently different between the surveys was the amount of bank erosion, which decreased significantly statewide and in all ecoregions. Associated with the reductions in bank erosion was a corresponding decrease in Total Suspended Solids (TSS) statewide and in both the Mixed Wood Shield and Temperate Prairies ecoregions. In terms of the aquatic communities, fish community parameters were similar to slightly improving between surveys, but many macroinvertebrate community attributes indicated a decline in condition including the number of Ephemeroptera Plecoptera and Trichoptera (EPT) taxa, number of intolerant and tolerant taxa, and the overall taxa count. A third probabilistic survey that will be conducted in 2015 will enable us to determine if the changes noted between these two surveys are an artifact of the survey design differences, a temporary shift, or are in fact a longer term trend.

The probability of a monitoring location obtaining a passing index of biotic integrity (IBI) score varies by ecoregion, and is therefore inextricably linked to prevailing land use patterns that impact the biology through direct (e.g. channelization) or indirect mechanisms (e.g. agricultural and urban runoff) that alter the physical and chemical composition of streams. In general the probability of meeting biological community expectations increases from southwest to northeast Minnesota, corresponding to the ecoregion and land uses patterns. The conditional probability results initially show that small percentages of agricultural development within a watershed lead to relatively large decreases in the probability of meeting biological expectations, before leveling off. Then at approximately 80% agricultural land use a second inflection point occurs where once again the likelihood that a river or stream will meet biological expectations is dramatically reduced. Impervious surfaces show a more dramatic decrease in biological expectations, than agriculture, even at very low levels (less than 3%). Strong negative relationships were also observed between the biology and some chemistry variables including phosphorus, TSS, conductivity. Strong relationships between the biology and Dissolved Oxygen (DO) were observed at both high and low concentrations. The probability of obtaining a good fish or macroinvertebrates IBI score decreased with both low and high concentrations of DO, suggesting that the range of DO is also an important indicator of biological health. Habitat condition as indicated by the MSHA score was positively correlated with fish and macroinvertebrate IBI scores. Among the habitat variables tested, substrate composition (i.e. the presence of coarse substrate material) was the strongest predictor of biological condition.

These surveys have provided a baseline assessment of the condition of rivers and streams in Minnesota. Furthermore, the observed ecoregional differences illustrate the impacts of land use on stream health and shed light on the water quality challenges that each region faces. Ultimately, the health of the aquatic communities that reside in these systems is a product of not one factor but the interactions of

many factors, natural and anthropogenic, which act on streams by changing their physical and/or chemical composition. Describing the health of aquatic communities and how they change through time is particularly challenging because the factors that influence their condition are most often co-occurring, multifaceted, and interdependent. The MPCA will conduct a third probabilistic survey in 2015 to assess the status of the state's rivers and streams. This third survey will mimic the 2010-2011 survey in its design, allowing a better assessment of the temporal trends. Having combined these surveys give us a perspective not gained by many states other than Minnesota, and has laid the foundation for future surveys and gaining a better understanding of the complex relationship between our water resources and the factors that influence their condition.

# Introduction

Environmental monitoring is essential in investigating the quality, quantity, and overall health of environmental resources such as rivers and streams. In Minnesota, the Minnesota Pollution Control Agency (MPCA) has performed biological monitoring including the collection of data on fish, aquatic macroinvertebrates, water chemistry, and habitat characteristics for over 20 years. These data are used in concert with data collected by other entities to help characterize conditions found throughout the state, and provide information on the possible stressors that impact the quality of Minnesota's waters. The objective of this report is to compare the differences between two biological monitoring datasets collected by the MPCA. The first set was collected by major drainage basin from 1996-2005 and the second set by major ecoregion from 2010-2011. Both sets of data utilized a probabilistic survey methodology to select sampling locations throughout the state of Minnesota. This type of survey can be used to extrapolate conditions to areas that have not been sampled. Probabilistic surveys are vital to make population estimates for large geographical areas, because sampling every lake, stream, or wetland would require an immense amount of time and money (Larsen, 1997).

The MPCA has collected stream data since 1996 using a probabilistic survey design originally developed by the Environmental Monitoring and Assessment Program (EMAP) of the U.S. Environmental Protection Agency (EPA) for the purpose of conducting national surveys. The MPCA also developed its own sampling protocols to adequately address the unique habitats and stream conditions found in Minnesota. The initial monitoring framework called for an assessment of Minnesota's 10 major basins to be sampled and assessed one at a time complemented with targeted poor and good sites to develop a dataset to be used for statewide Index of Biological Integrity (IBI) development. Monitoring started by sampling approximately 50 EMAP sites in the St. Croix River basin in 1996 (Niemela et al., 2004). Monitoring continued until all 10 basins had been sampled by 2005 (Table 1). A total of 435 sites were sampled across the state using this basin by basin approach (Figure 1).

In 2006, the MPCA piloted a new water quality monitoring strategy in the Snake River watershed in the St. Croix basin (http://www.pca.state.mn.us/index.php/water/water-types-and-programs/surface-water/watershed-approach/index.html ); the new strategy focused on sampling all HUC 8 level watersheds in Minnesota over the course of 10 years, averaging about eight watersheds per year. The new Intensive Watershed Monitoring (IWM) strategy requires a high density of sampling for biology and conventional pollutants. To complement the IWM sampling strategy, the MPCA opted to use a framework based on Omernik ecoregion level II (Commission for Environmental Cooperation, 1997) for the 2010-2011 probabilistic survey, instead of the former basin by basin approach (Figure 1). This new framework provides an unbiased estimate of statewide condition, unbiased time trends, and a cheaper way to determine the extent of the presence of new and emerging chemicals. The level II ecoregions roughly divide the state into three regions: a northern region known as the Mixed Wood Shield (MWS); a central region known as the Mixed Wood Plains (MWP); and a southern region called the Temperate Prairies (TP). Each ecoregion has varying levels of human disturbance and encompasses different

primary land use practices, ecological structures, and geological composition (Table 2). The use of the new ecoregion-based survey began in 2010 and is scheduled to occur once every five years, with 150 sites statewide including 50 sites in each ecoregion.

This report characterizes the condition of rivers and streams in Minnesota utilizing the datasets collected from the two MPCA probabilistic surveys. The early survey conducted by the MPCA (1996 to 2005) organized by major basins was grouped into three ecoregions to provide an overall assessment for the state and for each ecoregion, comparable to the later ecoregion survey. The results from the two surveys were contrasted and compared, providing estimates of stream conditions and a preliminary indication of temporal changes for Minnesota's rivers and streams. Lastly, we examined the relationship between numerous in-stream and watershed level environmental variables and the condition of aquatic communities (i.e. fish and macroinvertebrates) in streams.

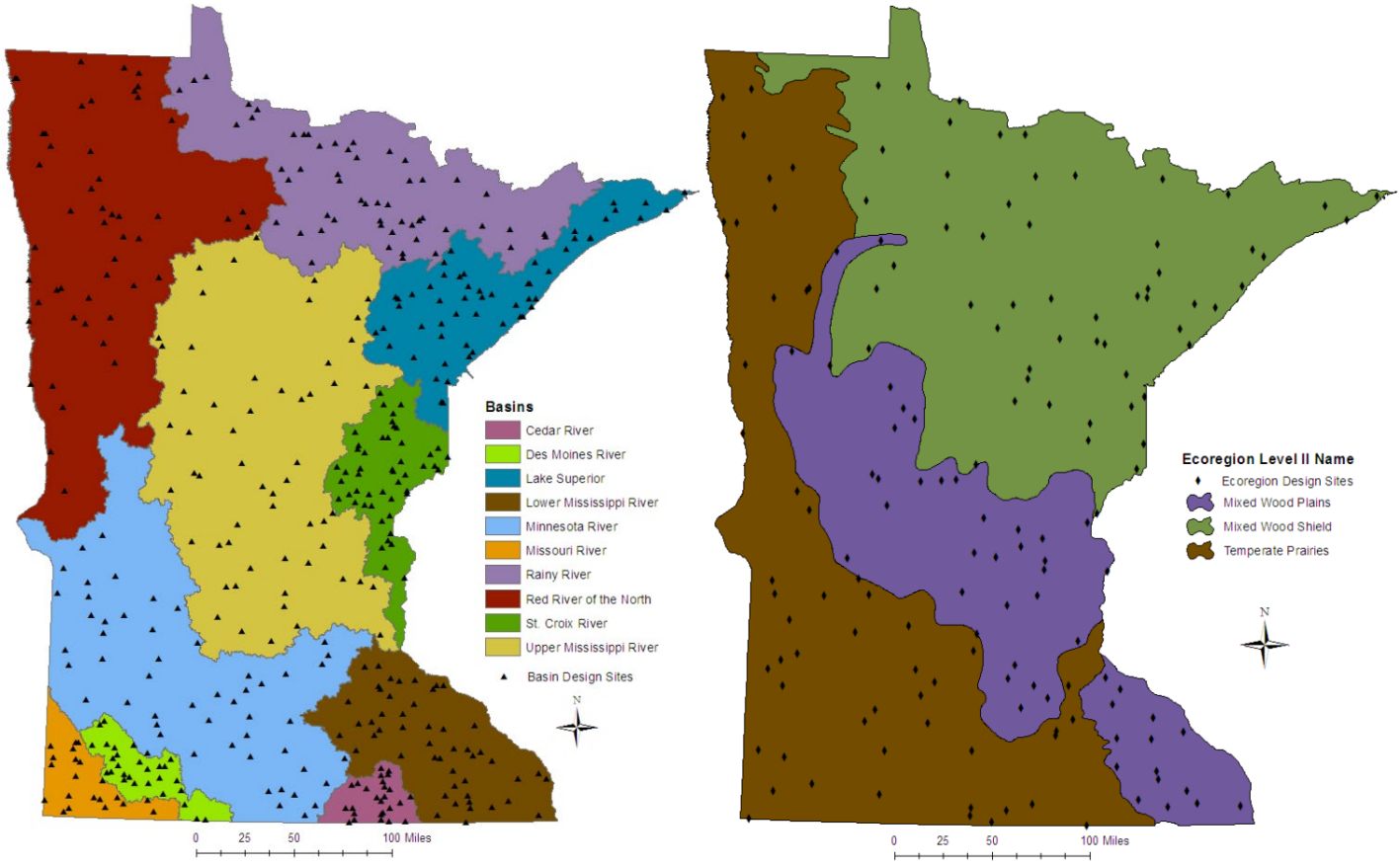



**Figure 1. Site locations for the basin (left) and ecoregion (right) surveys**

**Table 1. Basins and number of sites sampled between 1996 and 2005**

| Basin | Years sampled | # of sites sampled |
|---|---|---|
| St. Croix River | 1996,1998 | 46 |
| Lake Superior | 1997,1998 | 54 |
| Upper Mississippi River | 1999-2000 | 57 |
| Minnesota River | 2001 | 53 |
| Cedar River | 2004 | 26 |
| Des Moines River | 2004 | 27 |
| Lower Mississippi River | 2004 | 50 |
| Missouri River | 2004 | 21 |
| Rainy River | 2005 | 51 |
| Red River | 2005 | 50 |

**Table 2. Ecoregion descriptions (Commission for Environmental Cooperation, 1997)**

| Ecoregion name | Description |
|---|---|
| **Mixed Wood Shield (MWS)** | Located in northeastern Minnesota and into Canada on Precambrian bedrock of the Canadian Shield. The exposed granitic bedrock is a remnant of the last glaciations that contributed to shallow, nutrient-poor soils and plentiful lakes and wetlands. This area is not dominated by agriculture, unlike the other two regions, because of the shallow nutrient poor soils. |
| **Mixed Wood Plains (MWP)** | Located in the center of the state and most southeast corner. The area contains deciduous and conifer forests and glacial deposits sediments with varying parent materials. There are fewer wetlands than in the MWS, but contains many lakes. This region includes more urban areas and dairy farming than either of the other two regions. |
| **Temperate Prairies (TP)** | Located in the southern and western parts of the state with flat topography and varied soil textures often high in calcium carbonate. Numerous small lakes are found in the southern part of this area, as well as a few remaining prairie pothole wetlands. Land use is strongly dominated by livestock and row crops because of the rich, productive soils. |

# Methods

## Site selection

Potential site locations are selected using the National Hydrography Dataset (NHDplus) line work and a method of generalized random-tessellation stratification (GRTS) (Stevens & Olsen, 2004). The NHDplus lines are similar to a map of possible water-carrying channels such as rivers and streams. All lines in NHDplus are assigned a code that indicates channel type (e.g. natural, canal, ditch, pipeline, etc.). For these surveys, channels coded for pipelines and coastlines were excluded; all other channel types were included. Randomly selected sites are generated on the appropriate NHDplus linework using the GRTS. In order to be able to estimate conditions for an entire given area, all stream sizes need to be sampled in proportion to the frequency in which stream orders naturally occur. The GRTS allows for this stratification as well as maintaining spatial balance between generated points (Stevens, 2004). Surveys such as one done on the Mid-Atlantic Coastal Plain used the GRTS design along with calculated weights based on probabilities of a point being generated at a given location and the number of target sites to extrapolate population estimates from sampled sites (Ator et al.,2003). Similar studies in Wisconsin and Arizona have used the regional EMAP to conduct random surveys in streams to be able to assess biological, physical, and chemical conditions (Condon et al., 2007, and Miller et al., 2009).

Sites are visited sequentially off the list of generated site locations until the desired number of sampleable sites is reached. A sufficient number of overdraw sites are provided in anticipation that not all the sites on the list will prove to be sampleable. For a site to be considered sampleable it first must be "target", meaning it must be on a defined channel with water present in greater than 50% of the reach. Sites can be moved 30 meters or less in the channel to meet this sampling criterion. Commonly, sites are considered "non-target" due to discrepancies between NHDplus linework and the true channel location. Often the linework will be drawn through wetlands where there are no true stream channels or where what was once a channel has been moved.

Not all target sites are sampleable. Some common reasons why targeted sites cannot be sampled are because of landowner permission denial, the site is inaccessible, or it is unsafe to sample because of geological features such as waterfalls. Non-target and non-sampleable sites are replaced with the next available site on the potential site list until the number of sampled sites reaches the desirable sample number.

## Sampling protocol

The four components of the field work were the collection of fish and aquatic macroinvertebrate community samples, habitat observations, and water chemistry analysis. Fish were sampled using electrofishing equipment of varying sizes (backpack, stream shocker, miniboom, or boom shocker) based on stream width and depth. Macroinvertebrates were collected with a D-net using a multi-habitat collection approach. Quantitative habitat data was collected using a transect-based approach with the use of tape measures and measurement rods (Simonson et al, 1994). Further habitat information was gathered using a qualitative survey developed by the MPCA - the Minnesota Stream Habitat Assessment (MSHA) which can be found at: http://www.pca.state.mn.us/index.php/view-document.html?gid=6088 (Minnesota Pollution Control Agency, March 2007). Stream water chemistry was characterized with hand held meters following the manufacturer's recommendations for sampling and calibration. One time water chemistry grab samples were collected and lab analyzed for phosphorus, Total Suspended Solids (TSS), nitrogen (nitrite and nitrate), and total ammonia. Because water chemistry sampling is a one-time grab sample in these surveys, the data alone is not sufficient for use in performing Clean

Water Act waterbody assessments. However, when the entire dataset is evaluated and compared to the current standards/acceptable levels for each parameter, a snapshot of baseline water chemistry conditions on a broad scale (i.e. basin level and ecoregions) can be obtained. Further information and all standard operating procedures for these components can be found on the biological monitoring section of the MPCA website at: http://www.pca.state.mn.us/index.php/water/water-monitoring-and-reporting/biological-monitoring/biological-monitoring-of-water-in-minnesota.html (Minnesota Pollution Control Agency, July 2013).

The ecoregion based survey in 2010 included additional water chemistry parameters including pesticides and pharmaceuticals and personal care products to enhance understanding of the possible distribution of contaminants that are not currently monitored in the IWM framework. Pharmaceuticals and personal care products samples were processed by the Minnesota Department of Health. The agricultural herbicide and pesticide samples were collected in two ecoregions (i.e. the MWP and TP) that receive the most agricultural activity. The methods used to collect these samples can be found at http://www.mda.state.mn.us/monitoring/.

# Threshold establishment

To interpret the results of the surveys, thresholds for each of the sampling parameters were based on both existing or proposed MPCA standards and criteria. Individual water chemistry values for each parameter (found in appendices 1 and 2) should not be considered a formal assessment of any particular site. In aggregation, the results do provide an understanding of the overall condition of the entire population of rivers and streams.

## Index of biological integrity

Fish IBI (MPCA-2, 2013) and macroinvertebrate (MPCA-3, 2013) IBI scores were calculated for each site and compared to biological thresholds designed to protect aquatic life. The Minnesota IBI framework for fish and invertebrates classifies streams into 9 classes based on stream size, region, temperature and gradient (Table 2). Impairment thresholds (MPCA-1, 2013) were used to distinguish sites that support aquatic life from those that are potentially impaired for aquatic life use. In addition to the waterbody classification distinctions, tiered uses based on each stream's potential to support biological communities were used following the Tiered Aquatic Life Use (TALU) concepts described by the EPA (USEPA, 2005) which are still in development at the MPCA. In the TALU framework streams can be categorized as "modified" if they have limited habitat due to channelization. All IBI scores for sites on a channelized stream were compared to the modified threshold in Table 3; if the stream was natural the IBI scores were compared to the general thresholds.

**Table 3. Fish and invertebrate IBI thresholds, general thresholds are applied to natural streams; modified thresholds are only applied when streams are ditched or channelized**

| Group | Class | Class Name | General | Modified |
|---|---|---|---|---|
| Fish | 1 | Southern Rivers | 39 | |
| | 2 | Southern Streams | 45 | 34 |
| | 3 | Southern Headwaters | 51 | 44 |
| | 4 | Northern Rivers | 35 | |
| | 5 | Northern Streams | 50 | 34 |
| | 6 | Northern Headwaters | 40 | 25 |
| | 7 | Low Gradient Streams | 40 | 15 |
| | 10 | Southern Coldwater | 45 | |
| | 11 | Northern Coldwater | 37 | |
| Invertebrates | 1 | Northern Forest Rivers | 51 | |
| | 2 | Prairie Forest Rivers | 31 | |
| | 3 | Northern Forest Streams RR | 50 | |
| | 4 | Northern Forest Streams GP | 52 | 42 |
| | 5 | Southern Streams RR | 36 | 27 |
| | 6 | Southern Forest Streams GP | 47 | 34 |
| | 7 | Prairie Streams GP | 38 | 28 |
| | 8 | Northern Coldwater | 26 | |
| | 9 | Southern Coldwater | 46 | |

## Water chemistry

The criteria used to evaluate TSS concentrations were derived from the regional water quality criteria for TSS mg/L draft report (Markus, 2011). Similar to the methods used for phosphorus, the northern and southern draft standards were used to create the acceptable range of TSS as seen in Table 4. The north region has lower average concentrations of TSS due to the more minimal impact from human development than in the south, thus the north is used as the threshold between Good and Fair, and the southern threshold is used to define the difference between Fair and Poor.

The criteria used to evaluate nitrogen concentrations were taken from the draft Aquatic Life Water Quality Standards Technical Support Documents for Nitrate Triennial Water Quality Standard Amendments (Monson, 2011). The divisions between good and poor nitrogen concentrations are a draft cold water chronic value of 3.1 mg/L and a draft warm water value of 4.9 mg/L, both based on a four-day duration. Streams with a nitrogen concentration higher than the designated value were given a rating of Poor while concentrations lower than the designated values were classified as Good.

The criteria used to evaluate phosphorus concentrations are from the draft Minnesota Nutrient Criteria Development for Rivers (Heiskary, 2010). Values for these draft standards were developed to protect streams from eutrophication, as well as for the protection of downstream water bodies, such as lakes and larger rivers. Good, Fair, and Poor thresholds for phosphorus were derived using the draft standards (Table 3). Sites meeting the proposed standard for northern streams were considered Good and sites that did not meet the proposed standard for southern streams were considered Poor. Sites between the two proposed standards were given a Fair rating.

**Table 4. Draft values used to determine general water quality conditions (All values are mg/L)**

| | Good | Fair | Poor |
|---|---|---|---|
| TSS | <15 | 15-65 | >65 |
| Phosphorus | < 0.055 | 0.055 - 0.150 | > 0.150 |
| Nitrogen Warm Water | ≤ 4.9 | ---- | > 4.9 |
| Nitrogen Cold Water 2A | ≤ 3.1 | ---- | > 3.1 |

## Habitat

Land use percentages were calculated with Geographic Information System (GIS) land use and watershed area layers. Sinuosity and gradient were calculated using GIS and available topographic maps and areal imagery. Qualitative habitat data were collected and scored according to procedures in the Minnesota Pollution Control Agency's MSHA methods (http://www.pca.state.mn.us/index.php/view-document.html?gid=6088). Good, Fair, or Poor thresholds for the qualitative habitat assessment were developed by examining MSHA scores at three levels of disturbance. Disturbance levels were quantified using a watershed disturbance index known as the Human Disturbance Score (HDS) developed by the MPCA (Minnesota Pollution Control Agency July 19, 2013). Over 1,700 sites across the state were used to set the criteria. MSHA values above the median of least disturbed sites were considered Good, MSHA values below the median for most disturbed sites were considered Poor, and values falling in between these thresholds were considered Fair.

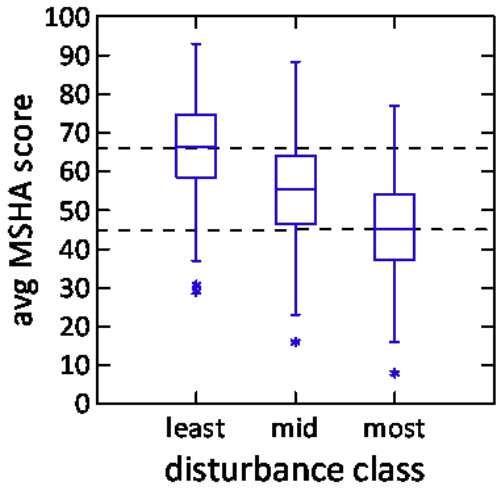



**Figure 2. Box plot of MSHA scores - Good= > 66 - Fair - < 45 = Poor**

# Statistical methods

The statistical programs "R" (R Development Core Team, 2008) and "spsurvey" (Kincaid, 2012) were used to determine the percentages of stream miles for both categorical and continuous variables. The categorical variables were summarized either as a percent or total number of stream miles (condition estimates), using pie charts to visually depict the results. Change analysis was conducted to calculate the confidence intervals and the standard deviation to then use a two tailed Z-test to test for significant difference between the categorical data. Cumulative distribution functions (CDFs) and percentile estimation were used to summarize the results of the quantitative variables. Line graphs with associated confidence limits were created to estimate conditions within the state and in each ecoregion. The various methods used can be found in Table 5.

CDFs were compared directly using the mean Eigen value corrected CDF test. This test makes use of the full range of values to test for significance differences between the CDFs. Further analyses were done to examine biological responses to chemical or physical factors, such as nutrient levels and MSHA scores. CDF tests once again were used to identify where significant differences occurred between sites that meet and did not meet their designated thresholds. Additionally, condition probability analyses (CPAs) were utilized to calculate the probability of meeting biological thresholds given a specific condition, (e.g.

the probability of attaining a passing IBI score, if the habitat score is greater than or equal to a given value). The CPA graphs in this study are depicted as line graphs with the variable of interest (i.e. habitat, water chemistry, land use, etc.) on the X-axis and the probability of meeting the IBI thresholds for fish and macroinvertebrates on the Y-axis.

**Table 5. Statistical analysis done**

| | **Data type** | **Info derived** | **Package used** |
|---|---|---|---|
| **Condition estimation** | Categorical | Estimates stream miles, total estimated percentage of stream miles, and 95% confidence intervals for all categorical data. | sp survey |
| **Change analysis** | Categorical | Calculates the confidence intervals and standard error for the condition estimates to be used to calculate p-values with a two tailed z-test | sp-survey |
| **Percentile estimation** | Quantitative | Calculates the 5, 10, 25, 50, 75, 90, and 95 percentiles. In addition to calculating the mean, variance, standard deviation, and 95% confidence limits for each variable. | sp survey |
| **CDF estimation** | Quantitative | Gives the estimated number of stream miles for everything less than or equal to variable value listed. The tabular form of the GDF graphs. | sp survey |
| **CDF graphs** | Quantitative | Depict the value of stream metrics and the percent of stream miles that include all values equal to or less than that variable, along with the 95% confidence intervals | sp survey |
| **CDF tests** | Quantitative | CDF comparisons between two sub-populations or geographic regions, based on a set parameters or indicators. Provide a Mean Eigen value and a p value to test for significant differences based on the data range. | sp survey |
| **Conditional Probability Analysis** | Quantitative | Determines the probability of meeting satisfactory IBI scores if X is equal to, greater than, or less than a given value for a given parameter | CADStat, JGR |

# Results

Due to the large number of variables studied during the survey this section depicts only a few of the variables tested. The full lists are in tables in Appendix 1 and 2. Variables that are displayed here were chosen for their ability to adequately summarize conditions.

## Condition estimations

### Site conditions

The categorical variables analyzed indicate both differences and similarities between the makeup and results of the two surveys. Graphs presenting the results are broken down to show the estimated conditions in percentages of stream miles for both the three ecoregions and as a general statewide view. Graphs such as stream order and site status illustrate the results from the EMAP site selection process itself. For example, stream order is a factor in site selection, and site status is an indication of the accuracy of the NHD linework from which the sites were selected. Thresholds described above were used for some variables to depict an estimated percentage of stream miles that either meet or do not meet the aforementioned criteria. Other graphs such as channel condition depict general estimated conditions.

Overall, 50 to 60% of original sites generated using the GRTS design were considered target sites (Figure 2). Non-target sites occur when the generated point falls on a location that is either not a stream or the stream channel does not contain sufficient amounts of water (i.e. water must be in at least 50% of the reach). In both the basin and ecoregion surveys, the top reasons for non-target sites is attributed to sites being located in wetlands, followed by sites falling in areas where no waterbody is present. In Figure 3 the TP charts depict a difference in the percentages of non-target sites between the surveys. This difference was found to be significant, but it may be due to the difference in flow regimes and or the accuracy of that region within the NHDs linework.

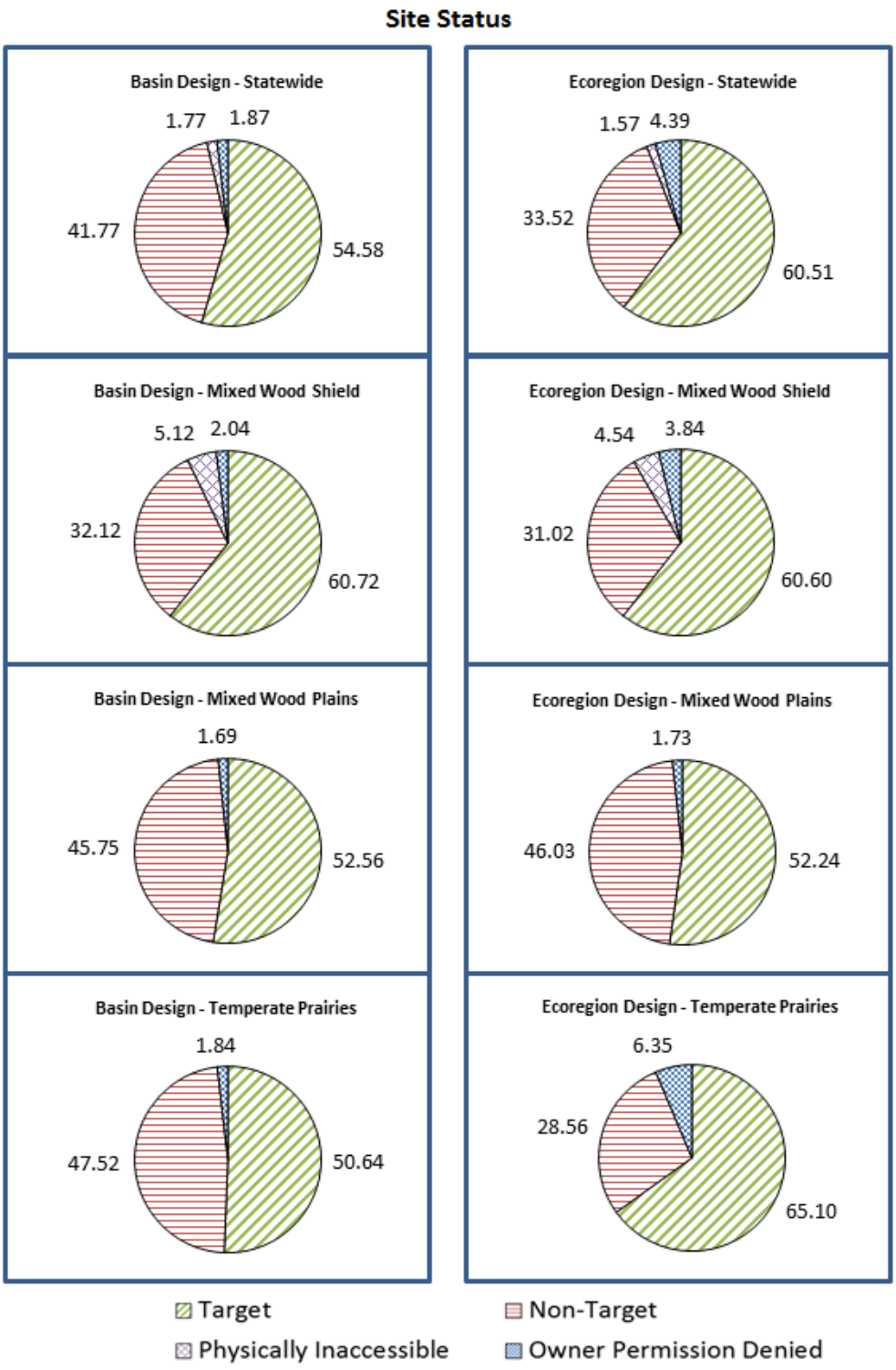



**Figure 3. Site status, estimated percent of stream miles for the basin and ecoregion**

The target sites are stratified by stream order (i.e. 1, 2, 3, and 4+), to ensure enough larger streams would be sampled. First order stream are the most plentiful in any watershed, so it is expected that all graphs in Figure 4 should show that first order streams have highest percentage of stream miles. The two surveys are very similar among both the statewide and ecoregion percentages.

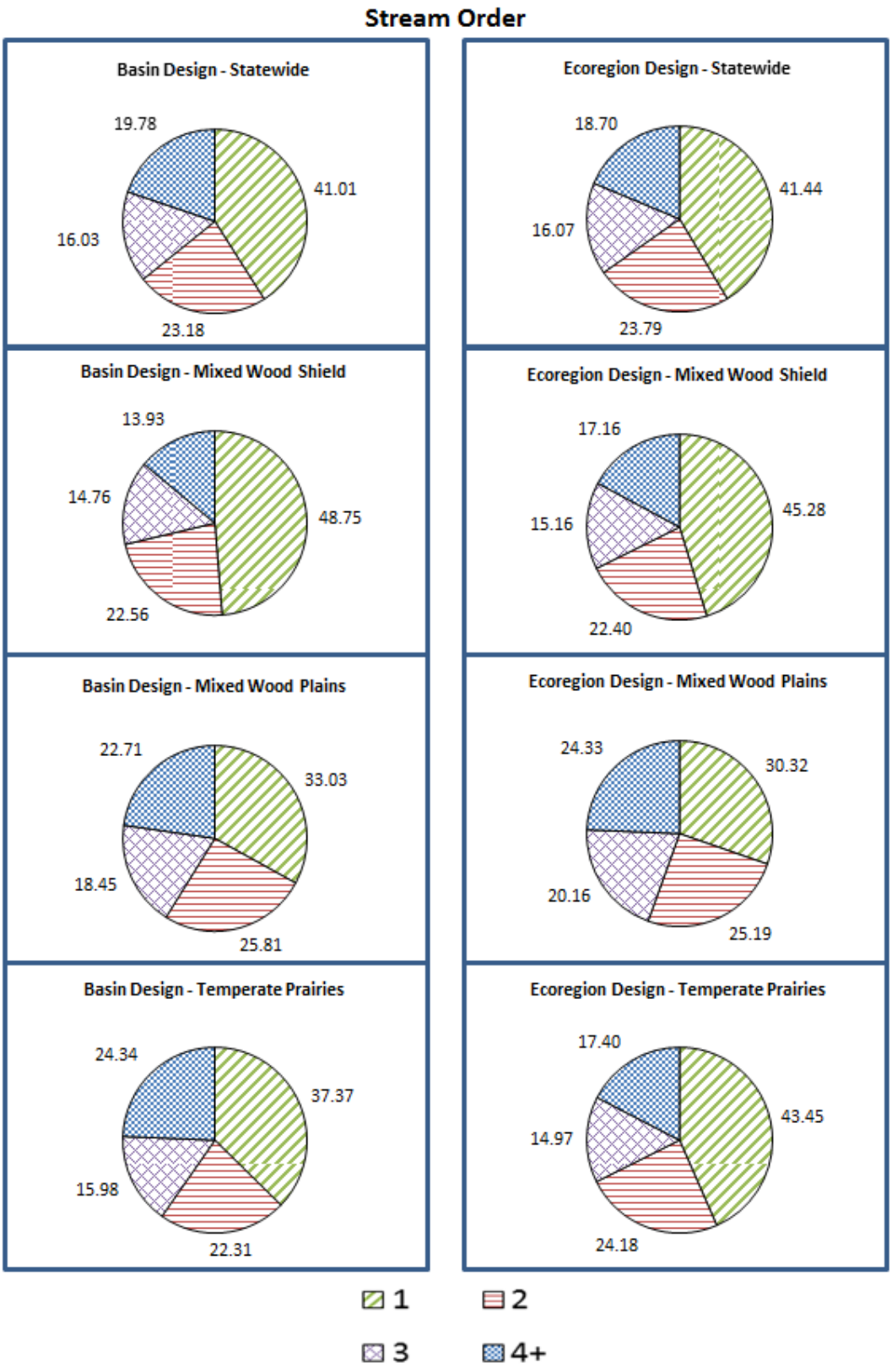



**Figure 4. Stream order, estimated percent of stream miles**

The MSHA scores summarize and integrate many stream habitat variables, such as substrate types and riparian conditions. Generally the better the habitat for fish and aquatic macroinvertebrates, the better the MSHA score. For example, sites with many substrate types and a high degree of channel morphology (riffle, run, pool), score better than sites with more homogenous features. Sites are categorized as Good, Fair, Poor, or Not Assessed (Figure 4). Sites that were not assessed were generally in large rivers where habitat data was not collected prior to 2008.

Generally speaking, habitat scores were fairly similar between time periods. Both samples indicate that about 20% of streams have good, diverse habitat, about 30% of streams have habitat that does not meet expectations, and the rest fall somewhere in between. As expected, the more northern streams in the MWS ecoregion have better habitat characteristics than the other ecoregions. The TP ecoregion has the highest percentage of poorly scoring streams, ranging from 50 to 57%. Streams in this region have finer substrates, their riparian zones are narrower, and fish cover is relatively sparse in contrast to streams in northern Minnesota. Some of the loss of habitat can be explained by the relatively high percentage of streams that have been channelized or ditched in the TP ecoregion.

Ditching is a common practice in areas where soil has a low drainage capacity, and is often used by agricultural producers to extend growing seasons. In Figure 5, this is illustrated in both surveys with ecoregions having higher agricultural land use also having higher percentages of channelized stream miles. The percentage of channelized streams in northern Minnesota is somewhat more surprising. Although agriculture is not a dominant land use in northern Minnesota, between 12 and 18% of the streams have still been channelized. A large percent of the ditching in northern Minnesota occurred around the 1900s when agriculture started to take root in this area. The efforts to drain the land were largely unsuccessful as the vast amounts of wetlands, shorter growing seasons, and thin topsoil made crop farming impractical. Recovery of these historically channelized streams has been slow as they still display the poor habitat characteristics that are indicative of their more agricultural counterparts in the south and west.

The statewide and ecoregion estimates indicate that the percentage of channelized streams is different between the two surveys. Statewide there is a about a 10% difference that was tested as significantly different using the two-tailed Z-test. The largest difference in the ecoregions occurred in the Temperate Prairies with close to a 10% rise in channelized streams leaving only 34.5% of stream channels to be considered natural within that ecoregion, this difference was not significant.

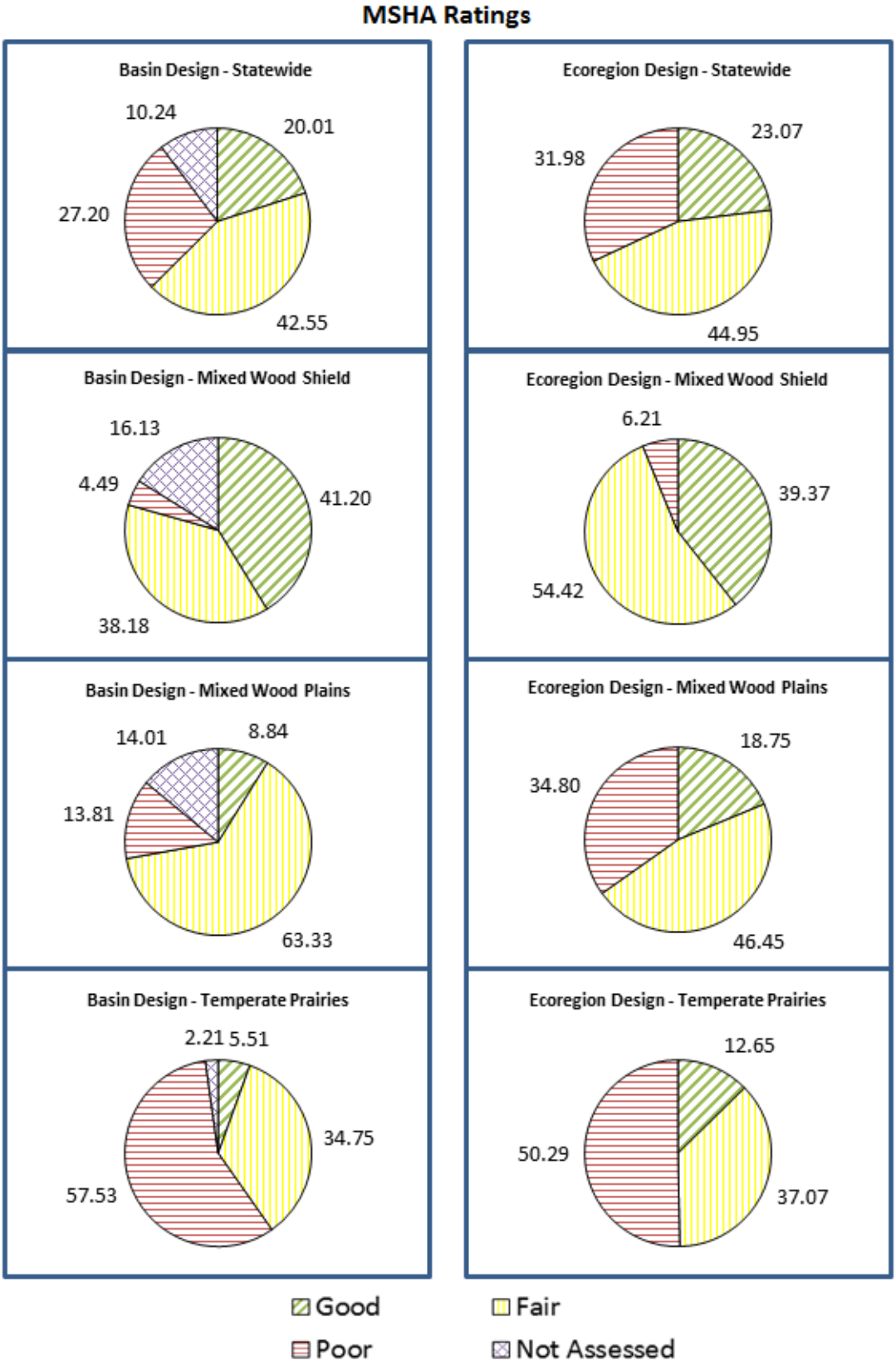



**Figure 5. MSHA, estimated percentage of stream miles**

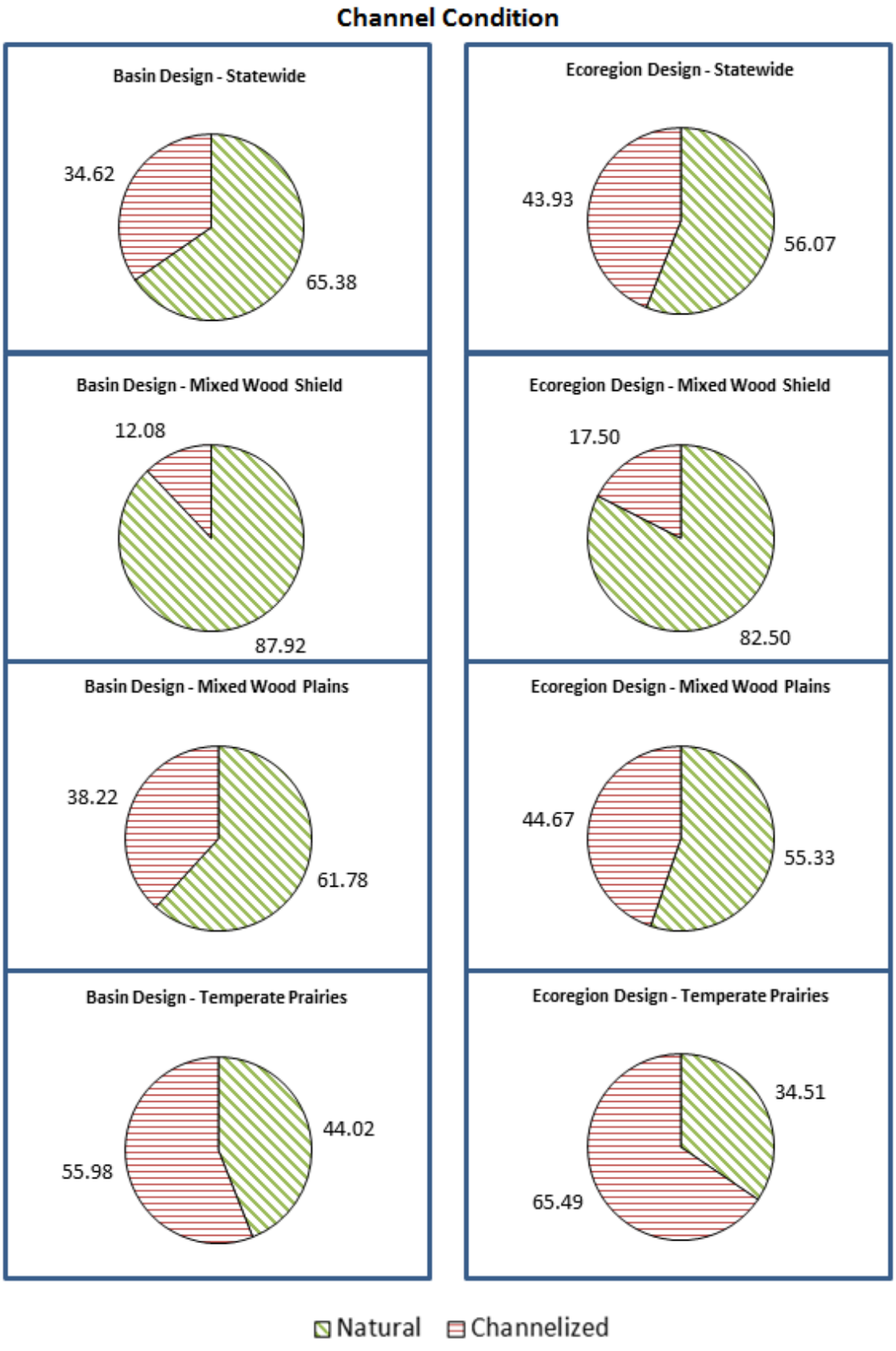



**Figure 6. Channel condition estimated percentage of stream miles**

## Water chemistry

All water chemistry samples collected during these surveys represent one-time grab samples taken during base flow conditions. Therefore, the estimates do not represent the more extreme values that may be found during high runoff events. In addition, nutrient and TSS values can be attributed to both natural geological and anthropogenic differences so it is necessary to calibrate our expectations for these parameters for different ecoregions of the state. For these parameters, the criteria used to define the thresholds for Good, Fair, and Poor were derived from an analysis of ecoregion data to ensure that the estimates take into account natural regional variation due to soil type, topography, etc.

Total suspended solids (TSS) originate from sediments being uplifted and moved within the channel, from overland flow, and from bank instability causing sloughing and mass sediment wasting. Poor TSS values were found in about 10% of streams in the MWP and TP ecoregions in the earlier basin level survey. The ecoregion survey all around had higher estimates for stream rated good. In all but the MWS these differences were significantly different (Figure 6).

Phosphorus and nitrogen levels provide an indication of the amount of nutrients that are entering into the stream system. The statewide and ecoregion patterns observed in the estimates for nitrogen and phosphorus coincide with expectations for these parameters (Figure 7, Figure 8). Nutrient values in northern streams are typically rated as Good. However, progressing southward up to nearly 50% of streams have nutrient levels that are considered Poor. The MWS chart depicts a difference in estimated conditions with higher estimates under the Fair category and few Good estimates for phosphorus. With Fair levels at 36% of the sites in the earlier survey and 54% Fair in the later survey, when tested these differences were found to be significant for both Fair and Good estimates. Overall, in the later ecoregion survey for phosphorus there are fewer streams rated as Good and more sites rated as Poor than in the earlier basin survey.

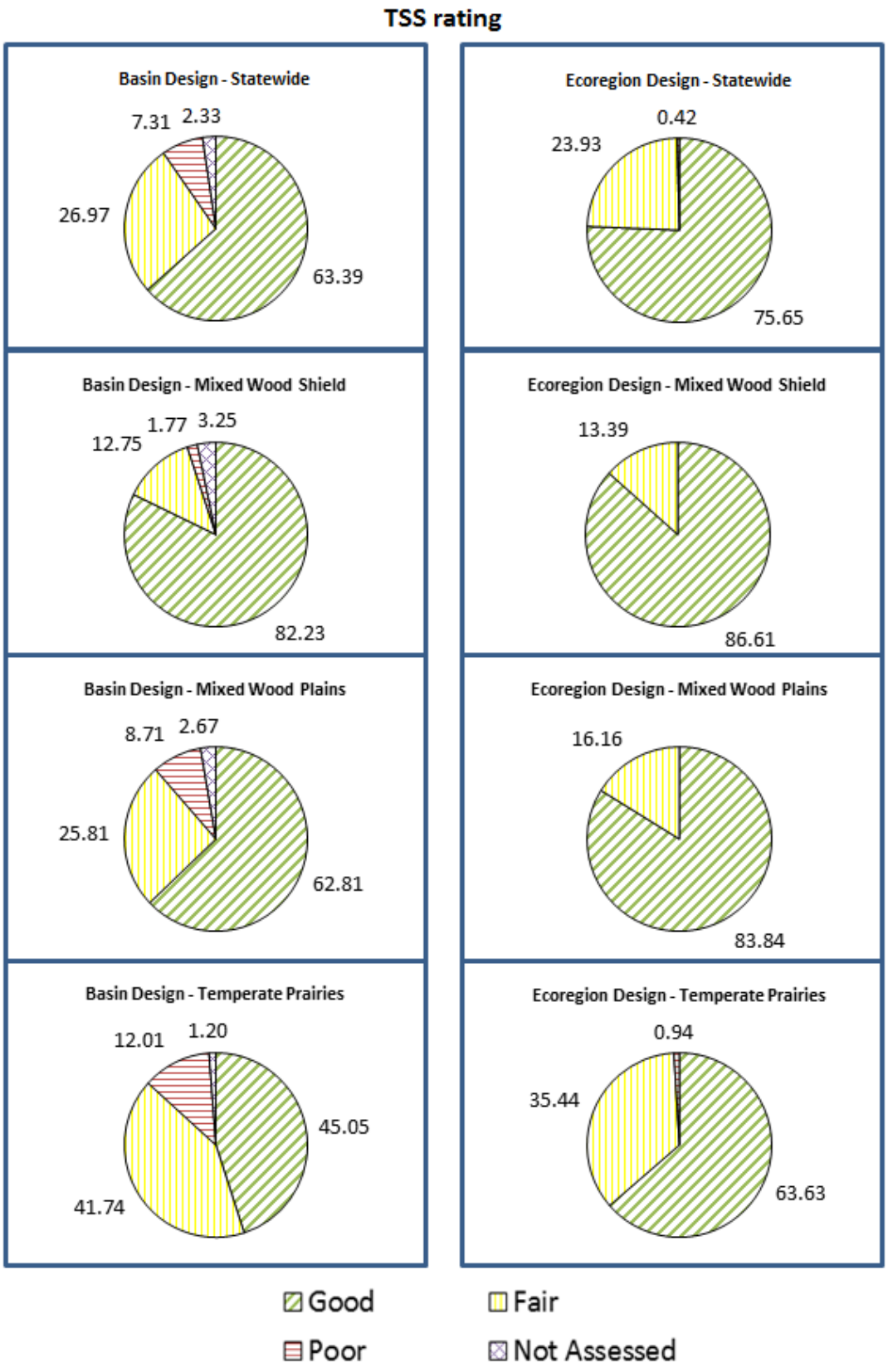



**Figure 7. Total suspended solids estimated percentage of stream miles**

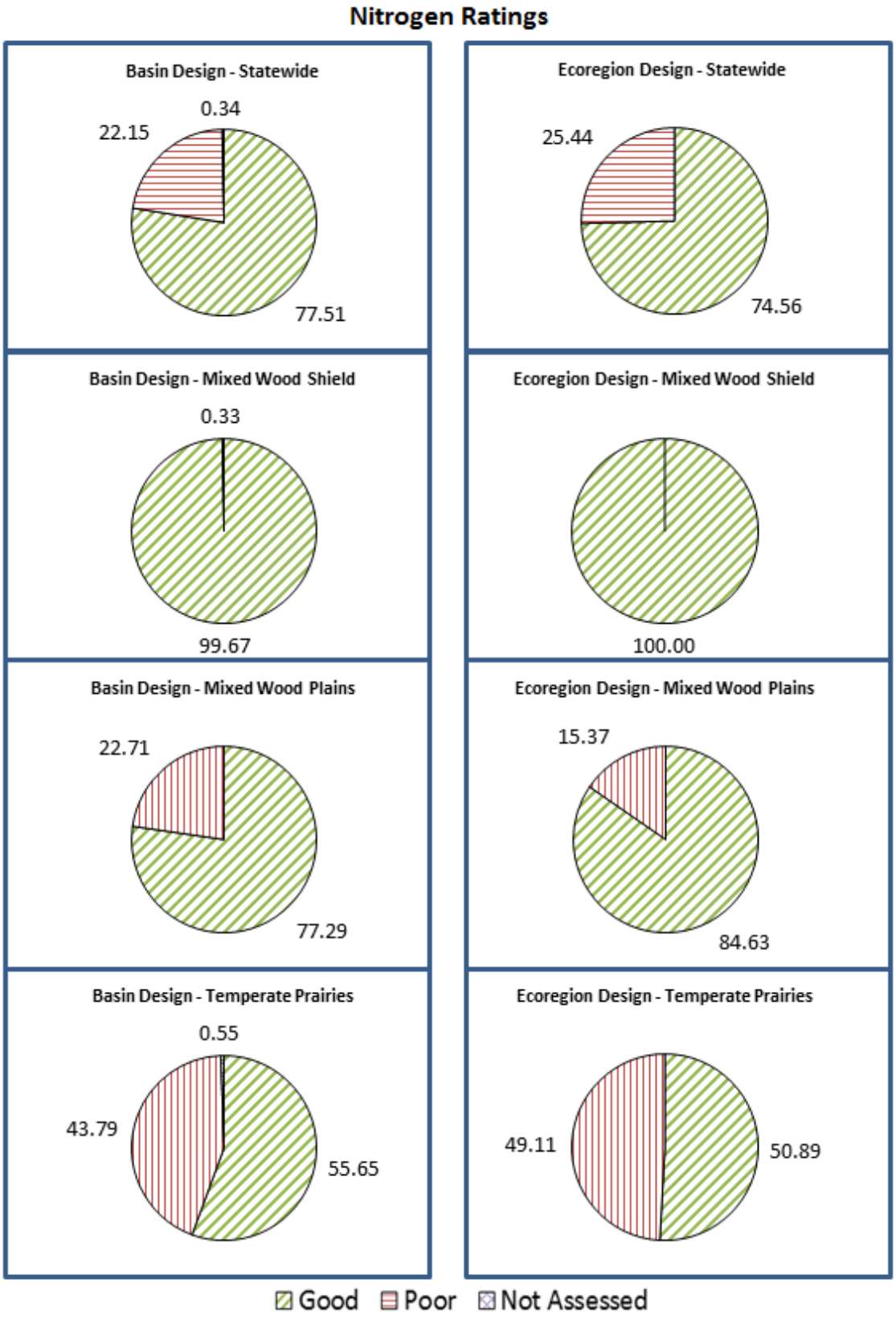



**Figure 8. Nitrogen estimated percentage of stream miles**

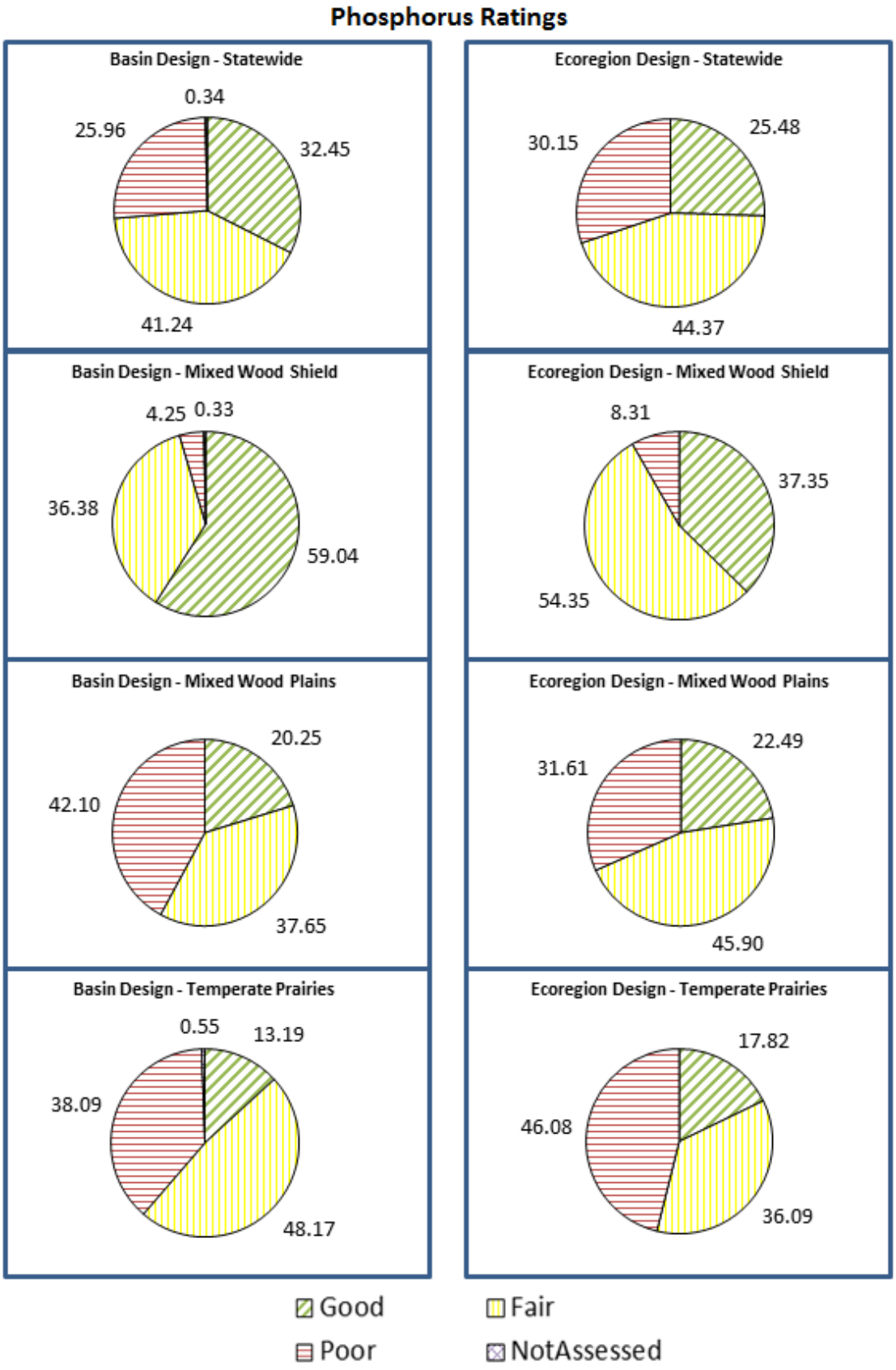



**Figure 9. Phosphorus estimated percentage of stream miles**

## Biological

The statewide estimates indicate that the fish communities meet or exceed the criteria and are considered healthy about 33 to 38% of the time (Figure 9). The percentages of stream miles with healthy fish communities were higher in the later ecoregion survey in every ecoregion and statewide. The MWS had the highest estimated miles meeting expectations with 41 to 54%. Only about 31 to 40% of streams in the MWP met or exceeded the criteria, followed by the TP with 24%. The percentage of stream miles that met macroinvertebrate expectations statewide was around 33 to 35% with decreasing percentages from north to the south (Figure 10). The percentage of statewide stream miles with healthy invertebrate communities was lower in the later ecoregion survey, with a substantial decline in healthy communities in the MWS ecoregion.

Taken together, only 20 to 25% of stream miles met both fish and macroinvertebrate expectations (Figure 11). However, a large percentage of sites could not be assessed using both biological indicators because at least one of the indicators was not sampled. In most of these cases, the macroinvertebrate information was missing because the sampling sites at the time of sampling (August-September) were either dry or stagnant. Ecoregion differences follow the same north-south pattern of better to worse that is common to most other parameters. In general, the percentages of stream miles meeting both biological expectations improved slightly statewide and substantially for the MWP and TP ecoregions between the two surveys. For the MWS ecoregion the percentage meeting expectations for both bioindicators dropped from 40% to 34%. The percentage of MWS streams not meeting expectations increased from 37% to 54%.

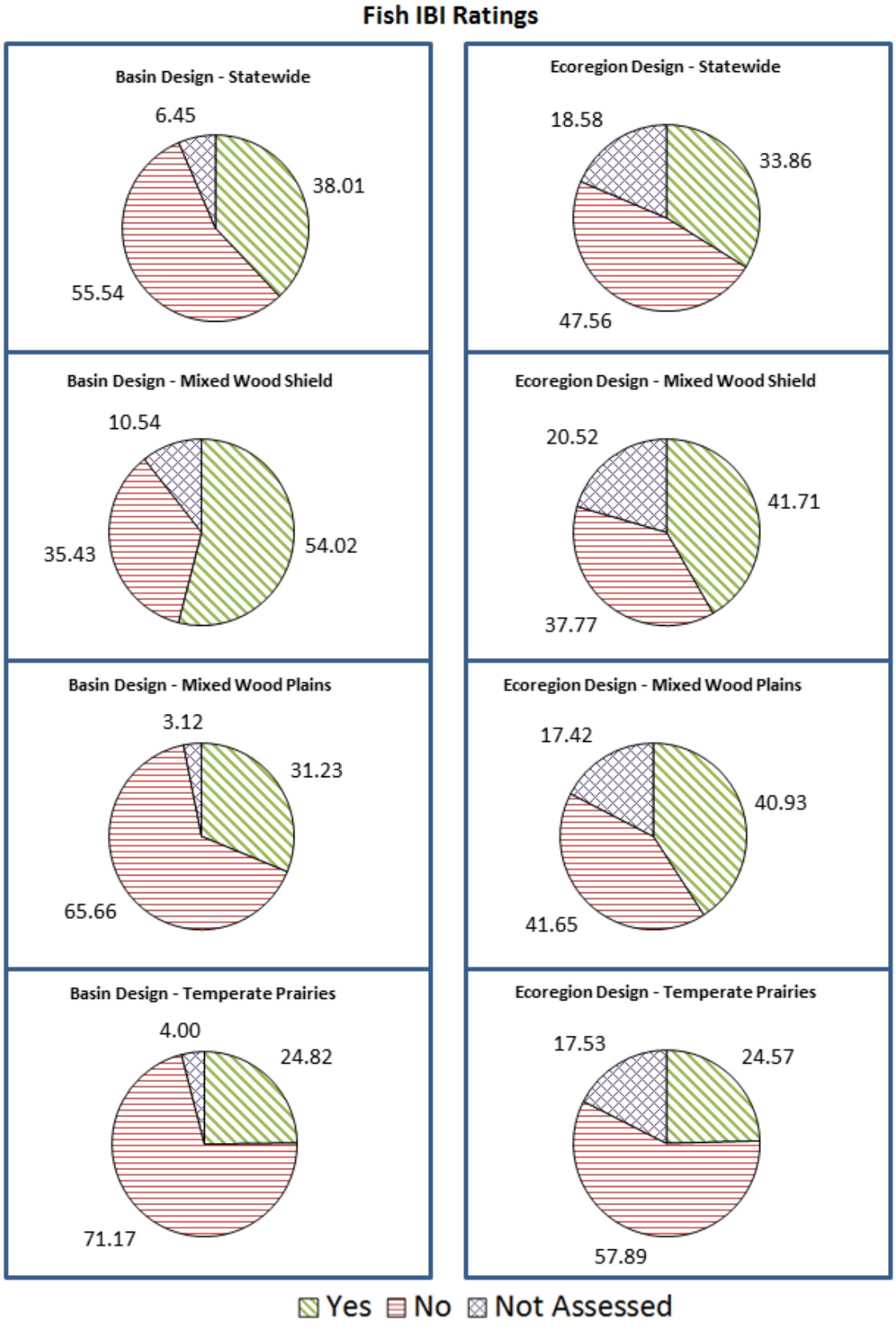



**Figure 10. Estimated percentage of stream miles that meet fish IBI thresholds**

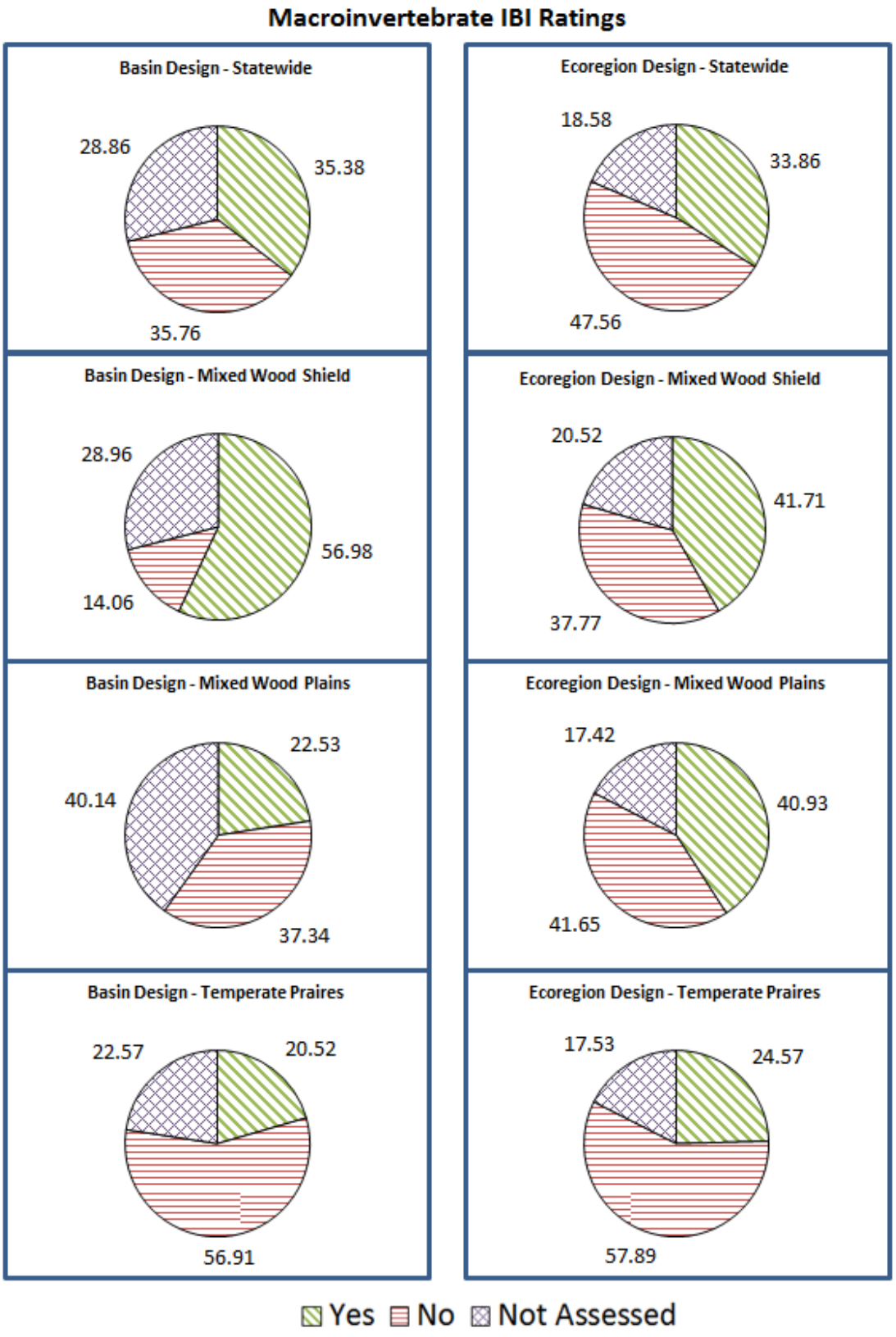



**Figure 11. Estimated percentage of stream miles that meet macroinvertebrate IBI thresholds**

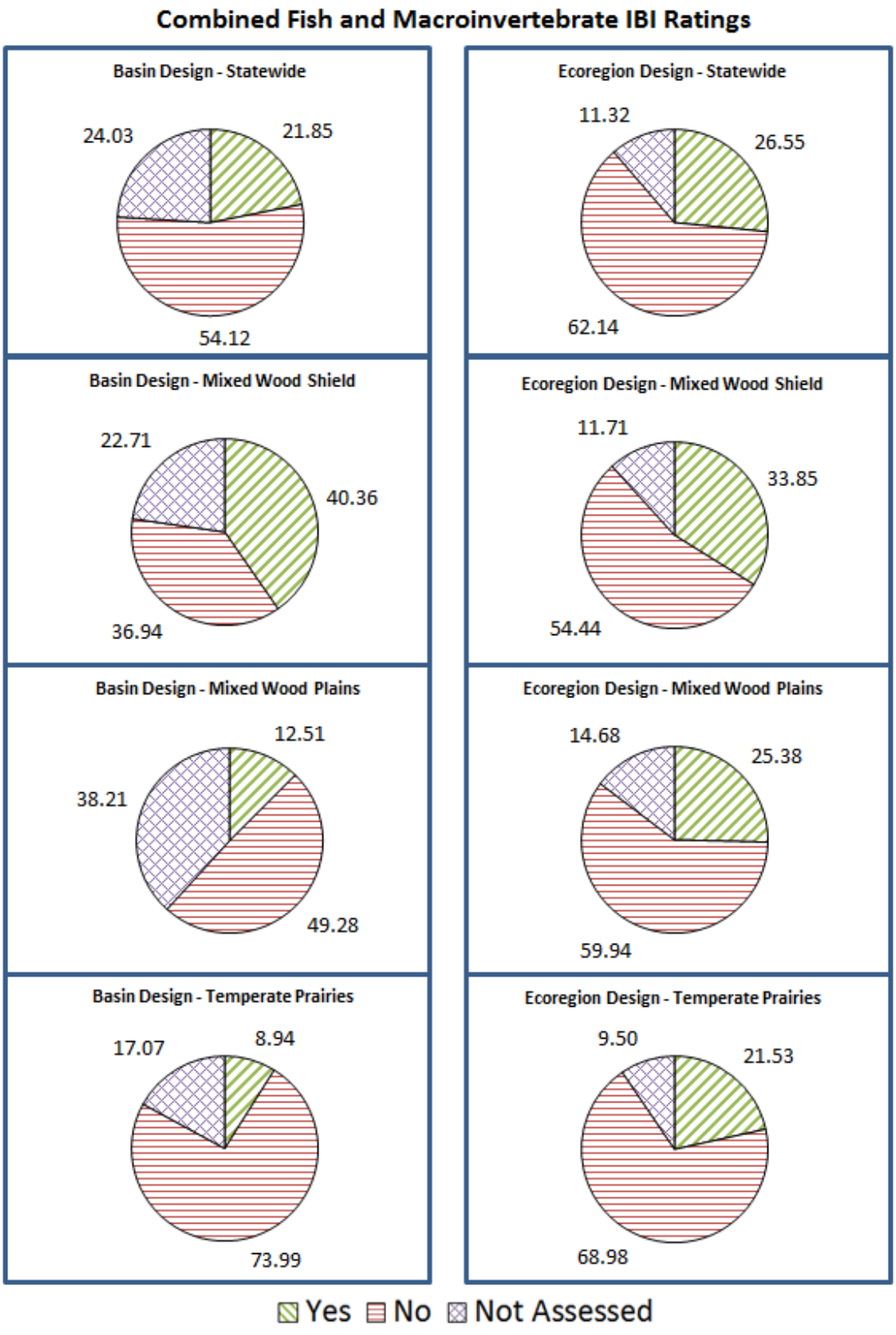



**Figure 12. Estimated percentage of stream miles that meet both fish and macroinvertebrate IBI thresholds at a single site**

# Cumulative distribution functions

Cumulative distribution functions (CDFs) describe the cumulative percentage of stream miles for the variables described below. CDFs were used to summarize the results of the quantitative variables, and to identify where significant differences occurred between sites that met and did not meet their designated thresholds. CDFs for each ecoregion are presented on the same graph to compare ecoregion variation for each parameter. Differences between CDFs are considered significant when the confidence interval lines do not overlap. Due to the larger sample sizes, the basin design graphs have smaller confidence intervals and therefore a greater ability to discern differences between ecoregions.

## Minnesota habitat assessment

MSHA scores are qualitatively assigned in the field to evaluate stream habitat conditions; as scores increase sites are thought to support more robust biological communities. The MSHA CDFs for each ecoregion indicate clear differences in habitat between each ecoregion, particularly for the MWS ecoregion which is significantly shifted to the right indicating that a greater percentage of sites have high MSHA scores (Figure 12). The habitat is considered poor if the MSHA score falls below 45. Approximately 55% of TP streams had a score below 45, while only 15% of MWP and less than 5% within the MWS did. This is comparable to the condition estimates presented in the previous section (Figure 5).

Where the MSHA score is an indicator of in-stream habitat conditions, the percent disturbance measure indicates the degree to which humans have altered the landscape within the upstream watershed of each sampling site. CDFs shifted to the right indicate that the watershed disturbance is higher. The CDF graphs indicate that watershed disturbance varies dramatically by ecoregion. As shown in Figure 13, 95% of streams in the TP have over 50% disturbance in their watershed, contrasting sharply with the MWP and MWS ecoregions at about 20% and 5% respectively. The two graphs between the surveys are similar because the land use data used to calculate percent disturbance did not change between time periods; the largest difference is in the size of the confidence intervals.

## Human disturbance score

The human disturbance score or HDS is a measure of anthropogenic impacts at the site as well as within the upstream watershed of each site. It is similar to the MSHA in that it describes riparian conditions, but it also takes it into account watershed characteristics similar to the percent disturbance score. As HDS increases, the overall conditions at the sampling site and within the watershed are also likely to increase. As shown in figure 15 the MWS has generally higher HDS with only 5% of stream miles estimated to score below 55. This percentage is much lower than either the MWP at 70% or TP with 90-95% indicating that most of the stream miles do not have an HDS above 55. Like the MSHA and percent watershed disturbance CDFs, the ecoregion HDS CDFs are significantly different from one another. These differences again show a gradient within Minnesota where conditions are best in the northeast and become more disturbed moving southwest.

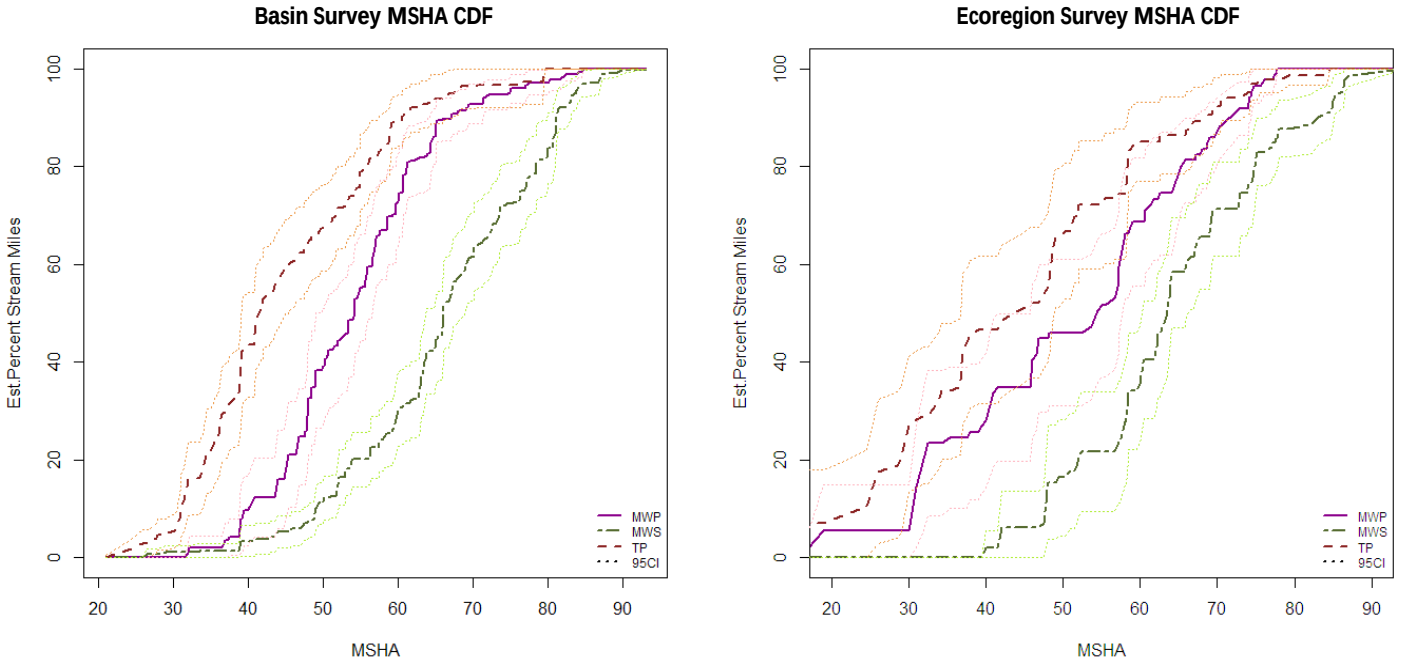



**Figure 13. MSHA score, estimated percent of stream miles with MSHA values that are equal to, or greater than a given value**

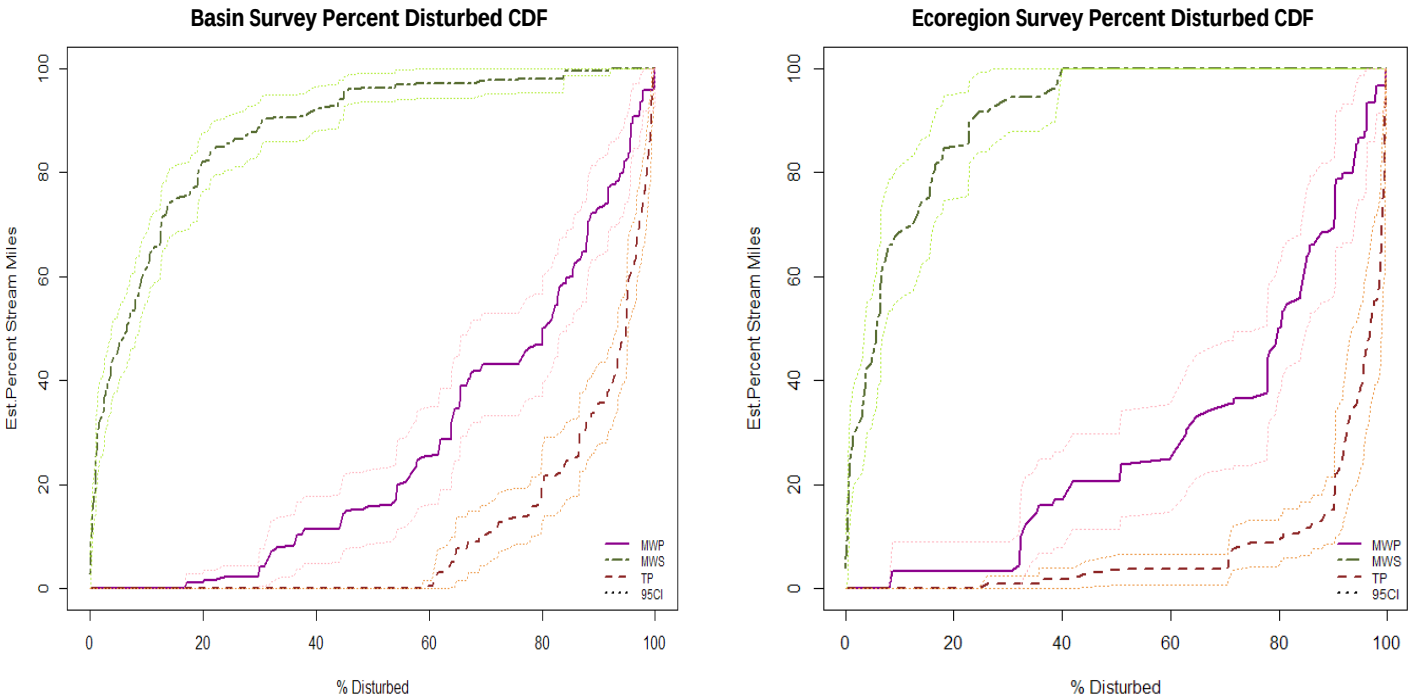



**Figure 14. Percent disturbance within site reach watershed, estimated percent of stream miles with disturbance percentage equal to, or greater than a given value**

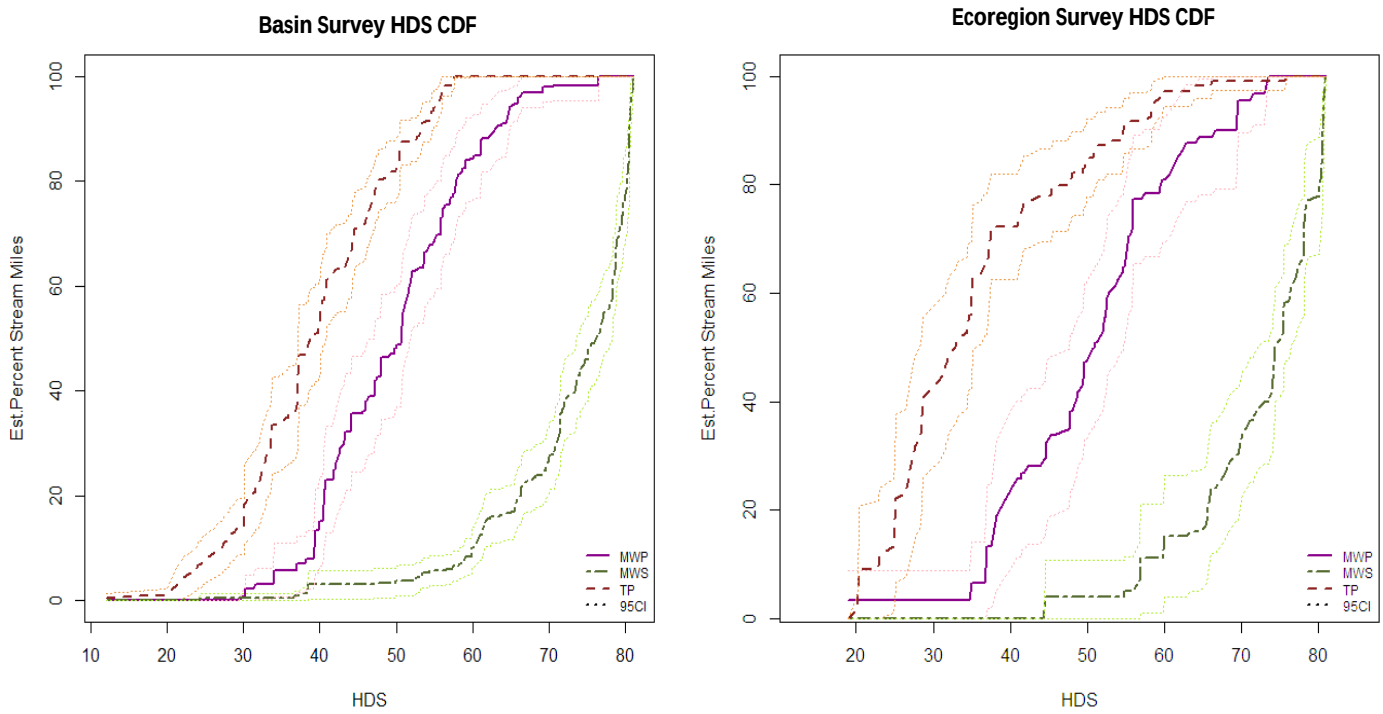


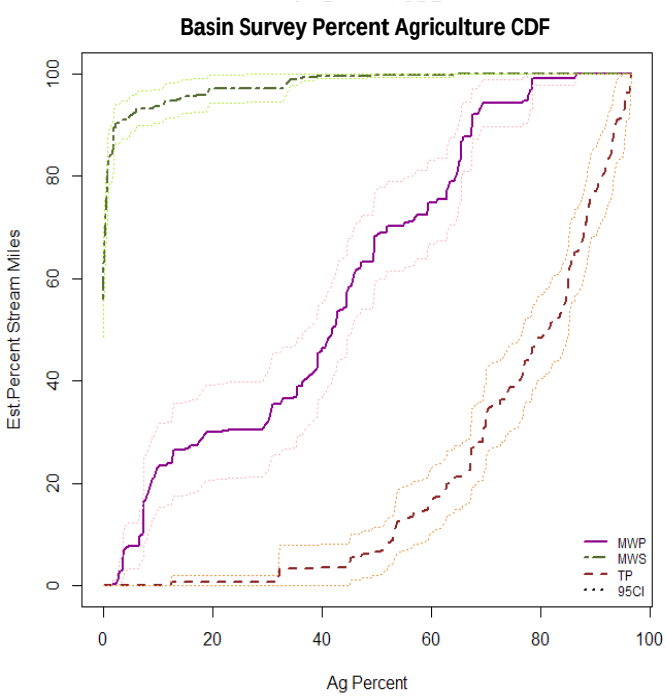

**Figure 15. Human disturbance score, estimated percent of stream miles with human disturbance values equal to, or greater than a given value**

## Watershed land use

The two main categories of watershed disturbance are agriculture and urbanization. Within these broad categories of disturbance are many potential stressors to water resources such as impervious surfaces, artificial drainage, and riparian loss.

The CDF graphs indicate that agriculture in general has much more of a widespread influence on the watersheds of the state's streams. The TP ecoregion is dominated by agricultural land use. Nearly 50% of stream miles have watersheds with over 80% agricultural land use (Figure 16). This is in contrast with the MWS ecoregion where nearly 100% of stream miles have under 50% agricultural land use in their watersheds.

Urban land use on the other hand is not predominant in any of the ecoregions as a whole, with most watersheds having less than 10% urban area. The CDFs for the MWP and TP ecoregions not only have crossing confidence intervals, the CDF lines also run close and cross one another indicating that the percentage of urban land use are similar between the two ecoregions. Urban land use in Minnesota is heavily concentrated within the Twin Cities metropolitan area. The higher percentages of urban land use in the TP and MWP ecoregions are no doubt strongly influenced by the Twin Cities as the ecoregional divide splits this large area of urbanization. In contrast, few large cities exist in the MWS with the notable exception being the Duluth area. The MWS is the only one of the three regions that appears to be siginficantly different as it has the least amount of urban land use. Similar to the disturbance percentage graphs, both surveys used the same datasource to calculate agriculture and urban land use percentages.



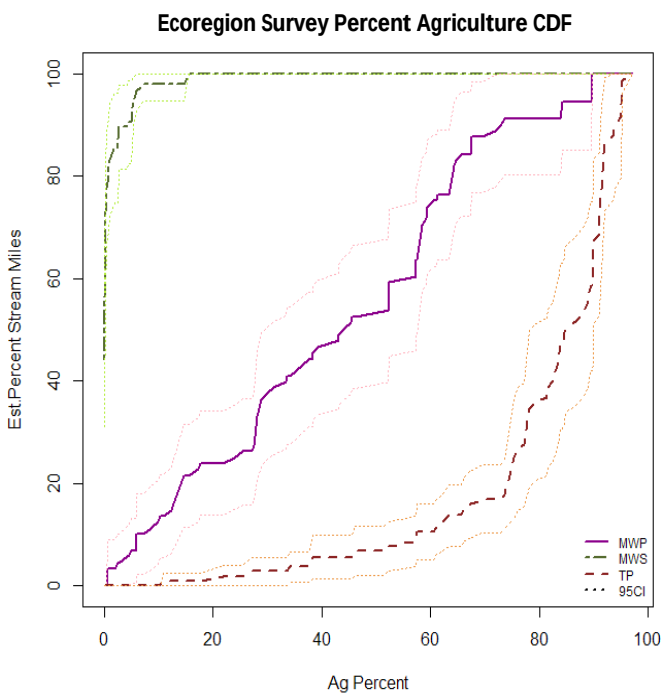
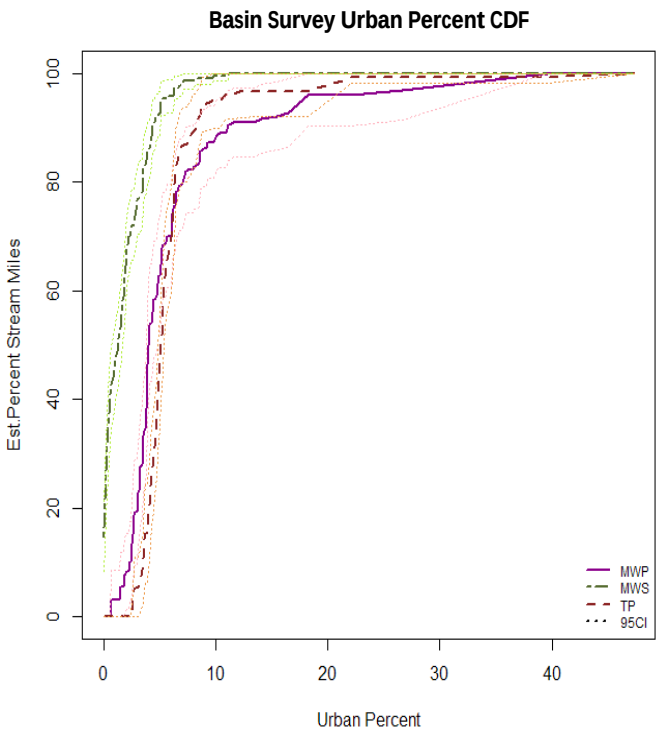




**Figure 16. Percent agriculture land use in watershed, estimated percent of stream miles with percent agriculture land use values equal to, or greater than a given value**



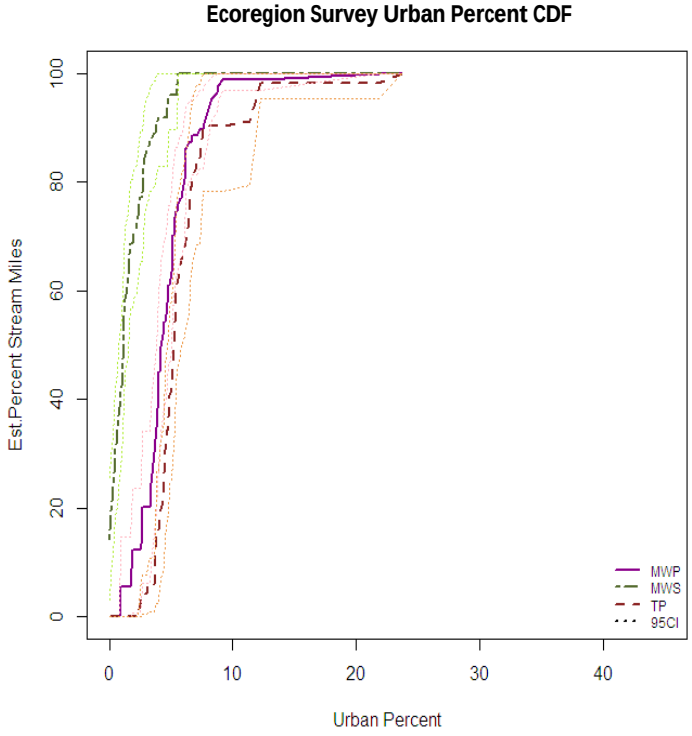




**Figure 17. Percent urban land use in watershed, estimated percent of stream miles with percent urban land use values equal to, or greater than a given value**

## Water chemistry

### Dissolved oxygen

Both low and high DO levels can be a good indicator of potential water quality problems. High DO levels can be a result of excess nutrients creating an overgrowth of vegetation. The excessive plant growth creates DO super-saturation during sunny hours of the day through the release of oxygen during photosynthesis. However, under these conditions oxygen levels can plummet once the sun sets and plants begin to respire, creating a stressful cycle of oxygen extremes for biota. Low DO levels can also be a result of decaying organic matter or high inputs of groundwater with naturally low levels of DO. Most sites studied fall between 5 and 10 mg/l (Figure 19) of DO. The three ecoregions are nearly indistinguishable from one another with similar values and overlapping confidence intervals, although there appears to be more variability in the ecoregion design with smaller sample size.

### pH

Most stream miles in both the basin and ecoregion designs have pH readings between 7 and 8. The ecoregion design indicates that streams are slightly more alkaline with greater numbers of stream miles between 7.5 and 8.5. Both designs suggest that streams in the MWS are slightly more acidic, possibly an indication of the riparian wetland complexes within the ecoregion.

### Conductivity

Natural conductivity levels in streams generally reflect the type of soils and land use in the stream's watershed. Conductivity varies among each ecoregion with the MWS having the lowest readings of the three regions and the TP having the highest average readings (Figure 19). In the TP ecoregion conductivity values rarely drop below 40 µmhos/cm and over 15% of stream miles have values over 1000µmhos/cm. In contrast, conductivity values in the MWS are often below 100µmhos/cm and are very rarely above 500100µmhos/cm.

### Nitrogen

Levels of nitrogen in the MWS are between 0 mg/l and less than 1 mg/l with a mean concentration just above the detection limit of .5mg/l. The values for the MWP have mean value between 2.3 mg/l and 2.9 mg/l. The TP region has a mean concentration of 6.5 mg/l in the basin sample and 6.6 mg/l in the ecoregion sample, the highest values of both surveys. The draft threshold for nitrogen is 4.9 mg/L. About 50 to 55% of stream miles in the TP region would be meeting this threshold, depending on which survey is used. This agrees with the condition estimates which indicate that approximately 50 to 55% of streams in the TP region would meet the draft nitrogen standard.

### Phosphorus

Phosphorus levels in the MWS are lower than in the other regions with less than 10% of stream miles estimated to have levels considered poor. In contrast, phosphorus levels are estimated to be poor in the MWP and TP regions in 30-45% of the stream miles respectively. The overlapping confidence intervals suggest that there is little to no discernible difference between the MWP and TP. There is more separation between the CDF lines for phosphorus levels in the MWP and TP in the ecoregion survey due to the smaller sample size but the confidence intervals still overlap. In contrast, the confidence intervals in for the MWS are often separated, suggesting that the MWS is significantly different than the other regions, particularly the TP.

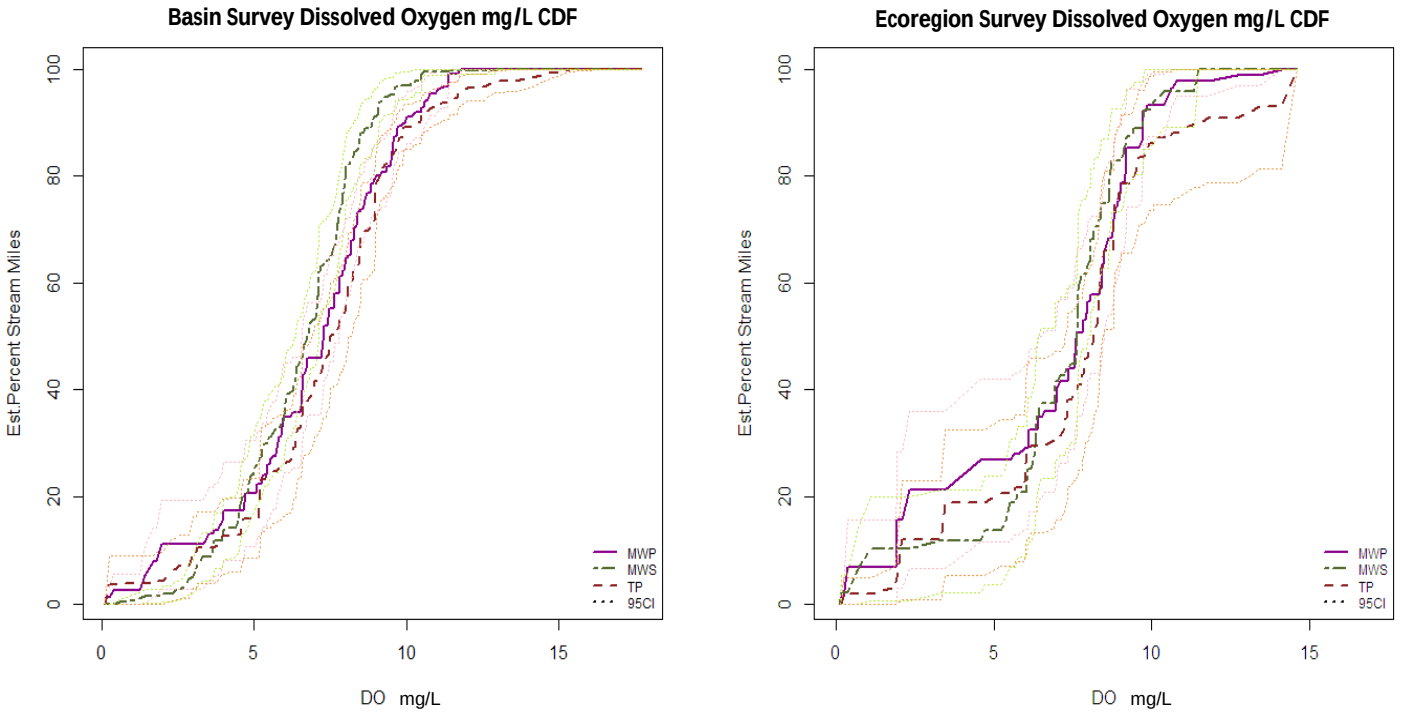



**Figure 18. Dissolved oxygen concentrations, estimated percent of stream miles with dissolved oxygen concentrations equal to, or greater than a given concentrations**

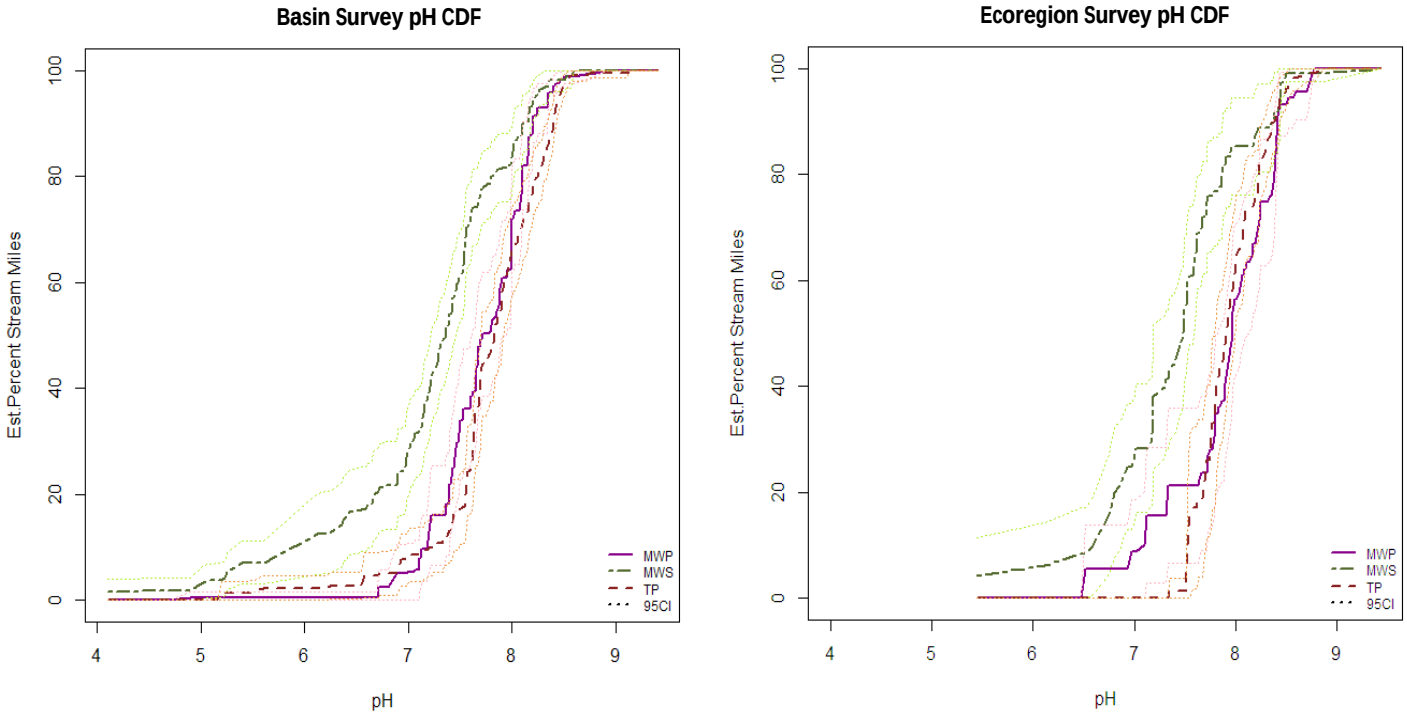



**Figure 19. pH, estimated percent of stream miles with pH values equal to, or greater than a given value**

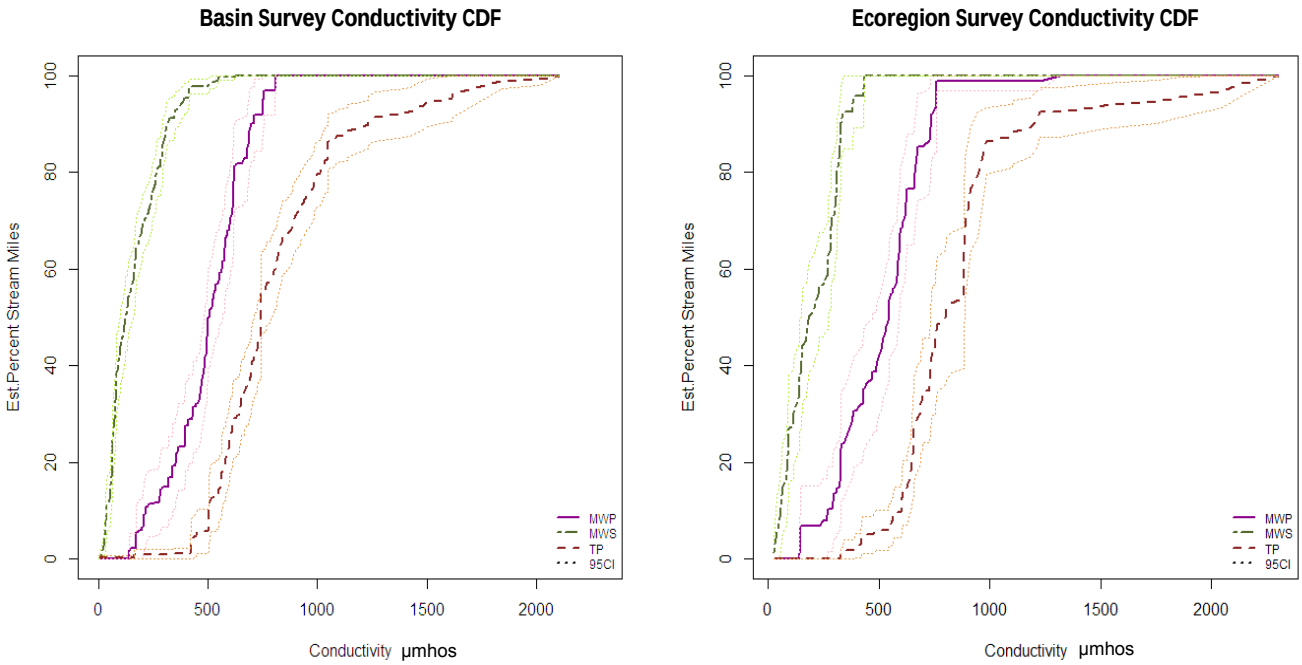



**Figure 20. Conductivity, estimated percent of stream miles with conductivity values equal to, or greater than a given value**

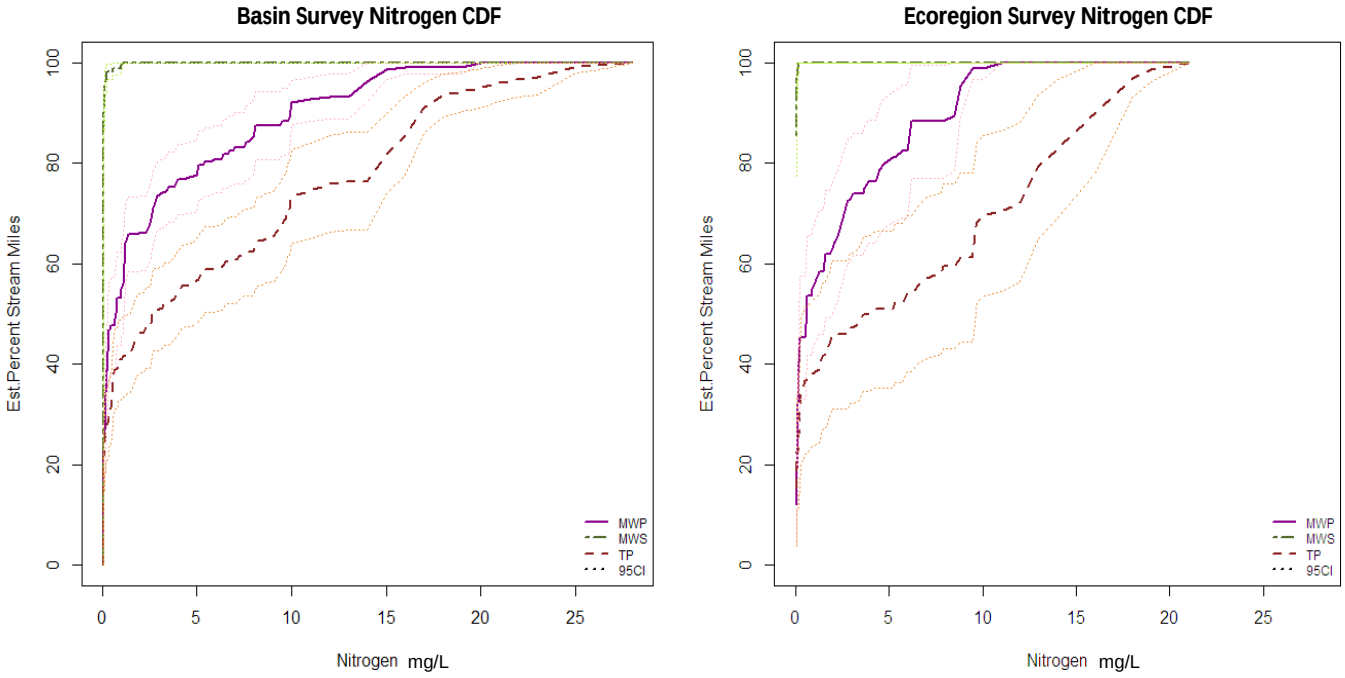



**Figure 21. Nitrogen concentrations, estimated percent of stream miles with nitrogen concentrations equal to, or greater than a given concentration**

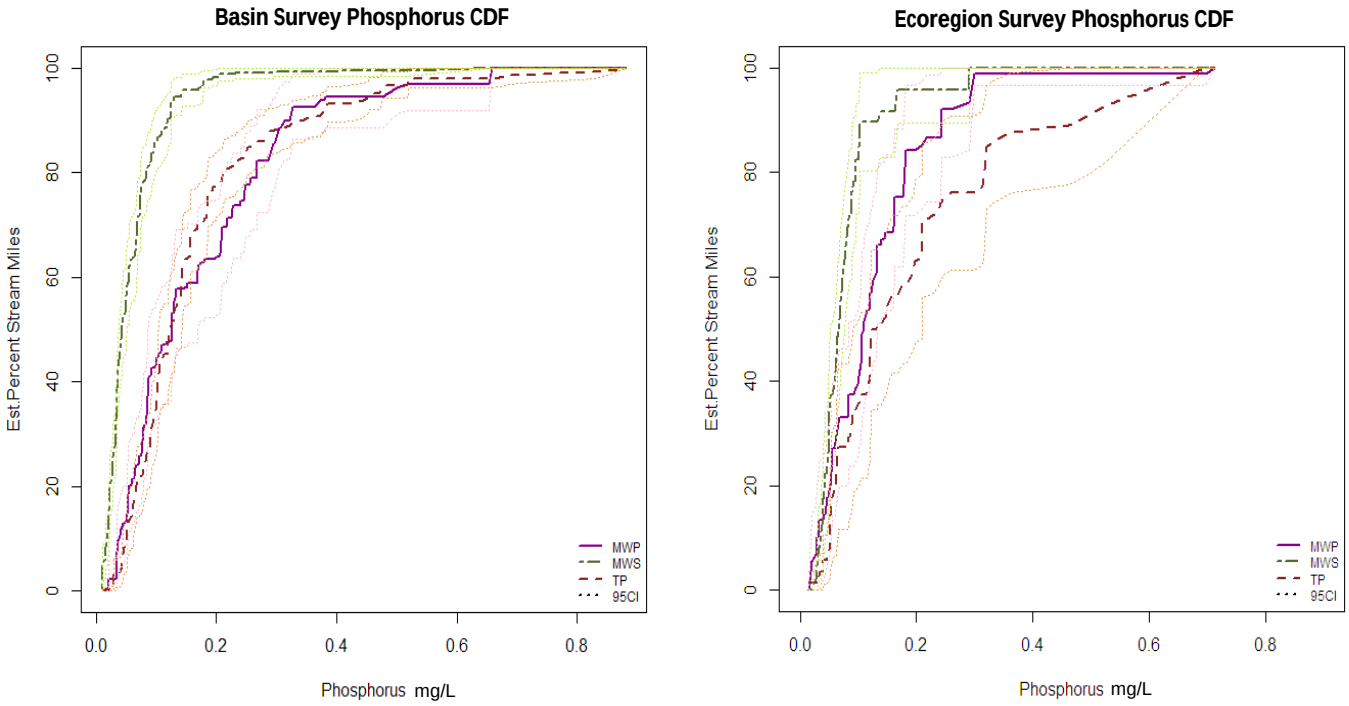



**Figure 22. Phosphorus concentrations, estimated percent of stream miles with phosphorus concentration equal to, or greater than a given concentration**

## Biological

The number of tolerant fish and macroinvertebrate species is influenced by the quality of water and habitat conditions. As conditions degrade the percentage of tolerant species will generally increase as they are better adapted to survive a range of conditions. Both basin and ecoregion results suggest that there is a greater chance of seeing tolerant fish and macroinvertebrate species in the TP ecoregion. In contrast to the IBI score, the numbers of tolerant species in the MWS and MWP ecoregions are nearly indistinguishable from one another, particularly for the macroinvertebrates.

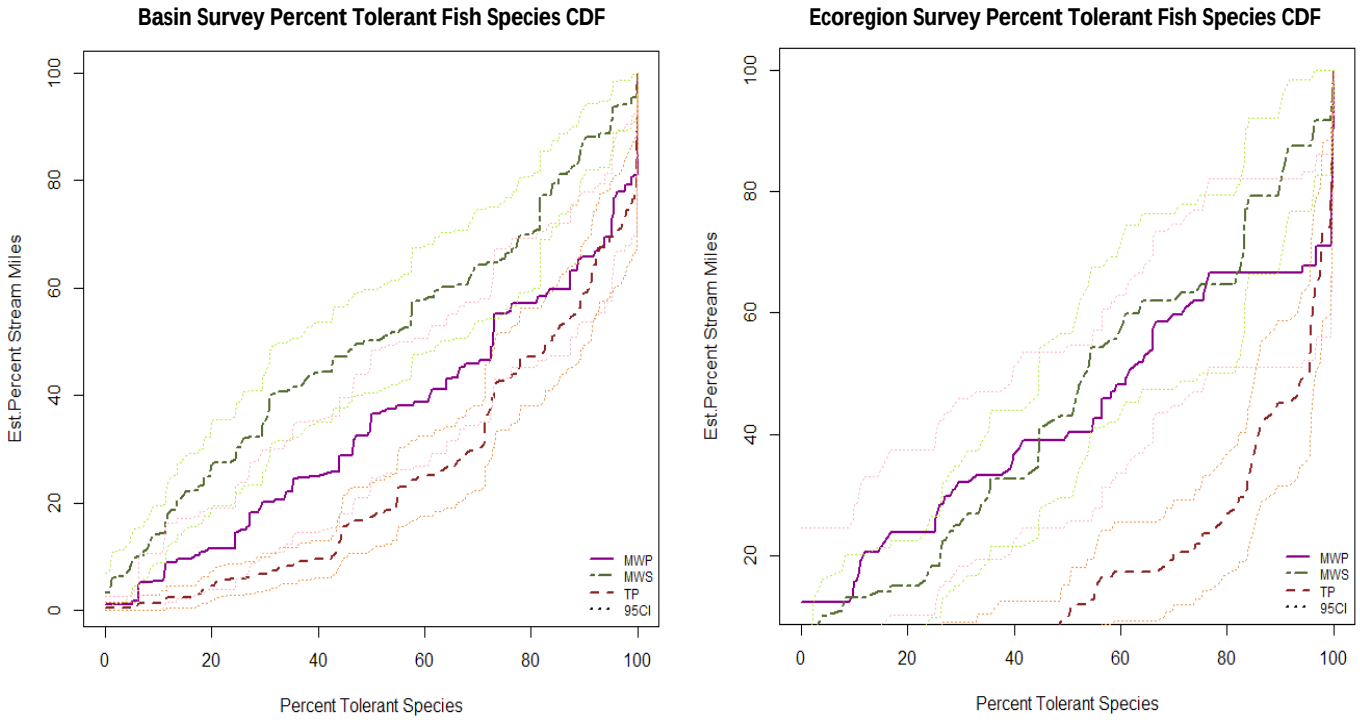



**Figure 23. Percent tolerant fish species per site, estimated percent of stream miles with percent tolerant fish values equal to, or greater than a given value**

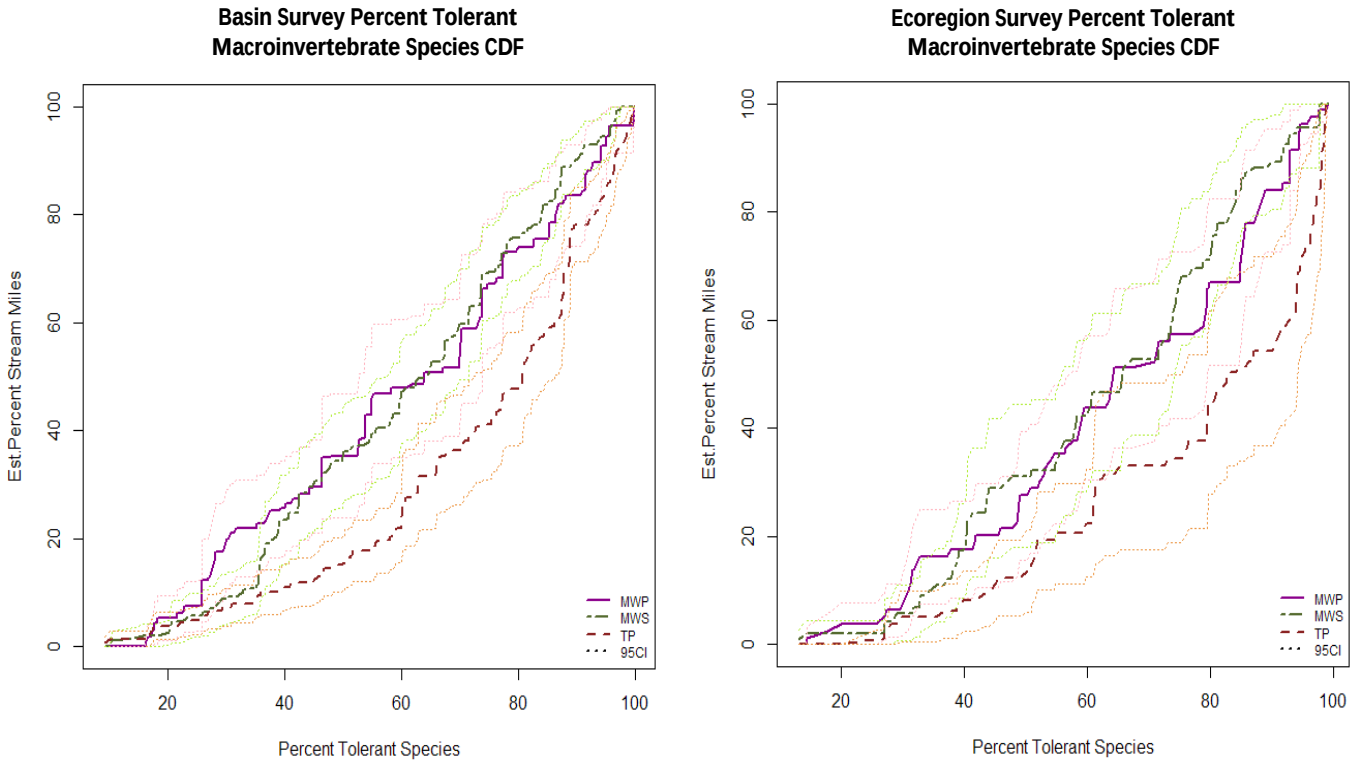



**Figure 24. Percent tolerant macroinvertebrate species per site, estimated percent of stream miles with percent tolerant macroinvertebrate values equal to, or greater than a given value**

## Cumulative distribution functions test

The mean Eigen value corrected CDF test looks for differences between the ranges of two different data sets. We calculated the differences between the basin and ecoregion survey surveys using a 99% confidence interval (Table 6).

The percent of forest in the watershed was significantly greater in the ecoregion survey than in the basin survey, However, since the land use metrics were all calculated using the same GIS layer any significant differences are caused by the variation in site selection between the designs and the weights that are assigned to each site that are used to extrapolate the results to the state wide stream population.

Only two habitat variables were found to be significantly different when looking at the larger state wide picture. Those variables were mean bank erosion and width to depth ratio. With both variables, higher mean values were calculated for the basin survey than the ecoregion survey. Of these two variables only mean bank erosion was found to be significantly different for statewide and for all three ecoregions. Width to depth was only significantly different on the statewide scale. From an ecoregion standpoint, there were more significant differences detected in the MWS ecoregion including the number of substrates types [↓] at a site, the percentage of fine sediments [↑], and the percentage of run [↑] that encompassed the stream channel. In the TP ecoregion there was significant differences between surveys for gradient and HDS. It is not likely that gradient should have changed over this time period. Rather, this result may be due to the difference in the study designs (i.e. spatial intensity, basin or ecoregion framework) and highlights the importance of maintaining a consistent sampling strategy when conducting long term monitoring.

Water chemistry data for conductivity, total ammonia, phosphorus, and TSS all had some indication of significant differences between the two surveys. Conductivity levels were higher statewide scale in the ecoregion survey. Higher levels of total ammonia were found in the ecoregion samples for the MWS, MWP and statewide estimates but there was not a significant difference in the TP ecoregion. Phosphorus levels were higher in the MWS in the ecoregion survey.

Biological differences between surveys were minimal for nearly all fish variables tested however they were prevalent amongst the macroinvertebrate variables. The “dominant two percent” fish variable was the only fish variable to test significantly different and only in the MWP. All of the macroinvertebrate variables that were significantly different suggested a decrease in the health of the community. Decreases in variables such as the taxa count, intolerant taxa, EPT taxa, and long lived taxa may have also impacted the drop in the overall macroinvertebrate IBI (M-IBI) score (Figure 10). Taxa count was the only variable that was found to be significantly different in all three regions and statewide. The MWP had the fewest significant differences between surveys in contrast to the statewide and MWS where the majority of variables were found to be significantly different between the surveys. We would expect that some of the metrics would be correlated with one another. For example, the number of intolerant taxa and tolerant taxa is linked to lower taxa numbers in general. Because there was no significant difference found in the percent tolerant taxa, it would suggest that the ratio of tolerant and intolerant taxa within samples did not change.

**Table 6. CDF test comparison of significance differences among the basin and ecoregion designs. Arrows mark where significant differences were found between surveys. An up arrow indicates that the parameter increased from the first survey to the second survey. A down arrow indicates the opposite is true. NA indicates that not enough information was available to test for significant differences**

| **Watershed Land Use Metrics** | | | | |
|---|---|---|---|---|
| | State | MWS | MWP | TP |
| Ag Percent | --- | --- | --- | --- |
| Disturbed Percent | --- | --- | --- | --- |
| Ditch Percent | ↑ | ↑ | --- | --- |
| Drainage Square Miles | --- | --- | --- | --- |
| Forest Percent | ↓ | --- | --- | --- |
| Impervious Percent | --- | --- | --- | --- |
| Range Percent | --- | --- | --- | --- |
| Urban Percent | --- | --- | --- | --- |
| Wetland Percent | --- | --- | --- | --- |
| **Habitat Characteristics Metrics** | | | | |
| | State | MWS | MWP | TP |
| Forest in 100 Meters | --- | --- | --- | --- |
| Gradient | --- | --- | --- | ↓ |
| HDS | --- | --- | --- | ↓ |
| Mean Bank Erosion | ↓ | ↓ | ↓ | ↓ |
| Mean Thalweg Depth | --- | --- | --- | --- |
| MSHA | --- | --- | --- | --- |
| # Substrate Types | --- | ↓ | --- | --- |
| Percent Ag Land use 100M Buffer | --- | --- | --- | --- |
| Percent Cover for Fish | --- | --- | --- | --- |
| Percent Disturbed in 100M | --- | --- | --- | --- |
| Percent Fine Sediments | --- | ↑ | --- | --- |
| Percent Pool | --- | --- | --- | --- |
| Percent Riffle | --- | --- | --- | --- |
| Percent Rock | --- | --- | --- | --- |
| Percent Run | --- | ↑ | --- | --- |
| Percent Woody Debris | --- | --- | --- | --- |
| Sinuosity | --- | --- | --- | --- |
| Width to Depth Ratio | ↓ | --- | --- | --- |

| Water Chemistry | | | | |
|---|---|---|---|---|
| | State | MWS | MWP | TP |
| Conductivity | ↑ | --- | --- | --- |
| DO | --- | --- | --- | --- |
| Total ammonia | ↑ | ↑ | ↑ | --- |
| Nitrogen | --- | NA | --- | --- |
| pH | --- | --- | --- | --- |
| Phosphorus | --- | ↑ | --- | --- |
| Temperature of water | --- | --- | --- | --- |
| TSS | ↓ | ↓ | --- | ↓ |
| **Fish Metrics** | | | | |
| | State | MWS | MWP | TP |
| Count of Taxa | --- | --- | --- | --- |
| Dominant Two Percent | --- | --- | ↓ | --- |
| Fish DELT Percent | --- | NA | --- | --- |
| Sensitive Taxa | --- | --- | --- | --- |
| Tolerant Individuals Percent | --- | --- | --- | --- |
| **Macroinvertebrate Metrics** | | | | |
| | State | MWS | MWP | TP |
| EPT Taxa | ↓ | ↓ | --- | --- |
| EPT Percent | --- | --- | --- | ↓ |
| Intolerant Taxa | ↓ | ↓ | --- | ↓ |
| Long Lived Taxa | ↓ | ↓ | --- | ↓ |
| Taxa Count | ↓ | ↓ | ↓ | ↓ |
| Tolerant Taxa | ↓ | ↓ | --- | --- |
| Tolerant Percent | --- | --- | --- | --- |

# Factors influencing biological condition

## Biological cumulative distribution functions test

Within each survey the data was divided between sites that meet IBI thresholds and those that do not. Then the CDF tests were applied, but this time to test if there were physical or chemical differences among streams that meet or do not meet biological thresholds. These tests were done using a 99.9% confidence interval. Variables that tested as having significant differences between meeting and not meeting IBI thresholds were placed in Table 7, along with an arrow indicating if the mean values were higher or lower for the sites that meet IBI thresholds.

In general, indicators that were found to be significant for fish and macroinvertebrate communities in the ecoregion study were also found to be significant in the basin study. However, due to the larger sample size, the basin study was more often able to identify differences among parameters that either did or did not meet biological thresholds. In general, CDF differences were most often associated with

watershed land use (forest and agricultural use), and habitat factors related to substrate and geomorphology. The CDFs for the two main indices that the MPCA uses to describe the physical characteristics of a site (MSHA score) and the anthropogenic disturbances in the watershed (HDS) were both significantly different. For both MSHA and HDS, the estimated mean percentage of stream miles was higher for sites that passed IBI thresholds than when IBI thresholds were not met. The results suggest that when watershed and in-stream disturbances are minimal fish and macroinvertebrate communities will typically perform better. Variables such as HDS and MSHA are positive metrics in that an increase in their scores reflects a more undisturbed condition. Other metrics, like road crossing density and disturbances in the buffer zone are negative, where higher values for these variables are often associated with a poor IBI score. The differences between CDFs for many of the watershed land use and habitat metrics illustrates the importance of habitat quality and the impact that land use can have on aquatic communities.

**Table 7. Watershed land use and habitat variables that were associated with IBI scores that were above their respective impairment thresholds. B indicates that a significant difference was noted in the basin survey, an E indicates that a significant difference was noted in the ecoregion survey. Arrows indicate whether or not the relationship was positive ( up arrow) or negative (down arrow).**

| Significant Variables | Fish | Macroinvertebrate |
|---|---|---|
| **Watershed Land Use** | | |
| Agriculture Percent | B,E ↓ | B,E ↓ |
| Disturbed Percent | B,E ↓ | B,E ↓ |
| Ditch Percent | B,E ↓ | B,E ↓ |
| Drain Square Miles | B,E ↑ | E ↓ |
| Forest Percent | B,E ↑ | B,E ↑ |
| Impervious Percent | B ↓ | B,E ↓ |
| Road Crossing Density | B ↓ | B,E ↓ |
| Urban Percent | B ↓ | B,E ↓ |
| **Habitat Characteristics** | | |
| CV Depth | ---- | B ↑ |
| Forest in 100 Meters | B,E ↑ | B,E ↑ |
| HDS | B,E ↑ | B,E ↑ |
| Mean Thalweg Depth | ---- | B ↑ |
| Mean Depth Fine Sediments | B ↓ | ---- |
| Mean Width | ---- | B,E ↑ |
| MSHA | B,E ↑ | B,E ↑ |
| Number_Stream_Features100M | B,E ↑ | ---- |
| Percent Agriculture in 30 Meters | B,E ↓ | B,E ↓ |
| Percent Boulder | B,E ↑ | B,E ↑ |
| Percent Cover for Fish | B,E ↓ | E ↓ |
| Percent Disturbed in 30 Meters | ---- | B,E ↓ |
| Percent Disturbed in 100 Meters | B,E ↓ | B,E ↓ |

| | | |
|---|---|---|
| Percent Fine sediments | B,E ↓ | B,E ↓ |
| Percent Pool | B ↑ | ---- |
| Percent Rock | B,E ↑ | B,E ↑ |
| Percent Run | B ↓ | ---- |
| Percent Woody | ---- | B,E ↑ |
| Percent Riffle | B,E ↑ | B,E ↑ |
| Width to Depth Ratio | E ↑ | B,E ↑ |
| **Water Chemistry** | | |
| Conduct | B,E ↓ | B,E ↓ |
| DO | B ↑ | B ↑ |
| Nitrogen | B ↓ | B ↓ |
| pH | ---- | E ↑ |
| Phosphorus | B,E ↓ | B,E ↓ |
| TSS | ---- | B ↓ |

# Condition probability analysis

Conditional probability analysis can help determine the chance of meeting biological thresholds given a specific set of conditions or stressors. The graphs are directional in that the probabilities are dependent on the specific inquiry.

A conditional probability analysis of fish IBI (F-IBI) and M-IBI by latitude and longitude indicates that the probability of meeting the biological thresholds increase from south to north (i.e. increasing latitude), and from west to east (i.e. decreasing longitude). The longitudinal relationship appears to stronger for both assemblages indicating that the west to east gradient in Minnesota has more influence on IBI scores than does the north to south gradient. Together this analysis reveals that sites located in the southwest part of the state are less likely to pass IBI thresholds than those in the northeast for both fish and macroinvertebrates. This is likely due to land use differences that have similar gradients.

Watershed drainage area is known to influence aquatic communities, particularly for fish. For example, fish species richness tends to increase with increasing drainage area up to about 500 $mi^2$ and then level off thereafter. Streams with very small drainage areas (i.e. headwater environments) are particularly harsh environments for aquatic organisms. The physical, chemical, and hydrologic extremes in headwaters force aquatic communities to become highly adaptable and/or mobile. In addition, headwater environments are more susceptible to the negative human influences of habitat destruction and pollution. Larger rivers on the other hand are less susceptible to these natural variations as well as impacts due to anthropogenic disturbances. They have natural buffering capacities or stability that tends to mediate the extremes and allow for the development of aquatic organisms that are niche specialists (e.g. dependent on a specific habitat or food source). The conditional probability analysis for drainage area tends to support the assumption that headwater environments are more susceptible to human influences. The probability of meeting the IBI thresholds for both fish and macroinvertebrates increases with drainage area before leveling off at about 500 $mi^2$.

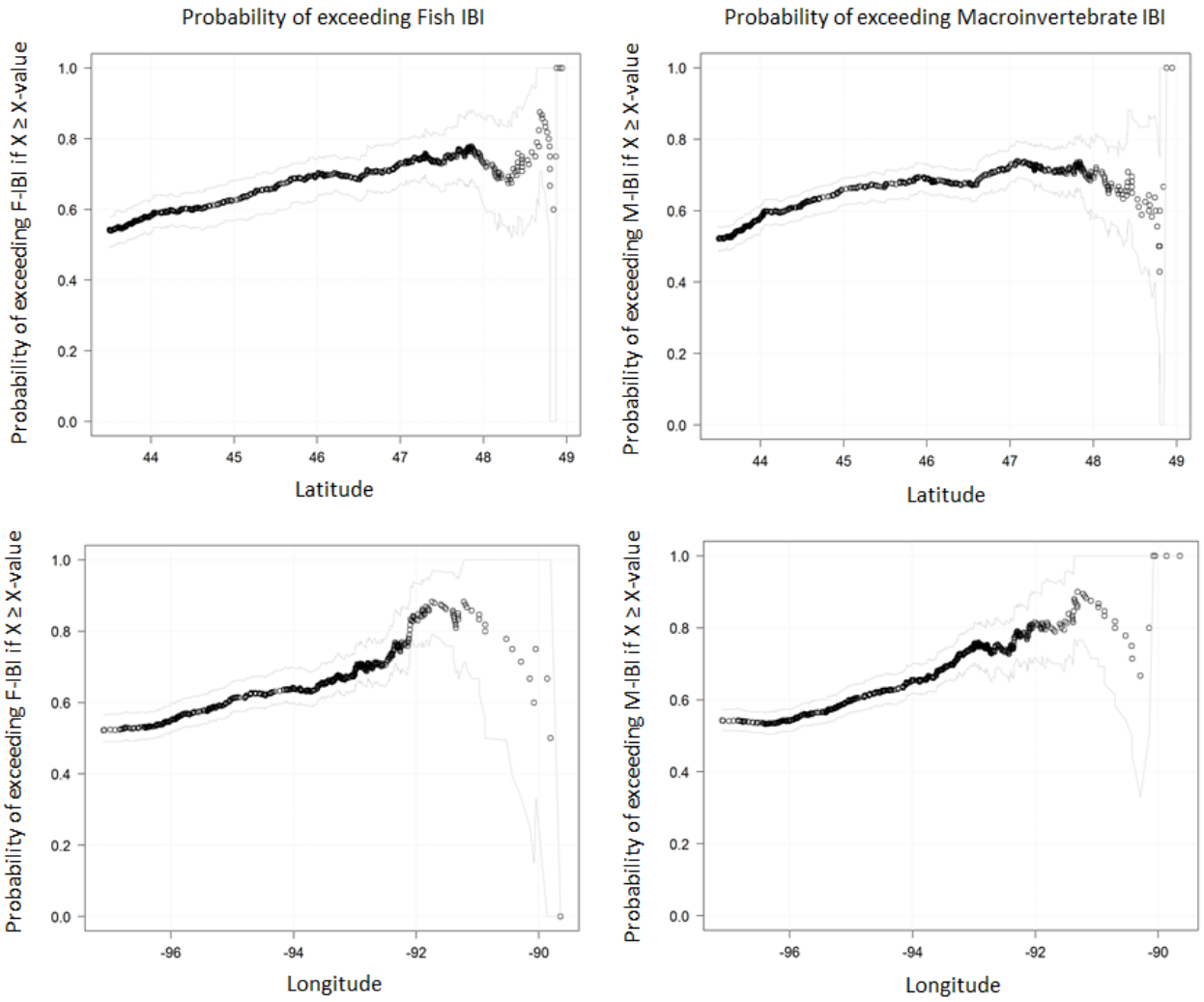



**Figure 25. Conditional probability latitude and longitude influences on fish and macroinvertebrate IBIs**

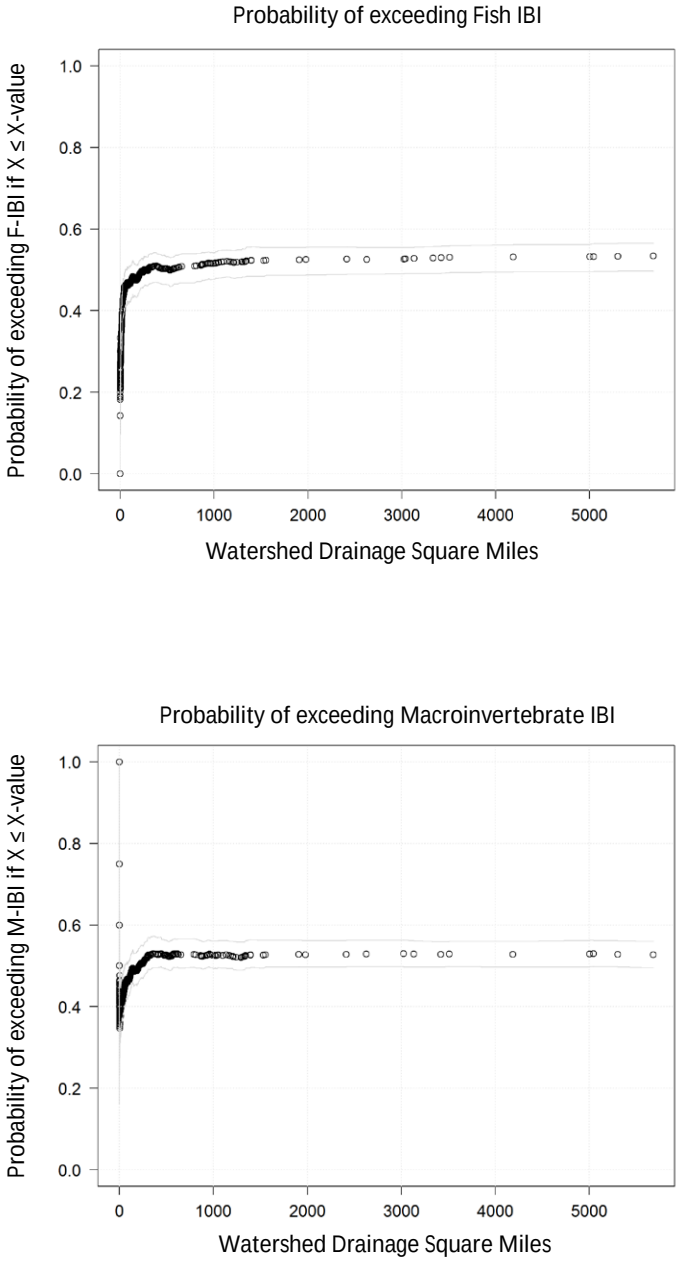



**Figure 26. Drainage area and probability of passing biological IBI thresholds**

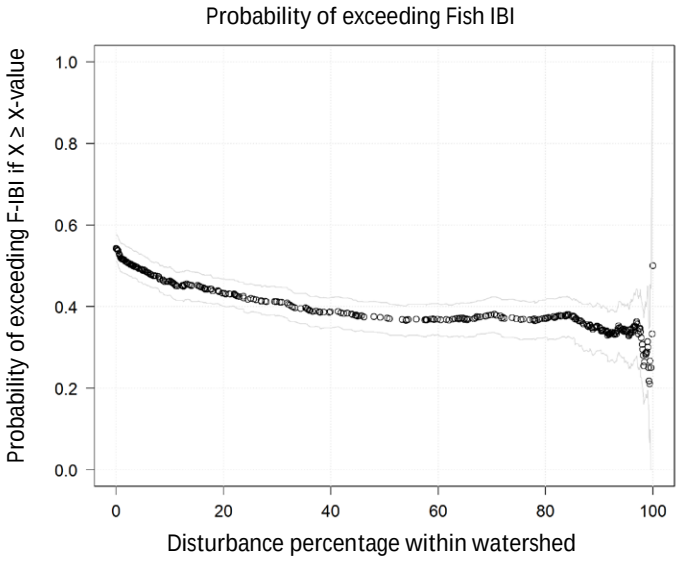
## Watershed land use

The probability for both fish and macroinvertebrate scores to meet IBI thresholds drops as watershed disturbance increases. Sites with very little watershed disturbance most often meet the biological criteria. Both fish and macroinvertebrate curves drop sharply at about 80% disturbance, suggesting a possible critical level not to be exceeded if protection of aquatic communities is a priority. Watershed disturbance can be further divided into major subgroups including urban, agriculture, and forests. Both urban and agricultural land uses have a strong negative impact on aquatic communities.

Though the percentage of urban influence in the watersheds of the sites studied are generally low (<5%), the probability of passing fish and invertebrate IBIs decreased from about 55 to 35% as land use approached 5% urban (Figure 27). The effects on aquatic communities from impervious surfaces, a common impact of urbanization, are even more striking. As little as 1% impervious surfaces in the watershed lowers the probability of meeting the F-IBI and M-IBI significantly. Fish communities appear to be more susceptible to impervious surfaces with a rather dramatic decrease in meeting F-IBI scores at levels of imperviousness exceeding 1.5%.

The agricultural conditional probability curves are similar to the watershed disturbance curves. However the agricultural graphs in Figure 29 have two inflection points where the probabilities of meeting biological thresholds decrease at high rates. The first inflection occurs before 2%, the second occurs at approximately 80%. After the second inflection point there is little chance of finding acceptable aquatic communities. Once the agricultural land use reaches about 95%, the probability flattens to 0% probability of meeting biological thresholds. Related to agricultural land use is channelization or ditching of streams. The channelization graph does not show an inflection point but shows a steady decrease in the probability of meeting thresholds (Figure 31).

Forested areas are often less disturbed areas, so it is no surprise that the general trend is that as the percent forested area increases so does the probability that IBI thresholds are met. The greatest increases in probability are from 0 to 10% forest.



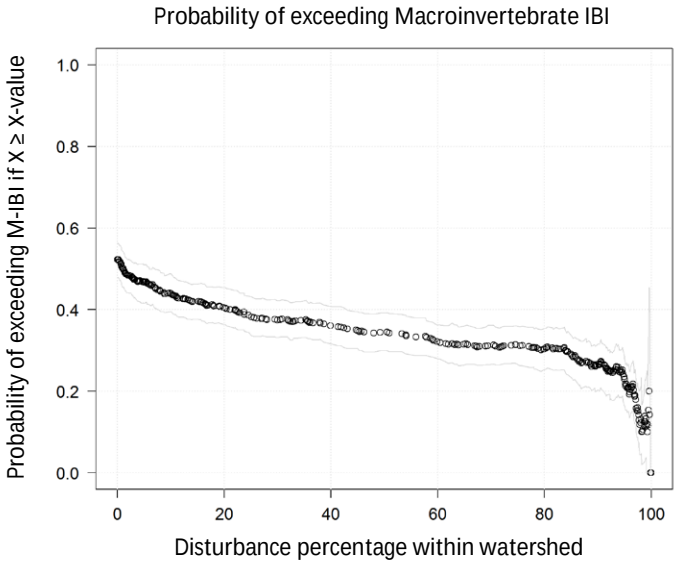
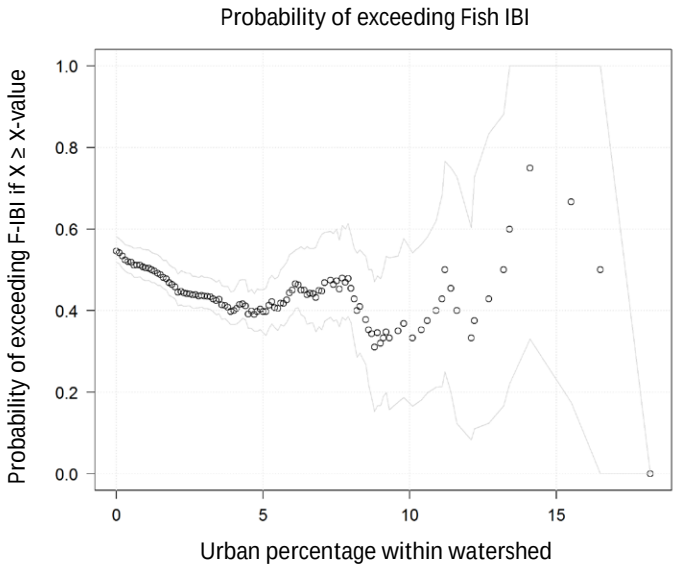




**Figure 27. Disturbed percentages with probability of passing IBI thresholds**



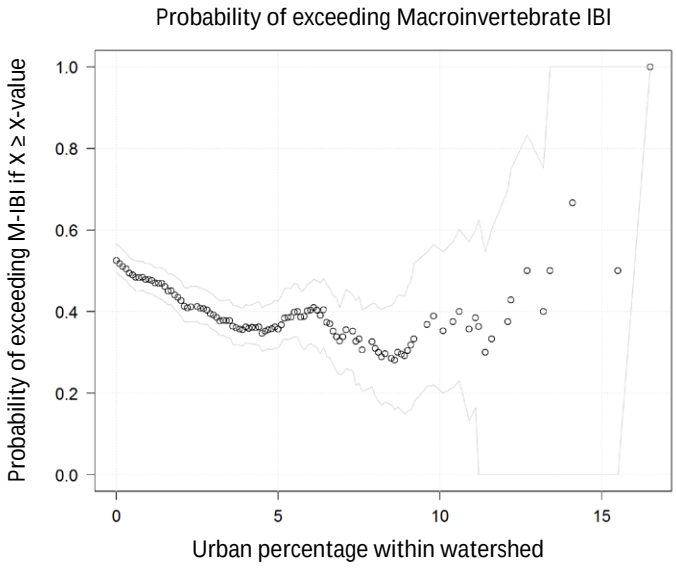
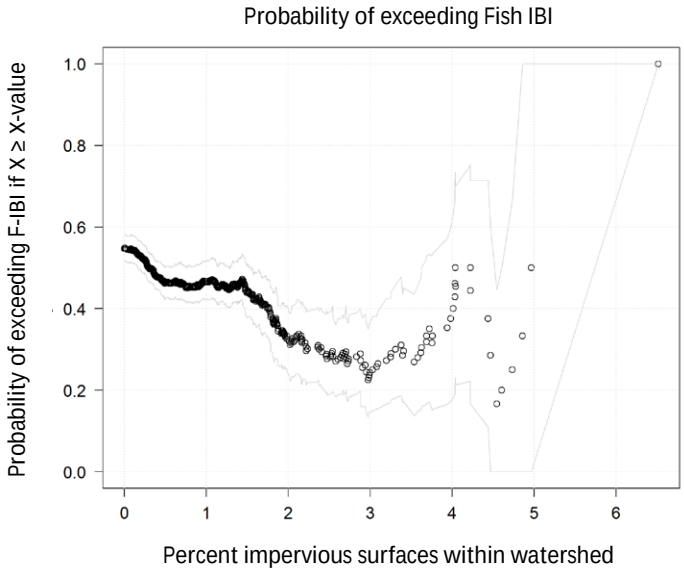




**Figure 28. Urban land use percentage and probability of passing biological IBI thresholds**



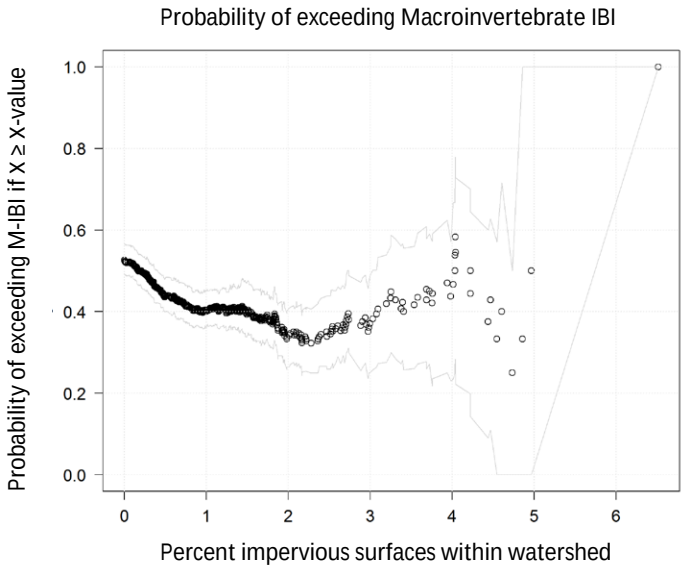




**Figure 29. Impervious percentage in watershed and probability of passing biological IBI thresholds**

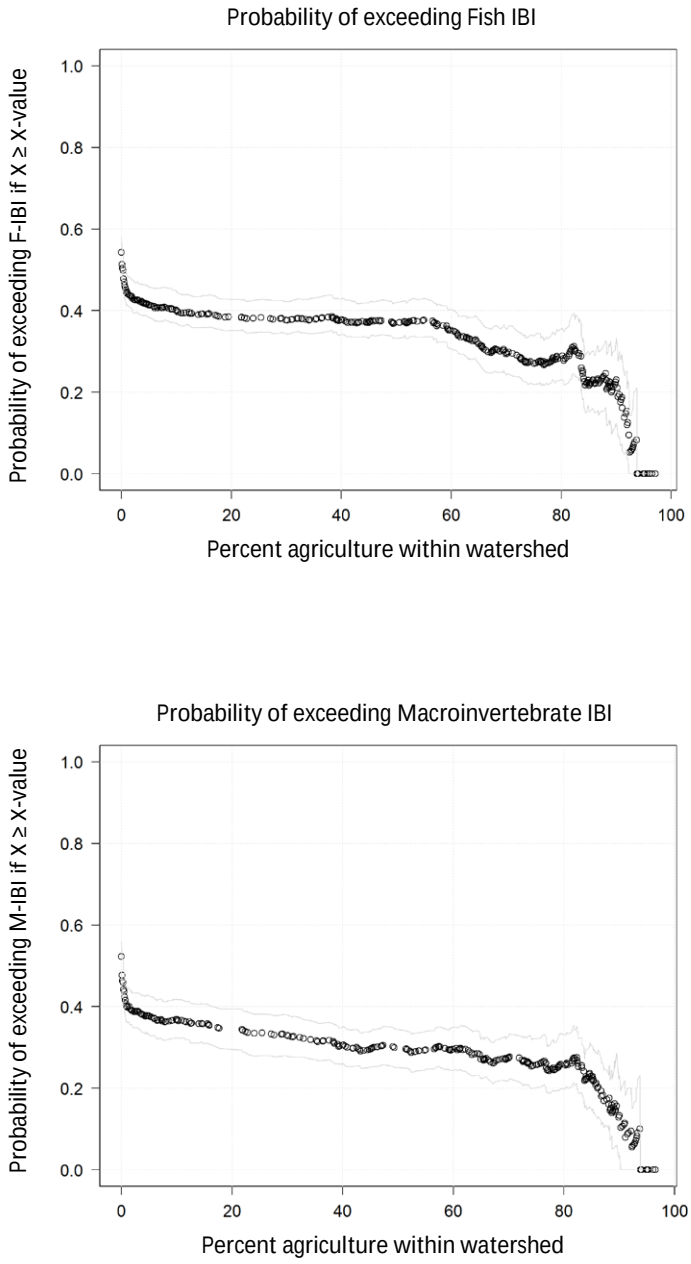



**Figure 30. Agriculture land use percentage and probability of passing biological IBI thresholds**

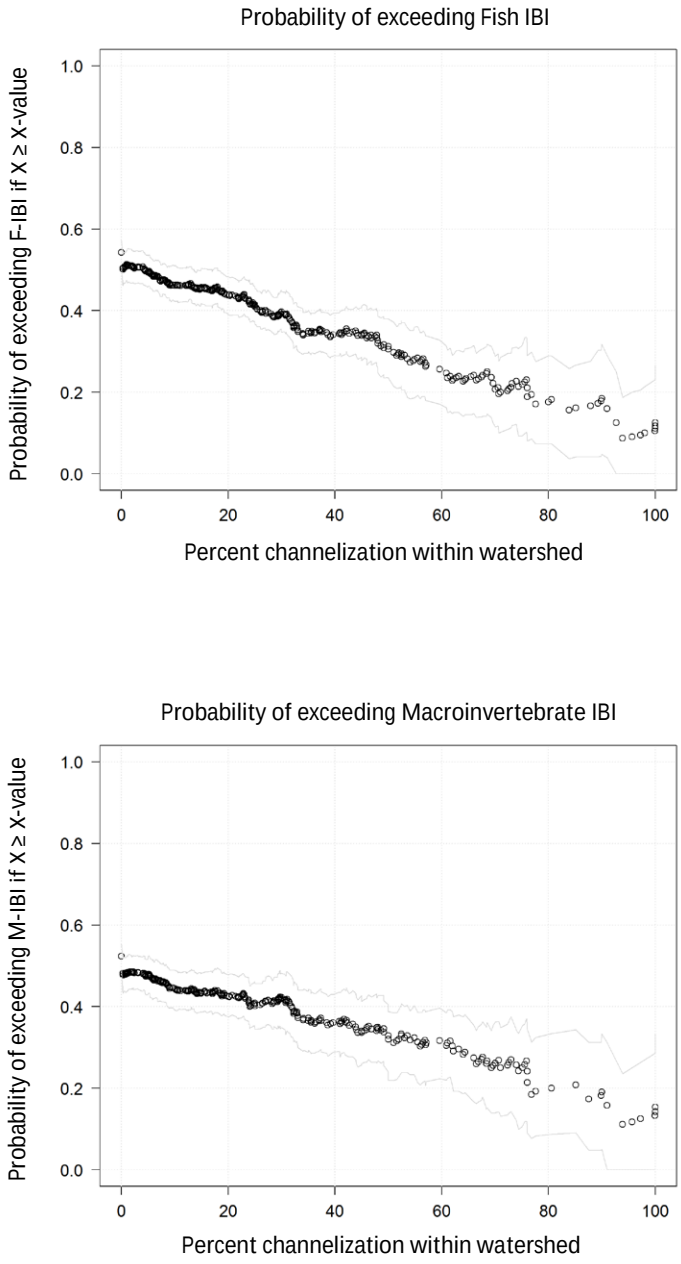



**Figure 31. Channelized percentage and probability of passing biological IBI thresholds**

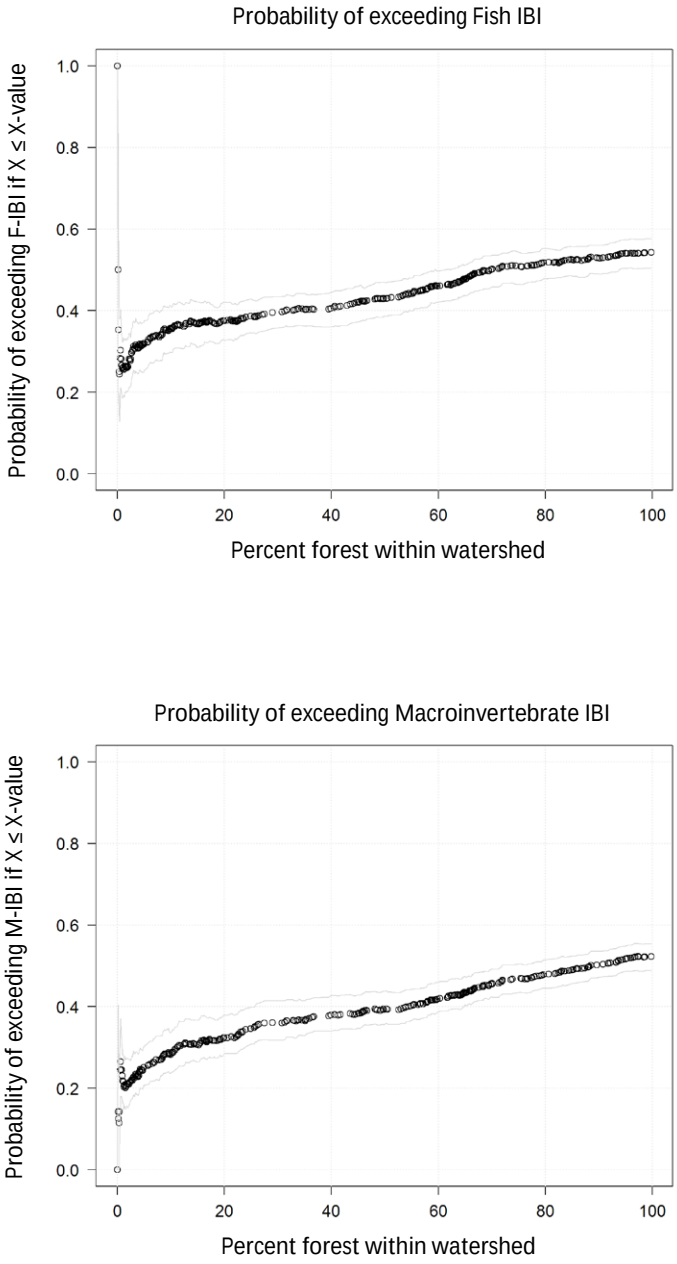



**Figure 32. Forested land use percentage and probability of passing biological IBI thresholds**

## Habitat

The MSHA score integrates all aspects of stream habitat (substrate, cover, stream morphology, riparian condition, etc.) into a single score. High MSHA scores suggest that a stream has all the necessary habitat components of undisturbed streams and is therefore likely to have the necessary habitat to support healthy fish and macroinvertebrate populations. The conditional probability graphs indicate a very strong positive relationship between the MSHA score and the probability of meeting biological thresholds for fish and macroinvertebrates. Streams with MSHA scores above 75 have greater than an 80% chance of meeting biological thresholds for both fish and macroinvertebrates. The HDS is more focused on watershed level anthropogenic disturbances, although there are components of the HDS

that look at disturbances in the riparian zone. Similar to the MSHA score, as the HDS increases the probability that both fish and invertebrates will meet thresholds also increases, albeit not quite as dramatically as the MSHA. This may suggest that instream habitat has a stronger relationship with biological condition than watershed level indicators like the HDS. Consequently, a focus to maintain quality in-stream habitat where it exists and improve it where it does not, should be a priority for water managers.

Stream morphological characteristics appear to have only a modest influence on the probability of meeting an IBI threshold. This may be due to the fact that each IBI is calibrated to a unique stream type (i.e. headwater streams, low gradient streams, etc.) so that natural differences in stream morphology have already been accounted for. However, streams that lack riffles altogether, or nearly so, are less able to meet the biological thresholds. The conditional probability curve is most steep where riffles comprise less than 20% of the sampling site. The prevalence of runs elicits the opposite effect on biological performance. Streams largely dominated by runs (>60%) have the steepest negative probability curves for both fish and macroinvertebrates.

Substrate types are a reflection of the underling geological material and the streams hydrology, but may also reflect sedimentation due to human disturbance in the watershed. The conditional probability curve for the percent of fine particles indicates that when a site is dominated by fine particles its chance of meeting thresholds is diminished. This change becomes most pronounced when the percentage of the substrate at a site is more than 85% dominated by fines. Sediments dominated by rocky substrate have the opposite relationship with a greater probability of meeting thresholds. In fact, streams with greater than 90% rocky substrates have an 80 to 90% chance of meeting the biological thresholds. These graphs illustrate the importance of minimizing sedimentation in Minnesota's rivers and streams. Fine particles from overland runoff and bank erosion can infiltrate the interstitial spaces of larger particles reducing shelter for both fish and macroinvertebrates, smothering eggs, and reducing the available spawning habitat for gravel spawning fish species.

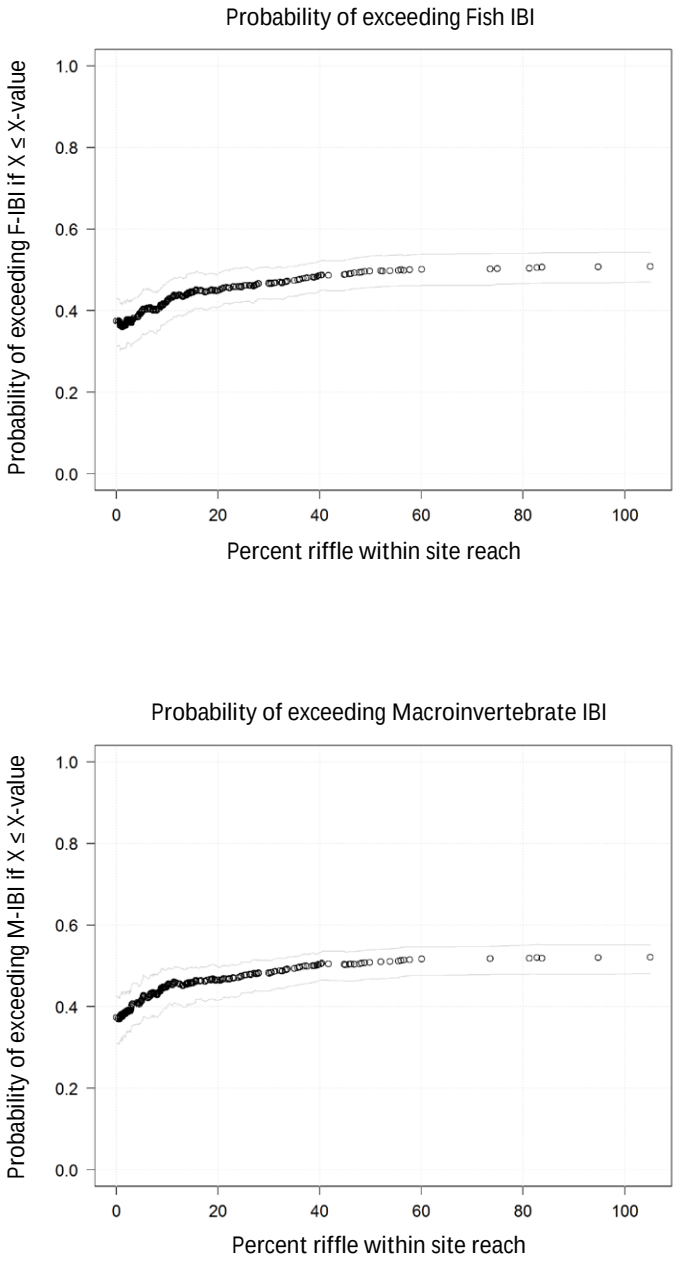



**Figure 33. Percentage of stream reach that is riffle and probability of passing biological IBI thresholds**

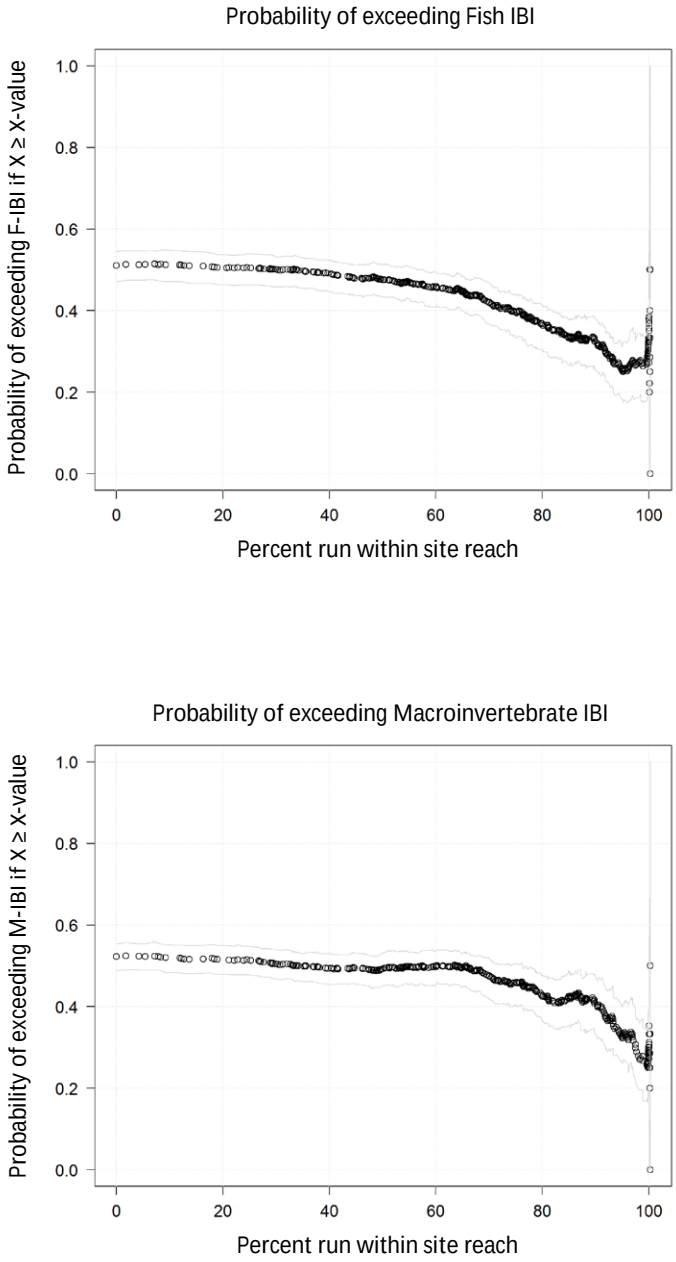



**Figure 34. Percentage of stream reach that is run and probability of passing biological IBI thresholds**

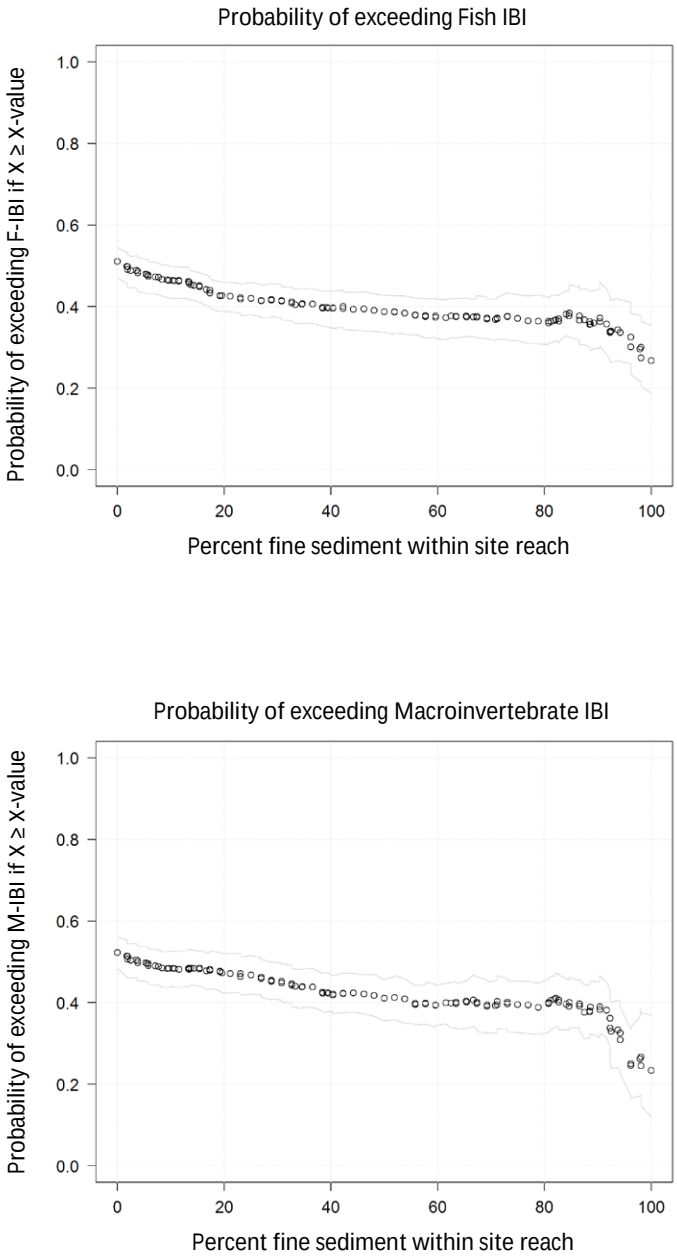



**Figure 35. Percent fines of sediment composition and probability of passing biological IBI thresholds**

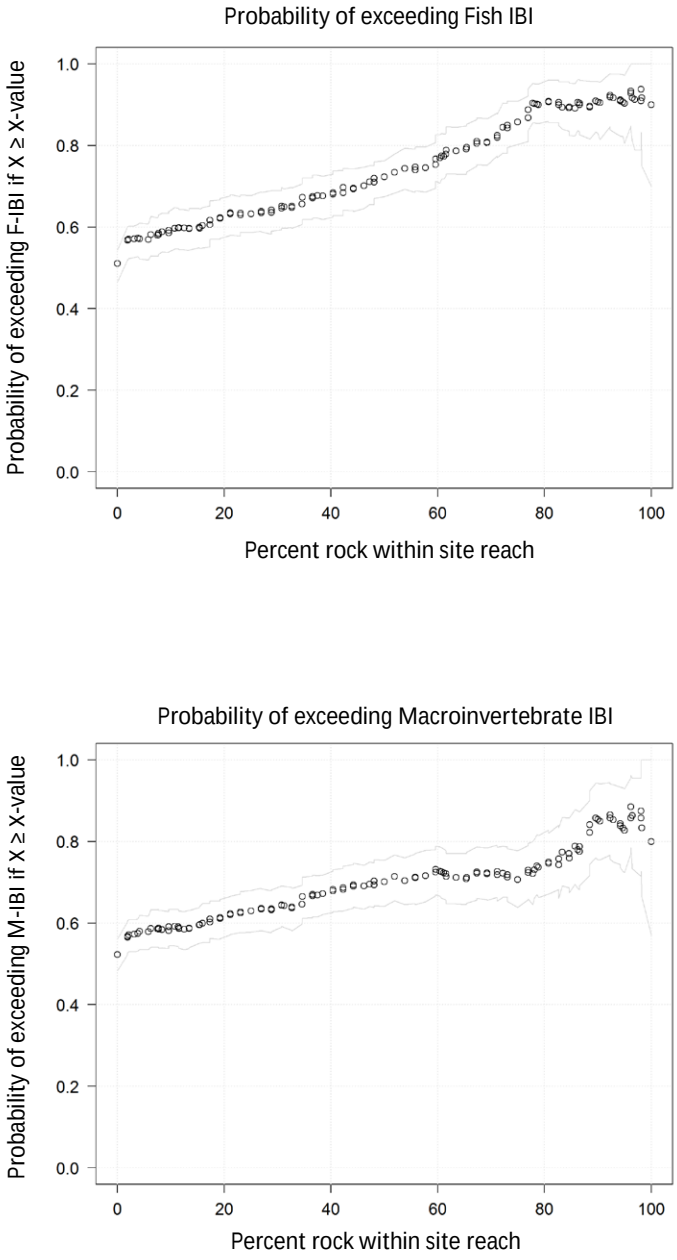



**Figure 36. Percent rock in sediment composition and probability of passing biological IBI thresholds**

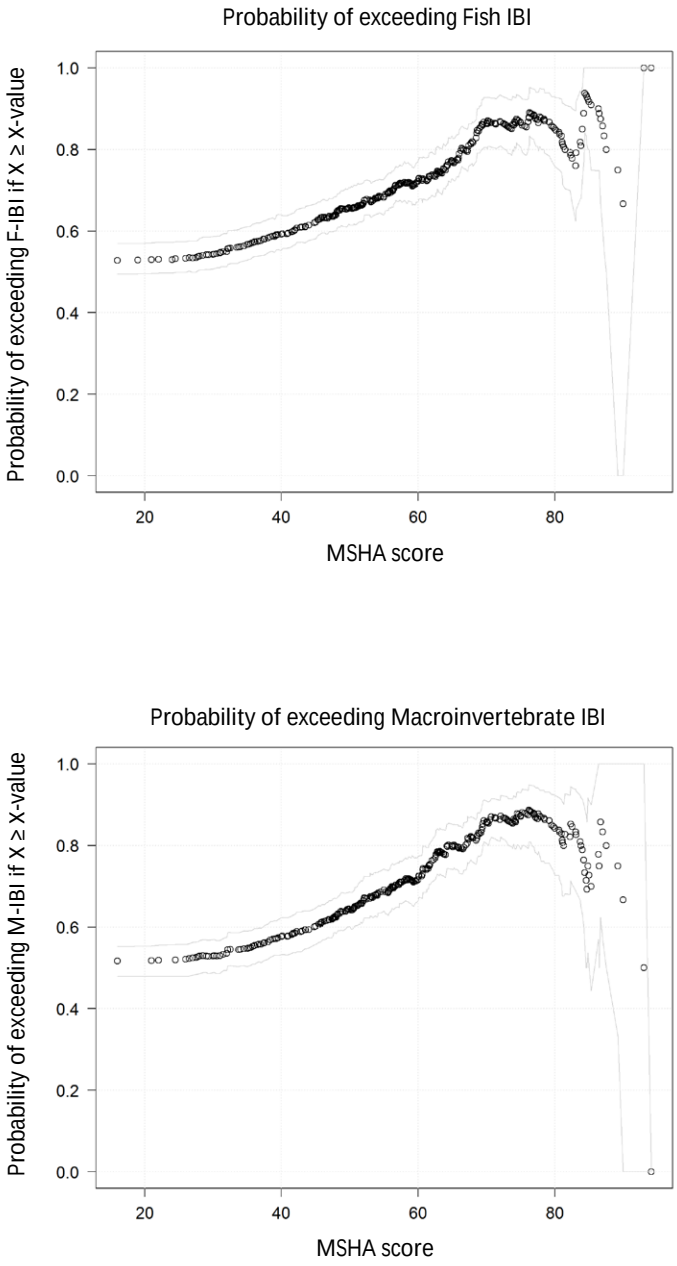



**Figure 37. MSHA and probability of passing biological IBI thresholds**

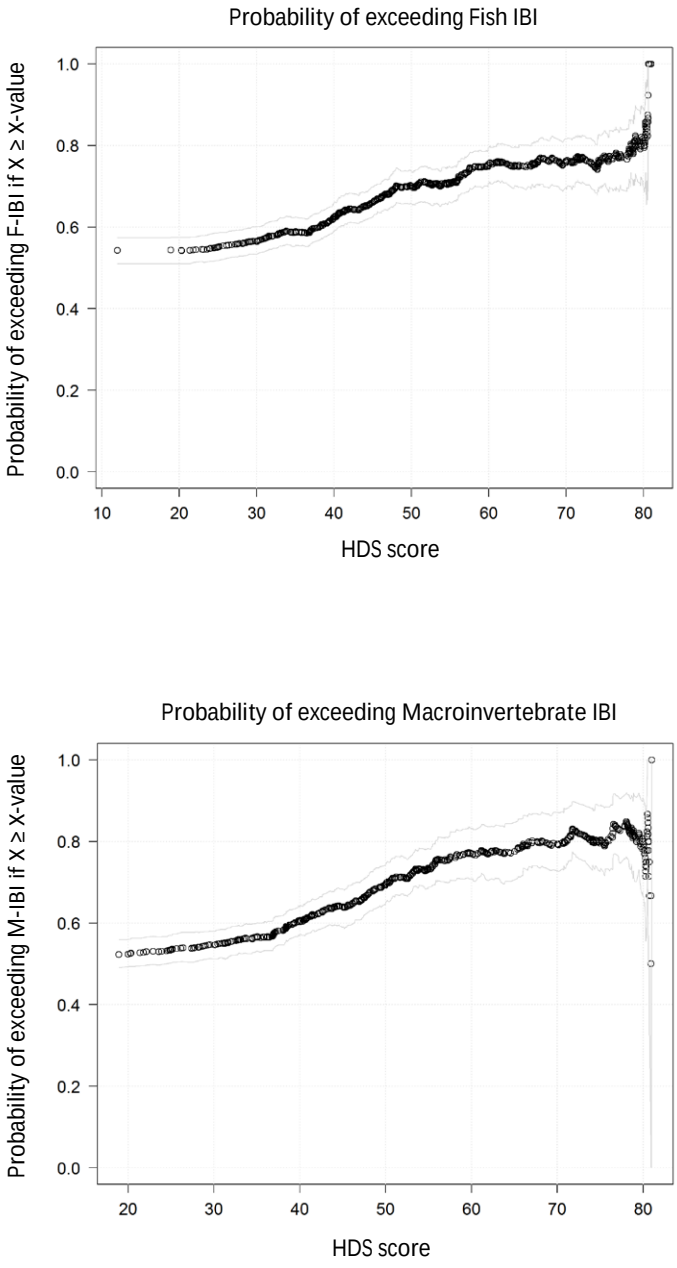



**Figure 38. HDS and probability of passing biological IBI thresholds**

## Water chemistry

Dissolved oxygen (DO) levels are one of the most important chemical factors that influence the composition of aquatic communities in Minnesota streams. Streams with naturally low levels of DO, often due to the influence of riparian wetlands, are very common throughout northern Minnesota. These streams have a characteristic fauna comprised of fish and macroinvertebrate species that are very tolerant of low DO levels. On the other hand, Minnesota has an abundance of high gradient streams as well, and many of them are coldwater streams with species that require a fairly high minimum level of DO (7 mg/l is the state standard for coldwater streams in Minnesota). Though the state standards are based on daily minimum values of DO, wide fluctuations in daily DO levels (i.e. DO flux) can also be problematic. High DO flux is an indication of nutrient enrichment and stress on stream communities.

For this reason conditional probability curves were developed for DO to compute the probability of meeting the biological thresholds if the DO was less than a given value and also when the DO was more than a given value. The probability of meeting biological thresholds for both fish and macroinvertebrates appears to diminish below and above DO levels of 8 to 9 mg/l. Furthermore, by the time the DO levels reach 5mg/l, the state minimum standard for warm water streams, the probability of meeting the biological thresholds is reduced from greater than 50% to just over 30%. However, due to the fact that this data was derived from a single grab sample at each site during most any time of the day or evening, it does not suggest that the DO standards currently in rule are not fully protective of aquatic communities in Minnesota streams. The data does indicate that there is a fairly narrow optimum level of DO for fish and macroinvertebrates in Minnesota streams and that the suitability of a stream to support robust biological assemblages diminishes quite rapidly on either side of that narrow range of DO values (Figure 39).

Phosphorus (Figure 40) and nitrogen (Figure 41) levels in water samples are an indication of nutrient enrichment. The probability of meeting biological thresholds falls steeply with increasing levels of phosphorus. For both biological assemblages the probability of meeting biological thresholds falls to less than 20% at phosphorus levels of 0.2 mg/l. Nitrogen is similar to phosphorus although the reduction in probabilities is initially not as steep, falling only slightly up to nitrogen values of 10 mg/l, with steeper declines thereafter. As conductivity and TSS (Figure 42) levels increase, the probability of meeting thresholds decreases. Conductivity concentrations have a steeper slope that levels off at lower probabilities than that of the invertebrates. On the other hand, invertebrates seem slightly more affected by TSS than fish as the slope is steeper between 0 and 50, and the few sites that are above 150 have a 0% probability of meeting the biological thresholds.

Dissolved organic carbon (DOC) is an important part of the carbon cycle within a natural riverine system. At high concentrations it can reduce light penetration making photosynthesis harder for some aquatic plants. An example is dark brown stained waters from naturally forming tannic acids. DOC (Figure 43) has a fairly strong negative association with biological performance. The probability of f-IBI scores meeting the threshold drops continuously, beginning at about 20 mg/l before bottoming out at concentrations greater than 40mg/l where the probability of meeting the fish biological threshold is zero. Macroinvertebrates did not show a change in M-IBI with a change in DOC, so they are not shown.

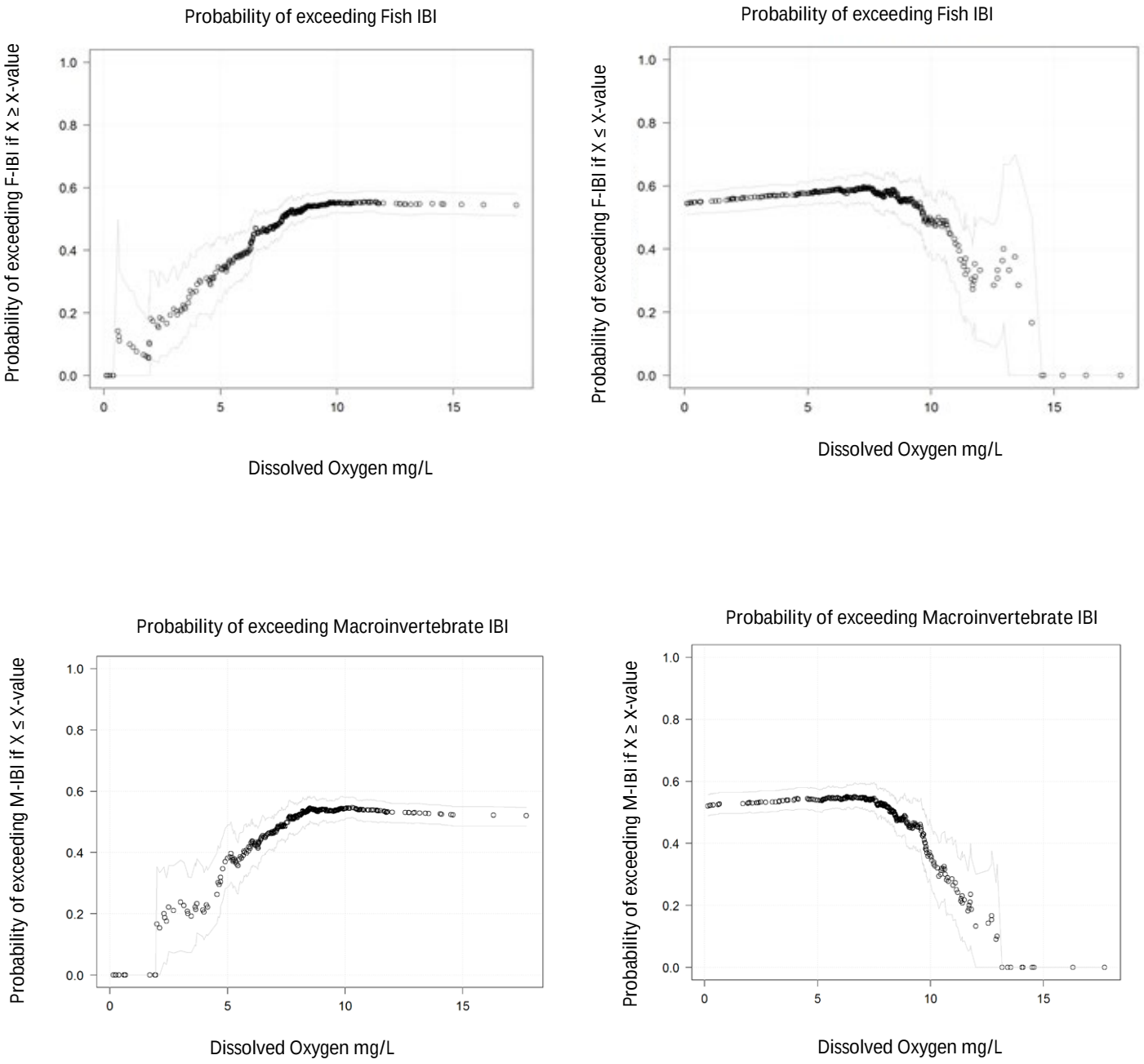
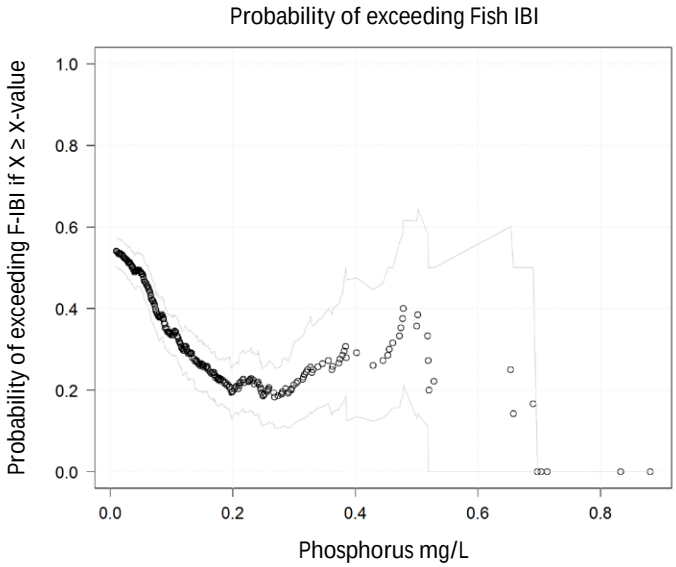



**Figure 39. Dissolved oxygen (mg/L) levels and probability of passing biological IBI thresholds**



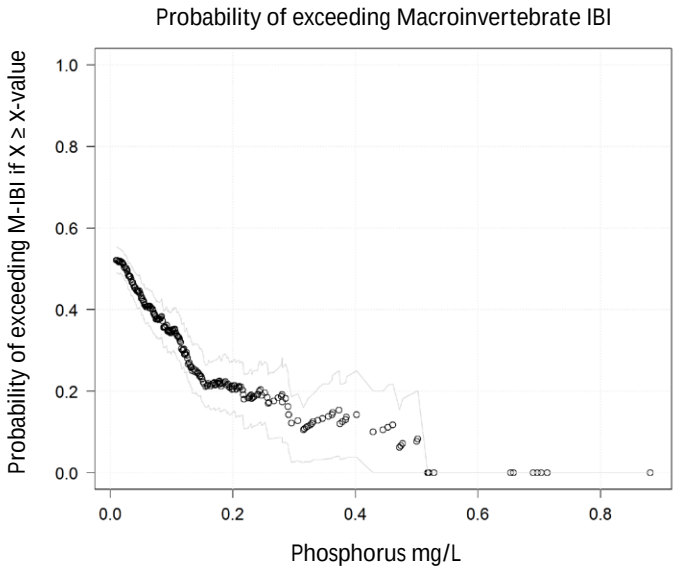




**Figure 40. Phosphorus mg/L concentration and probability of passing biological IBI thresholds**

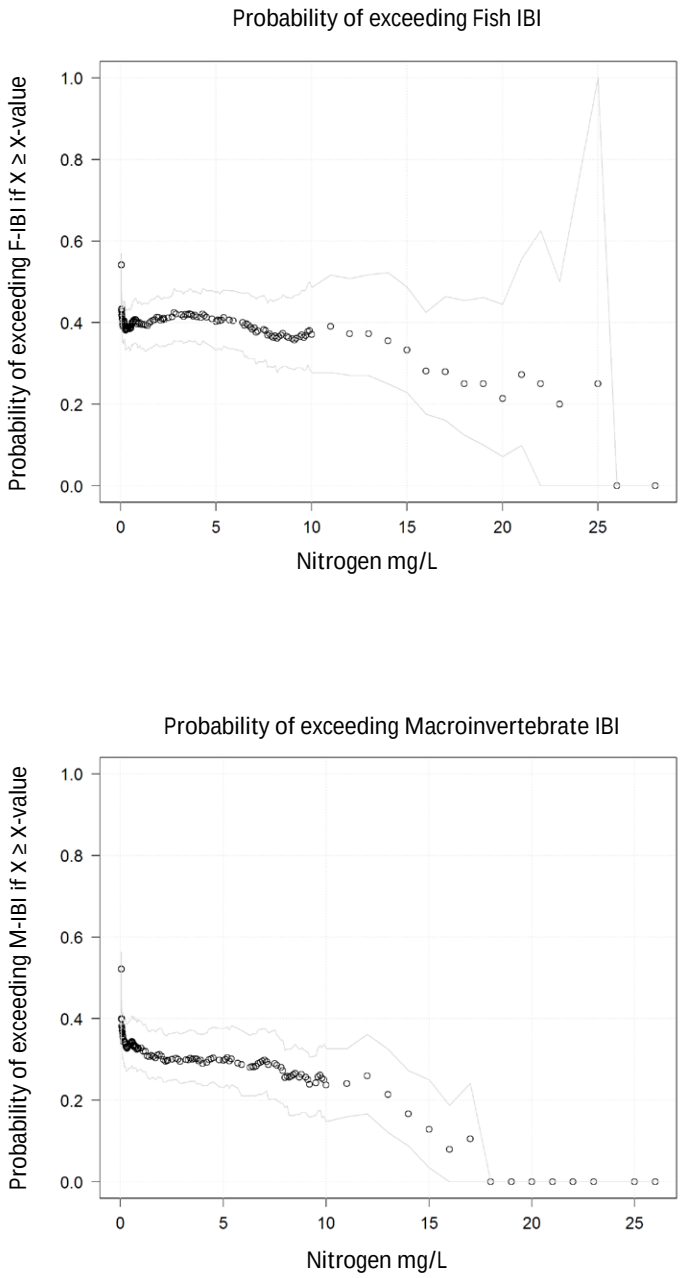



**Figure 41. Nitrogen mg/L, concentrations and probability of passing biological IBI thresholds**

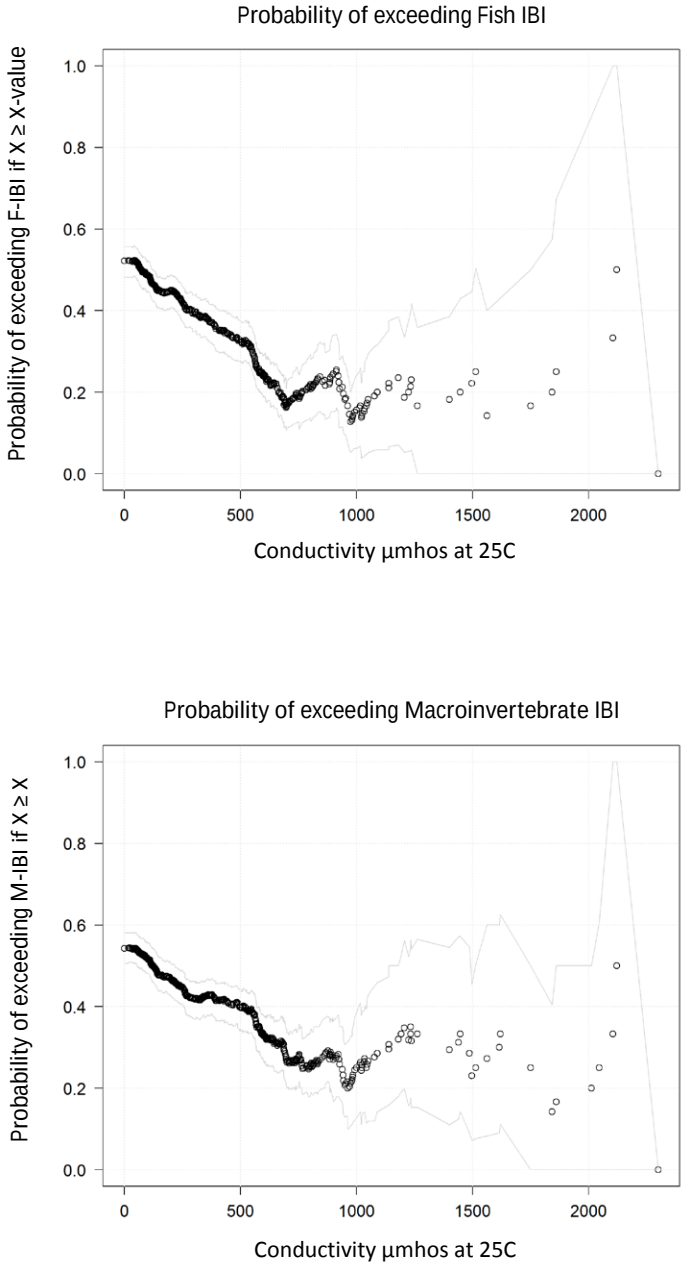



**Figure 42. Conductivity (µmhos at 25C) and probability of passing biological IBI thresholds**

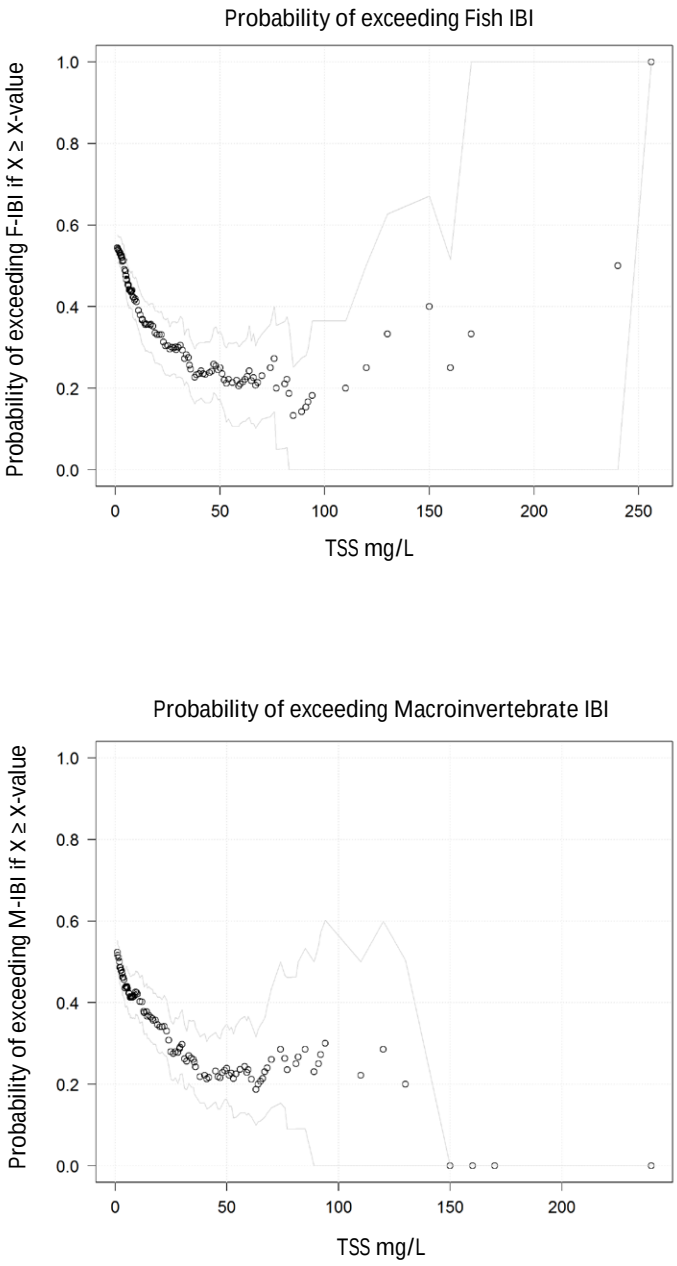



**Figure 43. TSS concentrations (mg/L) and probability of passing biological IBI thresholds**

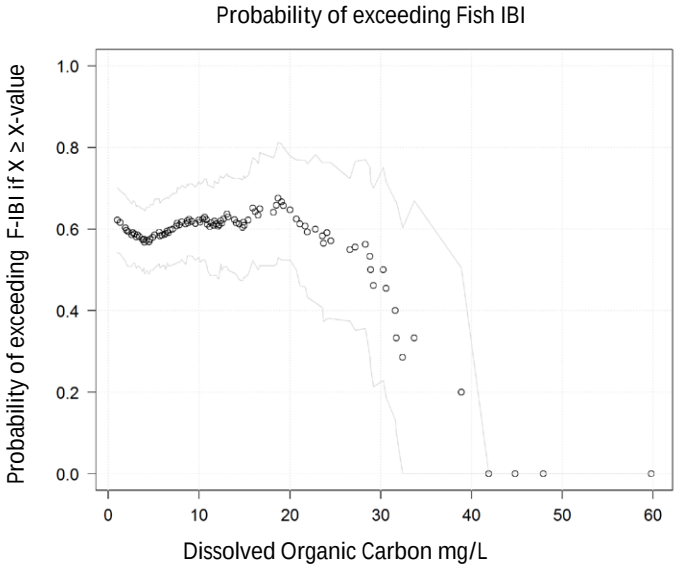



**Figure 44. DOC (mg/L) levels and probability of passing fish IBI thresholds**

# Discussion

The original intent of both surveys was to gain an understanding of the general biological, chemical, and physical condition of Minnesota's flowing waters. Through the utilization of a random survey design and statistical methods that allow for extrapolation to the greater population of streams with a known level of confidence, we were able to estimate the condition of all streams in the state and within each major ecoregion. By aggregating data from earlier basin level random surveys, we were able to contrast conditions in streams between two study periods, with the later ecoregion survey providing the most current estimates of conditions. Finally, we were able to evaluate the factors that were most related to biological community health, and determine the probability of streams attaining their biological thresholds for fish and macroinvertebrates as environmental factors varied.

Overall, there were few differences between surveys. The only habitat parameter that was consistently different between the surveys was the amount of bank erosion, which decreased significantly statewide and in all ecoregions. Associated with the reductions in bank erosion was a corresponding decrease in TSS statewide and in both the Mixed Wood Shield (MWS) and Temperate Prairies (TP) ecoregions. In terms of the aquatic communities, fish community parameters were similar to slightly improving between surveys, but many macroinvertebrate community attributes indicated a decline in condition including the number of EPT taxa, number of intolerant and tolerant taxa, and the overall taxa count. While the two sampling survey designs were similar in that both survey designs used sites selected at random and nearly all sampling protocols were identical, they differed in the spatial intensity of sampling as well as temporally. Because the basin surveys occurred over a 10 year period and the ecoregion survey occurred within a single year, changes in weather and flow patterns may have influenced the results. The weather pattern in 2010 when most of the ecoregion samples were collected was particularly wet, possibly reducing the number sites that were non-target due to dry or partially dry stream beds. Also, because there had been about two-thirds fewer samples in the ecoregion based survey, the estimates had wider confidence intervals, making this design less sensitive to differences between time periods and ecoregions. The lower sampling size in the ecoregion survey may have also

reduced the overall range of values for any given variable because there is less chance of sampling the extremes within the population. This may explain the apparently erroneous differences that occurred between survey results when, for example, data taken from the same GIS layers for both surveys were compared to one another. Since this data was taken from the same data layer for both surveys, no differences would have been expected.

In at least one case the sampling protocols differed between surveys. The change in protocol involved the allocation of kick net samples by habitat type (riffle, woody debris, aquatic vegetation) during macroinvertebrate sampling. From 1996 to 1998 the number of kick net samples within each habitat type was based on the proportion of those habitat types at each site. From 1999 to the present, kick net samples were distributed equally among the habitat types. The St. Croix and the Lake Superior basins, located primarily in the MWS, were surveyed using the earlier method. The shift towards a more equal distribution of effort may have resulted in an overall reduction in the number of samples taken within riffles, therefore it is reasonable to assume that the number and proportion of riffle dwelling macroinvertebrate species would have also been reduced, resulting in a reduction in key metrics that involve those species, and consequently a lower overall IBI score. It is anticipated that the MPCA will employ the ecoregion sampling strategy with an equivalent number of sites (approximately 150) during the random survey in 2015. Maintaining a consistent survey design and sampling protocol make future comparisons easier and more reliable.

The physical, chemical, and biological characteristics of stream conditions throughout the three ecoregions in Minnesota are a reflection of many different natural and anthropogenic factors coming together to influence stream biology, habitat, and water chemistry. The most vivid differences between ecoregions were often between the MWS and TP with the MWP often forming a sort of transition zone between the two extremes. The MWS has more undisturbed land than that of the other regions with many wetlands and forests and less agriculture and urban development, leading to better overall conditions. With less anthropogenic disturbance in the MWS, there are more intact stream miles. Streams in the heavily disturbed TP ecoregion often had higher percentages of stream miles with high nutrient levels and disturbances ratings, and more channelized stream miles. Consequently, this ecoregion also had the lowest percentage of stream miles that met either fish or invertebrate IBI thresholds.

Finally, we found that the degree that monitoring sites either met or did not meet their biological thresholds was associated with specific habitat, water chemistry and land use variables. Variables most closely associated with in-stream habitat appeared to be more influential on stream biology than did factors more associated with land use. However, many chemical variables were also important and although the results of these surveys should not be used to judge the impairment status of any particular sampling site, researchers and managers may be able to use these relationships to define stress points related to biological condition.

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# Appendix

## Appendix 1. Variable abbreviations and explanations

**For a completed data set for these variables go to**
\\X1600\vol1\Databases\Water_Quality\Biological_Monitoring\Streams\Projects\Lueck\EMAP\Report Data Table.xlsx

| Table name | Explanation |
|---|---|
| FieldNum | Site field number assigned by MPCA |
| siteID | Site ID provided by EPA |
| DrainSqM | Drainage area in square miles for each site |
| WBName | Water body name |
| Latitude | Latitude in Decimal Degrees (NAD-83) |
| Longitude | Longitude in Dedmai Degrees (NAD-83) |
| ER2Name | Ecogregion level 2 names |
| Strahler | Strahler stream order (1-6) |
| Class | Stream class (Coldwater, Warmwater, Class 7) |
| Site Status | Site Status - Target Site, Non-Target Site, Land Owner Permission Denied, Physically inaccessible |
| Disturbed Percent | Percent disturbed land use in the watershed |
| AgPercent | Percent agriculture in the watershed |
| RangePercent | Percent rangeland in the watershed |
| UrbanPercent | Percent urban in the watershed |
| ForestPercent | Percent forest in the watershed |
| WetlandPercent | Percent wetland in the watershed |
| ImpervPercent | Percent impervious surface in the watershed |
| AgRiparianPercent | Percent agriculture within stream riparian of the site (30 meters) |
| DitchPercent | Percent of ditched streams in watershed |
| PctAgLT100M | Percent agriculture within 100 meters of streams in the watershed |
| PctForestLT100M | Percent forest within 100 meters of streams in the watershed |
| PctDisturbedLT100M | Percent disturbed within 100 meters of streams in the watershed |
| RoadXDensity | Number of Road Crossings per Stream Kilometer |
| PctDistLU | Percent Disturbed Land Use Within 100 Meters of Stream Bank |
| ChanCon | Channel condition either NA = Natural OC = Channelized |
| MDepth | Mean Stream Depth (cm) |
| MThalDepth | Mean Stream Thalweg Depth (cm) |
| MWidth | Mean Stream Width (m) |
| Gradient | Gradient (m/km) |
| Sinuosity | Sinuosity (Total Length/Straight-Line Length) |
| numstreamftsper100 | Number of Stream Features per 100 Meters |
| PctRiffle | Percent Riffle |
| PctPool | Percent Pool |

| | |
|---|---|
| PctRun | Percent Run |
| WD Ratio | Width to Depth Ratio |
| NumSubTypes | Number of Substrate Types |
| PctFines | Percent Fine Substrates (i.e. Smaller Than Gravel) |
| MDepthFine | Mean Depth of Fines (cm) |
| Pct Embed | Percent Substrate Embeddedness |
| PctRock | Percent Coarse Substrates (i.e. Gravel or Larger) |
| PctBoulder | Percent Boulder |
| CVDepth | Coefficient of Variation of Depth |
| PctCover | Percent Stream Cover |
| PctOverVeg | Percent Overhanging Vegetation |
| PctEmerMac | Percent Emergent Macrophytes |
| PctSubMac | Percent Submergent Macrophytes |
| PctWoody | Percent Woody Debris |
| PctUnderCut | Percent Undercut Bank |
| MBankEros | Mean Bank Erosion (m) |
| MSHA | Score Based on MPCA's Stream Habitat Assessment (MSHA) |
| MSHA_Rating | Ratings based examining the distribution of MSHA scores across |
| HDS | Human Disturbance Score |
| TOC | Total organic carbon |
| DOC | Dissolved organic carbon |
| TempH2O | Water temperature (°C) during fish sample |
| pH | pH |
| DO | Dissolved Oxygen (mg/L) |
| Phos | Total Phosphorus (mg/L) |
| Nitrogen | Nitrite/Nitrate (mg/L) |
| T_Ammonia | Total Ammonia (mg/L) |
| Conduct | Conductivity (µmhos/cm) |
| TSS | Total Suspended Solids (mg/L) |
| TSS Rating | Good= < 15 mg/L, Fair= 15- 65mg/L, Poor= > 65 mg/L |
| Nitrogen Rating | Warm water value 49 mg/L, Cold water 2A 3,1 mg/L |
| Phosphorus Rating | Good <0,055 mg/L, Fair 0.055-0,150 mg/L, Poor >0,158 mg/L |
| Fish Visit | Date that Fish, Habitat, and Water Chemistry Sampling Was Conducted (mm/dd/yyyy) |
| FishIBI | Fish IBI (0-100) |
| MeetsFishThreshold | Yes or No, Based on thresholds established for each fish class |
| Count of Taxa | Number of Fish Taxa |
| Sensitive | Number of Intolerant Fish Taxa |
| Hdw | Number of Headwater Fish Taxa |
| Minnow | Number of Minnow Taxa |
| Darter | Number of Darter Taxa |
| Insect | Number of Invertivore Fish Taxa |
| BenInsect | Number of Benthic Invertivore Fish Taxa |

| | |
|---|---|
| Omnivore | Number of Omnivore Fish Taxa |
| GameFishTaxa | Number of Game Fish Taxa |
| NumPerMeter-Tolerant | Number of Fish per Meter without Tolerant Fish Taxa |
| DomTwoPct | Percent of Individual Fish that are of the dominant two taxa |
| TolPct | Percent of Individual Fish that are Tolerant Taxa |
| FishDELTPct | Percent of Individual Fish with DELT Anomalies |
| PiscivorePct | Percent of individual fish that are Piscivores |
| SLithopPct | Percent of Individual Fish that are Simple Lithophltic Spawners |
| Invert Visit | Inverts Date That Macroinvertebrate Sampling Was Conducted (mm/dd/yyyy) |
| MIBI | Macro invertebrate IBI (0-100) |
| MeetsInvertThreshold | Yes or No, Based on thresholds established for each invert class |
| TaxaCount | Number of Macro invertebrate Taxa |
| Tolerant | Number of Tolerant Macro invertebrate Taxa |
| VeryTolerant | Number of Very Tolerant Macro invertebrate Taxa |
| EPT | Number of Ephemeroptera/Plecoptera/Tricoptera Taxa |
| Ephemeroptera | Number of Ephemeroptera Taxa |
| Plecoptera | Number of Plecoptera Taxa |
| Tricoptera | Number of Tricoptera Taxa |
| Chironomidae Ch | Number of Chironomidae Taxa |
| TaxaCountAllChir | Number of Macro Invertebrate Tax a—All Chironomidae Taxa included |
| IntolerantCh | Number of Intolerant Macroinvertebrate Taxa-All Chironomidae Taxa included |
| PredatorCh | Number of Predator Macroinvertebrate Taxa-All Chironomidae Taxa included |
| ClingerCh | Number of clinger Macroinvertebrate Taxa-All Chironomidae Taxa Included |
| ScraperCh | Number of Scraper Macroinvertebrate Taxa-All Chironomidae Taxa Included |
| Collector-filtererCh | Number of Collector-Filterer Macroinvertebrate Taxa-All Chironomidae Taxa Included |
| Collector-gathererCh | Number of collector-Gatherer Macroinvertebrate Taxa-All Chironomidae Taxa included |
| TanytarsIniCh | Number of Tanytarsini Macroinvertebrate Taxa-All Chironomidae Taxa included |
| LongLivedCh | Number of Long-lived Macroinvertebrate Taxa-All Chironomidae Taxa included |
| InvertTolerantPct | Percent of Individual Macro Invertebrates That Are Tolerant Taxa |
| VeryTolerant Pct | Percent of Individual Macro Invertebrates That Are Very Tolerant Taxa |
| EPT Pct | Percent of Individual Macro In vertebrates That Are Ephemeroptera/ Plecoptera/ Tricoptera |
| EphemeropteraPct | Percent of Individual Macroinvertebrates That Are Ephemeroptera |
| PlecopteraPct | Percent of Individual Macroinvertebrates That Are Plecoptera |
| TricopteraPct | Percent of Individual Macroinvertebrates That Are Tricoptera |
| ChironomidaeChPct | Percent of Individual Macroinvertebrates That Are Chironomidae |
| AmphipodaPct | Percent of Individual Macro Invertebrates That Are Am phi pod a |
| PredatorPct | Percent of Individual Macroinvertebrates That Are Predators |
| ScraperPct | Percent of Individual Macroinvertebrates That Are Scrapers |
| Collector-filtererPct | Percent of Individual Macroinvertebrates That Are Collector-Filterers |

| | |
|---|---|
| Collector_gathererPct | Percent of Individual Macroinvertebrates That Are Collector-Gatherers |
| MeetsBothIBI | Meeting both Fish and Invert thresholds - Yes, No, or Not Assessed |
| IBIBoth | Meets both, Fish only, Invert only, or Not assessed |
| oversamp | Oversample |
| division | division |
| Intended# | Intended number of samples (Nest1) |
| nest1_wt | original draw weights |
| Basin | Major Basin site is in |
| WeightCat | Weight category with ecoregion, basin, and stream order 1,2,3, 4+ |
| final_wgt | Final weights used to extrapolate estimates |

# Appendix 2. CDF test p-values

**Bold p-values are valued found to be significantly different.**

| **Watershed Land Use Metrics** | | | | |
|---|---|---|---|---|
| | State | MWS | MWP | TP |
| AgPercent | 0.08235 | 0.03385 | 0.03350 | 0.18092 |
| DisturbedPercent | 0.03973 | 0.38212 | 0.95898 | 0.09906 |
| DitchPercent | **0.00354** | **0.00616** | 0.36153 | 0.11261 |
| DrainSqMile | 0.67453 | 0.84434 | 0.42795 | 0.39584 |
| ForestPercent | **0.00324** | 0.16913 | 0.40830 | 0.07837 |
| ImpervPercent | 0.57909 | 0.99741 | 0.42600 | 0.31704 |
| RangePercent | 0.11915 | 0.09732 | 0.06881 | 0.77926 |
| RoadCrossingDensity | 0.45568 | 0.09988 | 0.89162 | 0.05200 |
| UrbanPercent | 0.73691 | 0.47097 | 0.21325 | 0.90081 |
| WetlandPercent | 0.93557 | 0.01042 | 0.01082 | 0.14217 |
| **Habitat Characteristics Metrics** | | | | |
| | State | MWS | MWP | TP |
| CVDepth | 0.34579 | 0.15136 | 0.01317 | 0.06143 |
| Forestin100M | 0.02599 | 0.37972 | 0.94675 | 0.08851 |
| Gradient | 0.06434 | 0.78407 | 0.92334 | **0.00859** |
| HDS | 0.28545 | 0.55074 | 0.57924 | **0.00073** |
| MBankEros | **0.00001** | **0.00666** | **0.00023** | **0.00003** |
| Mean_Depth | 0.36484 | 0.47843 | 0.02514 | 0.90179 |
| MeanDepthFines | 0.01333 | 0.46440 | 0.16091 | 0.01523 |
| MeanThalweg_depth | 0.25240 | 0.63561 | 0.03884 | 0.77434 |
| MeanWidth | 0.45439 | 0.28398 | 0.15109 | 0.50518 |
| MSHA | 0.56727 | 0.62811 | 0.54151 | 0.95702 |
| Number_Stream_Features100M | 0.04946 | 0.28436 | **0.00342** | 0.62869 |
| NumSubTypes | 0.12167 | **0.00217** | 0.02927 | 0.34538 |
| PctAgLT | 0.19432 | 0.45195 | 0.65575 | 0.14748 |
| PctBoulder | 0.02161 | 0.06341 | 0.04287 | 0.11216 |
| PctCover | 0.03110 | 0.88513 | 0.09741 | 0.24928 |

| | | | | |
|---|---|---|---|---|
| PctDistLU | 0.30909 | NA | 0.85050 | 0.09821 |
| PctDisturbedin100M | 0.01974 | 0.32140 | 0.83609 | 0.02298 |
| PctEmbededsubstrate | 0.06190 | 0.94788 | 0.96481 | 0.03367 |
| PctEmerMac | 0.06152 | 0.18119 | 0.11747 | 0.20185 |
| PctFines | 0.75888 | **0.00046** | 0.17033 | 0.01414 |
| PctOverVeg | 0.48599 | 0.96605 | 0.86209 | 0.03775 |
| PctPool | 0.12480 | 0.23295 | 0.07697 | 0.14318 |
| PctRock | 0.95674 | 0.05855 | 0.82359 | 0.05529 |
| PctRun | 0.11257 | **0.00696** | 0.32882 | 0.06179 |
| PctSubMac | 0.14341 | 0.13133 | 0.14011 | 0.02364 |
| PctUnderCut | 0.01268 | 0.25348 | **0.00063** | 0.61888 |
| PctWoody | 0.34210 | 0.97847 | 0.11818 | 0.19116 |
| PerRiffle | 0.08185 | 0.45547 | 0.52331 | 0.34754 |
| Sinuosity | 0.08063 | 0.05248 | 0.06790 | 0.93983 |
| WidthtoDepthRatio | **0.00224** | 0.57953 | 0.55377 | 0.27381 |
| **Water Chemistry** | | | | |
| | State | MWS | MWP | TP |
| Conduct | **0.00375** | 0.01963 | 0.33088 | 0.19208 |
| DO | 0.13648 | 0.20812 | 0.78177 | 0.27152 |
| NH3 | **0.00001** | **0.00000** | **0.00045** | 0.76589 |
| Nitrogen | 0.29925 | NA | 0.77892 | 0.78110 |
| ph | 0.27427 | 0.73765 | 0.02644 | 0.48443 |
| Phos | 0.22555 | **0.00011** | 0.67626 | 0.19371 |
| TempH2O | 0.12300 | 0.37687 | 0.64590 | 0.43763 |
| TSS | **0.00910** | **0.00000** | 0.01474 | **0.00343** |
| **Fish Metrics** | | | | |
| | State | MWS | MWP | TP |
| Count_of_Taxa | 0.04537 | 0.02366 | 0.28686 | 0.29659 |
| Benthic Insectivore | 0.06702 | 0.13414 | 0.38297 | 0.13558 |
| Darter | **0.00496** | **0.00259** | 0.50324 | 0.12373 |
| DomTwoPct | 0.90242 | 0.64651 | **0.00773** | 0.81244 |
| FishDELTPct | 0.05038 | NA | 0.49963 | 0.29105 |
| GameFish | 0.26594 | 0.01595 | 0.60461 | 0.13650 |
| HeadwaterSp | 0.10176 | 0.13025 | 0.39141 | 0.03227 |
| Insectivores | 0.08083 | 0.12224 | 0.10174 | 0.32255 |
| Minnow | 0.31428 | 0.34159 | 0.88291 | 0.08976 |
| #PerMeter_WO_tolerantSp | 0.03389 | 0.02453 | 0.13343 | 0.15847 |
| Omnivore | **0.00966** | NA | 0.08648 | 0.01390 |
| PiscivorePct | 0.72013 | 0.89096 | 0.71186 | 0.34025 |
| Sensitive | 0.25185 | 0.05165 | 0.03490 | 0.61873 |
| SLithopPct | 0.28216 | 0.29977 | 0.26519 | 0.95150 |
| TolPct | 0.11452 | 0.23081 | 0.27803 | 0.12984 |

| **Macroinvertebrate Metrics** | | | | |
|---|---|---|---|---|
| | State | MWS | MWP | TP |
| Amphipoda % | 0.11246 | 0.13302 | 0.46665 | 0.00051 |
| ChironomidaeCh | 0.61556 | 0.36879 | 0.59747 | 0.19179 |
| ChironomidaeCh% | 0.10374 | **0.00228** | 0.27234 | 0.92548 |
| ClingerCh | 0.23011 | 0.05572 | 0.40515 | 0.94637 |
| Collector_filtererCh | 0.11609 | 0.04250 | 0.94413 | 0.95058 |
| Collector_gathererCh | **0.00417** | 0.40724 | 0.00049 | 0.05216 |
| CollectORfiltererPct | 0.01618 | 0.01102 | 0.40529 | 0.12537 |
| CollectORgathererPct | **0.00666** | 0.37865 | 0.16413 | **0.00083** |
| Ephemeroptera | **0.00108** | 0.08752 | 0.34659 | **0.00000** |
| Ephemeroptera Pct | 0.02045 | 0.19666 | 0.98417 | **0.00000** |
| EPT | **0.00017** | **0.00089** | 0.89084 | 0.01007 |
| EPT Pct | 0.11374 | 0.08074 | 0.90357 | **0.00001** |
| Intolerant Ch | **0.00000** | **0.00059** | 0.04639 | **0.00005** |
| Long Lived Ch | **0.00000** | **0.00000** | 0.01198 | **0.00001** |
| Predator Ch | **0.00000** | **0.00000** | 0.10091 | **0.00137** |
| Predator Pct | 0.58415 | **0.00337** | 0.01086 | 0.58862 |
| Scraper Ch | 0.01593 | 0.20747 | 0.22926 | 0.33192 |
| Scraper Pct | 0.34195 | 0.33084 | 0.87198 | 0.51804 |
| Tanytharsini Ch | 0.31878 | 0.49977 | 0.32017 | 0.25888 |
| Taxa Count | **0.00000** | **0.00000** | **0.00168** | **0.00710** |
| Tolerant | **0.00036** | **0.00447** | 0.09992 | 0.05323 |
| Tolerant Pct | 0.29192 | 0.61530 | 0.47304 | 0.61055 |
| Trichoptera | **0.00316** | **0.00001** | 0.84171 | 0.34370 |
| Trichoptera Pct | 0.22152 | 0.25876 | 0.87525 | 0.90820 |
| Very Tolerant | **0.00010** | 0.01403 | 0.03813 | 0.02041 |

# Appendix 3. Change estimate values

**Significant differences indicated by bold numbers. When lower and upper confidence intervals do not overlap the estimated difference (DiffEst) is significant.**

Change estimations is an alternative to the CDF test for finding significant differences between the basin survey and ecoregion survey. The differences between the surveys is based closer to the mean or average value found for each data set in comparison to the CDF test which looks at data range. The difference estimates use a 99% confidence interval to predict significant differences between the two surveys. In many of the indicators used significant differences are aligned with the results found in the CDF test results. There are a few discrepancies. These discrepancies between the CDF test and change estimate analysis were not investigated due to the time restraints on the project. However since the data had been analyzed and may prove to be beneficial for future surveys, it was included here in the appendix.

| | State | | | MWS | | | MWP | | | TP | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Indicator | DiffEst | LCB99% | UCB99% | DiffEst | LCB99% | UCB99% | DiffEst | LCB99% | UCB99% | DiffEst | LCB99% | UCB99% |
| AgPercent | 5.953 | -1.703 | 13.609 | -1.050 | -2.641 | 0.540 | 3.995 | -6.686 | 14.675 | 3.910 | -2.083 | 9.903 |
| DisturbedPercent | 3.428 | -4.058 | 10.914 | -2.876 | -7.937 | 2.186 | -1.230 | -10.739 | 8.279 | 2.922 | -0.766 | 6.610 |
| DitchPercent | 9.405 | -0.536 | 19.345 | 8.278 | -4.358 | 20.915 | -5.158 | -18.218 | 7.903 | 12.782 | -4.637 | 30.201 |
| DrainSqMile | -106.674 | -665.849 | 452.501 | 266.976 | -237.423 | 771.374 | -601.201 | -3003.139 | 1800.736 | -153.900 | -683.226 | 375.427 |
| ForestPercent | -4.650 | -10.742 | 1.441 | -4.966 | -14.604 | 4.672 | 1.077 | -5.908 | 8.062 | -0.771 | -2.635 | 1.094 |
| ImpervPercent | -0.099 | -0.456 | 0.259 | 0.085 | -0.290 | 0.460 | -0.498 | -1.155 | 0.159 | -0.148 | -0.830 | 0.534 |
| RangePercent | -2.189 | -5.036 | 0.659 | -1.439 | -5.563 | 2.684 | -3.476 | -11.221 | 4.270 | -1.005 | -3.846 | 1.836 |
| RoadCrossingDensity | -0.026 | -0.116 | 0.063 | **-0.114** | **-0.207** | **-0.022** | 0.035 | -0.196 | 0.266 | -0.004 | -0.148 | 0.140 |
| UrbanPercent | -0.289 | -1.379 | 0.802 | -0.264 | -0.930 | 0.401 | -1.749 | -4.398 | 0.901 | 0.010 | -1.869 | 1.888 |
| WetlandPercent | 1.296 | -2.970 | 5.562 | NA | NA | NA | -0.706 | -5.188 | 3.775 | -1.542 | -3.400 | 0.316 |
| CVDepth | -2.852 | -8.205 | 2.500 | -5.155 | -13.352 | 3.042 | **-14.853** | **-23.964** | **-5.741** | 5.016 | -3.473 | 13.505 |
| Forestin100M | -4.059 | -9.850 | 1.733 | -2.618 | -12.823 | 7.587 | 0.203 | -6.457 | 6.863 | -1.722 | -3.456 | 0.011 |
| Gradient | -0.929 | -2.216 | 0.357 | -2.623 | -5.445 | 0.198 | 0.973 | -2.030 | 3.976 | -0.113 | -0.548 | 0.322 |
| HDS | -3.334 | -7.688 | 1.020 | -0.580 | -4.352 | 3.192 | 0.415 | -5.199 | 6.030 | -3.770 | -7.830 | 0.291 |
| MBankEros | **-0.146** | **-0.191** | **-0.101** | **-0.037** | **-0.067** | **-0.007** | **-0.133** | **-0.210** | **-0.057** | **-0.250** | **-0.348** | **-0.151** |
| Mean_Depth | 2.870 | -2.866 | 8.607 | 3.409 | -5.035 | 11.853 | 10.672 | -0.277 | 21.621 | -0.928 | -10.212 | 8.357 |
| MeanDepthFines | **-4.947** | **-7.536** | **-2.359** | **-5.218** | **-9.642** | **-0.793** | **-5.549** | **-9.959** | **-1.139** | **-4.406** | **-8.485** | **-0.327** |
| MeanThalweg_depth | -2.010 | -15.673 | 11.652 | 3.585 | -11.252 | 18.422 | -11.544 | -60.915 | 37.827 | -0.441 | -13.891 | 13.009 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MeanWidth | 0.196 | -1.353 | 1.745 | 0.164 | -2.507 | 2.836 | 1.298 | -1.857 | 4.452 | -0.145 | -2.428 | 2.138 |
| MSHA | -2.168 | -6.578 | 2.241 | -1.784 | -6.197 | 2.629 | -3.282 | -10.334 | 3.770 | -0.934 | -8.137 | 6.270 |
| # Stream_Features100M | -0.875 | -2.356 | 0.606 | 0.383 | -2.136 | 2.902 | **-3.196** | **-5.812** | **-0.579** | -0.375 | -2.329 | 1.579 |
| NumSubTypes | -0.411 | -0.867 | 0.045 | -0.410 | -1.106 | 0.286 | -0.604 | -1.527 | 0.318 | -0.288 | -1.029 | 0.454 |
| PctAgLT | 6.289 | -1.747 | 14.325 | -0.974 | -2.008 | 0.060 | 1.939 | -8.711 | 12.588 | 6.404 | -2.609 | 15.418 |
| PctBoulder | -0.675 | -2.933 | 1.583 | -0.675 | -7.087 | 5.736 | -0.622 | -1.732 | 0.488 | -0.335 | -1.607 | 0.938 |
| PctCover | 7.354 | -4.210 | 18.918 | 1.552 | -14.933 | 18.037 | 1.054 | -22.371 | 24.479 | 14.394 | -4.372 | 33.161 |
| PctDistLU | 5.379 | -6.013 | 16.771 | **-8.814** | **-13.624** | **-4.004** | 6.154 | -15.139 | 27.446 | 9.545 | -4.226 | 23.316 |
| PctDisturbedin100M | 4.297 | -3.656 | 12.251 | -2.535 | -7.024 | 1.953 | -3.823 | -15.085 | 7.438 | 6.280 | -0.731 | 13.291 |
| PctEmbededsubstrate | **11.702** | **0.236** | **23.167** | 4.830 | -10.485 | 20.145 | 4.413 | -14.424 | 23.250 | 18.378 | -1.115 | 37.871 |
| PctEmerMac | -1.060 | -7.182 | 5.063 | 3.799 | -3.174 | 10.771 | -0.424 | -7.554 | 6.706 | -5.961 | -17.379 | 5.457 |
| PctFines | 2.387 | -5.543 | 10.317 | 6.179 | -8.705 | 21.062 | -0.315 | -16.556 | 15.926 | -0.367 | -11.344 | 10.611 |
| PctPool | **-7.796** | **-12.816** | **-2.776** | -7.287 | -15.040 | 0.466 | **-9.426** | **-16.178** | **-2.674** | -6.650 | -15.116 | 1.816 |
| PctPverVeg | 4.553 | -3.866 | 12.971 | -4.506 | -9.397 | 0.384 | -1.307 | -18.568 | 15.954 | 13.636 | -1.206 | 28.479 |
| Percent_Riffle | -0.068 | -4.182 | 4.047 | 0.092 | -8.725 | 8.909 | -2.193 | -8.325 | 3.938 | 1.520 | -3.741 | 6.780 |
| PctRock | -2.213 | -10.300 | 5.875 | -5.792 | -21.117 | 9.534 | 1.284 | -14.586 | 17.154 | -0.189 | -11.487 | 11.108 |
| PctRun | 4.648 | -2.474 | 11.770 | 6.425 | -3.499 | 16.348 | 4.674 | -10.305 | 19.652 | 1.702 | -9.433 | 12.837 |
| PctSubMac | 6.749 | -1.113 | 14.611 | 4.274 | -5.124 | 13.672 | 5.819 | -6.243 | 17.881 | 8.980 | -4.839 | 22.800 |
| PctUnderCut | -0.391 | -1.209 | 0.427 | -0.083 | -1.989 | 1.824 | **-0.964** | **-1.746** | **-0.182** | -0.296 | -1.337 | 0.745 |
| PctWoody | -1.098 | -3.594 | 1.397 | -1.123 | -7.178 | 4.933 | -1.315 | -4.664 | 2.034 | -0.089 | -1.260 | 1.083 |
| PerRiffle | -0.068 | -4.182 | 4.047 | 0.092 | -8.725 | 8.909 | -2.193 | -8.325 | 3.938 | 1.520 | -3.741 | 6.780 |
| Sinuosity | 0.002 | -0.091 | 0.096 | 0.048 | -0.100 | 0.195 | 0.075 | -0.106 | 0.257 | -0.080 | -0.242 | 0.082 |
| WidthtoDepthRatio | -1.278 | -2.976 | 0.420 | NA | NA | NA | 0.304 | -3.108 | 3.715 | -1.158 | -3.399 | 1.082 |

| | State | | | MWS | | | MWP | | | TP | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Indicator | DiffEst | LCB99Pct | UCB99Pct | DiffEst | LCB99Pct | UCB99Pct | DiffEst | LCB99Pct | UCB99Pct | DiffEst | LCB99Pct | UCB99Pct |
| Conduct | 73.411 | -2.243 | 149.064 | **42.401** | **0.584** | **84.217** | 12.361 | -67.066 | 91.788 | 47.389 | -77.207 | 171.985 |
| DO | 0.337 | -0.581 | 1.255 | 0.468 | -0.658 | 1.593 | -0.071 | -1.603 | 1.460 | 0.319 | -1.461 | 2.100 |
| NH3 | **0.001** | **0.000** | **0.002** | **0.002** | **0.000** | **0.003** | **0.001** | **0.000** | **0.003** | 0.000 | -0.002 | 0.002 |
| Nitrogen | 0.281 | -1.411 | 1.972 | -0.019 | -0.038 | 0.000 | -0.563 | -2.053 | 0.926 | 0.082 | -3.439 | 3.603 |
| ph | **0.196** | **0.044** | **0.349** | 0.187 | -0.144 | 0.519 | 0.164 | -0.105 | 0.433 | **0.162** | **0.009** | **0.315** |
| Phos | -0.025 | -0.137 | 0.086 | 0.018 | -0.007 | 0.042 | -0.041 | -0.101 | 0.018 | -0.076 | -0.350 | 0.198 |
| TempH2O | -0.162 | -1.210 | 0.885 | -0.021 | -1.535 | 1.494 | 0.301 | -1.525 | 2.128 | -0.767 | -2.614 | 1.081 |
| TSS | **-12.864** | **-23.222** | **-2.505** | -0.055 | -4.320 | 4.210 | -24.524 | -51.948 | 2.900 | -19.709 | -40.117 | 0.699 |
| BenInsect | -0.306 | -0.833 | 0.222 | -0.669 | -1.404 | 0.065 | 0.558 | -0.729 | 1.846 | -0.444 | -1.289 | 0.402 |
| Count_of_Taxa | -1.160 | -2.790 | 0.470 | -2.017 | -4.219 | 0.185 | 0.169 | -3.743 | 4.081 | -1.161 | -3.841 | 1.518 |
| Darter | -0.193 | -0.462 | 0.076 | **-0.495** | **-0.960** | **-0.031** | 0.191 | -0.359 | 0.741 | -0.161 | -0.571 | 0.249 |
| DomTwoCHPct | **5.307** | **0.005** | **10.609** | 6.580 | -0.401 | 13.561 | 2.589 | -7.338 | 12.515 | 4.585 | -4.496 | 13.666 |
| FishDELTPct | -0.203 | -0.498 | 0.092 | -0.404 | -0.907 | 0.099 | -0.247 | -1.007 | 0.513 | 0.029 | -0.327 | 0.385 |
| GameFish | -0.316 | -0.800 | 0.169 | **-0.853** | **-1.610** | **-0.096** | -0.447 | -1.627 | 0.732 | 0.065 | -0.653 | 0.783 |
| HeadwaterSp | -0.183 | -0.515 | 0.149 | -0.323 | -0.999 | 0.354 | -0.273 | -0.781 | 0.234 | -0.056 | -0.502 | 0.389 |
| Insectivores | -0.547 | -1.412 | 0.317 | **-1.169** | **-2.297** | **-0.042** | 0.704 | -1.323 | 2.730 | -0.682 | -2.073 | 0.709 |
| Minnow | -0.462 | -1.195 | 0.271 | -0.530 | -1.623 | 0.563 | -0.222 | -1.876 | 1.433 | -0.570 | -1.781 | 0.641 |
| #/Meter WO tolerantSp | **-0.212** | **-0.375** | **-0.049** | **-0.309** | **-0.575** | **-0.043** | -0.010 | -0.300 | 0.279 | -0.242 | -0.526 | 0.043 |
| Omnivore | **-0.362** | **-0.629** | **-0.095** | -0.334 | -0.679 | 0.010 | -0.382 | -0.960 | 0.197 | -0.387 | -0.847 | 0.072 |
| PiscivorePct | 0.031 | -2.629 | 2.690 | 0.734 | -5.266 | 6.735 | 0.866 | -4.748 | 6.480 | -0.713 | -2.937 | 1.510 |
| Sensitive | -0.119 | -0.649 | 0.410 | -0.292 | -1.215 | 0.632 | 0.477 | -0.753 | 1.707 | -0.255 | -0.886 | 0.376 |
| SLithopPct | 3.221 | -2.692 | 9.134 | 7.148 | -3.605 | 17.900 | 3.020 | -8.745 | 14.784 | 0.461 | -7.596 | 8.518 |
| TolPct | 3.342 | -4.520 | 11.204 | 4.931 | -8.641 | 18.502 | -8.189 | -27.682 | 11.305 | 7.364 | -0.911 | 15.640 |

| | State | | | MWS | | | MWP | | | TP | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Indicator | DiffEst | LCB99Pct | UCB99Pct | DiffEst | LCB99Pct | UCB99Pct | DiffEst | LCB99Pct | UCB99Pct | DiffEst | LCB99Pct | UCB99Pct |
| AmphipodaPct | -1.998 | -5.473 | 1.477 | 4.183 | -2.172 | 10.539 | 3.372 | -4.794 | 11.538 | **-9.061** | **-14.020** | **-4.103** |
| Chironomidae | -2.278 | -9.742 | 5.185 | -8.383 | -18.518 | 1.752 | -0.196 | -11.581 | 11.188 | 2.209 | -11.591 | 16.009 |
| ChironomidaeCh | -0.311 | -1.892 | 1.270 | -1.453 | -4.112 | 1.207 | -0.125 | -2.664 | 2.414 | 0.856 | -1.444 | 3.155 |
| ClingerCh | -1.484 | -2.992 | 0.024 | **-2.539** | **-4.635** | **-0.442** | -0.362 | -3.064 | 2.341 | -0.575 | -2.595 | 1.445 |
| Collector_filtererCh | **-0.611** | **-1.208** | **-0.014** | **-0.914** | **-1.727** | **-0.102** | -0.060 | -1.062 | 0.942 | -0.455 | -1.374 | 0.464 |
| Collector_gathererCh | **-1.910** | **-3.239** | **-0.580** | -1.133 | -3.677 | 1.410 | -1.772 | -3.701 | 0.156 | **-2.214** | **-3.834** | **-0.594** |
| CollectORfiltererPct | -3.925 | -8.173 | 0.324 | -5.777 | -12.050 | 0.496 | -5.548 | -15.516 | 4.419 | -1.331 | -7.550 | 4.889 |
| CollectORgathererPct | -4.675 | -11.169 | 1.819 | 5.636 | -2.639 | 13.911 | -3.758 | -13.100 | 5.583 | **-13.117** | **-25.343** | **-0.891** |
| Ephemeroptera | **-1.057** | **-1.617** | **-0.497** | -0.617 | -1.416 | 0.183 | -0.242 | -1.291 | 0.806 | **-1.588** | **-2.410** | **-0.767** |
| EphemeropteraPct | -3.130 | -7.356 | 1.097 | 3.134 | -3.717 | 9.985 | -2.003 | -9.372 | 5.366 | **-8.303** | **-14.500** | **-2.107** |
| EPT | **-2.476** | **-3.663** | **-1.289** | **-3.054** | **-4.823** | **-1.285** | -0.686 | -2.900 | 1.527 | **-2.176** | **-3.646** | **-0.707** |
| EPTPct | -5.052 | -11.026 | 0.922 | -1.461 | -10.290 | 7.368 | -1.604 | -11.870 | 8.662 | -8.384 | -17.208 | 0.440 |
| IntolerantCh | **-2.021** | **-2.752** | **-1.291** | **-3.101** | **-4.545** | **-1.657** | -0.898 | -1.966 | 0.170 | **-1.218** | **-2.058** | **-0.379** |
| LongLivedCh | **-2.282** | **-2.857** | **-1.707** | **-3.459** | **-4.465** | **-2.453** | **-1.637** | **-2.731** | **-0.542** | **-1.320** | **-2.008** | **-0.632** |
| PredatorCh | **-2.901** | **-3.936** | **-1.866** | **-5.066** | **-6.477** | **-3.655** | **-1.491** | **-2.817** | **-0.166** | -1.403 | -3.230 | 0.424 |
| PredatorPct | -0.797 | -3.107 | 1.512 | **-4.646** | **-7.392** | **-1.900** | 2.612 | -0.426 | 5.650 | 1.075 | -3.429 | 5.579 |
| ScraperCh | **-0.625** | **-1.201** | **-0.048** | -0.812 | -1.934 | 0.311 | -0.567 | -1.629 | 0.496 | -0.402 | -1.150 | 0.347 |
| ScraperPct | 5.787 | -1.435 | 13.010 | 4.023 | -2.070 | 10.115 | 0.526 | -10.506 | 11.559 | 8.723 | -5.608 | 23.054 |
| TanytharsiniCh | 0.016 | -0.431 | 0.462 | -0.137 | -0.876 | 0.603 | 0.226 | -0.471 | 0.924 | 0.173 | -0.468 | 0.815 |
| TaxaCount | **-5.937** | **-7.832** | **-4.042** | **-8.116** | **-11.611** | **-4.621** | **-4.447** | **-7.580** | **-1.314** | **-4.075** | **-6.582** | **-1.568** |
| Tolerant | **-2.343** | **-3.558** | **-1.127** | **-2.394** | **-4.677** | **-0.112** | **-2.154** | **-3.856** | **-0.452** | **-2.334** | **-4.170** | **-0.498** |
| TolerantPct | 4.085 | -2.189 | 10.360 | 2.309 | -6.488 | 11.107 | 4.735 | -6.017 | 15.487 | 4.377 | -5.467 | 14.221 |
| Trichoptera | **-1.184** | **-1.844** | **-0.524** | **-2.169** | **-3.209** | **-1.129** | -0.304 | -1.547 | 0.939 | -0.410 | -1.145 | 0.326 |
| TrichopteraPct | -1.742 | -4.823 | 1.338 | -4.299 | -9.444 | 0.846 | 0.456 | -4.673 | 5.585 | -0.040 | -4.672 | 4.592 |
| VeryTolerant | **-1.443** | **-2.258** | **-0.627** | **-1.668** | **-3.070** | **-0.266** | -0.951 | -1.992 | 0.089 | **-1.519** | **-2.799** | **-0.239** |

# Appendix 4.

Condition estimates comparison of significant differences among the basin and ecoregion surveys – **X marks where significant differences were found, NA indicates where not enough information was available to test for significant differences.**

| **Watershed Land Use Metrics** | | | | |
|---|---|---|---|---|
| | State | MWS | MWP | TP |
| AgPercent | --- | --- | --- | --- |
| DisturbedPercent | --- | --- | --- | --- |
| DitchPercent | --- | --- | --- | --- |
| DrainSqMile | --- | --- | --- | --- |
| ForestPercent | --- | --- | --- | --- |
| ImpervPercent | --- | --- | --- | --- |
| RangePercent | --- | --- | --- | --- |
| UrbanPercent | --- | --- | --- | --- |
| WetlandPercent | --- | NA | --- | --- |
| **Habitat Characteristics Metrics** | | | | |
| | State | MWS | MWP | TP |
| Forest in 100M | --- | --- | --- | --- |
| Gradient | --- | --- | --- | --- |
| HDS | --- | --- | --- | --- |
| MBankEros | X | X | X | X |
| Mean Depth | --- | --- | --- | --- |
| MSHA | --- | --- | --- | --- |
| NumSubTypes | --- | --- | --- | --- |
| % AgLT | --- | --- | --- | --- |
| % Cover | --- | --- | --- | --- |
| % Disturbed in 100M | --- | --- | --- | --- |
| % Fines | --- | --- | --- | --- |
| % Pool | X | --- | X | --- |
| % Riffle | --- | --- | --- | --- |
| % Rock | --- | --- | --- | --- |
| % Run | --- | --- | --- | --- |
| % Woody | --- | --- | --- | --- |
| Sinuosity | --- | --- | --- | --- |
| Width/Depth Ratio | --- | NA | --- | --- |
| **Water Chemistry** | | | | |
| | State | MWS | MWP | TP |
| Conduct | --- | X | --- | --- |
| DO | --- | --- | --- | --- |
| NH3 | X | X | X | --- |
| Nitrogen | --- | --- | --- | --- |
| ph | X | --- | --- | X |
| Phos | --- | --- | --- | --- |
| TempH2O | --- | --- | --- | --- |
| TSS | X | --- | --- | --- |
| **Fish Metrics** | | | | |
| | State | MWS | MWP | TP |
| Count of Taxa | --- | --- | --- | --- |
| Dominant Two percent | X | --- | --- | --- |
| Fish DELT % | --- | --- | --- | --- |
| Sensitive taxa | --- | --- | --- | --- |
| Tolerant % | --- | --- | --- | --- |

| Macroinvertebrate Metrics | | | | |
|---|---|---|---|---|
| | State | MWS | MWP | TP |
| EPT | X | X | --- | X |
| EPT % | --- | --- | --- | --- |
| Intolerant taxa | X | X | --- | X |
| Long Lived taxa | X | X | X | X |
| Taxa Count | X | X | X | X |
| Tolerant taxa | X | X | X | X |
| Tolerant % | --- | --- | --- | --- |

# Appendix 5. Fish community CDF test p-values

| | Basin | Ecoregion |
|---|---|---|
| Fish Indicator | p_Value | p_Value |
| **Watershed Land Use Metrics** | | |
| AgPercent | 5.45E-13 | 9.56E-07 |
| DisturbedPercent | 8.88E-16 | 6.64E-06 |
| DitchPercent | 3.54E-07 | 5.82E-06 |
| DrainSqMile | 9.62E-09 | 0.000124 |
| ForestPercent | 6.77E-15 | 1.08E-08 |
| ImpervPercent | 8.49E-05 | ---- |
| RoadCrossingDensity | 0.000272 | ---- |
| UrbanPercent | 4.65E-05 | ---- |
| **Habitat Characteristics Metrics** | | |
| Forestin100M | 3.28E-13 | 2.07E-07 |
| HDS | 4.55E-15 | 3.19E-06 |
| MeanDepthFines | 1.55E-15 | ---- |
| MSHA | 0 | 3.83E-07 |
| Number_Stream_Features100M | 1.67E-05 | 1.46E-06 |
| PctAgLT | 1.17E-13 | 1.52E-06 |
| PctBoulder | 1.07E-11 | 0.000692 |
| PctCover | 8.65E-05 | 9.54E-05 |
| PctDisturbedin100M | 7.49E-10 | 0.000166 |
| PctFines | 2.64E-11 | 0.000878 |
| PctPool | 8.54E-07 | ---- |
| PctRock | 2.95E-14 | 2.57E-05 |
| PctRun | 3.9E-06 | ---- |
| Percent_Riffle | 6.3E-09 | 5.55E-08 |
| WidthtoDepthRatio | ---- | 0.000987 |
| **Water Chemistry** | | |
| Conduct | 5.6E-08 | 2.11E-07 |
| DO | 2.93E-05 | ---- |
| Nitrogen | 6.31E-07 | ---- |
| Phos | 3.41E-08 | 0.000198 |

# Appendix 6. Invertebrate CDF test p-values

| | Basin | Ecoregion |
|---|---|---|
| Invertebrate Indicator | p_Value | p_Value |
| **Watershed Land Use Metrics** | | |
| AgPercent | 1.11E-16 | 7.22E-15 |
| DisturbedPercent | 0 | 2.83E-10 |
| DitchPercent | 0.000168 | 3.42E-07 |
| DrainSqMile | ---- | 0.000402 |
| ForestPercent | 0 | 1.11E-16 |
| ImpervPercent | 2.58E-07 | 0.000435 |
| RoadCrossingDensity | 3.07E-11 | 1.58E-05 |
| UrbanPercent | 2.03E-09 | 5.18E-07 |
| **Habitat Characteristics Metrics** | | |
| CVDepth | 0.000112 | |
| Forestin100M | 0 | 2.22E-16 |
| HDS | 0 | 1.51E-12 |
| MeanThalweg_depth | 0.000319 | ---- |
| MeanWidth | 1.26E-05 | 3.38E-05 |
| MSHA | 0 | 2.75E-14 |
| PctAgLT | 0 | 1.2E-14 |
| PctBoulder | 7.31E-05 | 0.000865 |
| PctCover | ---- | 5.72E-05 |
| PctDistLU | 6.42E-13 | 6.98E-10 |
| PctDisturbedin100M | 0 | 1.75E-13 |
| PctFines | 0.000803 | 2.26E-05 |
| PctRock | 3.46E-05 | 4E-07 |
| PctWoody | 2.1E-08 | 3.48E-05 |
| Percent_Riffle | 0.000533 | 2.24E-10 |
| WidthtoDepthRatio | 0.000643 | 0.000289 |
| **Water Chemistry** | | |
| Conduct | 0 | 1.56E-12 |
| DO | 3.64E-05 | ---- |
| Nitrogen | 1.16E-07 | ---- |
| ph | ---- | 0.000179 |
| Phos | 1.45E-06 | 3.9E-07 |
| TSS | 1.43E-05 | ---- |

# Appendix 7. Site location information and weighting

| FieldNum | WBName | Latitude | Longitude | Ecoregion Name | Strahler | Class | Site Status | Weight Category | final_wgt |
|---|---|---|---|---|---|---|---|---|---|
| 96SC001 | | 45.89737 | -93.55553 | Mixed Wood Shield | NA | 2B | Non-Target | Mixed Wood Shield_St. Croix_1st | 97.77550448 |
| 96SC002 | Snake River | 46.06189 | -93.21952 | Mixed Wood Shield | 4 | 2B | Target | Mixed Wood Shield_St. Croix_4th+ | 25.70166 |
| 96SC003 | Snake River | 46.06017 | -93.22044 | Mixed Wood Shield | 4 | 2B | Target | Mixed Wood Shield_St. Croix_4th+ | 25.70166 |
| 96SC004 | Little Ann River | 45.96874 | -93.42882 | Mixed Wood Shield | 2 | 2B | Target | Mixed Wood Shield_St. Croix_2nd | 80.63209429 |
| 96SC005 | Trib. to Spring Lake | 45.89666 | -93.25932 | Mixed Wood Shield | 1 | 2B | Target | Mixed Wood Shield_St. Croix_1st | 97.77550448 |
| 96SC006 | Knife River | 46.03536 | -93.38002 | Mixed Wood Shield | 3 | 2B | Target | Mixed Wood Shield_St. Croix_3rd | 31.54614503 |
| 96SC007 | Snake River | 46.01766 | -93.23882 | Mixed Wood Shield | 4 | 2B | Target | Mixed Wood Shield_St. Croix_4th+ | 25.70166 |
| 96SC008 | Knife River (Dry Run) | 46.06915 | -93.46773 | Mixed Wood Shield | 1 | 2B | Target | Mixed Wood Shield_St. Croix_1st | 97.77550448 |
| 96SC009 | | 45.81034 | -93.03199 | Mixed Wood Plains | NA | 2B | Non-Target | Mixed Wood Plains_St. Croix_1st | 197.9187653 |
| 96SC010 | Snake River | 45.79031 | -93.10694 | Mixed Wood Plains | 5 | 2B | Target | Mixed Wood Plains_St. Croix_4th+ | 77.0298947 |
| 96SC011 | Mud Creek | 45.87203 | -93.1351 | Mixed Wood Plains | 3 | 2B | Target | Mixed Wood Plains_St. Croix_3rd | 32.79658587 |
| 96SC012 | Snake River | 45.84354 | -92.88971 | Mixed Wood Plains | 5 | 2B | Target | Mixed Wood Plains_St. Croix_4th+ | 77.0298947 |
| 96SC013 | Mission Creek | 45.89317 | -92.98041 | Mixed Wood Plains | 2 | 2B | Target | Mixed Wood Plains_St. Croix_2nd | 72.92070279 |
| 96SC014 | | 45.48745 | -93.10021 | Mixed Wood Plains | 2 | 2B | Permission denied | Mixed Wood Plains_St. Croix_2nd | 72.92070279 |
| 96SC015 | Rush Creek | 45.67968 | -92.98907 | Mixed Wood Plains | 3 | 2B | Target | Mixed Wood Plains_St. Croix_3rd | 32.79658587 |
| 96SC016 | unnamed ditch to Hay Creek | 45.53867 | -92.93325 | Mixed Wood Plains | 1 | 2B | Target | Mixed Wood Plains_St. Croix_1st | 197.9187653 |
| 96SC017 | Groundhouse River | 45.84109 | -93.44743 | Mixed Wood Shield | 3 | 2B | Target | Mixed Wood Shield_St. Croix_3rd | 31.54614503 |
| 96SC018 | Snake River | 45.81262 | -93.27988 | Mixed Wood Plains | 4 | 2B | Target | Mixed Wood Plains_St. Croix_4th+ | 77.0298947 |
| 96SC019 | Snake River | 45.79367 | -93.18112 | Mixed Wood Plains | 5 | 2B | Target | Mixed Wood Plains_St. Croix_4th+ | 77.0298947 |
| 96SC020 | | 45.71892 | -93.45634 | Mixed Wood Plains | NA | 2B | Non-Target | Mixed Wood Plains_St. Croix_1st | 197.9187653 |
| 96SC021 | Ann River | 45.87213 | -93.34392 | Mixed Wood Plains | 3 | 2B | Target | Mixed Wood Plains_St. Croix_3rd | 32.79658587 |
| 96SC022 | Rock Creek | 45.71852 | -92.91021 | Mixed Wood Plains | 3 | 2B | Target | Mixed Wood Plains_St. Croix_3rd | 32.79658587 |
| 96SC023 | Goose Creek | 45.59389 | -92.89985 | Mixed Wood Plains | 3 | 2B | Target | Mixed Wood Plains_St. Croix_3rd | 32.79658587 |
| 96SC024 | Sunrise River | 45.34659 | -92.95895 | Mixed Wood Plains | 2 | 2B | Target | Mixed Wood Plains_St. Croix_2nd | 72.92070279 |
| 96SC025 | North Branch Sunrise River | 45.51219 | -92.89282 | Mixed Wood Plains | 3 | 2B | Target | Mixed Wood Plains_St. Croix_3rd | 32.79658587 |
| 96SC026 | | 45.38503 | -92.69394 | Mixed Wood Plains | NA | 2B | Non-Target | Mixed Wood Plains_St. Croix_2nd | 72.92070279 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 96SC027 | County Ditch #7 | 45.48991 | -92.99101 | Mixed Wood Plains | 1 | 2B | Target | Mixed Wood Plains_St. Croix_1st | 197.9187653 |
| 96SC028 | St Croix River | 45.26927 | -92.75368 | Mixed Wood Shield | 6 | 2B | Target | Mixed Wood Shield_St. Croix_4th+ | 25.70166 |
| 96SC029 | Lower Tamarack River | 46.05412 | -92.39616 | Mixed Wood Shield | 3 | 2B | Target | Mixed Wood Shield_St. Croix_3rd | 31.54614503 |
| 96SC030 | St Croix River | 45.88046 | -92.72937 | Mixed Wood Shield | 6 | 2B | Target | Mixed Wood Shield_St. Croix_4th+ | 25.70166 |
| 96SC031 | | 45.87977 | -92.7751 | Mixed Wood Shield | NA | 2B | Non-Target | Mixed Wood Shield_St. Croix_1st | 97.77550448 |
| 96SC032 | Kettle River | 45.96045 | -92.82336 | Mixed Wood Shield | 5 | 2B | Target | Mixed Wood Shield_St. Croix_4th+ | 25.70166 |
| 96SC033 | Kettle River | 45.90114 | -92.7309 | Mixed Wood Shield | 5 | 2B | Target | Mixed Wood Shield_St. Croix_4th+ | 25.70166 |
| 96SC034 | Bear Creek | 46.01359 | -92.74487 | Mixed Wood Shield | 2 | 2B | Target | Mixed Wood Shield_St. Croix_2nd | 80.63209429 |
| 96SC035 | | 46.42465 | -92.94721 | Mixed Wood Shield | NA | 2B | Non-Target | Mixed Wood Shield_St. Croix_1st | 97.77550448 |
| 96SC036 | Trib. to Dead Moose River | 46.52159 | -92.97184 | Mixed Wood Shield | 1 | 2B | Target | Mixed Wood Shield_St. Croix_1st | 97.77550448 |
| 96SC037 | Upper Tamarack River | 46.14237 | -92.29416 | Mixed Wood Shield | 3 | 2B | Target | Mixed Wood Shield_St. Croix_3rd | 31.54614503 |
| 96SC038 | McDermott Creek | 46.20655 | -92.39439 | Mixed Wood Shield | 2 | 2B | Target | Mixed Wood Shield_St. Croix_2nd | 80.63209429 |
| 96SC039 | West Branch Kettle River | 46.60136 | -93.01392 | Mixed Wood Shield | 1 | 2B | Target | Mixed Wood Shield_St. Croix_1st | 97.77550448 |
| 96SC040 | Kettle River | 46.45577 | -92.87349 | Mixed Wood Shield | 3 | 2B | Target | Mixed Wood Shield_St. Croix_3rd | 31.54614503 |
| 96SC041 | | 46.49466 | -92.6556 | Mixed Wood Shield | NA | 2B | Non-Target | Mixed Wood Shield_St. Croix_1st | 97.77550448 |
| 96SC042 | Gillespie Brook | 46.52108 | -92.79198 | Mixed Wood Shield | 2 | 2B | Target | Mixed Wood Shield_St. Croix_2nd | 80.63209429 |
| 96SC043 | Pine River | 46.28036 | -92.92781 | Mixed Wood Shield | 4 | 2B | Target | Mixed Wood Shield_St. Croix_4th+ | 25.70166 |
| 96SC044 | Trib. to Burnam Creek | 46.2857 | -92.98711 | Mixed Wood Shield | 1 | 2B | Target | Mixed Wood Shield_St. Croix_1st | 97.77550448 |
| 96SC045 | Cane Creek | 46.24622 | -92.78165 | Mixed Wood Shield | 2 | 2B | Target | Mixed Wood Shield_St. Croix_2nd | 80.63209429 |
| 96SC046 | Kettle River | 46.36704 | -92.86101 | Mixed Wood Shield | 4 | 2B | Target | Mixed Wood Shield_St. Croix_4th+ | 25.70166 |
| 96SC047 | Kettle River | 46.39817 | -92.87971 | Mixed Wood Shield | 4 | 2B | Target | Mixed Wood Shield_St. Croix_4th+ | 25.70166 |
| 96SC048 | Kettle River | 46.35323 | -92.8402 | Mixed Wood Shield | 4 | 2B | Target | Mixed Wood Shield_St. Croix_4th+ | 25.70166 |
| 96SC049 | Trib. to Snake River | 46.20026 | -93.25423 | Mixed Wood Shield | 2 | 2B | Target | Mixed Wood Shield_St. Croix_2nd | 80.63209429 |
| 96SC050 | Snake River | 46.32376 | -93.27618 | Mixed Wood Shield | 3 | 2B | Target | Mixed Wood Shield_St. Croix_3rd | 31.54614503 |
| 96SC051 | Trib. to Chelsey Brook | 46.17343 | -93.17561 | Mixed Wood Shield | 1 | 2B | Target | Mixed Wood Shield_St. Croix_1st | 97.77550448 |
| 96SC052 | Snake River | 46.22272 | -93.24182 | Mixed Wood Shield | 3 | 2B | Target | Mixed Wood Shield_St. Croix_3rd | 31.54614503 |
| 96SC053 | Kettle River | 46.03673 | -92.87197 | Mixed Wood Shield | 5 | 2B | Target | Mixed Wood Shield_St. Croix_4th+ | 25.70166 |
| 96SC054 | Deer Creek | 46.05361 | -92.88169 | Mixed Wood Shield | 1 | 2B | Target | Mixed Wood Shield_St. Croix_1st | 97.77550448 |
| 96SC055 | Bear Creek | 46.11166 | -92.7907 | Mixed Wood Shield | 2 | 2B | Target | Mixed Wood Shield_St. Croix_2nd | 80.63209429 |
| 96SC056 | Lower Tamarack River | 46.07927 | -92.42779 | Mixed Wood Shield | 3 | 2B | Target | Mixed Wood Shield_St. Croix_3rd | 31.54614503 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 96SC057 | | 46.19387 | -92.7165 | Mixed Wood Shield | NA | 2B | Non-Target | Mixed Wood Shield_St. Croix_1st | 97.77550448 |
| 96SC058 | East Fork Crooked Creek | 46.07914 | -92.55502 | Mixed Wood Shield | 2 | 2B | Target | Mixed Wood Shield_St. Croix_2nd | 80.63209429 |
| 96SC059 | | 46.15937 | -92.47709 | Mixed Wood Shield | 1 | 2B | Target | Mixed Wood Shield_St. Croix_1st | 97.77550448 |
| 96SC060 | | 44.79937 | -92.8198 | Mixed Wood Plains | NA | 2B | Non-Target | Mixed Wood Plains_St. Croix_1st | 197.9187653 |
| 97LS001 | unnamed creek | 47.54153 | -92.31159 | Mixed Wood Shield | 1 | 2B | Target | Mixed Wood Shield_Lake Superior_1st | 408.2916937 |
| 97LS002 | St Louis River | 47.45257 | -92.3109 | Mixed Wood Shield | 4 | 2B | Target | Mixed Wood Shield_Lake Superior_4th+ | 94.02260335 |
| 97LS003 | St Louis River | 47.46101 | -92.09245 | Mixed Wood Shield | 3 | 2B | Target | Mixed Wood Shield_Lake Superior_3rd | 134.0565907 |
| 97LS004 | | 47.57551 | -92.15341 | Mixed Wood Shield | NA | 2B | Non-Target | Mixed Wood Shield_Lake Superior_1st | 408.2916937 |
| 97LS005 | Embarrass River | 47.62714 | -92.2361 | Mixed Wood Shield | 3 | 2B | Target | Mixed Wood Shield_Lake Superior_3rd | 134.0565907 |
| 97LS006 | | 47.37803 | -92.88072 | Mixed Wood Shield | NA | 2A | Non-Target | Mixed Wood Shield_Lake Superior_1st | 408.2916937 |
| 97LS007 | | 47.35351 | -92.81513 | Mixed Wood Shield | NA | 2B | Non-Target | Mixed Wood Shield_Lake Superior_2nd | 216.2142507 |
| 97LS008 | | 47.47263 | -92.74821 | Mixed Wood Shield | NA | 2B | Non-Target | Mixed Wood Shield_Lake Superior_3rd | 134.0565907 |
| 97LS009 | Skunk Creek | 47.2277 | -91.53174 | Mixed Wood Shield | 1 | 2A | Target | Mixed Wood Shield_Lake Superior_1st | 408.2916937 |
| 97LS010 | Beaver River | 47.27146 | -91.39485 | Mixed Wood Shield | 3 | 2A | Target | Mixed Wood Shield_Lake Superior_3rd | 134.0565907 |
| 97LS011 | Trib. to Lake Superior | 47.21094 | -91.36749 | Mixed Wood Shield | 2 | 2A | Target | Mixed Wood Shield_Lake Superior_2nd | 216.2142507 |
| 97LS012 | unnamed creek | 47.14388 | -91.48925 | Mixed Wood Shield | 1 | 2B | Target | Mixed Wood Shield_Lake Superior_1st | 408.2916937 |
| 97LS013 | | 47.09686 | -92.06422 | Mixed Wood Shield | NA | 2B | Non-Target | Mixed Wood Shield_Lake Superior_1st | 408.2916937 |
| 97LS014 | Cloquet River | 47.17129 | -91.96724 | Mixed Wood Shield | 5 | 2B | Target | Mixed Wood Shield_Lake Superior_4th+ | 94.02260335 |
| 97LS015 | Berry Creek | 47.29341 | -91.90066 | Mixed Wood Shield | 3 | 2A | Target | Mixed Wood Shield_Lake Superior_3rd | 134.0565907 |
| 97LS016 | Cloquet River | 47.30968 | -91.79668 | Mixed Wood Shield | 4 | 2B | Target | Mixed Wood Shield_Lake Superior_4th+ | 94.02260335 |
| 97LS017 | | 47.33502 | -91.93282 | Mixed Wood Shield | 1 | 2B | Target | Mixed Wood Shield_Lake Superior_1st | 408.2916937 |
| 97LS018 | St Louis River | 47.43925 | -92.14463 | Mixed Wood Shield | 3 | 2B | Target | Mixed Wood Shield_Lake Superior_3rd | 134.0565907 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 97LS019 | South Branch Whiteface River | 47.28468 | -92.09267 | Mixed Wood Shield | 3 | 2B | Target | Mixed Wood Shield_Lake Superior_3rd | 134.0565907 |
| 97LS020 | Trib. to Shiver Creek | 47.36835 | -92.05091 | Mixed Wood Shield | 1 | 2B | Target | Mixed Wood Shield_Lake Superior_1st | 408.2916937 |
| 97LS021 | East Swan River | 47.2343 | -92.80354 | Mixed Wood Shield | 4 | 2A | Target | Mixed Wood Shield_Lake Superior_4th+ | 94.02260335 |
| 97LS022 | Trib. to East Swan River | 47.28235 | -92.81148 | Mixed Wood Shield | 1 | 2A | Target | Mixed Wood Shield_Lake Superior_1st | 408.2916937 |
| 97LS023 | East Swan River | 47.29747 | -92.84359 | Mixed Wood Shield | 4 | 2A | Target | Mixed Wood Shield_Lake Superior_4th+ | 94.02260335 |
| 97LS024 | unnamed creek | 47.10464 | -92.34288 | Mixed Wood Shield | 1 | 2B | Target | Mixed Wood Shield_Lake Superior_1st | 408.2916937 |
| 97LS025 | Bug Creek | 47.17399 | -92.18311 | Mixed Wood Shield | 2 | 2B | Target | Mixed Wood Shield_Lake Superior_2nd | 216.2142507 |
| 97LS026 | Us-Kab-Wan-Ka River | 47.01326 | -92.34256 | Mixed Wood Shield | 3 | 2A | Target | Mixed Wood Shield_Lake Superior_3rd | 134.0565907 |
| 97LS027 | St Louis River | 47.31351 | -92.66757 | Mixed Wood Shield | 5 | 2B | Target | Mixed Wood Shield_Lake Superior_4th+ | 94.02260335 |
| 97LS028 | Paleface River | 47.26878 | -92.36609 | Mixed Wood Shield | 2 | 2B | Target | Mixed Wood Shield_Lake Superior_2nd | 216.2142507 |
| 97LS029 | St Louis River | 47.36904 | -92.46737 | Mixed Wood Shield | 4 | 2B | Target | Mixed Wood Shield_Lake Superior_4th+ | 94.02260335 |
| 97LS030 | Trib. to Little Whiteface | 47.08428 | -92.56287 | Mixed Wood Shield | 2 | 2B | Target | Mixed Wood Shield_Lake Superior_2nd | 216.2142507 |
| 97LS031 | | 47.03242 | -92.72274 | Mixed Wood Shield | NA | 2B | Non-Target | Mixed Wood Shield_Lake Superior_1st | 408.2916937 |
| 97LS032 | | 47.15661 | -93.11086 | Mixed Wood Shield | NA | 2B | Non-Target | Mixed Wood Shield_Lake Superior_1st | 408.2916937 |
| 97LS033 | Floodwood River | 46.94583 | -92.91112 | Mixed Wood Shield | 4 | 2B | Target | Mixed Wood Shield_Lake Superior_4th+ | 94.02260335 |
| 97LS034 | Vaara Creek | 47.07273 | -92.97887 | Mixed Wood Shield | 2 | 2B | Target | Mixed Wood Shield_Lake Superior_2nd | 216.2142507 |
| 97LS035 | | 47.04217 | -93.0563 | Mixed Wood Shield | 1 | 2B | Target | Mixed Wood Shield_Lake Superior_1st | 408.2916937 |
| 97LS036 | Trib. to Lester River | 46.89748 | -92.0099 | Mixed Wood Shield | 1 | 2A | Target | Mixed Wood Shield_Lake Superior_1st | 408.2916937 |
| 97LS037 | Trib. to Lester River | 46.94814 | -92.0759 | Mixed Wood Shield | 1 | 2A | Target | Mixed Wood Shield_Lake Superior_1st | 408.2916937 |
| 97LS038 | East Branch Amity Creek | 46.86378 | -92.04708 | Mixed Wood Shield | 2 | 2A | Target | Mixed Wood Shield_Lake Superior_2nd | 216.2142507 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 97LS039 | Trib. to Midway River | 46.81214 | -92.31206 | Mixed Wood Shield | 1 | 2A | Target | Mixed Wood Shield_Lake Superior_1st | 408.2916937 |
| 97LS040 | | 46.91936 | -92.332 | Mixed Wood Shield | NA | 2B | Non-Target | Mixed Wood Shield_Lake Superior_2nd | 216.2142507 |
| 97LS041 | Gooseberry River | 47.14279 | -91.45988 | Mixed Wood Shield | 4 | 2A | Target | Mixed Wood Shield_Lake Superior_4th+ | 94.02260335 |
| 97LS042 | Trib. to Stewart River | 47.09504 | -91.67897 | Mixed Wood Shield | 1 | 2B | Target | Mixed Wood Shield_Lake Superior_1st | 408.2916937 |
| 97LS043 | | 46.39092 | -92.45269 | Mixed Wood Shield | NA | 2B | Non-Target | Mixed Wood Shield_Lake Superior_2nd | 216.2142507 |
| 97LS044 | | 46.49766 | -92.53874 | Mixed Wood Shield | NA | 2A | Non-Target | Mixed Wood Shield_Lake Superior_1st | 408.2916937 |
| 97LS045 | Nemadji River | 46.53029 | -92.33361 | Mixed Wood Shield | 4 | 2A | Target | Mixed Wood Shield_Lake Superior_4th+ | 94.02260335 |
| 97LS046 | Rock Creek | 46.53538 | -92.3527 | Mixed Wood Shield | 3 | 2A | Target | Mixed Wood Shield_Lake Superior_3rd | 134.0565907 |
| 97LS047 | Mission Creek | 46.68533 | -92.28569 | Mixed Wood Shield | 3 | 2A | Target | Mixed Wood Shield_Lake Superior_3rd | 134.0565907 |
| 97LS048 | Crystal Creek | 46.70672 | -92.40637 | Mixed Wood Shield | 2 | 2B | Target | Mixed Wood Shield_Lake Superior_2nd | 216.2142507 |
| 97LS049 | | 46.84406 | -92.83324 | Mixed Wood Shield | NA | 2B | Non-Target | Mixed Wood Shield_Lake Superior_2nd | 216.2142507 |
| 97LS050 | Trib. to Stoney Brook | 46.85999 | -92.64625 | Mixed Wood Shield | 1 | 2B | Target | Mixed Wood Shield_Lake Superior_1st | 408.2916937 |
| 97LS051 | Temperance River | 47.69763 | -90.8751 | Mixed Wood Shield | 4 | 2A | Target | Mixed Wood Shield_Lake Superior_4th+ | 94.02260335 |
| 97LS052 | Poplar River | 47.69712 | -90.70368 | Mixed Wood Shield | 4 | 2A | Target | Mixed Wood Shield_Lake Superior_4th+ | 94.02260335 |
| 97LS053 | Poplar River | 47.70161 | -90.70383 | Mixed Wood Shield | 4 | 2A | Target | Mixed Wood Shield_Lake Superior_4th+ | 94.02260335 |
| 97LS054 | Hockamin Creek | 47.38227 | -91.37659 | Mixed Wood Shield | 1 | 2A | Target | Mixed Wood Shield_Lake Superior_1st | 408.2916937 |
| 97LS055 | Beaver River | 47.27245 | -91.31752 | Mixed Wood Shield | 4 | 2A | Target | Mixed Wood Shield_Lake Superior_4th+ | 94.02260335 |
| 97LS056 | Schoolhouse Creek | 47.46498 | -91.17221 | Mixed Wood Shield | 1 | 2A | Target | Mixed Wood Shield_Lake Superior_1st | 408.2916937 |
| 97LS057 | Cross River | 47.62204 | -90.97359 | Mixed Wood Shield | 3 | 2A | Target | Mixed Wood Shield_Lake Superior_3rd | 134.0565907 |
| 97LS058 | East Branch Beaver River | 47.38202 | -91.39846 | Mixed Wood Shield | 2 | 2A | Target | Mixed Wood Shield_Lake Superior_2nd | 216.2142507 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 97LS059 | West Branch Baptism River | 47.53034 | -91.31521 | Mixed Wood Shield | 2 | 2A | Target | Mixed Wood Shield_Lake Superior_2nd | 216.2142507 |
| 97LS060 | Cascade River | 47.83343 | -90.53323 | Mixed Wood Shield | 3 | 2A | Target | Mixed Wood Shield_Lake Superior_3rd | 134.0565907 |
| 97LS061 | | 47.78729 | -90.76331 | Mixed Wood Shield | NA | 2B | Non-Target | Mixed Wood Shield_Lake Superior_2nd | 216.2142507 |
| 97LS062 | Temperance River | 47.75135 | -90.87618 | Mixed Wood Shield | 4 | 2A | Target | Mixed Wood Shield_Lake Superior_4th+ | 94.02260335 |
| 97LS063 | Pigeon River | 48.00552 | -89.6477 | Mixed Wood Shield | 4 | 2B | Target | Mixed Wood Shield_Lake Superior_4th+ | 94.02260335 |
| 97LS064 | Kemo Lake Outlet | 47.89609 | -90.42478 | Mixed Wood Shield | 1 | 2B | Target | Mixed Wood Shield_Lake Superior_1st | 408.2916937 |
| 97LS065 | South Brule River | 47.94347 | -90.43316 | Mixed Wood Shield | 3 | 2B | Target | Mixed Wood Shield_Lake Superior_3rd | 134.0565907 |
| 97LS066 | Kadunce River | 47.82892 | -90.14926 | Mixed Wood Shield | 2 | 2A | Target | Mixed Wood Shield_Lake Superior_2nd | 216.2142507 |
| 97LS067 | | 47.95051 | -89.81026 | Mixed Wood Shield | 1 | 2A | Permission denied | Mixed Wood Shield_Lake Superior_1st | 408.2916937 |
| 97LS068 | Trib. to Tom Lake | 47.94007 | -90.08049 | Mixed Wood Shield | 1 | 2B | Target | Mixed Wood Shield_Lake Superior_1st | 408.2916937 |
| 97LS069 | | 48.00465 | -90.5796 | Mixed Wood Shield | NA | 2B | Non-Target | Mixed Wood Shield_Lake Superior_1st | 408.2916937 |
| 97LS070 | Reservation River | 47.87913 | -89.86306 | Mixed Wood Shield | 3 | 2A | Target | Mixed Wood Shield_Lake Superior_3rd | 134.0565907 |
| 99UM001 | Moose Creek | 47.71597 | -94.37437 | Mixed Wood Shield | 2 | 2B | Target | Mixed Wood Shield_Upper Mississippi_2nd | 144.1066769 |
| 99UM002 | unnamed creek | 46.35034 | -95.26299 | Mixed Wood Plains | 1 | 2B | Target | Mixed Wood Plains_Upper Mississippi_1st | 481.3417042 |
| 99UM003 | Little Elk River | 46.08582 | -94.4882 | Mixed Wood Shield | 3 | 2B | Target | Mixed Wood Shield_Upper Mississippi_3rd | 150.9034737 |
| 99UM004 | unnamed creek | 45.24389 | -93.21798 | Mixed Wood Plains | 1 | 2B | Target | Mixed Wood Plains_Upper Mississippi_1st | 481.3417042 |
| 99UM005 | unnamed creek | 45.33592 | -94.37907 | Mixed Wood Plains | 1 | 2B | Target | Mixed Wood Plains_Upper Mississippi_1st | 481.3417042 |
| 99UM006 | Grant Creek | 47.49114 | -94.98813 | Mixed Wood Shield | 2 | 2B | Target | Mixed Wood Shield_Upper Mississippi_2nd | 144.1066769 |
| 99UM007 | unnamed creek | 46.59601 | -95.11783 | Mixed Wood Plains | 2 | 2B | Target | Mixed Wood Plains_Upper Mississippi_2nd | 272.8218389 |
| 99UM008 | | 46.05535 | -94.88186 | Mixed Wood Plains | NA | 2B | Non-Target | Mixed Wood Plains_Upper Mississippi_1st | 481.3417042 |

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| 99UM009 | Trib. to Rum River | 45.26251 | -93.40639 | Mixed Wood Plains | 1 | 2B | Target | Mixed Wood Plains_Upper Mississippi_1st | 481.3417042 |
| 99UM010 | South Fork Crow River | 44.91912 | -93.87605 | Temperate Prairies | 5 | 2B | Target | Temperate Prairies_Upper Mississippi_4th+ | 108.1543652 |
| 99UM011 | Fish Creek | 46.97812 | -95.4101 | Mixed Wood Shield | 1 | 2B | Target | Mixed Wood Shield_Upper Mississippi_1st | 394.2938726 |
| 99UM012 | Trib. to Bear Creek | 46.30532 | -95.05601 | Mixed Wood Plains | 2 | 2B | Target | Mixed Wood Plains_Upper Mississippi_2nd | 272.8218389 |
| 99UM013 | County Ditch #4 | 45.67929 | -93.60711 | Mixed Wood Shield | 2 | 2B | Target | Mixed Wood Shield_Upper Mississippi_2nd | 144.1066769 |
| 99UM014 | | 45.28377 | -94.41934 | Mixed Wood Plains | 2 | 2B | Permission denied | Mixed Wood Plains_Upper Mississippi_2nd | 272.8218389 |
| 99UM015 | unnamed ditch | 46.67187 | -93.50588 | Mixed Wood Shield | 1 | 2B | Target | Mixed Wood Shield_Upper Mississippi_1st | 394.2938726 |
| 99UM016 | | 47.37746 | -93.28198 | Mixed Wood Shield | NA | 2B | Non-Target | Mixed Wood Shield_Upper Mississippi_1st | 394.2938726 |
| 99UM017 | Mississippi River | 44.85958 | -93.00777 | Mixed Wood Plains | 8 | 2B | Target | Mixed Wood Plains_Upper Mississippi_4th+ | 404.2539019 |
| 99UM018 | Bogus Brook | 45.73833 | -93.51109 | Mixed Wood Shield | 2 | 2B | Target | Mixed Wood Shield_Upper Mississippi_2nd | 144.1066769 |
| 99UM019 | unnamed creek | 45.99003 | -94.93232 | Mixed Wood Plains | 1 | 2B | Target | Mixed Wood Plains_Upper Mississippi_1st | 481.3417042 |
| 99UM020 | County Ditch #13 | 44.81221 | -94.15025 | Temperate Prairies | 2 | 2B | Target | Temperate Prairies_Upper Mississippi_2nd | 219.1196397 |
| 99UM021 | Turtle River | 47.55211 | -94.61251 | Mixed Wood Shield | 3 | 2B | Target | Mixed Wood Shield_Upper Mississippi_3rd | 150.9034737 |
| 99UM022 | Farnham Creek | 46.50713 | -94.79366 | Mixed Wood Plains | 3 | 2B | Target | Mixed Wood Plains_Upper Mississippi_3rd | 168.6209344 |
| 99UM023 | Hillman Creek | 45.97072 | -94.00387 | Mixed Wood Plains | 3 | 2B | Target | Mixed Wood Plains_Upper Mississippi_3rd | 168.6209344 |
| 99UM024 | unnamed creek | 45.20462 | -93.08264 | Mixed Wood Plains | 1 | 2B | Target | Mixed Wood Plains_Upper Mississippi_1st | 481.3417042 |
| 99UM025 | Trib. to Crow River, North Fork | 45.15433 | -94.01125 | Mixed Wood Plains | 1 | 2B | Target | Mixed Wood Plains_Upper Mississippi_1st | 481.3417042 |
| 99UM026 | SchoolCraft River | 47.31309 | -94.94706 | Mixed Wood Shield | 4 | 2B | Target | Mixed Wood Shield_Upper Mississippi_4th+ | 305.5924243 |
| 99UM027 | Home Brook | 46.46906 | -94.40754 | Mixed Wood Shield | 3 | 2B | Target | Mixed Wood Shield_Upper Mississippi_3rd | 150.9034737 |
| 99UM028 | Battle Brook | 45.50139 | -93.61548 | Mixed Wood Plains | 3 | 2B | Target | Mixed Wood Plains_Upper Mississippi_3rd | 168.6209344 |

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| 99UM029 | Trib. to Sauk River | 45.49662 | -94.70526 | Mixed Wood Plains | 2 | 2B | Target | Mixed Wood Plains_Upper Mississippi_2nd | 272.8218389 |
| 99UM030 | unnamed ditch | 46.65208 | -93.15937 | Mixed Wood Shield | 2 | 2B | Target | Mixed Wood Shield_Upper Mississippi_2nd | 144.1066769 |
| 99UM031 | Fish Hook River | 46.91932 | -95.05258 | Mixed Wood Shield | 3 | 2B | Target | Mixed Wood Shield_Upper Mississippi_3rd | 150.9034737 |
| 99UM032 | | 46.15819 | -95.06633 | Mixed Wood Plains | NA | 2B | Non-Target | Mixed Wood Plains_Upper Mississippi_1st | 481.3417042 |
| 99UM033 | unnamed creek | 45.66159 | -93.75188 | Mixed Wood Plains | 2 | 2B | Target | Mixed Wood Plains_Upper Mississippi_2nd | 272.8218389 |
| 99UM034 | Mississippi River | 45.40453 | -94.01215 | Mixed Wood Plains | 6 | 2B | Target | Mixed Wood Plains_Upper Mississippi_4th+ | 404.2539019 |
| 99UM035 | unnamed ditch | 46.59786 | -93.76498 | Mixed Wood Shield | 2 | 2B | Target | Mixed Wood Shield_Upper Mississippi_2nd | 144.1066769 |
| 99UM036 | Island Lake Creek | 47.41504 | -93.72506 | Mixed Wood Shield | 2 | 2B | Target | Mixed Wood Shield_Upper Mississippi_2nd | 144.1066769 |
| 99UM037 | Pine River | 46.61597 | -94.0682 | Mixed Wood Shield | 4 | 2B | Target | Mixed Wood Shield_Upper Mississippi_4th+ | 305.5924243 |
| 99UM038 | Elk River | 45.37821 | -93.76975 | Mixed Wood Plains | 4 | 2B | Target | Mixed Wood Plains_Upper Mississippi_4th+ | 404.2539019 |
| 99UM039 | Long Prairie River | 46.01292 | -94.9906 | Mixed Wood Plains | 3 | 2B | Target | Mixed Wood Plains_Upper Mississippi_3rd | 168.6209344 |
| 99UM040 | County Ditch #23 | 44.97914 | -94.7111 | Temperate Prairies | 1 | 2B | Target | Temperate Prairies_Upper Mississippi_1st | 912.1186269 |
| 99UM041 | unnamed creek | 46.98552 | -93.32022 | Mixed Wood Shield | 2 | 2B | Target | Mixed Wood Shield_Upper Mississippi_2nd | 144.1066769 |
| 99UM042 | Arvig Creek | 46.7058 | -94.36327 | Mixed Wood Shield | 2 | 2B | Target | Mixed Wood Shield_Upper Mississippi_2nd | 144.1066769 |
| 99UM043 | Trib. to Zuleger Creek | 45.78353 | -94.14326 | Mixed Wood Plains | 2 | 2B | Target | Mixed Wood Plains_Upper Mississippi_2nd | 272.8218389 |
| 99UM044 | South Two River | 45.64559 | -94.51517 | Mixed Wood Plains | 3 | 2B | Target | Mixed Wood Plains_Upper Mississippi_3rd | 168.6209344 |
| 99UM045 | Grove Creek | 45.19817 | -94.62801 | Mixed Wood Plains | 3 | 2B | Target | Mixed Wood Plains_Upper Mississippi_3rd | 168.6209344 |
| 99UM046 | | 47.01477 | -93.89481 | Mixed Wood Shield | NA | 2B | Non-Target | Mixed Wood Shield_Upper Mississippi_1st | 394.2938726 |
| 99UM047 | Trib. to Shell River | 46.91625 | -95.36414 | Mixed Wood Shield | 1 | 2B | Target | Mixed Wood Shield_Upper Mississippi_1st | 394.2938726 |
| 99UM048 | Platte River | 45.92666 | -94.25674 | Mixed Wood Plains | 4 | 2B | Target | Mixed Wood Plains_Upper Mississippi_4th+ | 404.2539019 |

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| 99UM049 | | 45.66186 | -95.10232 | Mixed Wood Plains | NA | 2B | Non-Target | Mixed Wood Plains_Upper Mississippi_1st | 481.3417042 |
| 99UM050 | North Fork Crow River | 45.51745 | -95.00312 | Mixed Wood Plains | 4 | 2B | Target | Mixed Wood Plains_Upper Mississippi_4th+ | 404.2539019 |
| 99UM051 | unnamed ditch | 46.81848 | -93.57098 | Mixed Wood Shield | 2 | 2B | Target | Mixed Wood Shield_Upper Mississippi_2nd | 144.1066769 |
| 99UM052 | | 44.76329 | -94.16137 | Temperate Prairies | NA | class7 | Non-Target | Temperate Prairies_Upper Mississippi_2nd | 219.1196397 |
| 99UM053 | | 45.97283 | -94.49365 | Mixed Wood Shield | 1 | class7 | Permission denied | Mixed Wood Shield_Upper Mississippi_1st | 394.2938726 |
| 99UM054 | Trib. to Fairfield Creek | 45.88325 | -95.23643 | Mixed Wood Plains | 3 | 2B | Target | Mixed Wood Plains_Upper Mississippi_3rd | 168.6209344 |
| 99UM055 | Trib. to Crow River, North Fork | 45.20048 | -94.52947 | Mixed Wood Plains | 3 | 2B | Target | Mixed Wood Plains_Upper Mississippi_3rd | 168.6209344 |
| 99UM056 | Trib. to Swan River | 47.15015 | -93.25523 | Mixed Wood Shield | 2 | 2A | Target | Mixed Wood Shield_Upper Mississippi_2nd | 144.1066769 |
| 99UM057 | | 46.85139 | -94.67877 | Mixed Wood Shield | NA | 2B | Non-Target | Mixed Wood Shield_Upper Mississippi_1st | 394.2938726 |
| 99UM058 | Little Rock Creek | 45.87271 | -94.14576 | Mixed Wood Plains | 2 | 2A | Target | Mixed Wood Plains_Upper Mississippi_2nd | 272.8218389 |
| 99UM059 | | 45.13092 | -93.26196 | Mixed Wood Plains | NA | 2B | Non-Target | Mixed Wood Plains_Upper Mississippi_1st | 481.3417042 |
| 99UM060 | Twelvemile Creek | 45.06223 | -94.01806 | Mixed Wood Plains | 3 | 2B | Target | Mixed Wood Plains_Upper Mississippi_3rd | 168.6209344 |
| 99UM061 | Hay Creek | 47.28507 | -93.14539 | Mixed Wood Shield | 3 | 2B | Target | Mixed Wood Shield_Upper Mississippi_3rd | 150.9034737 |
| 99UM062 | Crow Wing River | 46.3258 | -94.58758 | Mixed Wood Shield | 5 | 2B | Target | Mixed Wood Shield_Upper Mississippi_4th+ | 305.5924243 |
| 99UM063 | | 45.58938 | -94.01796 | Mixed Wood Plains | NA | 2B | Non-Target | Mixed Wood Plains_Upper Mississippi_1st | 481.3417042 |
| 99UM064 | Trib. to Sauk River | 45.51737 | -94.6064 | Mixed Wood Plains | 2 | 2B | Target | Mixed Wood Plains_Upper Mississippi_2nd | 272.8218389 |
| 99UM065 | unnamed ditch to Mississippi R | 46.55338 | -93.85298 | Mixed Wood Shield | 1 | 2B | Target | Mixed Wood Shield_Upper Mississippi_1st | 394.2938726 |
| 99UM066 | Mississippi River | 47.27383 | -93.785 | Mixed Wood Shield | 1 | 2B | Target | Mixed Wood Shield_Upper Mississippi_1st | 394.2938726 |
| 99UM067 | Skunk River | 46.09823 | -93.89825 | Mixed Wood Plains | 2 | 2B | Target | Mixed Wood Plains_Upper Mississippi_2nd | 272.8218389 |
| 99UM068 | | 45.51242 | -93.5769 | Mixed Wood Plains | NA | 2B | Non-Target | Mixed Wood Plains_Upper Mississippi_1st | 481.3417042 |

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| 99UM069 | | 45.54203 | -95.14017 | Mixed Wood Plains | NA | 2B | Non-Target | Mixed Wood Plains_Upper Mississippi_1st | 481.3417042 |
| 99UM070 | South Fork Crow River | 44.8784 | -94.453 | Temperate Prairies | 4 | 2B | Target | Temperate Prairies_Upper Mississippi_4th+ | 108.1543652 |
| 01MN001 | County Ditch #22 | 45.44484 | -96.14459 | Temperate Prairies | 3 | 2B | Target | Temperate Prairies_Minnesota_3rd | 133.7722815 |
| 01MN002 | | 43.98764 | -94.43507 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Minnesota_1st | 1118.643251 |
| 01MN003 | Judicial Ditch # 8 | 45.24749 | -95.78862 | Temperate Prairies | 3 | 2B | Target | Temperate Prairies_Minnesota_3rd | 133.7722815 |
| 01MN004 | Co. Ditch #70 | 43.70282 | -93.88253 | Temperate Prairies | 1 | 2B | Target | Temperate Prairies_Minnesota_1st | 1118.643251 |
| 01MN005 | unnamed trib. to Co. Ditch #3 | 45.03162 | -95.13097 | Temperate Prairies | 2 | 2B | Target | Temperate Prairies_Minnesota_2nd | 188.0439179 |
| 01MN006 | Trib. to Dutch Charley Creek | 44.19091 | -95.31427 | Temperate Prairies | 3 | 2B | Target | Temperate Prairies_Minnesota_3rd | 133.7722815 |
| 01MN007 | Highwater Creek | 43.98404 | -95.40188 | Temperate Prairies | 3 | 2B | Target | Temperate Prairies_Minnesota_3rd | 133.7722815 |
| 01MN008 | East Creek | 44.80982 | -93.58485 | Temperate Prairies | 2 | 2B | Target | Temperate Prairies_Minnesota_2nd | 188.0439179 |
| 01MN009 | | 44.89073 | -96.02736 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Minnesota_1st | 1118.643251 |
| 01MN010 | Minnesota River | 44.41588 | -94.69632 | Temperate Prairies | 7 | 2B | Target | Temperate Prairies_Minnesota_4th+ | 143.1175772 |
| 01MN011 | Spring Creek | 44.96903 | -95.6861 | Temperate Prairies | 2 | 2B | Target | Temperate Prairies_Minnesota_2nd | 188.0439179 |
| 01MN012 | Middle Branch Rush River | 44.50381 | -94.23469 | Temperate Prairies | 4 | class7 | Target | Temperate Prairies_Minnesota_4th+ | 143.1175772 |
| 01MN013 | Trib. to Yellow Medicine, North Branch | 44.59514 | -96.24579 | Temperate Prairies | 2 | 2B | Target | Temperate Prairies_Minnesota_2nd | 188.0439179 |
| 01MN014 | Rice Creek | 43.74074 | -94.02315 | Temperate Prairies | 3 | 2B | Target | Temperate Prairies_Minnesota_3rd | 133.7722815 |
| 01MN015 | Perch Creek | 43.97317 | -94.34133 | Temperate Prairies | 4 | 2B | Target | Temperate Prairies_Minnesota_4th+ | 143.1175772 |
| 01MN016 | | 45.98974 | -95.73935 | Mixed Wood Plains | NA | 2B | Non-Target | Mixed Wood Plains_Minnesota_1st | 858.8412564 |
| 01MN017 | | 44.82202 | -96.37213 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Minnesota_2nd | 188.0439179 |
| 01MN018 | | 44.47456 | -94.66131 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Minnesota_3rd | 133.7722815 |
| 01MN019 | unnamed trib. to Emily Creek | 45.09599 | -96.05961 | Temperate Prairies | 3 | 2B | Target | Temperate Prairies_Minnesota_3rd | 133.7722815 |
| 01MN020 | unnamed trib. to Minnesota River. | 44.23273 | -93.93835 | Temperate Prairies | 1 | 2B | Target | Temperate Prairies_Minnesota_1st | 1118.643251 |
| 01MN021 | Canby Creek | 44.70456 | -96.2797 | Temperate Prairies | 2 | 2B | Target | Temperate Prairies_Minnesota_2nd | 188.0439179 |
| 01MN022 | Brush Creek | 43.55534 | -93.77549 | Temperate Prairies | 3 | 2B | Target | Temperate Prairies_Minnesota_3rd | 133.7722815 |
| 01MN023 | unnamed ditch to Storm Lake | 44.12691 | -94.38386 | Temperate Prairies | 1 | 2B | Target | Temperate Prairies_Minnesota_1st | 1118.643251 |
| 01MN024 | | 45.26534 | -95.2906 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Minnesota_1st | 1118.643251 |
| 01MN025 | East Fork Beaver Creek | 44.78948 | -94.90842 | Temperate Prairies | 2 | class7 | Target | Temperate Prairies_Minnesota_2nd | 188.0439179 |

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| 01MN026 | Pell Creek | 44.25081 | -95.32616 | Temperate Prairies | 3 | 2B | Target | Temperate Prairies_Minnesota_3rd | 133.7722815 |
| 01MN027 | | 44.23975 | -96.18981 | Temperate Prairies | 2 | 2B | Permission denied | Temperate Prairies_Minnesota_2nd | 188.0439179 |
| 01MN028 | Co. Ditch #42 | 44.55432 | -94.37029 | Temperate Prairies | 3 | 2B | Target | Temperate Prairies_Minnesota_3rd | 133.7722815 |
| 01MN029 | | 44.51635 | -95.97516 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Minnesota_2nd | 188.0439179 |
| 01MN030 | Judicial Ditch #51 | 43.89048 | -93.7937 | Temperate Prairies | 2 | 2B | Target | Temperate Prairies_Minnesota_2nd | 188.0439179 |
| 01MN031 | | 44.07011 | -95.10344 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Minnesota_1st | 1118.643251 |
| 01MN032 | Muddy Creek | 45.5434 | -95.93771 | Temperate Prairies | 4 | class7 | Target | Temperate Prairies_Minnesota_4th+ | 143.1175772 |
| 01MN033 | South Fork Yellow Bank River | 45.11468 | -96.38887 | Temperate Prairies | 5 | 2B | Target | Temperate Prairies_Minnesota_4th+ | 143.1175772 |
| 01MN034 | Cottonwood River | 44.22891 | -94.77944 | Temperate Prairies | 5 | 2B | Target | Temperate Prairies_Minnesota_4th+ | 143.1175772 |
| 01MN035 | unnamed ditch | 45.09551 | -95.38015 | Temperate Prairies | 2 | 2B | Target | Temperate Prairies_Minnesota_2nd | 188.0439179 |
| 01MN036 | Cobb Creek Ditch | 43.7871 | -93.55724 | Temperate Prairies | 2 | class7 | Target | Temperate Prairies_Minnesota_2nd | 188.0439179 |
| 01MN037 | Ten Mile Creek (Jud. Ditch #1) | 44.8356 | -95.89618 | Temperate Prairies | 3 | 2B | Target | Temperate Prairies_Minnesota_3rd | 133.7722815 |
| 01MN038 | Judicial Ditch #30 | 44.33697 | -94.95221 | Temperate Prairies | 2 | 2B | Target | Temperate Prairies_Minnesota_2nd | 188.0439179 |
| 01MN039 | Cobb River | 44.02337 | -93.99199 | Temperate Prairies | 4 | 2B | Target | Temperate Prairies_Minnesota_4th+ | 143.1175772 |
| 01MN040 | Trib. to Le Suer River | 43.97094 | -93.37469 | Temperate Prairies | 2 | 2B | Target | Temperate Prairies_Minnesota_2nd | 188.0439179 |
| 01MN041 | Chetomba Creek | 44.87323 | -95.38003 | Temperate Prairies | 4 | 2B | Target | Temperate Prairies_Minnesota_4th+ | 143.1175772 |
| 01MN042 | Cottonwood River | 44.34457 | -95.62086 | Temperate Prairies | 3 | 2B | Target | Temperate Prairies_Minnesota_3rd | 133.7722815 |
| 01MN043 | | 44.35821 | -96.33638 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Minnesota_2nd | 188.0439179 |
| 01MN044 | Sand Creek | 44.64965 | -93.61406 | Temperate Prairies | 4 | 2B | Target | Temperate Prairies_Minnesota_4th+ | 143.1175772 |
| 01MN045 | Judicial Ditch #20 | 44.65083 | -95.89787 | Temperate Prairies | 2 | 2B | Target | Temperate Prairies_Minnesota_2nd | 188.0439179 |
| 01MN046 | Blue Earth River | 43.72444 | -94.15387 | Temperate Prairies | 5 | 2B | Target | Temperate Prairies_Minnesota_4th+ | 143.1175772 |
| 01MN047 | Watonwan River | 43.98273 | -94.9193 | Temperate Prairies | 4 | 2B | Target | Temperate Prairies_Minnesota_4th+ | 143.1175772 |
| 01MN048 | | 45.78507 | -95.43594 | Mixed Wood Plains | NA | 2B | Non-Target | Mixed Wood Plains_Minnesota_1st | 858.8412564 |
| 01MN049 | | 44.73452 | -96.42792 | Temperate Prairies | 4 | 2B | Permission denied | Temperate Prairies_Minnesota_4th+ | 143.1175772 |
| 01MN050 | Minnesota River | 44.37067 | -94.51919 | Temperate Prairies | 7 | 2B | Target | Temperate Prairies_Minnesota_4th+ | 143.1175772 |

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| 01MN051 | Stony Run | 45.29213 | -96.33878 | Temperate Prairies | 3 | 2B | Target | Temperate Prairies_Minnesota_3rd | 133.7722815 |
| 01MN052 | Watonwan River | 44.05527 | -94.53227 | Temperate Prairies | 5 | 2B | Target | Temperate Prairies_Minnesota_4th+ | 143.1175772 |
| 01MN053 | Judicial Ditch #33 | 44.5373 | -95.40674 | Temperate Prairies | 2 | 2B | Target | Temperate Prairies_Minnesota_2nd | 188.0439179 |
| 01MN054 | East Branch Blue Earth River | 43.62653 | -93.67392 | Temperate Prairies | 3 | 2B | Target | Temperate Prairies_Minnesota_3rd | 133.7722815 |
| 01MN055 | Boiling Springs Creek | 44.66318 | -95.3081 | Temperate Prairies | 2 | 2B | Target | Temperate Prairies_Minnesota_2nd | 188.0439179 |
| 01MN056 | Highwater Creek | 44.12105 | -95.27092 | Temperate Prairies | 3 | 2B | Target | Temperate Prairies_Minnesota_3rd | 133.7722815 |
| 01MN057 | Coon Creek | 44.3512 | -96.04929 | Temperate Prairies | 3 | 2B | Target | Temperate Prairies_Minnesota_3rd | 133.7722815 |
| 01MN058 | unnamed trib. to Sand Creek | 44.70951 | -93.54999 | Temperate Prairies | 2 | 2B | Target | Temperate Prairies_Minnesota_2nd | 188.0439179 |
| 01MN059 | Lac Qui Parle River | 44.95847 | -96.02286 | Temperate Prairies | 6 | 2B | Target | Temperate Prairies_Minnesota_4th+ | 143.1175772 |
| 01MN060 | Judicial Ditch #1 | 44.45742 | -94.39599 | Temperate Prairies | 3 | 2B | Target | Temperate Prairies_Minnesota_3rd | 133.7722815 |
| 01MN061 | Ten Mile Creek | 44.91759 | -95.87703 | Temperate Prairies | 3 | 2B | Target | Temperate Prairies_Minnesota_3rd | 133.7722815 |
| 01MN062 | High Island Creek | 44.57676 | -93.98517 | Temperate Prairies | 4 | 2B | Target | Temperate Prairies_Minnesota_4th+ | 143.1175772 |
| 01MN063 | | 44.73125 | -96.01406 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Minnesota_3rd | 133.7722815 |
| 01MN064 | East Branch Blue Earth River | 43.62757 | -94.03454 | Temperate Prairies | 4 | 2B | Target | Temperate Prairies_Minnesota_4th+ | 143.1175772 |
| 01MN065 | Minnesota River | 44.26008 | -94.35771 | Temperate Prairies | 7 | 2B | Target | Temperate Prairies_Minnesota_4th+ | 143.1175772 |
| 01MN066 | | 45.99338 | -95.86534 | Mixed Wood Plains | NA | 2B | Non-Target | Mixed Wood Plains_Minnesota_1st | 858.8412564 |
| 01MN067 | | 45.09064 | -96.22896 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Minnesota_1st | 1118.643251 |
| 01MN068 | | 44.70451 | -94.68191 | Temperate Prairies | 2 | 2B | Permission denied | Temperate Prairies_Minnesota_2nd | 188.0439179 |
| 01MN069 | Pomme de Terre River | 45.19846 | -96.07399 | Temperate Prairies | 4 | 2B | Target | Temperate Prairies_Minnesota_4th+ | 143.1175772 |
| 01MN070 | | 44.14704 | -93.67218 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Minnesota_1st | 1118.643251 |
| 04CD001 | Rose Creek | 43.65098 | -92.81104 | Temperate Prairies | 3 | 2B | Target | Temperate Prairies_Cedar_3rd | 20.50907731 |
| 04CD002 | Cedar River | 43.56581 | -93.00011 | Temperate Prairies | 5 | 2B | Target | Temperate Prairies_Cedar_4th+ | 8.930973665 |
| 04CD003 | Cedar River | 43.87964 | -92.92665 | Temperate Prairies | 3 | 2B | Target | Temperate Prairies_Cedar_3rd | 20.50907731 |
| 04CD004 | County Ditch No. 16 | 43.60781 | -93.36476 | Temperate Prairies | 1 | 2B | Target | Temperate Prairies_Cedar_1st | 99.56942983 |
| 04CD005 | | 43.67318 | -92.88379 | Temperate Prairies | 2 | 2B | Permission denied | Temperate Prairies_Cedar_2nd | 70.93944179 |

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| 04CD006 | Turtle Creek | 43.68657 | -93.05021 | Temperate Prairies | 4 | 2B | Target | Temperate Prairies_Cedar_4th+ | 8.930973665 |
| 04CD007 | | 43.70624 | -93.38201 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Cedar_1st | 99.56942983 |
| 04CD008 | Little Cedar River | 43.51369 | -92.755 | Temperate Prairies | 3 | 2B | Target | Temperate Prairies_Cedar_3rd | 20.50907731 |
| 04CD009 | Trib. to Cedar River | 43.7998 | -92.98403 | Temperate Prairies | 4 | 2B | Target | Temperate Prairies_Cedar_4th+ | 8.930973665 |
| 04CD010 | Turtle Creek | 43.66116 | -93.00322 | Temperate Prairies | 4 | 2B | Target | Temperate Prairies_Cedar_4th+ | 8.930973665 |
| 04CD011 | | 43.74612 | -93.12441 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Cedar_4th+ | 8.930973665 |
| 04CD012 | Rose Creek | 43.6082 | -92.91851 | Temperate Prairies | 3 | 2B | Target | Temperate Prairies_Cedar_3rd | 20.50907731 |
| 04CD013 | County Ditch No. 30 | 43.77716 | -93.30578 | Temperate Prairies | 2 | 2B | Target | Temperate Prairies_Cedar_2nd | 70.93944179 |
| 04CD014 | | 43.55741 | -92.81258 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Cedar_1st | 99.56942983 |
| 04CD015 | Shell Rock River | 43.52886 | -93.2764 | Temperate Prairies | 4 | 2B | Target | Temperate Prairies_Cedar_4th+ | 8.930973665 |
| 04CD016 | Little Cedar River | 43.89922 | -92.99983 | Temperate Prairies | 3 | 2B | Target | Temperate Prairies_Cedar_3rd | 20.50907731 |
| 04CD017 | Shell Rock River | 43.57348 | -93.27782 | Temperate Prairies | 4 | 2B | Target | Temperate Prairies_Cedar_4th+ | 8.930973665 |
| 04CD018 | Cedar River | 43.84459 | -93.00162 | Temperate Prairies | 4 | 2B | Target | Temperate Prairies_Cedar_4th+ | 8.930973665 |
| 04CD019 | | 43.58558 | -92.90078 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Cedar_1st | 99.56942983 |
| 04CD020 | | 43.53161 | -93.44584 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Cedar_1st | 99.56942983 |
| 04CD021 | | 43.90148 | -92.86035 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Cedar_1st | 99.56942983 |
| 04CD022 | | 43.78019 | -92.88478 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Cedar_3rd | 20.50907731 |
| 04CD023 | Cedar River | 43.76701 | -92.96342 | Temperate Prairies | 4 | 2B | Target | Temperate Prairies_Cedar_4th+ | 8.930973665 |
| 04CD024 | Cedar River | 43.52727 | -93.00032 | Temperate Prairies | 5 | 2B | Target | Temperate Prairies_Cedar_4th+ | 8.930973665 |
| 04CD025 | unnamed trib. to Cedar River | 43.5803 | -92.9861 | Temperate Prairies | 3 | 2B | Target | Temperate Prairies_Cedar_3rd | 20.50907731 |
| 04CD026 | | 43.61273 | -92.99781 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Cedar_1st | 99.56942983 |
| 04CD027 | Deer Creek | 43.75364 | -93.15221 | Temperate Prairies | 4 | 2B | Target | Temperate Prairies_Cedar_4th+ | 8.930973665 |
| 04CD028 | County Ditch No. 17 | 43.50766 | -93.32843 | Temperate Prairies | 2 | 2B | Target | Temperate Prairies_Cedar_2nd | 70.93944179 |
| 04CD029 | | 43.84202 | -92.82456 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Cedar_1st | 99.56942983 |
| 04CD030 | | 43.53445 | -92.65249 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Cedar_1st | 99.56942983 |
| 04CD031 | Otter Creek | 43.51144 | -92.9196 | Temperate Prairies | 3 | 2B | Target | Temperate Prairies_Cedar_3rd | 20.50907731 |
| 04CD032 | | 43.78769 | -92.80275 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Cedar_1st | 99.56942983 |
| 04CD033 | Roberts Creek | 43.74815 | -92.91614 | Temperate Prairies | 4 | 2B | Target | Temperate Prairies_Cedar_4th+ | 8.930973665 |
| 04CD034 | Knolvold Branch | 43.7901 | -93.24137 | Temperate Prairies | 2 | 2B | Target | Temperate Prairies_Cedar_2nd | 70.93944179 |
| 04CD035 | unnamed trib. to Rose Creek | 43.69537 | -92.70467 | Temperate Prairies | 1 | 2B | Target | Temperate Prairies_Cedar_1st | 99.56942983 |

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| 04CD036 | Trib. to Cedar River, East Fork | 43.8513 | -92.93194 | Temperate Prairies | 2 | 2B | Target | Temperate Prairies_Cedar_2nd | 70.93944179 |
| 04CD037 | Shell Rock River | 43.60775 | -93.29153 | Temperate Prairies | 4 | 2B | Target | Temperate Prairies_Cedar_4th+ | 8.930973665 |
| 04CD038 | Cedar River | 43.69295 | -92.96744 | Temperate Prairies | 5 | 2B | Target | Temperate Prairies_Cedar_4th+ | 8.930973665 |
| 04DM001 | Beaver Creek | 44.01255 | -95.74041 | Temperate Prairies | 4 | 2B | Target | Temperate Prairies_Des Moines_4th+ | 38.97297019 |
| 04DM002 | Trib. to Des Moines River | 43.88886 | -95.21718 | Temperate Prairies | 2 | 2B | Target | Temperate Prairies_Des Moines_2nd | 35.37001531 |
| 04DM003 | Judicial Ditch No. 12 | 43.82321 | -95.63455 | Temperate Prairies | 2 | 2B | Target | Temperate Prairies_Des Moines_2nd | 35.37001531 |
| 04DM004 | Jack Creek | 43.76311 | -95.52506 | Temperate Prairies | 4 | 2B | Target | Temperate Prairies_Des Moines_4th+ | 38.97297019 |
| 04DM005 | Judicial Ditch No. 11 | 43.52095 | -94.8836 | Temperate Prairies | 2 | 2B | Target | Temperate Prairies_Des Moines_2nd | 35.37001531 |
| 04DM006 | County Ditch #26 | 44.17938 | -95.90033 | Temperate Prairies | 2 | 2B | Target | Temperate Prairies_Des Moines_2nd | 35.37001531 |
| 04DM007 | | 43.98362 | -95.58753 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Des Moines_1st | 151.359433 |
| 04DM008 | Trib. to Jack Creek | 43.78707 | -95.62789 | Temperate Prairies | 1 | 2B | Target | Temperate Prairies_Des Moines_1st | 151.359433 |
| 04DM009 | unnamed stream | 43.93707 | -95.75345 | Temperate Prairies | 3 | class7 | Target | Temperate Prairies_Des Moines_3rd | 37.04975135 |
| 04DM010 | Judicial Ditch No. 66 | 43.61919 | -95.00403 | Temperate Prairies | 1 | 2B | Target | Temperate Prairies_Des Moines_1st | 151.359433 |
| 04DM011 | unnamed ditch | 43.69268 | -95.22739 | Temperate Prairies | 2 | 2B | Target | Temperate Prairies_Des Moines_2nd | 35.37001531 |
| 04DM012 | Beaver Creek | 44.03612 | -95.82377 | Temperate Prairies | 4 | 2B | Target | Temperate Prairies_Des Moines_4th+ | 38.97297019 |
| 04DM013 | Des Moines River | 43.86876 | -95.39571 | Temperate Prairies | 5 | 2B | Target | Temperate Prairies_Des Moines_4th+ | 38.97297019 |
| 04DM014 | | 43.89456 | -95.78783 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Des Moines_1st | 151.359433 |
| 04DM015 | Beaver Creek | 44.02842 | -95.9739 | Temperate Prairies | 3 | 2B | Target | Temperate Prairies_Des Moines_3rd | 37.04975135 |
| 04DM016 | | 43.76517 | -95.40637 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Des Moines_1st | 151.359433 |
| 04DM017 | | 43.59733 | -94.88275 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Des Moines_1st | 151.359433 |
| 04DM018 | Heron Lake Outlet | 43.80445 | -95.26753 | Temperate Prairies | 5 | 2B | Target | Temperate Prairies_Des Moines_4th+ | 38.97297019 |

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| 04DM019 | Trib. to Des Moines River | 43.94091 | -95.15585 | Temperate Prairies | 2 | 2B | Target | Temperate Prairies_Des Moines_2nd | 35.37001531 |
| 04DM020 | Des Moines River | 43.89186 | -95.26881 | Temperate Prairies | 6 | 2B | Target | Temperate Prairies_Des Moines_4th+ | 38.97297019 |
| 04DM021 | Judicial Ditch No. 10 | 43.51204 | -94.79489 | Temperate Prairies | 2 | 2B | Target | Temperate Prairies_Des Moines_2nd | 35.37001531 |
| 04DM022 | Trib. to Jack Creek | 43.88599 | -95.69497 | Temperate Prairies | 3 | 2B | Target | Temperate Prairies_Des Moines_3rd | 37.04975135 |
| 04DM023 | | 43.97806 | -95.96429 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Des Moines_2nd | 35.37001531 |
| 04DM024 | Des Moines River | 43.79026 | -95.09411 | Temperate Prairies | 6 | 2B | Target | Temperate Prairies_Des Moines_4th+ | 38.97297019 |
| 04DM025 | Jack Creek | 43.76744 | -95.37864 | Temperate Prairies | 4 | 2B | Target | Temperate Prairies_Des Moines_4th+ | 38.97297019 |
| 04DM026 | County Ditch No. 48 | 44.2047 | -95.85681 | Temperate Prairies | 3 | 2B | Target | Temperate Prairies_Des Moines_3rd | 37.04975135 |
| 04DM027 | Des Moines River | 43.91911 | -95.47716 | Temperate Prairies | 1 | 2B | Target | Temperate Prairies_Des Moines_1st | 151.359433 |
| 04DM028 | | 43.77111 | -95.68048 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Des Moines_1st | 151.359433 |
| 04DM029 | Trib. to Lime Lake | 43.96509 | -95.71247 | Temperate Prairies | 3 | class7 | Target | Temperate Prairies_Des Moines_3rd | 37.04975135 |
| 04DM030 | Devil's Run (County Ditch # 4) | 44.03607 | -95.54627 | Temperate Prairies | 1 | 2B | Target | Temperate Prairies_Des Moines_1st | 151.359433 |
| 04DM031 | | 43.87027 | -95.57266 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Des Moines_3rd | 37.04975135 |
| 04DM032 | unnamed ditch | 43.84026 | -95.76637 | Temperate Prairies | 2 | 2B | Target | Temperate Prairies_Des Moines_2nd | 35.37001531 |
| 04DM033 | Trib. to Jack Creek | 43.80477 | -95.58096 | Temperate Prairies | 3 | 2B | Target | Temperate Prairies_Des Moines_3rd | 37.04975135 |
| 04DM034 | | 43.53221 | -94.57351 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Des Moines_3rd | 37.04975135 |
| 04DM035 | Jack Creek | 43.83279 | -95.8066 | Temperate Prairies | 2 | 2B | Target | Temperate Prairies_Des Moines_2nd | 35.37001531 |
| 04DM043 | Des Moines River | 43.7192 | -95.04529 | Temperate Prairies | 6 | 2B | Target | Temperate Prairies_Des Moines_4th+ | 38.97297019 |
| 04LM001 | Trib. to Trout Brook | 44.36026 | -92.66667 | Mixed Wood Plains | 2 | 2B | Target | Mixed Wood Plains_Lower Mississippi_2nd | 140.535273 |
| 04LM002 | | 43.80122 | -92.00117 | Mixed Wood Plains | NA | 2B | Non-Target | Mixed Wood Plains_Lower Mississippi_1st | 347.4032206 |

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| 04LM003 | Trib. to Zumbro River, South Fork | 44.07769 | -92.50182 | Mixed Wood Plains | 2 | 2B | Target | Mixed Wood Plains_Lower Mississippi_2nd | 140.535273 |
| 04LM004 | Pine Creek | 44.54643 | -92.90216 | Temperate Prairies | 2 | 2A | Target | Temperate Prairies_Lower Mississippi_2nd | 94.13019687 |
| 04LM005 | North Fork Whitewater River | 44.03764 | -92.25775 | Mixed Wood Plains | 1 | 2B | Target | Mixed Wood Plains_Lower Mississippi_1st | 347.4032206 |
| 04LM006 | Root River | 43.80696 | -92.14283 | Mixed Wood Plains | 5 | 2B | Target | Mixed Wood Plains_Lower Mississippi_4th+ | 87.46947681 |
| 04LM007 | Wells Creek | 44.4956 | -92.36151 | Mixed Wood Plains | 4 | 2B | Target | Mixed Wood Plains_Lower Mississippi_4th+ | 87.46947681 |
| 04LM008 | Trib. to Zumbro River, North Fork | 44.29196 | -92.77828 | Mixed Wood Plains | 1 | 2B | Target | Mixed Wood Plains_Lower Mississippi_1st | 347.4032206 |
| 04LM009 | | 43.62588 | -91.57324 | Mixed Wood Plains | NA | 2B | Non-Target | Mixed Wood Plains_Lower Mississippi_2nd | 140.535273 |
| 04LM010 | Trib. to Salem Creek | 43.9915 | -92.79536 | Temperate Prairies | 2 | 2B | Target | Temperate Prairies_Lower Mississippi_2nd | 94.13019687 |
| 04LM011 | Trib. to Forestville Creek | 43.64208 | -92.24696 | Mixed Wood Plains | 2 | 2A | Target | Mixed Wood Plains_Lower Mississippi_2nd | 140.535273 |
| 04LM012 | | 44.27249 | -91.96171 | Mixed Wood Plains | NA | 2B | Non-Target | Mixed Wood Plains_Lower Mississippi_3rd | 84.9649189 |
| 04LM013 | | 44.21815 | -92.24349 | Mixed Wood Plains | NA | 2A | Non-Target | Mixed Wood Plains_Lower Mississippi_2nd | 140.535273 |
| 04LM014 | Straight River | 44.2171 | -93.23107 | Temperate Prairies | 5 | 2B | Target | Temperate Prairies_Lower Mississippi_4th+ | 130.0526023 |
| 04LM015 | | 44.58465 | -93.20891 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Lower Mississippi_2nd | 94.13019687 |
| 04LM016 | Money Creek | 43.81312 | -91.60149 | Mixed Wood Plains | 4 | 2B | Target | Mixed Wood Plains_Lower Mississippi_4th+ | 87.46947681 |
| 04LM017 | | 43.85924 | -92.74427 | Mixed Wood Plains | NA | 2B | Non-Target | Mixed Wood Plains_Lower Mississippi_1st | 347.4032206 |
| 04LM018 | Beaver Creek | 43.5605 | -92.43285 | Temperate Prairies | 3 | 2B | Target | Temperate Prairies_Lower Mississippi_3rd | 51.24601295 |
| 04LM019 | | 43.87291 | -91.48512 | Mixed Wood Plains | NA | 2B | Non-Target | Mixed Wood Plains_Lower Mississippi_1st | 347.4032206 |
| 04LM020 | South Fork Whitewater River | 43.982 | -92.05829 | Mixed Wood Plains | 4 | 2B | Target | Mixed Wood Plains_Lower Mississippi_4th+ | 87.46947681 |
| 04LM021 | Willow Creek | 43.64886 | -92.10254 | Mixed Wood Plains | 3 | 2A | Target | Mixed Wood Plains_Lower Mississippi_3rd | 84.9649189 |
| 04LM022 | Judicial Ditch No. 1 | 44.13343 | -93.42666 | Temperate Prairies | 1 | 2B | Target | Temperate Prairies_Lower Mississippi_1st | 506.1281867 |

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| 04LM023 | | 44.63381 | -92.8515 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Lower Mississippi_2nd | 94.13019687 |
| 04LM024 | Willow Creek | 43.97268 | -92.45133 | Mixed Wood Plains | 3 | 2B | Target | Mixed Wood Plains_Lower Mississippi_3rd | 84.9649189 |
| 04LM025 | North Branch Root River | 43.88028 | -92.26376 | Mixed Wood Plains | 4 | 2B | Target | Mixed Wood Plains_Lower Mississippi_4th+ | 87.46947681 |
| 04LM026 | | 43.74896 | -92.57381 | Mixed Wood Plains | NA | 2B | Non-Target | Mixed Wood Plains_Lower Mississippi_1st | 347.4032206 |
| 04LM027 | | 44.05583 | -92.60025 | Mixed Wood Plains | NA | 2B | Non-Target | Mixed Wood Plains_Lower Mississippi_1st | 347.4032206 |
| 04LM028 | Trib. to Zumbro River, Middle Fork | 44.17396 | -93.01694 | Temperate Prairies | 1 | 2B | Target | Temperate Prairies_Lower Mississippi_1st | 506.1281867 |
| 04LM029 | South Branch Vermillion River | 44.63628 | -93.02933 | Temperate Prairies | 3 | 2B | Target | Temperate Prairies_Lower Mississippi_3rd | 51.24601295 |
| 04LM030 | Trib. to Winnebago Creek | 43.54948 | -91.394 | Mixed Wood Plains | 1 | 2A | Target | Mixed Wood Plains_Lower Mississippi_1st | 347.4032206 |
| 04LM031 | Wells Creek | 44.46514 | -92.46448 | Mixed Wood Plains | 3 | 2B | Target | Mixed Wood Plains_Lower Mississippi_3rd | 84.9649189 |
| 04LM032 | Rush Creek | 43.94278 | -91.86603 | Mixed Wood Plains | 3 | 2A | Target | Mixed Wood Plains_Lower Mississippi_3rd | 84.9649189 |
| 04LM033 | Straight River | 44.02598 | -93.26107 | Temperate Prairies | 3 | 2B | Target | Temperate Prairies_Lower Mississippi_3rd | 51.24601295 |
| 04LM034 | Pine Creek | 43.81039 | -91.31144 | Mixed Wood Plains | 4 | 2B | Target | Mixed Wood Plains_Lower Mississippi_4th+ | 87.46947681 |
| 04LM035 | Middle Fork Whitewater River | 44.03039 | -92.11539 | Mixed Wood Plains | 3 | 2A | Target | Mixed Wood Plains_Lower Mississippi_3rd | 84.9649189 |
| 04LM036 | | 43.76345 | -91.89784 | Mixed Wood Plains | NA | 2B | Non-Target | Mixed Wood Plains_Lower Mississippi_2nd | 140.535273 |
| 04LM037 | Spring Creek | 44.53533 | -92.65447 | Mixed Wood Plains | 3 | 2A | Target | Mixed Wood Plains_Lower Mississippi_3rd | 84.9649189 |
| 04LM038 | Little Cannon River | 44.42038 | -92.91391 | Mixed Wood Plains | 4 | 2B | Target | Mixed Wood Plains_Lower Mississippi_4th+ | 87.46947681 |
| 04LM039 | | 43.7219 | -91.995 | Mixed Wood Plains | NA | 2A | Non-Target | Mixed Wood Plains_Lower Mississippi_1st | 347.4032206 |
| 04LM040 | | 43.78012 | -92.31663 | Mixed Wood Plains | NA | 2B | Non-Target | Mixed Wood Plains_Lower Mississippi_1st | 347.4032206 |
| 04LM041 | | 44.16781 | -91.84815 | Mixed Wood Plains | 2 | 2B | Permission denied | Mixed Wood Plains_Lower Mississippi_2nd | 140.535273 |
| 04LM042 | Silver Spring Creek | 44.18177 | -92.35827 | Mixed Wood Plains | 2 | 2B | Target | Mixed Wood Plains_Lower Mississippi_2nd | 140.535273 |

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|---|---|---|---|---|---|---|---|---|---|
| 04LM043 | | 44.07807 | -92.93675 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Lower Mississippi_3rd | 51.24601295 |
| 04LM044 | Wolf Creek | 44.37986 | -93.3402 | Mixed Wood Plains | 2 | 2B | Target | Mixed Wood Plains_Lower Mississippi_2nd | 140.535273 |
| 04LM045 | | 43.51979 | -91.52131 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Lower Mississippi_1st | 506.1281867 |
| 04LM046 | Spring Creek | 44.49035 | -93.02646 | Temperate Prairies | 2 | 2B | Target | Temperate Prairies_Lower Mississippi_2nd | 94.13019687 |
| 04LM047 | | 43.75689 | -91.66245 | Mixed Wood Plains | NA | 2B | Non-Target | Mixed Wood Plains_Lower Mississippi_1st | 347.4032206 |
| 04LM048 | Upper Iowa River | 43.50248 | -92.14043 | Temperate Prairies | 4 | 2B | Target | Temperate Prairies_Lower Mississippi_4th+ | 130.0526023 |
| 04LM049 | East Indian Creek | 44.20585 | -92.04279 | Mixed Wood Plains | 3 | 2A | Target | Mixed Wood Plains_Lower Mississippi_3rd | 84.9649189 |
| 04LM050 | | 44.27366 | -92.47945 | Mixed Wood Plains | NA | 2B | Non-Target | Mixed Wood Plains_Lower Mississippi_1st | 347.4032206 |
| 04LM051 | Trib. to Zumbro River, North Fork | 44.23329 | -93.10236 | Temperate Prairies | 2 | 2B | Target | Temperate Prairies_Lower Mississippi_2nd | 94.13019687 |
| 04LM052 | Vermillion River | 44.62908 | -93.16926 | Temperate Prairies | 3 | 2A | Target | Temperate Prairies_Lower Mississippi_3rd | 51.24601295 |
| 04LM053 | Trib. to Zumbro River, Middle Fork | 44.13864 | -93.07586 | Temperate Prairies | 1 | 2B | Target | Temperate Prairies_Lower Mississippi_1st | 506.1281867 |
| 04LM054 | North Branch Middle Fork Zumbro River | 44.19392 | -92.78008 | Mixed Wood Plains | 4 | 2B | Target | Mixed Wood Plains_Lower Mississippi_4th+ | 87.46947681 |
| 04LM055 | Cannon River | 44.5296 | -92.81147 | Mixed Wood Plains | 5 | 2B | Target | Mixed Wood Plains_Lower Mississippi_4th+ | 87.46947681 |
| 04LM056 | Badger Run | 43.96993 | -92.39787 | Mixed Wood Plains | 3 | 2B | Target | Mixed Wood Plains_Lower Mississippi_3rd | 84.9649189 |
| 04LM057 | Watson Creek | 43.69839 | -92.11472 | Mixed Wood Plains | 2 | 2A | Target | Mixed Wood Plains_Lower Mississippi_2nd | 140.535273 |
| 04LM058 | Spring Valley Creek | 43.70105 | -92.35236 | Mixed Wood Plains | 2 | 2A | Target | Mixed Wood Plains_Lower Mississippi_2nd | 140.535273 |
| 04LM059 | Prairie Creek | 44.46803 | -93.00797 | Temperate Prairies | 3 | 2B | Target | Temperate Prairies_Lower Mississippi_3rd | 51.24601295 |
| 04LM060 | Riceford Creek | 43.65126 | -91.70318 | Mixed Wood Plains | 3 | 2B | Target | Mixed Wood Plains_Lower Mississippi_3rd | 84.9649189 |
| 04LM061 | Pine Creek | 43.8474 | -91.38739 | Mixed Wood Plains | 4 | 2B | Target | Mixed Wood Plains_Lower Mississippi_4th+ | 87.46947681 |
| 04LM062 | | 44.0935 | -92.21788 | Mixed Wood Plains | NA | 2B | Non-Target | Mixed Wood Plains_Lower Mississippi_1st | 347.4032206 |

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|---|---|---|---|---|---|---|---|---|---|
| 04LM063 | | 44.26125 | -93.38478 | Mixed Wood Plains | NA | 2B | Non-Target | Mixed Wood Plains_Lower Mississippi_2nd | 140.535273 |
| 04LM064 | | 44.39033 | -92.56522 | Mixed Wood Plains | NA | 2B | Non-Target | Mixed Wood Plains_Lower Mississippi_1st | 347.4032206 |
| 04LM065 | | 43.90703 | -91.86725 | Mixed Wood Plains | NA | 2B | Non-Target | Mixed Wood Plains_Lower Mississippi_2nd | 140.535273 |
| 04LM066 | Pine Island Creek | 44.19844 | -92.51397 | Mixed Wood Plains | 3 | 2B | Target | Mixed Wood Plains_Lower Mississippi_3rd | 84.9649189 |
| 04LM067 | | 43.7908 | -91.27455 | Mixed Wood Plains | NA | 2B | Non-Target | Mixed Wood Plains_Lower Mississippi_1st | 347.4032206 |
| 04LM068 | South Fork White Water River | 44.00959 | -91.97659 | Mixed Wood Plains | 4 | 2A | Target | Mixed Wood Plains_Lower Mississippi_4th+ | 87.46947681 |
| 04LM069 | South Fork Root River | 43.61076 | -91.86959 | Mixed Wood Plains | 3 | 2A | Target | Mixed Wood Plains_Lower Mississippi_3rd | 84.9649189 |
| 04LM070 | Wells Creek | 44.49189 | -92.42816 | Mixed Wood Plains | 4 | 2B | Target | Mixed Wood Plains_Lower Mississippi_4th+ | 87.46947681 |
| 04LM071 | Trib. to Zumbro River | 44.2878 | -92.99189 | Temperate Prairies | 2 | 2B | Target | Temperate Prairies_Lower Mississippi_2nd | 94.13019687 |
| 04LM072 | Middle Branch Root River | 43.76511 | -92.24786 | Mixed Wood Plains | 4 | 2B | Target | Mixed Wood Plains_Lower Mississippi_4th+ | 87.46947681 |
| 04LM073 | | 43.98176 | -92.65429 | Mixed Wood Plains | NA | 2B | Non-Target | Mixed Wood Plains_Lower Mississippi_1st | 347.4032206 |
| 04LM074 | Trib. to Willow Creek | 43.60581 | -92.09406 | Mixed Wood Plains | 1 | 2A | Target | Mixed Wood Plains_Lower Mississippi_1st | 347.4032206 |
| 04LM075 | | 44.18991 | -92.08641 | Mixed Wood Plains | NA | 2B | Non-Target | Mixed Wood Plains_Lower Mississippi_1st | 347.4032206 |
| 04MS001 | | 43.60719 | -95.17961 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Missouri_2nd | 84.17387324 |
| 04MS002 | Ash Creek | 43.53962 | -96.23807 | Temperate Prairies | 3 | 2B | Target | Temperate Prairies_Missouri_3rd | 80.37005066 |
| 04MS003 | Trib. of Rock River | 43.65432 | -95.69169 | Temperate Prairies | 1 | 2B | Target | Temperate Prairies_Missouri_1st | 242.1752168 |
| 04MS004 | | 43.7106 | -96.25121 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Missouri_1st | 242.1752168 |
| 04MS005 | Split Rock Creek | 43.87291 | -96.38307 | Temperate Prairies | 4 | 2B | Target | Temperate Prairies_Missouri_4th+ | 38.65240005 |
| 04MS006 | | 43.79666 | -95.93686 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Missouri_1st | 242.1752168 |
| 04MS007 | | 43.6976 | -96.33805 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Missouri_1st | 242.1752168 |
| 04MS008 | Trib. to Kanaranzi Creek | 43.77263 | -95.85404 | Temperate Prairies | 1 | 2B | Target | Temperate Prairies_Missouri_1st | 242.1752168 |
| 04MS009 | Rock River | 43.99298 | -96.16736 | Temperate Prairies | 3 | 2B | Target | Temperate Prairies_Missouri_3rd | 80.37005066 |
| 04MS010 | Rock River | 43.91805 | -96.13264 | Temperate Prairies | 4 | 2B | Target | Temperate Prairies_Missouri_4th+ | 38.65240005 |

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| 04MS011 | Trib. to Rock River, West Branch | 43.58202 | -95.81738 | Temperate Prairies | 2 | 2B | Target | Temperate Prairies_Missouri_2nd | 84.17387324 |
| 04MS012 | East Branch Rock River | 44.04052 | -96.13686 | Temperate Prairies | 3 | 2B | Target | Temperate Prairies_Missouri_3rd | 80.37005066 |
| 04MS013 | | 43.98893 | -96.44289 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Missouri_2nd | 84.17387324 |
| 04MS014 | Trib. to Little Sioux River | 43.64287 | -95.3883 | Temperate Prairies | 1 | 2B | Target | Temperate Prairies_Missouri_1st | 242.1752168 |
| 04MS015 | | 43.79781 | -96.10214 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Missouri_1st | 242.1752168 |
| 04MS016 | Rock River | 43.56511 | -96.18588 | Temperate Prairies | 5 | 2B | Target | Temperate Prairies_Missouri_4th+ | 38.65240005 |
| 04MS017 | | 44.07781 | -96.32839 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Missouri_1st | 242.1752168 |
| 04MS018 | Skunk Creek (Judicial Ditch #13) | 43.55909 | -95.32216 | Temperate Prairies | 2 | 2B | Target | Temperate Prairies_Missouri_2nd | 84.17387324 |
| 04MS019 | Rock River | 43.65725 | -96.18791 | Temperate Prairies | 5 | 2B | Target | Temperate Prairies_Missouri_4th+ | 38.65240005 |
| 04MS020 | Kanaranzi Creek | 43.65279 | -95.93034 | Temperate Prairies | 4 | 2B | Target | Temperate Prairies_Missouri_4th+ | 38.65240005 |
| 04MS021 | Pipestone Creek | 44.0106 | -96.39389 | Temperate Prairies | 3 | 2B | Target | Temperate Prairies_Missouri_3rd | 80.37005066 |
| 04MS022 | | 43.85097 | -96.2292 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Missouri_1st | 242.1752168 |
| 04MS023 | | 43.75909 | -96.43665 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Missouri_2nd | 84.17387324 |
| 04MS024 | | 44.12102 | -96.43624 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Missouri_1st | 242.1752168 |
| 04MS025 | Trib. to Okabena Lake | 43.61189 | -95.63575 | Temperate Prairies | 2 | 2B | Target | Temperate Prairies_Missouri_2nd | 84.17387324 |
| 04MS026 | Chanarambie Creek | 43.90076 | -96.08387 | Temperate Prairies | 4 | 2B | Target | Temperate Prairies_Missouri_4th+ | 38.65240005 |
| 04MS027 | Springwater Creek | 43.61905 | -96.43389 | Temperate Prairies | 3 | 2B | Target | Temperate Prairies_Missouri_3rd | 80.37005066 |
| 04MS028 | | 44.18193 | -96.39176 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Missouri_2nd | 84.17387324 |
| 04MS029 | | 43.55478 | -95.08166 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Missouri_1st | 242.1752168 |
| 04MS030 | | 43.56937 | -96.31697 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Missouri_2nd | 84.17387324 |
| 04MS031 | Split Rock Creek | 43.92327 | -96.36392 | Temperate Prairies | 2 | 2B | Target | Temperate Prairies_Missouri_2nd | 84.17387324 |
| 04MS032 | Rock River | 43.79755 | -96.12479 | Temperate Prairies | 5 | 2B | Target | Temperate Prairies_Missouri_4th+ | 38.65240005 |
| 04MS033 | | 43.8601 | -96.17352 | Temperate Prairies | 4 | 2B | Permission denied | Temperate Prairies_Missouri_4th+ | 38.65240005 |
| 04MS034 | Trib. to Kanaranzi Creek, East Branch | 43.64135 | -95.87493 | Temperate Prairies | 2 | 2B | Target | Temperate Prairies_Missouri_2nd | 84.17387324 |
| 04MS035 | East Branch Rock River | 44.04316 | -96.11319 | Temperate Prairies | 3 | 2B | Target | Temperate Prairies_Missouri_3rd | 80.37005066 |
| 05RD001 | | 45.72447 | -96.56853 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Red_1st | 679.3438481 |
| 05RD002 | County Ditch No. 4 | 48.62238 | -96.34581 | Temperate Prairies | 2 | 2B | Target | Temperate Prairies_Red_2nd | 336.8868461 |
| 05RD003 | Poplar River | 47.79274 | -96.04679 | Mixed Wood Plains | 3 | 2B | Target | Mixed Wood Plains_Red_3rd | 57.68051456 |

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|---|---|---|---|---|---|---|---|---|---|
| 05RD004 | Two Rivers | 48.79708 | -97.1006 | Temperate Prairies | 5 | 2B | Target | Temperate Prairies_Red_4th+ | 160.2064298 |
| 05RD005 | unnamed trib. to Wild Rice River | 47.24267 | -96.18166 | Temperate Prairies | 2 | 2B | Target | Temperate Prairies_Red_2nd | 336.8868461 |
| 05RD006 | | 46.83336 | -96.49306 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Red_1st | 679.3438481 |
| 05RD007 | Roseau River | 48.54407 | -95.34055 | Mixed Wood Shield | 1 | 2B | Target | Mixed Wood Shield_Red_1st | 1169.738825 |
| 05RD008 | Twelvemile Creek | 45.84738 | -96.36255 | Temperate Prairies | 4 | 2B | Target | Temperate Prairies_Red_4th+ | 160.2064298 |
| 05RD009 | Wild Rice River | 47.34629 | -95.70183 | Mixed Wood Plains | 3 | 2B | Target | Mixed Wood Plains_Red_3rd | 57.68051456 |
| 05RD010 | Red River | 46.60642 | -96.76848 | Temperate Prairies | 5 | 2B | Target | Temperate Prairies_Red_4th+ | 160.2064298 |
| 05RD011 | | 48.18103 | -96.62764 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Red_2nd | 336.8868461 |
| 05RD012 | Clearwater River | 47.8535 | -95.46041 | Mixed Wood Shield | 4 | 2B | Target | Mixed Wood Shield_Red_4th+ | 30.32565357 |
| 05RD013 | Rabbit River | 46.12578 | -96.52783 | Temperate Prairies | 4 | 2B | Target | Temperate Prairies_Red_4th+ | 160.2064298 |
| 05RD014 | Middle River | 48.32343 | -96.67292 | Temperate Prairies | 3 | 2B | Target | Temperate Prairies_Red_3rd | 151.854075 |
| 05RD015 | | 47.27525 | -95.99958 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Red_1st | 679.3438481 |
| 05RD016 | Pelican River | 46.78698 | -95.87181 | Mixed Wood Plains | 3 | 2B | Target | Mixed Wood Plains_Red_3rd | 57.68051456 |
| 05RD017 | Cormorant River | 47.90179 | -94.52913 | Mixed Wood Shield | 2 | 2B | Target | Mixed Wood Shield_Red_2nd | 664.9981379 |
| 05RD018 | Sandhill River | 47.59085 | -96.79116 | Temperate Prairies | 4 | 2B | Target | Temperate Prairies_Red_4th+ | 160.2064298 |
| 05RD019 | | 46.25173 | -96.32415 | Mixed Wood Plains | NA | 2B | Non-Target | Mixed Wood Plains_Red_1st | 449.7275068 |
| 05RD020 | County Ditch No. 15 | 48.29903 | -96.23212 | Temperate Prairies | 1 | 2B | Target | Temperate Prairies_Red_1st | 679.3438481 |
| 05RD021 | South Cormorant River | 47.79034 | -94.47157 | Mixed Wood Shield | 3 | 2B | Target | Mixed Wood Shield_Red_3rd | 60.1258544 |
| 05RD022 | | 47.25175 | -96.48439 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Red_1st | 679.3438481 |
| 05RD023 | | 46.48688 | -96.49883 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Red_3rd | 151.854075 |
| 05RD024 | | 47.89191 | -96.60368 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Red_1st | 679.3438481 |
| 05RD025 | | 48.83021 | -97.05417 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Red_1st | 679.3438481 |
| 05RD026 | Hill River | 47.69766 | -95.83572 | Mixed Wood Plains | 3 | 2B | Target | Mixed Wood Plains_Red_3rd | 57.68051456 |
| 05RD027 | Roseau River | 48.91274 | -95.89385 | Mixed Wood Shield | 5 | 2B | Target | Mixed Wood Shield_Red_4th+ | 30.32565357 |
| 05RD028 | | 48.63891 | -95.53315 | Mixed Wood Shield | NA | 2B | Non-Target | Mixed Wood Shield_Red_1st | 1169.738825 |
| 05RD029 | Clearwater River | 47.8981 | -96.06857 | Mixed Wood Plains | 4 | 2B | Target | Mixed Wood Plains_Red_4th+ | 15.57393428 |
| 05RD030 | Red River | 47.05869 | -96.82122 | Temperate Prairies | 7 | 2B | Target | Temperate Prairies_Red_4th+ | 160.2064298 |
| 05RD031 | | 47.55248 | -95.35505 | Mixed Wood Shield | NA | 2B | Non-Target | Mixed Wood Shield_Red_3rd | 60.1258544 |
| 05RD032 | Spring Creek | 47.11152 | -95.94354 | Temperate Prairies | 1 | 2B | Target | Temperate Prairies_Red_1st | 679.3438481 |

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|---|---|---|---|---|---|---|---|---|---|
| 05RD033 | County Ditch No. 6-A | 46.4518 | -96.41391 | Temperate Prairies | 1 | 2B | Target | Temperate Prairies_Red_1st | 679.3438481 |
| 05RD034 | Red Lake River | 48.10343 | -96.12517 | Mixed Wood Shield | 5 | 2B | Target | Mixed Wood Shield_Red_4th+ | 30.32565357 |
| 05RD035 | | 46.03628 | -96.22655 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Red_1st | 679.3438481 |
| 05RD036 | Wild Rice River | 47.19692 | -96.72487 | Temperate Prairies | 5 | 2B | Target | Temperate Prairies_Red_4th+ | 160.2064298 |
| 05RD037 | South Branch Buffalo River | 46.60247 | -96.53544 | Temperate Prairies | 4 | 2B | Target | Temperate Prairies_Red_4th+ | 160.2064298 |
| 05RD038 | | 47.96302 | -96.70467 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Red_2nd | 336.8868461 |
| 05RD039 | Roseau River | 48.94595 | -96.37297 | Mixed Wood Shield | 5 | 2B | Target | Mixed Wood Shield_Red_4th+ | 30.32565357 |
| 05RD040 | Trib. to Hill River | 47.68882 | -95.6632 | Mixed Wood Plains | 2 | 2B | Target | Mixed Wood Plains_Red_2nd | 114.3529425 |
| 05RD041 | | 47.73046 | -96.38807 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Red_2nd | 336.8868461 |
| 05RD042 | Tamarac River | 48.41452 | -96.73518 | Temperate Prairies | 3 | 2B | Target | Temperate Prairies_Red_3rd | 151.854075 |
| 05RD043 | Hay Creek (County Ditch #7) | 48.87919 | -95.71804 | Mixed Wood Shield | 3 | 2B | Target | Mixed Wood Shield_Red_3rd | 60.1258544 |
| 05RD044 | | 47.58718 | -95.57838 | Mixed Wood Plains | NA | 2B | Non-Target | Mixed Wood Plains_Red_1st | 449.7275068 |
| 05RD045 | Trib. to Buffalo River | 46.92225 | -96.00676 | Temperate Prairies | 2 | 2B | Target | Temperate Prairies_Red_2nd | 336.8868461 |
| 05RD046 | Lost River | 47.84515 | -95.88709 | Mixed Wood Plains | 4 | 2B | Target | Mixed Wood Plains_Red_4th+ | 15.57393428 |
| 05RD047 | Red River | 47.35547 | -96.83665 | Temperate Prairies | 7 | 2B | Target | Temperate Prairies_Red_4th+ | 160.2064298 |
| 05RD048 | | 46.36791 | -96.61296 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Red_1st | 679.3438481 |
| 05RD049 | | 48.70032 | -96.69133 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Red_1st | 679.3438481 |
| 05RD050 | | 45.72955 | -96.49628 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Red_2nd | 336.8868461 |
| 05RD051 | Trib. to Roseau River, South Fork | 48.74658 | -95.75962 | Mixed Wood Shield | 4 | 2B | Target | Mixed Wood Shield_Red_4th+ | 30.32565357 |
| 05RD052 | Sand Hill River | 47.53244 | -95.91259 | Temperate Prairies | 4 | 2B | Target | Temperate Prairies_Red_4th+ | 160.2064298 |
| 05RD053 | North Branch Two Rivers | 48.79901 | -97.08216 | Temperate Prairies | 4 | 2B | Target | Temperate Prairies_Red_4th+ | 160.2064298 |
| 05RD054 | Blackduck River | 47.84696 | -94.69107 | Mixed Wood Shield | 3 | 2B | Target | Mixed Wood Shield_Red_3rd | 60.1258544 |
| 05RD055 | Judicial Ditch No. 51 | 47.30876 | -96.48495 | Temperate Prairies | 3 | 2B | Target | Temperate Prairies_Red_3rd | 151.854075 |
| 05RD056 | | 46.94719 | -96.37647 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Red_1st | 679.3438481 |
| 05RD057 | Red Lake River | 47.86567 | -96.41671 | Mixed Wood Plains | 6 | 2B | Target | Mixed Wood Plains_Red_4th+ | 15.57393428 |
| 05RD058 | Roseau River | 48.7837 | -95.72662 | Mixed Wood Shield | 5 | 2B | Target | Mixed Wood Shield_Red_4th+ | 30.32565357 |
| 05RD059 | Marsh Creek | 47.41726 | -95.99205 | Temperate Prairies | 3 | 2B | Target | Temperate Prairies_Red_3rd | 151.854075 |
| 05RD060 | Stiner Creek | 47.0558 | -96.21273 | Temperate Prairies | 3 | 2B | Target | Temperate Prairies_Red_3rd | 151.854075 |
| 05RD061 | Lost River | 47.85136 | -95.96773 | Mixed Wood Plains | 4 | 2B | Target | Mixed Wood Plains_Red_4th+ | 15.57393428 |

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|---|---|---|---|---|---|---|---|---|---|
| 05RD062 | | 47.54965 | -96.7354 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Red_1st | 679.3438481 |
| 05RD063 | | 46.38396 | -96.4801 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Red_3rd | 151.854075 |
| 05RD064 | | 48.40722 | -96.25748 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Red_3rd | 151.854075 |
| 05RD065 | South Fork Roseau River | 48.70566 | -95.7264 | Mixed Wood Shield | 3 | 2B | Target | Mixed Wood Shield_Red_3rd | 60.1258544 |
| 05RD066 | Mosquito Creek | 47.41211 | -95.43134 | Mixed Wood Plains | 2 | 2B | Target | Mixed Wood Plains_Red_2nd | 114.3529425 |
| 05RD067 | | 47.01384 | -96.73724 | Temperate Prairies | 5 | 2B | Permission denied | Temperate Prairies_Red_4th+ | 160.2064298 |
| 05RD068 | | 47.57235 | -95.43083 | Mixed Wood Shield | NA | 2B | Non-Target | Mixed Wood Shield_Red_1st | 1169.738825 |
| 05RD069 | South Branch Wild Rice River | 47.10145 | -96.33046 | Temperate Prairies | 4 | 2B | Target | Temperate Prairies_Red_4th+ | 160.2064298 |
| 05RD070 | | 46.53769 | -96.3322 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Red_2nd | 336.8868461 |
| 05RD171 | Red Lake River | 48.03376 | -96.20593 | Mixed Wood Plains | 5 | 2B | Target | Mixed Wood Plains_Red_4th+ | 15.57393428 |
| 05RD172 | | 45.70129 | -96.1179 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Red_1st | 679.3438481 |
| 05RD173 | Marsh River | 47.29427 | -96.5379 | Temperate Prairies | 1 | 2B | Target | Temperate Prairies_Red_1st | 679.3438481 |
| 05RD174 | | 46.70512 | -96.77048 | Temperate Prairies | 3 | 2B | Permission denied | Temperate Prairies_Red_3rd | 151.854075 |
| 05RD175 | Snake River | 48.18947 | -96.78914 | Temperate Prairies | 4 | 2B | Target | Temperate Prairies_Red_4th+ | 160.2064298 |
| 05RD176 | | 48.93694 | -96.32408 | Mixed Wood Shield | 5 | 2B | Physically Inaccessible | Mixed Wood Shield_Red_4th+ | 30.32565357 |
| 05RD177 | | 47.83521 | -95.21267 | Mixed Wood Shield | 3 | 2B | Permission denied | Mixed Wood Shield_Red_3rd | 60.1258544 |
| 05RD178 | | 47.86505 | -96.58256 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Red_1st | 679.3438481 |
| 05RD179 | Tamarac River | 48.41073 | -96.76261 | Temperate Prairies | 4 | 2B | Target | Temperate Prairies_Red_4th+ | 160.2064298 |
| 05RD180 | | 45.61345 | -96.17423 | Temperate Prairies | NA | 2B | Non-Target | Temperate Prairies_Red_1st | 679.3438481 |
| 05RD181 | South Branch Two Rivers | 48.66483 | -96.24609 | Temperate Prairies | 4 | 2B | Target | Temperate Prairies_Red_4th+ | 160.2064298 |
| 05RN001 | Little Fork River | 47.99187 | -93.22537 | Mixed Wood Shield | 5 | 2B | Target | Mixed Wood Shield_Rainy_4th+ | 53.06984974 |
| 05RN002 | Sturgeon River | 48.21321 | -93.89214 | Mixed Wood Shield | 3 | 2B | Target | Mixed Wood Shield_Rainy_3rd | 70.040735 |
| 05RN003 | West Two River | 47.7806 | -92.29052 | Mixed Wood Shield | 2 | 2A | Target | Mixed Wood Shield_Rainy_2nd | 83.75793227 |
| 05RN004 | | 48.11938 | -91.98836 | Mixed Wood Shield | NA | 2B | Non-Target | Mixed Wood Shield_Rainy_2nd | 83.75793227 |
| 05RN005 | | 48.67141 | -94.66845 | Mixed Wood Shield | NA | 2B | Non-Target | Mixed Wood Shield_Rainy_1st | 334.2923407 |
| 05RN006 | | 47.58163 | -94.02067 | Mixed Wood Shield | NA | 2B | Non-Target | Mixed Wood Shield_Rainy_2nd | 83.75793227 |
| 05RN007 | | 48.49007 | -93.24516 | Mixed Wood Shield | NA | 2B | Non-Target | Mixed Wood Shield_Rainy_3rd | 70.040735 |
| 05RN008 | | 47.77351 | -91.26641 | Mixed Wood Shield | NA | 2B | Non-Target | Mixed Wood Shield_Rainy_4th+ | 53.06984974 |

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|---|---|---|---|---|---|---|---|---|---|
| 05RN009 | | 48.7477 | -94.82246 | Mixed Wood Shield | NA | 2B | Non-Target | Mixed Wood Shield_Rainy_1st | 334.2923407 |
| 05RN010 | Rice River | 47.81149 | -92.65948 | Mixed Wood Shield | 3 | 2B | Target | Mixed Wood Shield_Rainy_3rd | 70.040735 |
| 05RN011 | | 47.88982 | -93.89649 | Mixed Wood Shield | NA | 2B | Non-Target | Mixed Wood Shield_Rainy_2nd | 83.75793227 |
| 05RN012 | | 47.99061 | -91.00848 | Mixed Wood Shield | NA | 2B | Non-Target | Mixed Wood Shield_Rainy_2nd | 83.75793227 |
| 05RN013 | East Fork Rapid River | 48.64051 | -94.38107 | Mixed Wood Shield | 4 | 2B | Target | Mixed Wood Shield_Rainy_4th+ | 53.06984974 |
| 05RN014 | | 48.43827 | -93.17805 | Mixed Wood Shield | NA | 2B | Non-Target | Mixed Wood Shield_Rainy_3rd | 70.040735 |
| 05RN015 | Black River | 48.46369 | -93.81231 | Mixed Wood Shield | 4 | 2B | Target | Mixed Wood Shield_Rainy_4th+ | 53.06984974 |
| 05RN016 | | 47.93243 | -91.48472 | Mixed Wood Shield | NA | 2B | Non-Target | Mixed Wood Shield_Rainy_1st | 334.2923407 |
| 05RN017 | Trib. to Warroad River, East Branch | 48.76819 | -95.26451 | Mixed Wood Shield | 2 | 2B | Target | Mixed Wood Shield_Rainy_2nd | 83.75793227 |
| 05RN018 | Little Fork River | 47.84155 | -92.77452 | Mixed Wood Shield | 4 | 2B | Target | Mixed Wood Shield_Rainy_4th+ | 53.06984974 |
| 05RN019 | unnamed trib. to Big Fork River | 47.77194 | -93.66246 | Mixed Wood Shield | 2 | 2B | Target | Mixed Wood Shield_Rainy_2nd | 83.75793227 |
| 05RN020 | Sturgeon River | 47.65357 | -92.91992 | Mixed Wood Shield | 4 | 2B | Target | Mixed Wood Shield_Rainy_4th+ | 53.06984974 |
| 05RN021 | Vermilion River | 48.13981 | -92.5445 | Mixed Wood Shield | 4 | 2B | Target | Mixed Wood Shield_Rainy_4th+ | 53.06984974 |
| 05RN022 | Black River | 48.46283 | -93.86192 | Mixed Wood Shield | 4 | 2B | Target | Mixed Wood Shield_Rainy_4th+ | 53.06984974 |
| 05RN023 | | 48.30978 | -93.05842 | Mixed Wood Shield | NA | 2B | Non-Target | Mixed Wood Shield_Rainy_1st | 334.2923407 |
| 05RN024 | Stony River | 47.64685 | -91.57919 | Mixed Wood Shield | 3 | 2B | Target | Mixed Wood Shield_Rainy_3rd | 70.040735 |
| 05RN025 | North Branch Rapid River | 48.52987 | -94.61352 | Mixed Wood Shield | 3 | 2B | Target | Mixed Wood Shield_Rainy_3rd | 70.040735 |
| 05RN026 | Beaver Brook | 48.35748 | -93.36521 | Mixed Wood Shield | 4 | 2B | Target | Mixed Wood Shield_Rainy_4th+ | 53.06984974 |
| 05RN027 | | 47.95556 | -91.15854 | Mixed Wood Shield | NA | 2B | Non-Target | Mixed Wood Shield_Rainy_4th+ | 53.06984974 |
| 05RN028 | | 47.91776 | -94.17783 | Mixed Wood Shield | NA | 2B | Non-Target | Mixed Wood Shield_Rainy_2nd | 83.75793227 |
| 05RN029 | Trib. to Pike River | 47.60856 | -92.40767 | Mixed Wood Shield | 2 | 2B | Target | Mixed Wood Shield_Rainy_2nd | 83.75793227 |
| 05RN030 | Trib. to Long Lake | 48.28512 | -92.73818 | Mixed Wood Shield | 1 | 2B | Target | Mixed Wood Shield_Rainy_1st | 334.2923407 |
| 05RN031 | Little Fork River | 48.13211 | -93.46367 | Mixed Wood Shield | 5 | 2B | Target | Mixed Wood Shield_Rainy_4th+ | 53.06984974 |
| 05RN032 | | 47.84764 | -93.01293 | Mixed Wood Shield | 4 | 2B | Target | Mixed Wood Shield_Rainy_4th+ | 53.06984974 |
| 05RN033 | Dumbbell River | 48.13914 | -94.02342 | Mixed Wood Shield | 2 | 2A | Target | Mixed Wood Shield_Rainy_2nd | 83.75793227 |
| 05RN034 | East Branch Sturgeon River | 47.60781 | -92.76804 | Mixed Wood Shield | 2 | 2B | Target | Mixed Wood Shield_Rainy_2nd | 83.75793227 |
| 05RN035 | | 48.18836 | -92.03007 | Mixed Wood Shield | 3 | 2B | Physically Inaccessible | Mixed Wood Shield_Rainy_3rd | 70.040735 |
| 05RN036 | | 48.61227 | -94.95711 | Mixed Wood Shield | NA | 2B | Non-Target | Mixed Wood Shield_Rainy_1st | 334.2923407 |

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| 05RN037 | Beaver Brook | 48.40502 | -93.51693 | Mixed Wood Shield | 4 | 2B | Target | Mixed Wood Shield_Rainy_4th+ | 53.06984974 |
| 05RN038 | | 47.79536 | -91.42374 | Mixed Wood Shield | 3 | 2A | Physically Inaccessible | Mixed Wood Shield_Rainy_3rd | 70.040735 |
| 05RN039 | Rapid River | 48.58149 | -94.442 | Mixed Wood Shield | 4 | 2B | Target | Mixed Wood Shield_Rainy_4th+ | 53.06984974 |
| 05RN040 | | 48.17197 | -92.897 | Mixed Wood Shield | NA | 2A | Non-Target | Mixed Wood Shield_Rainy_1st | 334.2923407 |
| 05RN041 | | 47.79648 | -94.04533 | Mixed Wood Shield | NA | 2B | Non-Target | Mixed Wood Shield_Rainy_4th+ | 53.06984974 |
| 05RN042 | Dumbbell River | 47.71635 | -91.19884 | Mixed Wood Shield | 3 | 2A | Target | Mixed Wood Shield_Rainy_3rd | 70.040735 |
| 05RN043 | Ash River | 48.34501 | -92.90542 | Mixed Wood Shield | 4 | 2A | Target | Mixed Wood Shield_Rainy_4th+ | 53.06984974 |
| 05RN044 | Little Fork River | 48.18122 | -93.48451 | Mixed Wood Shield | 5 | 2B | Target | Mixed Wood Shield_Rainy_4th+ | 53.06984974 |
| 05RN045 | Willow River | 47.95972 | -92.92902 | Mixed Wood Shield | 3 | 2B | Target | Mixed Wood Shield_Rainy_3rd | 70.040735 |
| 05RN046 | Big Fork River | 47.88547 | -93.59445 | Mixed Wood Shield | 4 | 2B | Target | Mixed Wood Shield_Rainy_4th+ | 53.06984974 |
| 05RN047 | Bowstring River | 47.54357 | -93.76276 | Mixed Wood Shield | 2 | 2B | Target | Mixed Wood Shield_Rainy_2nd | 83.75793227 |
| 05RN048 | Clear Creek | 48.1342 | -92.68842 | Mixed Wood Shield | 2 | 2B | Target | Mixed Wood Shield_Rainy_2nd | 83.75793227 |
| 05RN049 | | 48.57337 | -94.10218 | Mixed Wood Shield | NA | 2B | Non-Target | Mixed Wood Shield_Rainy_1st | 334.2923407 |
| 05RN050 | Trib. to Bear River | 48.3844 | -93.68351 | Mixed Wood Shield | 3 | 2B | Target | Mixed Wood Shield_Rainy_3rd | 70.040735 |
| 05RN051 | | 47.82591 | -91.7256 | Mixed Wood Shield | NA | 2B | Non-Target | Mixed Wood Shield_Rainy_4th+ | 53.06984974 |
| 05RN052 | Little Fork River | 47.96972 | -93.17583 | Mixed Wood Shield | 5 | 2B | Target | Mixed Wood Shield_Rainy_4th+ | 53.06984974 |
| 05RN053 | Hay Creek | 48.2144 | -94.10181 | Mixed Wood Shield | 2 | 2B | Target | Mixed Wood Shield_Rainy_2nd | 83.75793227 |
| 05RN054 | | 47.63768 | -92.47102 | Mixed Wood Shield | NA | 2B | Non-Target | Mixed Wood Shield_Rainy_2nd | 83.75793227 |
| 05RN055 | | 48.41896 | -92.60871 | Mixed Wood Shield | 3 | 2B | Physically Inaccessible | Mixed Wood Shield_Rainy_3rd | 70.040735 |
| 05RN056 | | 48.63471 | -94.66869 | Mixed Wood Shield | NA | 2B | Non-Target | Mixed Wood Shield_Rainy_1st | 334.2923407 |
| 05RN057 | | 48.33994 | -93.40185 | Mixed Wood Shield | NA | 2B | Non-Target | Mixed Wood Shield_Rainy_1st | 334.2923407 |
| 05RN058 | Bear Island River | 47.80162 | -91.89091 | Mixed Wood Shield | 2 | 2B | Target | Mixed Wood Shield_Rainy_2nd | 83.75793227 |
| 05RN059 | Sturgeon River | 47.76284 | -92.8825 | Mixed Wood Shield | 4 | 2B | Target | Mixed Wood Shield_Rainy_4th+ | 53.06984974 |
| 05RN060 | Big Fork River | 47.85076 | -93.51262 | Mixed Wood Shield | 4 | 2B | Target | Mixed Wood Shield_Rainy_4th+ | 53.06984974 |
| 05RN061 | McNiven Creek | 47.57595 | -92.76407 | Mixed Wood Shield | 2 | 2B | Target | Mixed Wood Shield_Rainy_2nd | 83.75793227 |
| 05RN062 | | 48.2432 | -92.45065 | Mixed Wood Shield | 4 | 2B | Physically Inaccessible | Mixed Wood Shield_Rainy_4th+ | 53.06984974 |
| 05RN063 | Black River | 48.46679 | -93.97999 | Mixed Wood Shield | 3 | 2B | Target | Mixed Wood Shield_Rainy_3rd | 70.040735 |
| 05RN064 | | 48.394 | -93.86191 | Mixed Wood Shield | 1 | 2B | Physically Inaccessible | Mixed Wood Shield_Rainy_1st | 334.2923407 |

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| 05RN065 | August Creek | 47.77139 | -91.5828 | Mixed Wood Shield | 2 | 2B | Target | Mixed Wood Shield_Rainy_2nd | 83.75793227 |
| 05RN066 | Sturgeon River | 47.81696 | -92.99985 | Mixed Wood Shield | 4 | 2B | Target | Mixed Wood Shield_Rainy_4th+ | 53.06984974 |
| 05RN067 | | 48.17198 | -93.72925 | Mixed Wood Shield | NA | 2B | Non-Target | Mixed Wood Shield_Rainy_1st | 334.2923407 |
| 05RN068 | Rice River | 47.71118 | -92.61452 | Mixed Wood Shield | 3 | 2B | Target | Mixed Wood Shield_Rainy_3rd | 70.040735 |
| 05RN069 | Trib. to Range Line Creek | 48.13727 | -92.16282 | Mixed Wood Shield | 1 | 2B | Target | Mixed Wood Shield_Rainy_1st | 334.2923407 |
| 05RN070 | | 48.38418 | -94.65078 | Mixed Wood Shield | NA | 2B | Non-Target | Mixed Wood Shield_Rainy_1st | 334.2923407 |
| 05RN171 | Beaver Brook | 48.30097 | -93.26709 | Mixed Wood Shield | 3 | 2B | Target | Mixed Wood Shield_Rainy_3rd | 70.040735 |
| 05RN172 | | 47.68904 | -91.48003 | Mixed Wood Shield | NA | 2A | Non-Target | Mixed Wood Shield_Rainy_2nd | 83.75793227 |
| 05RN173 | Trib. to Zippel Creek, West Branch | 48.86929 | -94.95959 | Mixed Wood Shield | 2 | 2B | Target | Mixed Wood Shield_Rainy_2nd | 83.75793227 |
| 05RN174 | Trib. to Little Fork River | 47.86383 | -92.54634 | Mixed Wood Shield | 1 | 2B | Target | Mixed Wood Shield_Rainy_1st | 334.2923407 |
| 05RN175 | Big Fork River | 47.75693 | -93.88549 | Mixed Wood Shield | 3 | 2B | Target | Mixed Wood Shield_Rainy_3rd | 70.040735 |
| 05RN176 | | 47.94483 | -90.90003 | Mixed Wood Shield | 1 | 2B | Physically Inaccessible | Mixed Wood Shield_Rainy_1st | 334.2923407 |
| 05RN177 | | 48.26918 | -92.69619 | Mixed Wood Shield | NA | 2B | Non-Target | Mixed Wood Shield_Rainy_1st | 334.2923407 |
| 05RN178 | | 48.19389 | -93.35021 | Mixed Wood Shield | 2 | 2B | Physically Inaccessible | Mixed Wood Shield_Rainy_2nd | 83.75793227 |
| 05RN179 | | 48.06072 | -90.7173 | Mixed Wood Shield | NA | 2B | Non-Target | Mixed Wood Shield_Rainy_2nd | 83.75793227 |
| 05RN180 | Trib. to Willow River | 47.9764 | -93.04321 | Mixed Wood Shield | 2 | 2B | Target | Mixed Wood Shield_Rainy_2nd | 83.75793227 |
| 05RN181 | | 48.1366 | -93.82875 | Mixed Wood Shield | NA | 2B | Non-Target | Mixed Wood Shield_Rainy_1st | 334.2923407 |
| 05RN182 | | 47.65114 | -92.46268 | Mixed Wood Shield | NA | 2B | Non-Target | Mixed Wood Shield_Rainy_2nd | 83.75793227 |
| 05RN183 | Trib. to Picket Lake | 48.0319 | -91.84099 | Mixed Wood Shield | 1 | 2B | Target | Mixed Wood Shield_Rainy_1st | 334.2923407 |
| 05RN184 | Silver Creek | 48.67552 | -94.48494 | Mixed Wood Shield | 2 | 2B | Target | Mixed Wood Shield_Rainy_2nd | 83.75793227 |
| 05RN185 | Moose Brook | 47.83089 | -94.157 | Mixed Wood Shield | 1 | 2B | Target | Mixed Wood Shield_Rainy_1st | 334.2923407 |
| 05RN186 | Rat Root River | 48.4087 | -93.31418 | Mixed Wood Shield | 3 | 2B | Target | Mixed Wood Shield_Rainy_3rd | 70.040735 |
| 05RN187 | | 47.73882 | -91.20418 | Mixed Wood Shield | 3 | 2B | Target | Mixed Wood Shield_Rainy_3rd | 70.040735 |
| 05RN188 | Willow Creek | 48.8415 | -95.10164 | Mixed Wood Shield | 2 | 2B | Target | Mixed Wood Shield_Rainy_2nd | 83.75793227 |
| 05RN189 | Little Fork River | 47.8469 | -92.58574 | Mixed Wood Shield | 3 | 2B | Target | Mixed Wood Shield_Rainy_3rd | 70.040735 |
| 10EM001 | Unnamed ditch | 43.50587 | -96.36319 | Temperate Prairies | 2 | 2B | Target | Missouri_2nd | 599.8054 |
| 10EM002 | Little Whiteface River | 46.9799 | -92.80398 | Mixed Wood Shield | 1 | 2B | Target | Lake Superior_1st | 1050.920083 |
| 10EM003 | Lac qui Parle River | 44.9425 | -96.02348 | Temperate Prairies | 6 | 2B | Target | Minnesota_4th+ | 311.6175238 |

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| 10EM004 | Nemadji River | 46.51183 | -92.4326 | Mixed Wood Shield | 3 | 2A | Target | Lake Superior_3rd | 351.9390769 |
| 10EM005 | Wild Rice River | 47.30633 | -95.97372 | Temperate Prairies | 4 | 2B | Target | Red_4th+ | 311.6175238 |
| 10EM006 | Trib. to Lake Christina | 46.09314 | -95.65945 | Mixed Wood Plains | NA | NA | Non-Target | Minnesota_1st | 839.09555 |
| 10EM007 | County Ditch 38 | 44.31518 | -95.1069 | Temperate Prairies | 1 | 2B | Target | Minnesota_1st | 2334.925846 |
| 10EM008 | Unnamed creek | 46.15003 | -93.90983 | Mixed Wood Shield | NA | NA | Non-Target | Upper Mississippi_1st | 1050.920083 |
| 10EM009 | Unnamed ditch | 48.28753 | -93.68734 | Mixed Wood Shield | NA | NA | Non-Target | Rainy_1st | 1050.920083 |
| 10EM010 | Unnamed creek | 45.19329 | -94.57397 | Mixed Wood Plains | NA | NA | Non-Target | Upper Mississippi_2nd | 498.0406364 |
| 10EM011 | Straight River | 44.14779 | -93.24574 | Temperate Prairies | 4 | 2B | Target | Lower Mississippi_4th+ | 311.6175238 |
| 10EM012 | Baptism River | 47.36356 | -91.22147 | Mixed Wood Shield | 4 | 2A | Target | Lake Superior_4th+ | 234.1952778 |
| 10EM013 | Long Lake Creek | 47.44845 | -92.52875 | Mixed Wood Shield | NA | NA | Non-Target | Lake Superior_1st | 1050.920083 |
| 10EM014 | Champepadan Creek | 43.70975 | -96.12845 | Temperate Prairies | 3 | 2B | Target | Missouri_3rd | 438.7255 |
| 10EM015 | Spring Valley Creek | 43.68772 | -92.38942 | Mixed Wood Plains | 2 | 2A | Target | Lower Mississippi_2nd | 498.0406364 |
| 10EM016 | Yellow Medicine River, North Branch | 44.58284 | -96.23358 | Temperate Prairies | 3 | 2B | Target | Minnesota_3rd | 438.7255 |
| 10EM017 | Warroad River, East Branch | 48.79785 | -95.25602 | Mixed Wood Shield | 1 | 2B | Target | Rainy_1st | 1050.920083 |
| 10EM018 | Trib. to Sand Creek | 47.15691 | -92.8112 | Mixed Wood Shield | 1 | 2B | Target | Lake Superior_1st | 1050.920083 |
| 10EM019 | Unnamed ditch | 44.60886 | -94.69567 | Temperate Prairies | 1 | 2B | Target | Minnesota_1st | 2334.925846 |
| 10EM020 | Unnamed creek | 45.19156 | -93.56735 | Mixed Wood Plains | NA | NA | Non-Target | Upper Mississippi_1st | 839.09555 |
| 10EM021 | Unnamed creek | 47.59895 | -95.65579 | Mixed Wood Plains | 1 | 2B | Target | Red_1st | 839.09555 |
| 10EM022 | Redeye River | 46.63682 | -95.03306 | Mixed Wood Plains | 3 | 2B | Target | Upper Mississippi_3rd | 174.3946471 |
| 10EM023 | Wolf Creek | 44.41804 | -93.32245 | Mixed Wood Plains | 3 | 2B | Target | Lower Mississippi_3rd | 174.3946471 |
| 10EM024 | Kettle River | 46.38943 | -92.88247 | Mixed Wood Shield | 4 | 2B | Target | St. Croix_4th+ | 234.1952778 |
| 10EM025 | Big Fork River | 47.82064 | -93.54455 | Mixed Wood Shield | 4 | 2B | Target | Rainy_4th+ | 234.1952778 |
| 10EM026 | Pike Creek | 45.9757 | -94.46451 | Mixed Wood Plains | 2 | 2B | Target | Upper Mississippi_2nd | 498.0406364 |
| 10EM027 | Cannon River | 44.34306 | -93.60536 | Mixed Wood Plains | 4 | 2B | Target | Lower Mississippi_4th+ | 177.2181 |
| 10EM028 | Blue Earth River, West Branch | 43.56382 | -94.11388 | Temperate Prairies | 3 | 2B | Target | Minnesota_3rd | 438.7255 |
| 10EM029 | Pine Creek | 47.24697 | -91.74415 | Mixed Wood Shield | 2 | 2B | Target | Lake Superior_2nd | 519.75925 |
| 10EM030 | Trib. to Cottonwood River | 44.30485 | -95.65725 | Temperate Prairies | 1 | NA | Permission denied | Minnesota_1st | 2334.925846 |
| 10EM031 | Trib. to Dry Run Creek | 44.24829 | -92.66495 | Mixed Wood Plains | NA | NA | Non-Target | Lower Mississippi_1st | 839.09555 |
| 10EM032 | Red River of the North | 47.39133 | -96.83871 | Temperate Prairies | 7 | 2B | Target | Red_4th+ | 311.6175238 |

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| 10EM033 | Rainy River | 48.70293 | -94.33846 | Mixed Wood Shield | 6 | 2B | Target | Rainy_4th+ | 234.1952778 |
| 10EM034 | Trib. to Root River | 43.76899 | -91.77478 | Mixed Wood Plains | NA | NA | Non-Target | Lower Mississippi_1st | 839.09555 |
| 10EM035 | Judicial Ditch 8 | 44.75002 | -94.10369 | Temperate Prairies | 2 | 2B | Target | Upper Mississippi_2nd | 599.8054 |
| 10EM036 | Rum River | 45.5669 | -93.38167 | Mixed Wood Plains | 5 | 2B | Target | Upper Mississippi_4th+ | 177.2181 |
| 10EM037 | Unnamed ditch | 48.33815 | -95.1849 | Mixed Wood Shield | 1 | 2B | Target | Rainy_1st | 1050.920083 |
| 10EM038 | Buffalo Creek | 46.31205 | -94.1873 | Mixed Wood Shield | NA | NA | Non-Target | Upper Mississippi_1st | 1050.920083 |
| 10EM039 | Unnamed ditch | 44.55749 | -93.74182 | Mixed Wood Plains | 1 | 2B | Target | Minnesota_1st | 839.09555 |
| 10EM040 | Extortion Creek | 48.05908 | -90.78788 | Mixed Wood Shield | NA | NA | Non-Target | Rainy_1st | 1050.920083 |
| 10EM041 | St Louis River | 46.74653 | -92.48662 | Mixed Wood Shield | 6 | 2B | Target | Lake Superior_4th+ | 234.1952778 |
| 10EM042 | Long Prairie River | 45.9749 | -95.13761 | Mixed Wood Plains | 4 | 2B | Target | Upper Mississippi_4th+ | 177.2181 |
| 10EM043 | Whitewater River, trib. to South Fork | 44.07686 | -91.99559 | Mixed Wood Plains | NA | NA | Non-Target | Lower Mississippi_1st | 839.09555 |
| 10EM044 | Steer Creek | 45.63124 | -96.82678 | Temperate Prairies | NA | NA | Non-Target | Red_1st | 2334.925846 |
| 10EM045 | Embarrass River | 47.67706 | -92.13913 | Mixed Wood Shield | 3 | 2B | Target | Lake Superior_3rd | 351.9390769 |
| 10EM046 | Chetomba Creek | 44.86923 | -95.34162 | Temperate Prairies | 4 | class7 | Target | Minnesota_4th+ | 311.6175238 |
| 10EM047 | Trib. to Trout Brook | 44.3755 | -92.6553 | Mixed Wood Plains | 2 | 2B | Target | Lower Mississippi_2nd | 498.0406364 |
| 10EM048 | Red Lake River | 47.89385 | -96.35271 | Temperate Prairies | 6 | 2B | Target | Red_4th+ | 311.6175238 |
| 10EM049 | Hill River | 47.56872 | -95.53068 | Mixed Wood Plains | NA | NA | Non-Target | Red_1st | 839.09555 |
| 10EM050 | Unnamed creek | 46.55504 | -95.20827 | Mixed Wood Plains | NA | NA | Non-Target | Upper Mississippi_2nd | 498.0406364 |
| 10EM051 | Blue Earth River | 44.03715 | -94.10091 | Temperate Prairies | 5 | 2B | Target | Minnesota_4th+ | 311.6175238 |
| 10EM052 | Trib. to St Francis River | 45.5847 | -93.88519 | Mixed Wood Plains | NA | NA | Non-Target | Upper Mississippi_1st | 839.09555 |
| 10EM053 | South Cormorant River | 47.79272 | -94.4602 | Mixed Wood Shield | 2 | 2B | Target | Red_2nd | 519.75925 |
| 10EM054 | Silver Creek | 45.78371 | -95.03246 | Mixed Wood Plains | 3 | 2B | Target | Upper Mississippi_3rd | 174.3946471 |
| 10EM055 | Crow River | 45.08134 | -93.75719 | Mixed Wood Plains | 6 | 2B | Target | Upper Mississippi_4th+ | 177.2181 |
| 10EM056 | Brule River | 47.81435 | -90.05179 | Mixed Wood Shield | 4 | 2A | Target | Lake Superior_4th+ | 234.1952778 |
| 10EM057 | Water Hen Creek | 47.36054 | -92.24716 | Mixed Wood Shield | 2 | 2B | Target | Lake Superior_2nd | 519.75925 |
| 10EM058 | Minnesota River | 45.21914 | -96.21856 | Temperate Prairies | 7 | 2B | Target | Minnesota_4th+ | 311.6175238 |
| 10EM059 | Whitewater River, North Fork | 44.12087 | -92.25927 | Mixed Wood Plains | 3 | 2B | Target | Lower Mississippi_3rd | 174.3946471 |
| 10EM060 | Otter Tail River | 46.26731 | -96.59442 | Temperate Prairies | 4 | 2B | Target | Red_4th+ | 311.6175238 |
| 10EM061 | Bear Creek | 47.9072 | -92.22222 | Mixed Wood Shield | NA | NA | Non-Target | Rainy_2nd | 519.75925 |

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| 10EM062 | Yellow Medicine River, South Branch | 44.46461 | -96.07716 | Temperate Prairies | 3 | 2B | Target | Minnesota_3rd | 438.7255 |
| 10EM063 | Lower Tamarack River | 46.06227 | -92.3857 | Mixed Wood Shield | 3 | 2B | Target | St. Croix_3rd | 351.9390769 |
| 10EM064 | County Ditch 27 | 48.66623 | -96.98701 | Temperate Prairies | 3 | 2B | Target | Red_3rd | 438.7255 |
| 10EM065 | Unidentified Stream | 48.51294 | -92.91634 | Mixed Wood Shield | NA | NA | Non-Target | Rainy_1st | 1050.920083 |
| 10EM066 | Swan River | 47.00368 | -93.2048 | Mixed Wood Shield | 4 | 2B | Target | Upper Mississippi_4th+ | 234.1952778 |
| 10EM067 | Unnamed ditch | 45.12401 | -96.1853 | Temperate Prairies | 3 | 2B | Target | Minnesota_3rd | 438.7255 |
| 10EM068 | St Croix River | 45.74473 | -92.8091 | Mixed Wood Shield | 6 | 2B | Target | St. Croix_4th+ | 234.1952778 |
| 10EM069 | Unnamed trib. to Hay Creek | 46.86865 | -96.10504 | Mixed Wood Plains | 2 | 2B | Target | Red_2nd | 498.0406364 |
| 10EM070 | Long Prairie River | 46.00572 | -95.20137 | Mixed Wood Plains | 3 | 2B | Target | Upper Mississippi_3rd | 174.3946471 |
| 10EM071 | Watonwan River, trib. to North Fork | 44.01979 | -94.99741 | Temperate Prairies | 2 | 2B | Target | Minnesota_2nd | 599.8054 |
| 10EM072 | Pine River | 46.27033 | -92.90231 | Mixed Wood Shield | 4 | 2B | Target | St. Croix_4th+ | 234.1952778 |
| 10EM073 | Little Fork River | 48.16811 | -93.4824 | Mixed Wood Shield | 5 | 2B | Target | Rainy_4th+ | 234.1952778 |
| 10EM074 | County Ditch 12 | 45.69419 | -94.2869 | Mixed Wood Plains | NA | NA | Non-Target | Upper Mississippi_1st | 839.09555 |
| 10EM075 | Medford Creek | 44.18194 | -93.2311 | Temperate Prairies | 2 | 2B | Target | Lower Mississippi_2nd | 599.8054 |
| 10EM076 | Skunk Creek | 47.21706 | -91.51506 | Mixed Wood Shield | 2 | 2A | Target | Lake Superior_2nd | 519.75925 |
| 10EM077 | Knife River | 46.95129 | -91.80759 | Mixed Wood Shield | 4 | 2A | Target | Lake Superior_4th+ | 234.1952778 |
| 10EM078 | Jack Creek | 43.77263 | -95.74034 | Temperate Prairies | 3 | class7 | Target | Des Moines_3rd | 438.7255 |
| 10EM079 | Root River | 43.74789 | -91.89319 | Mixed Wood Plains | 5 | 2B | Target | Lower Mississippi_4th+ | 177.2181 |
| 10EM080 | Unnamed ditch | 44.78766 | -96.26812 | Temperate Prairies | NA | NA | Non-Target | Minnesota_1st | 2334.925846 |
| 10EM081 | County Ditch 13 | 48.81938 | -95.87718 | Temperate Prairies | NA | NA | Non-Target | Red_1st | 2334.925846 |
| 10EM082 | Mississippi River | 47.24074 | -93.71914 | Mixed Wood Shield | 5 | 2B | Target | Upper Mississippi_4th+ | 234.1952778 |
| 10EM083 | Trib. to Little Rock Creek | 44.42794 | -94.63697 | Temperate Prairies | 3 | 2B | Target | Minnesota_3rd | 438.7255 |
| 10EM084 | Elk River | 45.42509 | -93.88001 | Mixed Wood Plains | 4 | 2B | Target | Upper Mississippi_4th+ | 177.2181 |
| 10EM085 | Clearwater River | 47.6864 | -95.17198 | Mixed Wood Plains | 3 | 2A | Target | Red_3rd | 174.3946471 |
| 10EM086 | Swan Creek | 46.4115 | -94.76141 | Mixed Wood Plains | 3 | 2B | Target | Upper Mississippi_3rd | 174.3946471 |
| 10EM087 | Chub Creek | 44.51082 | -93.11052 | Temperate Prairies | 4 | 2B | Target | Lower Mississippi_4th+ | 311.6175238 |
| 10EM088 | Rice River | 46.52584 | -93.31691 | Mixed Wood Shield | 3 | 2B | Target | Upper Mississippi_3rd | 351.9390769 |
| 10EM089 | Unnamed creek | 47.86315 | -93.89669 | Mixed Wood Shield | NA | NA | Non-Target | Rainy_1st | 1050.920083 |
| 10EM090 | Mississippi River | 45.46033 | -94.10035 | Mixed Wood Plains | 6 | 2B | Target | Upper Mississippi_4th+ | 177.2181 |

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|---|---|---|---|---|---|---|---|---|---|
| 10EM091 | Unnamed ditch | 43.8243 | -92.66653 | Temperate Prairies | NA | NA | Non-Target | Lower Mississippi_1st | 2334.925846 |
| 10EM092 | Otter Creek | 43.50389 | -92.92179 | Temperate Prairies | 3 | 2B | Target | Cedar_3rd | 438.7255 |
| 10EM093 | St Louis River | 47.47032 | -92.12002 | Mixed Wood Shield | 3 | 2B | Target | Lake Superior_3rd | 351.9390769 |
| 10EM094 | Cottonwood River | 44.23235 | -95.21727 | Temperate Prairies | 5 | 2B | Target | Minnesota_4th+ | 311.6175238 |
| 10EM095 | Zumbro River, Middle Fork, South Branch | 44.12646 | -92.60993 | Mixed Wood Plains | 4 | 2B | Target | Lower Mississippi_4th+ | 177.2181 |
| 10EM096 | Unnamed ditch | 47.13188 | -96.2888 | Temperate Prairies | NA | NA | Non-Target | Red_2nd | 599.8054 |
| 10EM097 | Bartons Brook | 48.54989 | -94.43602 | Mixed Wood Shield | 3 | 2B | Target | Rainy_3rd | 351.9390769 |
| 10EM098 | Trib. to Thompson Creek | 43.73731 | -91.41284 | Mixed Wood Plains | NA | NA | Non-Target | Lower Mississippi_1st | 839.09555 |
| 10EM099 | County Ditch 13A | 44.52471 | -94.49458 | Temperate Prairies | 1 | 2B | Target | Minnesota_1st | 2334.925846 |
| 10EM100 | Rum River | 45.33882 | -93.36207 | Mixed Wood Plains | 5 | 2B | Target | Upper Mississippi_4th+ | 177.2181 |
| 10EM101 | Leech Lake River | 47.24139 | -94.17579 | Mixed Wood Shield | 4 | 2B | Target | Upper Mississippi_4th+ | 234.1952778 |
| 10EM102 | Platte River | 46.09096 | -94.10224 | Mixed Wood Shield | 3 | 2B | Target | Upper Mississippi_3rd | 351.9390769 |
| 10EM103 | Unnamed ditch | 44.65461 | -93.66534 | Mixed Wood Plains | 1 | 2B | Target | Minnesota_1st | 839.09555 |
| 10EM104 | Unidentified Stream | 48.02534 | -91.35365 | Mixed Wood Shield | 2 | 2B | Target | Rainy_2nd | 519.75925 |
| 10EM105 | Unnamed creek | 47.05951 | -92.30277 | Mixed Wood Shield | 2 | NA | Physically Inaccessible | Lake Superior_2nd | 519.75925 |
| 10EM106 | Pomme de Terre River | 45.73329 | -95.85687 | Temperate Prairies | 3 | 2B | Target | Minnesota_3rd | 438.7255 |
| 10EM107 | Zumbro River | 44.27197 | -92.2378 | Mixed Wood Plains | 6 | 2B | Target | Lower Mississippi_4th+ | 177.2181 |
| 10EM108 | Unnamed creek | 46.50821 | -96.24572 | Mixed Wood Plains | NA | NA | Non-Target | Red_1st | 839.09555 |
| 10EM109 | Portage River | 48.14667 | -92.07672 | Mixed Wood Shield | 3 | 2B | Target | Rainy_3rd | 351.9390769 |
| 10EM110 | Unnamed creek | 45.14365 | -95.2053 | Temperate Prairies | 2 | class7 | Target | Minnesota_2nd | 599.8054 |
| 10EM111 | Hay Creek | 44.4837 | -92.5727 | Mixed Wood Plains | 3 | 2A | Target | Lower Mississippi_3rd | 174.3946471 |
| 10EM112 | Burnham Creek | 47.77013 | -96.76411 | Temperate Prairies | 4 | 2B | Target | Red_4th+ | 311.6175238 |
| 10EM113 | Mississippi River | 47.33944 | -95.21011 | Mixed Wood Shield | 3 | 2B | Target | Upper Mississippi_3rd | 351.9390769 |
| 10EM114 | Unnamed creek | 46.75384 | -95.15219 | Mixed Wood Plains | 2 | NA | Permission denied | Upper Mississippi_2nd | 498.0406364 |
| 10EM115 | Unnamed ditch | 44.2301 | -94.56227 | Temperate Prairies | 2 | 2B | Target | Minnesota_2nd | 599.8054 |
| 10EM116 | Unnamed ditch | 45.62904 | -93.64094 | Mixed Wood Plains | 1 | 2B | Target | Upper Mississippi_1st | 839.09555 |
| 10EM117 | Unnamed creek | 47.73274 | -94.05752 | Mixed Wood Shield | 2 | 2B | Target | Rainy_2nd | 519.75925 |
| 10EM118 | Little Swan River | 45.96504 | -94.6878 | Mixed Wood Plains | 3 | 2B | Target | Upper Mississippi_3rd | 174.3946471 |

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|---|---|---|---|---|---|---|---|---|---|
| 10EM119 | Unnamed ditch | 43.60834 | -93.74063 | Temperate Prairies | 1 | 2B | Target | Minnesota_1st | 2334.925846 |
| 10EM120 | Brule River | 47.92185 | -90.28924 | Mixed Wood Shield | 4 | 2B | Target | Lake Superior_4th+ | 234.1952778 |
| 10EM121 | Water Hen Creek | 47.30543 | -92.36075 | Mixed Wood Shield | 3 | 2B | Target | Lake Superior_3rd | 351.9390769 |
| 10EM122 | Chippewa River, East Branch | 45.39847 | -95.43677 | Mixed Wood Plains | 3 | 2B | Target | Minnesota_3rd | 174.3946471 |
| 10EM123 | Root River, North Branch | 43.835 | -92.18487 | Mixed Wood Plains | 4 | 2B | Target | Lower Mississippi_4th+ | 177.2181 |
| 10EM124 | Unnamed ditch | 44.00173 | -96.29419 | Temperate Prairies | 3 | 2B | Target | Missouri_3rd | 438.7255 |
| 10EM125 | Willow River | 47.07224 | -93.88583 | Mixed Wood Shield | 2 | 2B | Target | Upper Mississippi_2nd | 519.75925 |
| 10EM126 | Mud Creek | 44.65153 | -96.10262 | Temperate Prairies | 4 | 2B | Target | Minnesota_4th+ | 311.6175238 |
| 10EM127 | Hay Creek | 46.24203 | -92.31065 | Mixed Wood Shield | 2 | 2B | Target | St. Croix_2nd | 519.75925 |
| 10EM128 | Unnamed ditch | 48.40136 | -96.73623 | Temperate Prairies | 2 | 2B | Target | Red_2nd | 599.8054 |
| 10EM129 | Trib. To Little Fork River | 48.4669 | -93.59675 | Mixed Wood Shield | 3 | 2B | Target | Rainy_3rd | 351.9390769 |
| 10EM130 | Unnamed creek | 47.42958 | -92.90136 | Mixed Wood Shield | NA | NA | Non-Target | Lake Superior_1st | 1050.920083 |
| 10EM131 | Crow River, North Fork | 45.1771 | -94.22447 | Mixed Wood Plains | 5 | 2B | Target | Upper Mississippi_4th+ | 177.2181 |
| 10EM132 | St Croix River | 45.32873 | -92.70383 | Mixed Wood Plains | 6 | 2B | Target | St. Croix_4th+ | 177.2181 |
| 10EM133 | Shell River | 46.90578 | -95.27247 | Mixed Wood Shield | 2 | 2B | Target | Upper Mississippi_2nd | 519.75925 |
| 10EM134 | Mission Creek | 46.5181 | -94.07851 | Mixed Wood Shield | NA | NA | Non-Target | Upper Mississippi_1st | 1050.920083 |
| 10EM135 | Mississippi River | 44.83161 | -93.01051 | Mixed Wood Plains | 8 | 2B | Target | Upper Mississippi_4th+ | 177.2181 |
| 10EM136 | Mississippi River | 46.54933 | -93.69068 | Mixed Wood Shield | 5 | 2B | Target | Upper Mississippi_4th+ | 234.1952778 |
| 10EM137 | Big Fork River | 47.96433 | -93.7801 | Mixed Wood Shield | 4 | 2B | Target | Rainy_4th+ | 234.1952778 |
| 10EM138 | Elk River | 45.71003 | -94.00657 | Mixed Wood Plains | 3 | 2B | Target | Upper Mississippi_3rd | 174.3946471 |
| 10EM139 | Zumbro River, North Fork | 44.26455 | -93.06235 | Temperate Prairies | 4 | 2B | Target | Lower Mississippi_4th+ | 311.6175238 |
| 10EM140 | Trib. to Donaldson Creek | 43.5289 | -91.84183 | Mixed Wood Plains | NA | NA | Non-Target | Lower Mississippi_1st | 839.09555 |
| 10EM141 | Brophy Creek | 47.06698 | -91.90578 | Mixed Wood Shield | 1 | 2A | Target | Lake Superior_1st | 1050.920083 |
| 10EM142 | Chanarambie Creek, North Branch | 43.9558 | -96.02782 | Temperate Prairies | 2 | 2B | Target | Missouri_2nd | 599.8054 |
| 10EM143 | Willow Creek | 43.6307 | -92.0963 | Mixed Wood Plains | 3 | 2A | Target | Lower Mississippi_3rd | 174.3946471 |
| 10EM144 | Coon Creek | 47.24457 | -96.32609 | Temperate Prairies | 2 | 2B | Target | Red_2nd | 599.8054 |
| 10EM145 | Unnamed creek | 48.56733 | -95.49606 | Mixed Wood Shield | NA | NA | Non-Target | Red_1st | 1050.920083 |
| 10EM146 | Root River, South Fork | 43.65571 | -91.79433 | Mixed Wood Plains | 4 | 2A | Target | Lower Mississippi_4th+ | 177.2181 |
| 10EM147 | Unnamed ditch | 44.92409 | -94.77786 | Temperate Prairies | 1 | 2B | Target | Upper Mississippi_1st | 2334.925846 |

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|---|---|---|---|---|---|---|---|---|---|
| 10EM148 | Rush Creek | 45.67806 | -92.91224 | Mixed Wood Plains | 3 | 2B | Target | St. Croix_3rd | 174.3946471 |
| 10EM149 | Red Lake River | 47.96764 | -95.35209 | Mixed Wood Shield | 5 | 2B | Target | Red_4th+ | 234.1952778 |
| 10EM150 | Little Partridge River | 46.34481 | -94.97512 | Mixed Wood Plains | 4 | 2B | Target | Upper Mississippi_4th+ | 177.2181 |
| 10EM151 | Unnamed ditch | 44.50726 | -93.46709 | Mixed Wood Plains | 1 | 2B | Target | Minnesota_1st | 839.09555 |
| 10EM152 | Houghtaling Creek | 47.62819 | -91.09656 | Mixed Wood Shield | 1 | 2A | Target | Lake Superior_1st | 1050.920083 |
| 10EM153 | Unnamed creek | 48.17553 | -93.04221 | Mixed Wood Shield | 1 | 2B | Target | Rainy_1st | 1050.920083 |
| 10EM154 | Unnamed creek | 45.36197 | -94.45173 | Mixed Wood Plains | NA | NA | Non-Target | Upper Mississippi_1st | 839.09555 |
| 10EM155 | Zumbro River, South Fork | 43.92643 | -92.61273 | Mixed Wood Plains | 4 | 2B | Target | Lower Mississippi_4th+ | 177.2181 |
| 10EM156 | Judicial Ditch 13 | 43.52067 | -93.89433 | Temperate Prairies | 2 | 2B | Target | Minnesota_2nd | 599.8054 |
| 10EM157 | Trappers Creek | 47.36598 | -91.70857 | Mixed Wood Shield | NA | NA | Non-Target | Lake Superior_1st | 1050.920083 |
| 10EM158 | Unnamed ditch | 43.93809 | -95.44745 | Temperate Prairies | NA | NA | Non-Target | Des Moines_1st | 2334.925846 |
| 10EM159 | Trib.  to Zumbro River | 44.26786 | -92.38172 | Mixed Wood Plains | NA | NA | Non-Target | Lower Mississippi_1st | 839.09555 |
| 10EM160 | Unnamed trib. to Red Lake River | 47.77677 | -96.91198 | Temperate Prairies | 2 | 2B | Target | Red_2nd | 599.8054 |
| 10EM161 | Williams Creek | 48.79834 | -94.91479 | Mixed Wood Shield | 1 | 2B | Target | Rainy_1st | 1050.920083 |
| 10EM162 | Unnamed creek | 43.62912 | -91.35436 | Mixed Wood Plains | 2 | 2A | Target | Lower Mississippi_2nd | 498.0406364 |
| 10EM163 | Blue Earth River | 43.62536 | -94.10808 | Temperate Prairies | 4 | 2B | Target | Minnesota_4th+ | 311.6175238 |
| 10EM164 | Rum River | 45.4024 | -93.3564 | Mixed Wood Plains | 5 | 2B | Target | Upper Mississippi_4th+ | 177.2181 |
| 10EM165 | Grant Creek | 47.51088 | -95.02394 | Mixed Wood Shield | 2 | 2B | Target | Upper Mississippi_2nd | 519.75925 |
| 10EM166 | Unnamed creek | 45.9804 | -94.30824 | Mixed Wood Plains | 2 | 2B | Target | Upper Mississippi_2nd | 498.0406364 |
| 10EM167 | Elm Creek | 45.15673 | -93.43799 | Mixed Wood Plains | 3 | 2B | Target | Upper Mississippi_3rd | 174.3946471 |
| 10EM168 | Two Island River | 47.57284 | -90.97189 | Mixed Wood Shield | 2 | 2A | Target | Lake Superior_2nd | 519.75925 |
| 10EM169 | Unnamed creek | 46.96353 | -92.71862 | Mixed Wood Shield | 1 | 2B | Target | Lake Superior_1st | 1050.920083 |
| 10EM170 | Unnamed creek | 45.86331 | -95.99196 | Temperate Prairies | 2 | 2B | Target | Red_2nd | 599.8054 |
| 10EM171 | Trout Creek | 44.17066 | -91.92527 | Mixed Wood Plains | 3 | 2A | Target | Lower Mississippi_3rd | 174.3946471 |
| 10EM172 | Stony Creek | 46.75869 | -96.60592 | Temperate Prairies | 4 | 2B | Target | Red_4th+ | 311.6175238 |
| 10EM173 | Unidentified steam | 47.99566 | -92.22192 | Mixed Wood Shield | 3 | NA | Physically Inaccessible | Rainy_3rd | 351.9390769 |
| 10EM174 | Unnamed ditch | 45.12211 | -95.67107 | Temperate Prairies | 3 | 2B | Target | Minnesota_3rd | 438.7255 |
| 10EM175 | Cannon River | 44.56378 | -92.72762 | Mixed Wood Plains | 5 | 2B | Target | Lower Mississippi_4th+ | 177.2181 |
| 10EM176 | Black River | 48.10573 | -96.42644 | Temperate Prairies | 2 | 2B | Target | Red_2nd | 599.8054 |

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|---|---|---|---|---|---|---|---|---|---|
| 10EM177 | Wild Rice River | 47.32786 | -95.93864 | Temperate Prairies | 4 | 2B | Target | Red_4th+ | 311.6175238 |
| 10EM178 | Otter Tail River | 46.77861 | -95.69077 | Mixed Wood Plains | 2 | 2B | Target | Red_2nd | 498.0406364 |
| 10EM179 | Des Moines River | 43.70619 | -95.04099 | Temperate Prairies | 6 | 2B | Target | Des Moines_4th+ | 311.6175238 |
| 10EM180 | Groundhouse River, West Fork | 45.89756 | -93.55505 | Mixed Wood Shield | NA | NA | Non-Target | St. Croix_1st | 1050.920083 |
| 10EM181 | Unnamed trib. to Tamarac River | 48.17241 | -94.45532 | Mixed Wood Shield | 1 | 2B | Target | Red_1st | 1050.920083 |
| 10EM182 | Unnamed trib. to Crow River, North Fork | 45.43798 | -94.78216 | Mixed Wood Plains | NA | NA | Non-Target | Upper Mississippi_1st | 839.09555 |
| 10EM183 | County Ditch 66 | 43.65619 | -93.48255 | Temperate Prairies | 2 | 2B | Target | Cedar_2nd | 599.8054 |
| 10EM184 | Unnamed trib. to Lake Superior | 47.98027 | -89.71057 | Mixed Wood Shield | 2 | 2A | Target | Lake Superior_2nd | 519.75925 |
| 10EM185 | Paleface River | 47.29548 | -92.2543 | Mixed Wood Shield | 1 | 2B | Target | Lake Superior_1st | 1050.920083 |
| 10EM186 | Unnamed ditch | 45.25612 | -95.31773 | Temperate Prairies | 1 | 2B | Target | Minnesota_1st | 2334.925846 |
| 10EM187 | Unnamed creek | 43.89094 | -92.20716 | Mixed Wood Plains | 1 | 2B | Target | Lower Mississippi_1st | 839.09555 |
| 10EM188 | Unnamed ditch | 44.28816 | -96.39394 | Temperate Prairies | NA | NA | Non-Target | Minnesota_1st | 2334.925846 |
| 10EM189 | Unnamed ditch | 46.78102 | -93.53054 | Mixed Wood Shield | 2 | 2B | Target | Upper Mississippi_2nd | 519.75925 |
| 10EM190 | Spring Creek | 44.6998 | -95.93031 | Temperate Prairies | 4 | 2B | Target | Minnesota_4th+ | 311.6175238 |
| 10EM191 | Unnamed creek | 46.58384 | -92.29455 | Mixed Wood Shield | 1 | 2B | Target | Lake Superior_1st | 1050.920083 |
| 10EM192 | Two Rivers, South Branch | 48.73893 | -96.67831 | Temperate Prairies | 4 | 2B | Target | Red_4th+ | 311.6175238 |
| 10EM193 | Black River | 48.46326 | -93.87516 | Mixed Wood Shield | 3 | 2B | Target | Rainy_3rd | 351.9390769 |
| 10EM194 | Swan River | 47.28955 | -93.30835 | Mixed Wood Shield | 4 | 2B | Target | Upper Mississippi_4th+ | 234.1952778 |
| 10EM195 | Crow River, South Fork | 44.87236 | -94.06496 | Mixed Wood Plains | 4 | 2B | Target | Upper Mississippi_4th+ | 177.2181 |
| 10EM196 | Battle Brook | 45.50462 | -93.61466 | Mixed Wood Plains | 3 | 2B | Target | Upper Mississippi_3rd | 174.3946471 |
| 10EM197 | Thief River | 48.18722 | -96.174 | Temperate Prairies | 4 | 2B | Target | Red_4th+ | 311.6175238 |
| 10EM198 | Redeye River | 46.48756 | -94.88863 | Mixed Wood Plains | 3 | 2B | Target | Upper Mississippi_3rd | 174.3946471 |
| 10EM199 | Trib. To Minnnesota River | 44.86987 | -93.18819 | Mixed Wood Plains | NA | NA | Non-Target | Minnesota_2nd | 498.0406364 |
| 10EM200 | Willow River | 46.7113 | -93.55514 | Mixed Wood Shield | 2 | 2B | Target | Upper Mississippi_2nd | 519.75925 |

# Appendix 8. Water chemistry concentrations

| Field # | Temp H2O (°C) | TOC (mg/L) | DOC (mg/L) | pH | DO (mg/L) | Phosphorus (mg/L) | Nitrogen (mg/L) | Total Ammonia (mg/L) | Conductivity (µmhos/cm) | TSS (mg/L) |
|---|---|---|---|---|---|---|---|---|---|---|
| 96SC001 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 96SC002 | 20.3 | NA | NA | 7.34 | 7.1 | 0.065 | < 0.05 | 0.02 | 110.8 | 2 |
| 96SC003 | 20.3 | NA | NA | 7.34 | 7.1 | 0.065 | < 0.05 | 0.02 | 110.8 | 2 |
| 96SC004 | 20.6 | NA | NA | 8.14 | 6.5 | 0.124 | 0.06 | 0.03 | 104.7 | 21 |
| 96SC005 | 16.3 | NA | NA | 6.98 | 1.4 | 0.194 | < 0.05 | 0.87 | 103.5 | 4.4 |
| 96SC006 | 21 | NA | NA | 7.65 | 10.6 | NA | NA | NA | 262 | 3.6 |
| 96SC007 | 12 | NA | NA | 7.67 | 8.7 | 0.017 | < 0.05 | < 0.02 | 262.8 | 2.4 |
| 96SC008 | 22 | NA | NA | 7.26 | 0.6 | 0.171 | < 0.05 | 0.03 | 198 | 10 |
| 96SC009 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 96SC010 | 22.4 | NA | NA | 7.11 | 5.3 | 0.087 | 0.21 | 0.04 | 147.3 | 8.8 |
| 96SC011 | 23.7 | NA | NA | 8.23 | 3.7 | 0.147 | 0.08 | 0.05 | 225.1 | 9.6 |
| 96SC012 | 25 | NA | NA | 8.9 | 8.6 | 0.053 | 0.1 | 0.06 | 198 | 6 |
| 96SC013 | 22.7 | NA | NA | 8.42 | 3.7 | 0.1 | < 0.05 | < 0.02 | 215 | 14 |
| 96SC014 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 96SC015 | 26.7 | NA | NA | 6.99 | 6 | 0.064 | < 0.05 | 0.03 | 293 | 10 |
| 96SC016 | 25 | NA | NA | 7.36 | 0.4 | 0.314 | < 0.05 | 0.22 | 340 | 770 |
| 96SC017 | 26.8 | NA | NA | 7.38 | 8.4 | 0.075 | 0.05 | 0.03 | 183 | 2.4 |
| 96SC018 | 21.9 | NA | NA | 7.06 | 9.6 | 0.045 | 0.18 | < 0.02 | 229 | 4 |
| 96SC019 | 19.5 | NA | NA | 7.11 | 5.6 | 0.085 | 0.3 | 0.03 | 187 | 9.6 |
| 96SC020 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 96SC021 | 22.5 | NA | NA | 8.49 | 9.7 | 0.048 | < 0.05 | < 0.02 | 293 | 3.2 |
| 96SC022 | 20.2 | NA | NA | 8.35 | 11.2 | 0.079 | 0.77 | < 0.02 | 537 | 4 |
| 96SC023 | NA | NA | NA | 8.2 | 8.9 | 0.092 | 0.68 | 0.04 | 356 | 24 |
| 96SC024 | 20 | NA | NA | 7.9 | 6.6 | 0.041 | 0.18 | 0.05 | 353 | 2 |
| 96SC025 | 18.3 | NA | NA | 8.9 | NA | 0.107 | 1.9 | < 0.02 | 362.8 | 2.4 |
| 96SC026 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

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|---|---|---|---|---|---|---|---|---|---|---|
| 96SC027 | 21.5 | NA | NA | 7.42 | 8.7 | 0.109 | 0.24 | 0.1 | 409.3 | 4.4 |
| 96SC028 | 21.7 | NA | NA | 7.7 | 7.2 | < 0.01 | 0.15 | 0.03 | 140 | 22 |
| 96SC029 | 19.6 | NA | NA | 7.73 | 7.9 | 0.038 | < 0.05 | 0.02 | 136.2 | 1.6 |
| 96SC030 | 14.6 | NA | NA | 7.57 | 9.8 | 0.026 | 0.046 | < 0.02 | 141.7 | 2.6 |
| 96SC031 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 96SC032 | 21 | NA | NA | 7.6 | 6.7 | 0.054 | 0.07 | < 0.02 | 112 | 5.2 |
| 96SC033 | 20.1 | NA | NA | 8.05 | 7.9 | 0.05 | < 0.05 | 0.02 | 147 | 1.6 |
| 96SC034 | 24.8 | NA | NA | 7.76 | 6.4 | 0.073 | 0.07 | 0.03 | 119.6 | 6.4 |
| 96SC035 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 96SC036 | 24.5 | NA | NA | 6.99 | 4 | 0.11 | < 0.05 | 0.12 | 120 | 5.6 |
| 96SC037 | 24.9 | NA | NA | 7.82 | 7.5 | 0.05 | < 0.05 | 0.03 | 76.2 | 3.2 |
| 96SC038 | 14.5 | NA | NA | 8 | 7.5 | 0.087 | < 0.05 | < 0.02 | 65.6 | 36 |
| 96SC039 | 18 | NA | NA | 6.61 | 2.7 | 0.051 | < 0.05 | 0.11 | 66.2 | 48 |
| 96SC040 | 19.2 | NA | NA | 7.3 | 7.6 | 0.06 | 0.06 | < 0.02 | 117.2 | 2 |
| 96SC041 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 96SC042 | 19.3 | NA | NA | 6.78 | 5.7 | 0.085 | < 0.05 | 0.05 | 71.5 | 24 |
| 96SC043 | 20.2 | NA | NA | 7.5 | NA | 0.133 | < 0.05 | 0.02 | 167.8 | 76 |
| 96SC044 | 19.2 | NA | NA | 7.46 | 6.3 | 0.05 | 0.06 | 0.05 | 200.3 | < 1 |
| 96SC045 | 16.3 | NA | NA | 6.65 | 5.3 | 0.114 | < 0.05 | < 0.02 | 60.1 | 20 |
| 96SC046 | 21.1 | NA | NA | 7.37 | 7.6 | 0.061 | < 0.05 | 0.02 | 138.8 | 5.6 |
| 96SC047 | 19.5 | NA | NA | 7.41 | 7.1 | 0.057 | < 0.05 | 0.04 | 130 | < 1 |
| 96SC048 | 21 | NA | NA | 7.42 | 6.5 | 0.126 | < 0.05 | 0.02 | 135.9 | 18 |
| 96SC049 | 16.4 | NA | NA | 7.15 | 5 | 0.103 | 0.07 | 0.1 | 153 | 3.6 |
| 96SC050 | 18.6 | NA | NA | 5.16 | 6.3 | 0.07 | < 0.05 | 0.04 | 84.7 | 8 |
| 96SC051 | 18.2 | NA | NA | 7.54 | 8.1 | 0.103 | 0.17 | < 0.02 | 233.6 | 12 |
| 96SC052 | 18.5 | NA | NA | 7.04 | 6.5 | 0.073 | < 0.05 | 0.03 | 92.8 | 5.2 |
| 96SC053 | 19.9 | NA | NA | NA | 7.6 | 0.049 | < 0.05 | < 0.02 | 113.3 | 4.8 |
| 96SC054 | 24.5 | NA | NA | 7.58 | 5.9 | 0.13 | 0.1 | 0.07 | 120.4 | 6.4 |
| 96SC055 | 13.5 | NA | NA | 7.43 | 7.9 | 0.085 | < 0.05 | 0.03 | 194 | 2.8 |
| 96SC056 | 22.3 | NA | NA | 8.06 | 8.2 | 0.048 | < 0.05 | 0.04 | 114.8 | 1.4 |

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|---|---|---|---|---|---|---|---|---|---|---|
| 96SC057 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 96SC058 | 18.4 | NA | NA | 8.2 | 7.9 | 0.034 | < 0.05 | < 0.02 | 166.9 | 4.8 |
| 96SC059 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 96SC060 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 97LS001 | 17.9 | NA | NA | 7.55 | 7.9 | 0.092 | < 0.05 | 0.03 | 80.7 | 1.6 |
| 97LS002 | 19.6 | NA | NA | 7.59 | 7.2 | 0.02 | < 0.05 | < 0.02 | 389.5 | 1.6 |
| 97LS003 | 22.7 | NA | NA | 6.72 | 6.3 | 0.034 | < 0.05 | < 0.02 | 548 | 3 |
| 97LS004 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 97LS005 | 21.4 | NA | NA | 7.34 | 6.75 | 0.049 | < 0.05 | < 0.02 | 243.7 | 11 |
| 97LS006 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 97LS007 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 97LS008 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 97LS009 | 20.4 | NA | NA | 7.61 | 7.75 | 0.016 | < 0.05 | 0.02 | 134 | 1.2 |
| 97LS010 | 18.6 | NA | NA | 7.15 | 8.45 | 0.016 | < 0.05 | 0.03 | 90.2 | 1.2 |
| 97LS011 | 16.4 | NA | NA | 7.61 | 9.25 | 0.031 | 0.12 | 0.02 | 98.3 | 2.8 |
| 97LS012 | 21 | NA | NA | 7.39 | 8 | 0.119 | < 0.05 | < 0.02 | 84.1 | 34 |
| 97LS013 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 97LS014 | 12.4 | NA | NA | 8.03 | 8.9 | 0.016 | < 0.05 | < 0.02 | 102 | 1 |
| 97LS015 | 21.6 | NA | NA | 7.51 | 8.3 | 0.028 | < 0.05 | 0.03 | 68.2 | 6 |
| 97LS016 | 23.6 | NA | NA | 7.23 | 7.85 | 0.024 | < 0.05 | < 0.02 | 110.5 | < 1 |
| 97LS017 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 97LS018 | 25.1 | NA | NA | 7.54 | 6.75 | 0.032 | < 0.05 | < 0.02 | 75 | 4.4 |
| 97LS019 | 18 | NA | NA | NA | 6.7 | 0.033 | 0.06 | 0.03 | 72.8 | 2.8 |
| 97LS020 | 15.5 | NA | NA | 7.43 | 4.9 | 0.022 | < 0.05 | < 0.02 | 62 | 19 |
| 97LS021 | 21.9 | NA | NA | 7.53 | 6.3 | 0.078 | 0.23 | 0.04 | 237.8 | 23 |
| 97LS022 | 18.5 | NA | NA | 7.29 | 4.55 | 0.074 | < 0.05 | 0.02 | 65 | 9.6 |
| 97LS023 | 21.1 | NA | NA | 8.23 | 12.95 | 0.056 | 1 | < 0.02 | 626 | 2.4 |
| 97LS024 | 17.1 | NA | NA | 7.02 | 3.1 | 0.039 | < 0.05 | < 0.02 | 27.8 | 1.2 |
| 97LS025 | 20.3 | NA | NA | 7.22 | 4.6 | 0.058 | < 0.05 | 0.09 | 78 | 5 |
| 97LS026 | 18.5 | NA | NA | 6.42 | 8.45 | 0.076 | < 0.05 | < 0.02 | 131.5 | 23 |

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|---|---|---|---|---|---|---|---|---|---|---|
| 97LS027 | 19.2 | NA | NA | 7.53 | 7.6 | 0.034 | < 0.05 | < 0.02 | 287.5 | 3.2 |
| 97LS028 | 17 | NA | NA | 7.23 | 5.5 | 0.035 | < 0.05 | < 0.02 | 95.8 | 2 |
| 97LS029 | 20.2 | NA | NA | 7.62 | 8.45 | 0.022 | < 0.05 | < 0.02 | 258.5 | 1.2 |
| 97LS030 | 18.9 | NA | NA | 6.12 | 4.9 | 0.084 | < 0.05 | 0.09 | 71.4 | 22 |
| 97LS031 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 97LS032 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 97LS033 | 19.6 | NA | NA | 7.05 | 5.85 | 0.074 | < 0.05 | 0.04 | 140.4 | 4.4 |
| 97LS034 | 19 | NA | NA | 7.67 | 5.35 | 0.065 | < 0.05 | 0.05 | 80.1 | 2.4 |
| 97LS035 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 97LS036 | 17.2 | NA | NA | 8.1 | 7.8 | 0.037 | < 0.05 | < 0.02 | 123.6 | 2 |
| 97LS037 | 25.7 | NA | NA | 7.14 | 5.05 | 0.05 | < 0.05 | 0.11 | 81 | 5.2 |
| 97LS038 | 16.4 | NA | NA | 7.43 | 8.9 | 0.037 | < 0.05 | < 0.02 | 205 | 2.4 |
| 97LS039 | 19.2 | NA | NA | 7.16 | 6.65 | 0.074 | 0.06 | 0.05 | 161.5 | 36 |
| 97LS040 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 97LS041 | 22.8 | NA | NA | 7.73 | 7.65 | 0.024 | < 0.05 | 0.02 | 133.2 | 8.4 |
| 97LS042 | 17 | NA | NA | 7.2 | 4 | 0.034 | < 0.05 | < 0.02 | 64 | 1.2 |
| 97LS043 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 97LS044 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 97LS045 | 17 | NA | NA | 8.19 | 9.45 | 0.098 | 0.15 | < 0.02 | 232 | 85 |
| 97LS046 | 15.8 | NA | NA | 7.25 | 6.65 | 0.042 | < 0.05 | 0.05 | 420.6 | 10 |
| 97LS047 | 15.5 | NA | NA | 7.69 | 10.3 | 0.022 | < 0.05 | < 0.02 | 64.3 | 34 |
| 97LS048 | 12.5 | NA | NA | 7.49 | 3.7 | 0.043 | < 0.05 | 0.03 | 179.1 | 3.6 |
| 97LS049 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 97LS050 | 12.1 | NA | NA | 4.1 | 6.05 | 0.042 | 0.05 | 0.08 | 190 | 2.4 |
| 97LS051 | 15.9 | NA | NA | 7.28 | 8.95 | 0.01 | < 0.05 | < 0.02 | 54.5 | < 1 |
| 97LS052 | 22.2 | NA | NA | 7.31 | 7.05 | 0.017 | 0.07 | 0.03 | 63.7 | 2 |
| 97LS053 | 22.2 | NA | NA | 7.31 | 7.05 | 0.017 | 0.07 | 0.03 | 63.7 | 2 |
| 97LS054 | 15.6 | NA | NA | 6.66 | 6.4 | 0.023 | < 0.05 | 0.06 | 56.5 | 2.4 |
| 97LS055 | 21 | NA | NA | 7.48 | 8 | 0.023 | < 0.05 | < 0.02 | 83.8 | 6 |
| 97LS056 | 14.4 | NA | NA | 7.54 | 8 | 0.011 | 0.1 | 0.04 | 76 | < 1 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 97LS057 | 18.7 | NA | NA | 7.36 | 8.5 | 0.02 | < 0.05 | < 0.02 | 59.7 | 2.4 |
| 97LS058 | 17.1 | NA | NA | 7.8 | 8 | 0.02 | < 0.05 | 0.03 | 55.2 | 6.4 |
| 97LS059 | 21.7 | NA | NA | 7.47 | 4.55 | 0.035 | < 0.05 | 0.03 | 61 | < 1 |
| 97LS060 | 16.5 | NA | NA | 7.68 | 8.65 | 0.013 | < 0.05 | < 0.02 | 62.2 | < 1 |
| 97LS061 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 97LS062 | 22.1 | NA | NA | 7.8 | 7.6 | 0.021 | < 0.05 | < 0.02 | 36.3 | 2.8 |
| 97LS063 | 21.4 | NA | NA | 8.22 | 10.55 | 0.014 | < 0.05 | < 0.02 | 100 | 4.8 |
| 97LS064 | 20.7 | NA | NA | 7.36 | 7.7 | 0.011 | < 0.05 | 0.02 | 36 | 1.4 |
| 97LS065 | 23.2 | NA | NA | 7.86 | 6.85 | 0.013 | < 0.05 | 0.02 | 34.1 | 2 |
| 97LS066 | 18.8 | NA | NA | 7.47 | 8.48 | 0.034 | < 0.05 | 0.02 | 76.3 | 27 |
| 97LS067 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 97LS068 | 18.4 | NA | NA | 7.55 | 6.85 | 0.034 | < 0.05 | 0.03 | 34.8 | 6.4 |
| 97LS069 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 97LS070 | 20.2 | NA | NA | 8.1 | 7.8 | 0.011 | < 0.05 | 0.06 | 153 | 1.2 |
| 99UM001 | 19.6 | NA | NA | 6.38 | 5.7 | 0.07 | < 0.05 | < 0.02 | 267.5 | 5.6 |
| 99UM002 | 17 | NA | NA | 7.67 | 5.8 | 0.035 | < 0.05 | < 0.02 | 618 | 2 |
| 99UM003 | 17.4 | NA | NA | 7.84 | 7.4 | 0.069 | 0.09 | < 0.02 | 311.8 | 1.2 |
| 99UM004 | 21.8 | NA | NA | 7.88 | 5.95 | 0.268 | 0.3 | 0.27 | 474 | 33 |
| 99UM005 | 16.5 | NA | NA | 8.09 | 7.45 | 0.209 | 10 | 0.07 | 753 | 6.1 |
| 99UM006 | 13 | NA | NA | 5.06 | 3.15 | 0.04 | < 0.05 | 0.03 | 308.1 | 1.6 |
| 99UM007 | 15.7 | NA | NA | 7.49 | 3.95 | 0.035 | < 0.05 | 0.03 | 433 | < 1 |
| 99UM008 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 99UM009 | 15 | NA | NA | 7.65 | 7.8 | 0.053 | 1.2 | < 0.02 | 622 | 3.3 |
| 99UM010 | 21.1 | NA | NA | 8.75 | 10.75 | 0.375 | 1.7 | 0.04 | 671 | 68 |
| 99UM011 | 22.5 | NA | NA | 8.01 | 5.25 | 0.022 | < 0.05 | 0.05 | 284.2 | 2 |
| 99UM012 | 20 | NA | NA | 6.71 | 1.7 | 0.247 | < 0.05 | 0.12 | 480.5 | 23 |
| 99UM013 | 16.1 | NA | NA | 7.71 | 7.1 | 0.124 | 0.58 | 0.04 | 508 | 2.8 |
| 99UM014 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 99UM015 | 23.9 | NA | NA | 7.22 | 6.05 | 0.179 | < 0.05 | 0.05 | 413.7 | 6.4 |
| 99UM016 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

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|---|---|---|---|---|---|---|---|---|---|---|
| 99UM017 | 24 | NA | NA | 8.35 | 7.3 | 0.327 | 1.2 | < 0.02 | 500 | 82 |
| 99UM018 | 21.5 | NA | NA | 7.45 | 7.2 | 0.203 | < 0.05 | < 0.02 | 247 | 2.1 |
| 99UM019 | 20.4 | NA | NA | 8.1 | 7.25 | 0.295 | 0.18 | < 0.02 | 497.4 | 3.3 |
| 99UM020 | 23.3 | NA | NA | 7.76 | 6.3 | 0.25 | 9.4 | 0.15 | 887 | 43 |
| 99UM021 | 22 | NA | NA | 7.56 | 1.25 | 0.033 | < 0.05 | < 0.02 | 305 | 2.4 |
| 99UM022 | 25 | NA | NA | 7.47 | 5.25 | 0.052 | < 0.05 | < 0.02 | 338.3 | 2 |
| 99UM023 | 24.6 | NA | NA | 7.72 | 5.55 | 0.17 | < 0.05 | < 0.02 | 218.6 | 5.2 |
| 99UM024 | 19.4 | NA | NA | 7.22 | 1.95 | 0.304 | < 0.05 | < 0.02 | 173.7 | 15 |
| 99UM025 | 22 | NA | NA | 7.2 | 4.7 | 0.658 | 0.32 | < 0.02 | 809 | 15 |
| 99UM026 | 23.2 | NA | NA | 7.06 | 7.75 | 0.035 | < 0.05 | < 0.02 | 310 | 2.8 |
| 99UM027 | 23.5 | NA | NA | 8.03 | 8.25 | 0.066 | < 0.05 | < 0.02 | 320 | 2.4 |
| 99UM028 | 17.1 | NA | NA | 7.65 | 6.55 | 0.059 | 0.7 | < 0.02 | 321.1 | 2.7 |
| 99UM029 | 19.7 | NA | NA | 7.45 | 5.45 | 0.5 | 2.5 | 0.14 | 710 | 390 |
| 99UM030 | 19.5 | NA | NA | 6.7 | 2.4 | 0.107 | < 0.05 | < 0.02 | 98.1 | 6.4 |
| 99UM031 | 22.9 | NA | NA | 8.52 | 8.2 | 0.021 | < 0.05 | < 0.02 | 268 | 2 |
| 99UM032 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 99UM033 | 17.4 | NA | NA | 7.43 | NA | 0.036 | < 0.05 | < 0.02 | 554 | 2 |
| 99UM034 | 21.4 | NA | NA | 8 | 7.65 | 0.077 | 0.21 | 0.02 | 283.4 | 13 |
| 99UM035 | 19.3 | NA | NA | 8.2 | 6.4 | 0.076 | 0.14 | 0.7 | 150 | 6.8 |
| 99UM036 | 22.1 | NA | NA | 8.02 | 5.15 | 0.036 | < 0.05 | 0.05 | 252.4 | 14 |
| 99UM037 | 11.6 | NA | NA | 8.6 | 10.5 | 0.143 | < 0.05 | 0.05 | 161.9 | 1.2 |
| 99UM038 | 23 | NA | NA | 8.2 | 6.6 | 0.126 | 0.77 | 0.05 | 395 | NA |
| 99UM039 | 23.3 | NA | NA | 7.95 | 6.7 | 0.079 | 0.12 | < 0.02 | 461.8 | 4.7 |
| 99UM040 | 20.8 | NA | NA | 7.56 | 0.25 | 0.103 | 2.7 | 0.06 | 1050 | 29 |
| 99UM041 | 24.3 | NA | NA | 7.97 | 6.6 | 0.083 | 0.13 | 0.22 | 212.7 | 2.8 |
| 99UM042 | 22.5 | NA | NA | 7.31 | 5.2 | 0.653 | 1.1 | 0.02 | 197.1 | NA |
| 99UM043 | 16.4 | NA | NA | 8.16 | 6.75 | 0.209 | 1.4 | 0.03 | 396 | 2 |
| 99UM044 | 28.6 | NA | NA | 8.15 | 8.2 | 0.133 | 0.16 | 0.06 | 523 | 12 |
| 99UM045 | 25.3 | NA | NA | 7.5 | 8.2 | 0.373 | 0.66 | < 0.02 | 365.6 | 120 |
| 99UM046 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

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|---|---|---|---|---|---|---|---|---|---|---|
| 99UM047 | 22.5 | NA | NA | 6.98 | 7.1 | 0.028 | < 0.05 | < 0.02 | 352.5 | 1.6 |
| 99UM048 | 21.3 | NA | NA | 6.89 | 1.4 | 0.126 | < 0.05 | 0.05 | 207.5 | 4.4 |
| 99UM049 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 99UM050 | 29 | NA | NA | 8 | 6.6 | 0.086 | 2.7 | 0.08 | 577 | 8 |
| 99UM051 | 23.7 | NA | NA | 6.37 | 3.65 | 0.093 | < 0.05 | 0.04 | 78.2 | NA |
| 99UM052 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 99UM053 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 99UM054 | 19.3 | NA | NA | 7.11 | 0.1 | 0.249 | < 0.05 | 0.07 | 498.3 | 6 |
| 99UM055 | 22.4 | NA | NA | 8.24 | 9.35 | 0.084 | 1.1 | < 0.02 | 537 | 3.1 |
| 99UM056 | 22.9 | NA | NA | 7.15 | 5.9 | 0.028 | 0.07 | 0.04 | 242.6 | 1.6 |
| 99UM057 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 99UM058 | 23.6 | NA | NA | 7.46 | 5.1 | 0.227 | 0.19 | 0.04 | 355 | 7.6 |
| 99UM059 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 99UM060 | 21.6 | NA | NA | 7.5 | 3.5 | 0.257 | 0.36 | 0.07 | 528 | 4 |
| 99UM061 | 19.2 | NA | NA | 8.02 | 6.05 | 0.028 | < 0.05 | < 0.02 | 390.5 | 18 |
| 99UM062 | 22.2 | NA | NA | 8.26 | 7.1 | 0.055 | 0.25 | < 0.02 | 377.4 | 4.4 |
| 99UM063 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 99UM064 | 18.5 | NA | NA | 8.16 | 8 | 0.218 | 2.9 | < 0.02 | 756 | 66 |
| 99UM065 | 25 | NA | NA | 6.36 | 4.5 | 0.045 | 0.05 | 0.27 | 35 | NA |
| 99UM066 | 18.8 | NA | NA | 7.56 | 2.85 | 0.036 | < 0.05 | 0.07 | 262.5 | 2.4 |
| 99UM067 | 17.6 | NA | NA | 7.13 | 4 | 0.054 | < 0.05 | < 0.02 | 141.5 | 2 |
| 99UM068 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 99UM069 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 99UM070 | 22.4 | NA | NA | 8.14 | 6.05 | 0.445 | 4.2 | 0.14 | 698 | 240 |
| 01MN001 | 19.9 | NA | NA | 7.71 | 8.45 | 0.083 | 1.9 | 0.09 | 1616 | 25 |
| 01MN002 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 01MN003 | 20.7 | NA | NA | 7.93 | 9.5 | 0.041 | 0.27 | < 0.05 | 953 | 2.4 |
| 01MN004 | 15.7 | NA | NA | 7.64 | 9 | 0.143 | 15 | 0.49 | 744 | 18 |
| 01MN005 | 23.1 | NA | NA | 7.87 | 3.15 | 0.881 | 0.65 | 0.35 | 1090 | 70 |
| 01MN006 | 25.5 | NA | NA | 8.15 | 7.65 | 0.073 | 15 | 0.05 | 1486 | 15 |

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|---|---|---|---|---|---|---|---|---|---|---|
| 01MN007 | 25.1 | NA | NA | 8 | 12.9 | 0.122 | 7.5 | 0.06 | 970 | 14 |
| 01MN008 | 20.2 | NA | NA | 7.91 | 8.25 | 0.094 | 0.49 | < 0.05 | 713 | 8.4 |
| 01MN009 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 01MN010 | 23.34 | NA | NA | 8.44 | 8 | NA | NA | NA | 878 | 52 |
| 01MN011 | 24.5 | NA | NA | 8.16 | 9.1 | 0.052 | 5 | < 0.05 | 1400 | 9.2 |
| 01MN012 | 27.1 | NA | NA | 8.34 | 9.65 | 0.112 | 11 | < 0.05 | 835 | 5.6 |
| 01MN013 | 20.7 | NA | NA | 7.86 | 8.05 | 0.068 | 4 | 0.09 | 1620 | 18 |
| 01MN014 | 22.9 | NA | NA | 8.35 | 9.2 | 0.134 | 12 | < 0.05 | 614 | 18 |
| 01MN015 | 31.8 | NA | NA | 8.42 | 6.4 | 0.21 | 9.1 | < 0.05 | 862 | 11 |
| 01MN016 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 01MN017 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 01MN018 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 01MN019 | 25.2 | NA | NA | 7.5 | 3.8 | 0.097 | < 0.05 | < 0.05 | 2012 | 30 |
| 01MN020 | 24.1 | NA | NA | 7.83 | 6.6 | 0.186 | 0.54 | 0.06 | 506 | 22 |
| 01MN021 | 20.5 | NA | NA | 7.96 | 6.4 | 0.054 | 0.8 | 0.16 | 1035 | 8.4 |
| 01MN022 | 23.2 | NA | NA | 8.2 | 9 | 0.101 | 9.7 | < 0.05 | 668 | 12 |
| 01MN023 | 24.8 | NA | NA | 7.71 | 5.2 | 0.157 | 17 | 0.07 | 743 | 6 |
| 01MN024 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 01MN025 | 25.2 | NA | NA | 8.11 | 15.35 | 0.102 | 2.3 | < 0.05 | 1192 | 4.4 |
| 01MN026 | 18.8 | NA | NA | 8.36 | 8.9 | 0.69 | 0.87 | < 0.05 | 1234 | 6 |
| 01MN027 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 01MN028 | 21.3 | NA | NA | 7.92 | 9.5 | 0.051 | 20 | < 0.05 | 769 | 4.8 |
| 01MN029 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 01MN030 | 25.8 | NA | NA | 8.18 | 7.8 | 0.046 | 17 | < 0.05 | 646 | 22 |
| 01MN031 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 01MN032 | 24.1 | NA | NA | 7.64 | 1.8 | 0.833 | 0.14 | < 0.05 | 1440 | 13 |
| 01MN033 | 29.1 | NA | NA | 8.06 | 8.45 | 0.085 | 0.6 | < 0.05 | 940 | 11 |
| 01MN034 | 24.4 | NA | NA | 8.4 | 7 | 0.138 | 7.2 | < 0.05 | 1139 | 41 |
| 01MN035 | 30.8 | NA | NA | 7.92 | 4.6 | 0.327 | 6.5 | 0.23 | 1025 | 92 |
| 01MN036 | 27.1 | NA | NA | 8.52 | 10.6 | 0.099 | 16 | < 0.05 | 601 | 38 |

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|---|---|---|---|---|---|---|---|---|---|---|
| 01MN037 | 16.7 | NA | NA | 8 | 7.4 | 0.078 | 9.5 | < 0.05 | 1563 | 6 |
| 01MN038 | 21.5 | NA | NA | 7.55 | 2.3 | 0.13 | 9.8 | 0.09 | 885 | 4.4 |
| 01MN039 | 23.7 | NA | NA | 8.38 | 8.55 | 0.286 | 9.8 | < 0.05 | 570 | 74 |
| 01MN040 | 18 | NA | NA | 8.07 | 6.95 | 0.123 | 8.2 | < 0.05 | 700 | 8.4 |
| 01MN041 | 25 | NA | NA | 8.4 | 12.7 | 0.029 | 3.8 | < 0.05 | 1022 | 7.2 |
| 01MN042 | 20 | NA | NA | 8.34 | 10.5 | 0.12 | 0.56 | < 0.05 | 1237 | 46 |
| 01MN043 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 01MN044 | 23.7 | NA | NA | 8.54 | 9.7 | 0.455 | 1.7 | < 0.05 | 843 | 6.8 |
| 01MN045 | 24.5 | NA | NA | 8.04 | 14.5 | 0.03 | 19 | < 0.05 | 2105 | 1.2 |
| 01MN046 | 28.3 | NA | NA | 8.47 | 7.25 | 0.306 | 3.9 | 0.09 | 688 | 130 |
| 01MN047 | 19.5 | NA | NA | 8.29 | 8.35 | 0.13 | 1.7 | 0.09 | 896 | 24 |
| 01MN048 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 01MN049 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 01MN050 | 24.1 | NA | NA | 8.43 | 9.2 | 0.286 | < 0.05 | < 0.05 | 898 | 83 |
| 01MN051 | 26.8 | NA | NA | 8.56 | 8.1 | 0.474 | 1.1 | 0.06 | 703 | 6.8 |
| 01MN052 | 27.6 | NA | NA | 8.23 | 6.45 | 0.28 | 5.2 | < 0.05 | 843 | 61 |
| 01MN053 | 25.7 | NA | NA | 7.99 | 11.7 | 0.046 | 9.6 | 0.1 | 985 | 6.8 |
| 01MN054 | 23.9 | NA | NA | 8.38 | 7.15 | 0.134 | 11 | 0.07 | 700 | 48 |
| 01MN055 | 23.8 | NA | NA | 8.44 | 7.25 | 0.131 | 8.1 | < 0.05 | 914 | 40 |
| 01MN056 | 21.2 | NA | NA | 8.49 | 7.8 | 0.084 | 1.8 | < 0.05 | 1017 | 15 |
| 01MN057 | 28.9 | NA | NA | 9.13 | 7.25 | 0.379 | 0.18 | < 0.05 | 606 | 82 |
| 01MN058 | 21.9 | NA | NA | 8.25 | 6.3 | 0.52 | 5.4 | 0.05 | 832 | 26 |
| 01MN059 | 25.7 | NA | NA | 8.09 | 5.95 | 0.195 | 1.7 | < 0.05 | 1262 | 35 |
| 01MN060 | 28.9 | NA | NA | 8.45 | 14.05 | 0.054 | 6.3 | < 0.05 | 699 | 3.2 |
| 01MN061 | 18.1 | NA | NA | 7.98 | 9.3 | 0.076 | 8.1 | < 0.05 | 1447 | 3.2 |
| 01MN062 | 20.5 | NA | NA | 8.31 | 8.3 | 0.107 | < 0.05 | < 0.05 | 924 | 16 |
| 01MN063 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 01MN064 | 24.4 | NA | NA | 8.28 | 7.5 | 0.083 | 0.59 | < 0.05 | 562 | 24 |
| 01MN065 | 23.9 | NA | NA | 8.42 | 8.03 | 0.246 | 0.1 | < 0.05 | 942 | 54 |
| 01MN066 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

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|---|---|---|---|---|---|---|---|---|---|---|
| 01MN067 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 01MN068 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 01MN069 | 18.8 | NA | NA | 8.4 | 9.6 | 0.097 | < 0.05 | < 0.05 | 805 | 41 |
| 01MN070 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 04CD001 | 16.45 | NA | NA | 8.33 | NA | 0.055 | 17 | < 0.05 | 610 | 6 |
| 04CD002 | 22.45 | NA | NA | 8.1 | 11 | 0.281 | 8.3 | < 0.05 | 610 | 16 |
| 04CD003 | 18 | NA | NA | 7.69 | 6.35 | 0.184 | 6.8 | 0.06 | 449 | 10 |
| 04CD004 | 18.08 | NA | NA | 6.9 | 6.4 | 0.225 | 12 | < 0.05 | 599 | 9.2 |
| 04CD005 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 04CD006 | 21.79 | NA | NA | 7.91 | 9.75 | 0.172 | 6.9 | < 0.05 | 602 | 47 |
| 04CD007 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 04CD008 | 23 | NA | NA | 7.15 | 7.55 | 0.116 | 17 | < 0.05 | 560 | 17 |
| 04CD009 | 16.05 | NA | NA | 7.15 | 6.85 | 0.163 | 25 | 0.12 | 568 | 4.4 |
| 04CD010 | 19.4 | NA | NA | 7.49 | 7.15 | 0.252 | 8 | < 0.05 | 641 | 110 |
| 04CD011 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 04CD012 | 17 | NA | NA | 7.9 | 8.15 | 0.057 | 13 | < 0.05 | 527 | 6.4 |
| 04CD013 | 18.15 | NA | NA | 7.67 | 8.4 | 0.2 | 6.6 | < 0.05 | 605 | 38 |
| 04CD014 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 04CD015 | 22.4 | NA | NA | 9.2 | 11.8 | 0.245 | 1.2 | < 0.05 | 367 | 45 |
| 04CD016 | 22.16 | NA | NA | 8.03 | 13.55 | 0.032 | 21 | < 0.05 | 708 | 2.4 |
| 04CD017 | 22.23 | NA | NA | 9.4 | 17.7 | 0.329 | 0.17 | 0.07 | 304 | 68 |
| 04CD018 | 20.48 | NA | NA | 8.11 | NA | 0.061 | 12 | < 0.05 | 590 | 7.2 |
| 04CD019 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 04CD020 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 04CD021 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 04CD022 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 04CD023 | 19.06 | NA | NA | 7.96 | 8.7 | 0.112 | 13 | < 0.05 | 555 | 6.8 |
| 04CD024 | 18.51 | NA | NA | 8.21 | 11.75 | 0.279 | 5.7 | < 0.05 | 612 | 28 |
| 04CD025 | 18.6 | NA | NA | 7.941 | 9.95 | 0.032 | 9 | < 0.05 | 450 | 2 |
| 04CD026 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

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|---|---|---|---|---|---|---|---|---|---|---|
| 04CD027 | 18.64 | NA | NA | 7.66 | 8.1 | 0.127 | 13 | < 0.05 | 671 | 29 |
| 04CD028 | 17.3 | NA | NA | 7.2 | 6.6 | 0.1 | 5.1 | 0.05 | 0.57 | 21 |
| 04CD029 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 04CD030 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 04CD031 | 20.7 | NA | NA | 6.8 | 9.7 | 0.042 | 15 | < 0.05 | 463 | 2 |
| 04CD032 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 04CD033 | 20.23 | NA | NA | 7.8 | 11.65 | 0.053 | 15 | < 0.05 | 563 | 3.2 |
| 04CD034 | 16.74 | NA | NA | 7.43 | 4.15 | 0.125 | 16 | < 0.1 | 749 | 20 |
| 04CD035 | 17.21 | NA | NA | 7.34 | 7.45 | 0.03 | 23 | < 0.05 | 619 | 8 |
| 04CD036 | 24.85 | NA | NA | 8.2 | 10.25 | 0.095 | 22 | < 0.05 | 634 | 5.6 |
| 04CD037 | 21.299 | NA | NA | 9.1 | 8.8 | 0.159 | 0.56 | < 0.05 | 338 | 40 |
| 04CD038 | 20.8 | NA | NA | 7.96 | 7.7 | 0.123 | 8.1 | < 0.05 | 534 | 11 |
| 04DM001 | 20.6 | NA | NA | 8.1 | 7.75 | 0.165 | 13 | < 0.05 | 1034 | 63 |
| 04DM002 | 28.89 | NA | NA | 5.51 | 0.65 | 0.472 | < 0.05 | 1.27 | 346 | 17 |
| 04DM003 | 19.7 | NA | NA | 8.3 | 8 | 0.087 | 18 | < 0.1 | 1042 | 13 |
| 04DM004 | 28 | NA | NA | 8.2 | 7 | 0.235 | 12 | < 0.05 | 1046 | 110 |
| 04DM005 | 20.12 | NA | NA | 7.09 | 8.9 | 0.075 | 0.35 | < 0.05 | 868 | 4 |
| 04DM006 | 17.2 | NA | NA | 7.75 | 8 | 0.274 | 10 | 0.06 | 982 | 31 |
| 04DM007 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 04DM008 | 17 | NA | NA | 7.38 | 8.1 | 0.141 | 28 | < 0.05 | 1233 | 62 |
| 04DM009 | 25.4 | NA | NA | 8.07 | 6.25 | 0.151 | 3.6 | < 0.05 | 961 | 28 |
| 04DM010 | 14.89 | NA | NA | 7.93 | 7.95 | 0.24 | 4.2 | 0.15 | 510 | 120 |
| 04DM011 | 26.4 | NA | NA | 7.61 | 4.9 | 0.296 | 8.4 | 0.14 | 980 | 70 |
| 04DM012 | 23 | NA | NA | 7.77 | NA | 0.156 | 12 | < 0.05 | 1000 | 42 |
| 04DM013 | 21 | NA | NA | 8.4 | 7.55 | 0.339 | 1.5 | < 0.05 | 738 | 89 |
| 04DM014 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 04DM015 | 25 | NA | NA | 8.13 | 16.3 | 0.127 | 3.3 | < 0.05 | 757 | 21 |
| 04DM016 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 04DM017 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 04DM018 | 17.31 | NA | NA | 8.15 | 5.6 | 0.703 | < 0.05 | < 0.05 | 784 | 46 |

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|---|---|---|---|---|---|---|---|---|---|---|
| 04DM019 | 16.74 | NA | NA | 7.59 | 5.2 | 0.19 | 1.8 | 0.09 | 629 | 23 |
| 04DM020 | 18.8 | NA | NA | 6.9 | 11.35 | 0.317 | 0.54 | < 0.05 | 682 | 53 |
| 04DM021 | 22 | NA | NA | 8.2 | 9.6 | 0.081 | 20 | < 0.05 | 865 | 2.4 |
| 04DM022 | 26.04 | NA | NA | 8.11 | NA | 0.23 | 9 | < 0.05 | 1023 | 91 |
| 04DM023 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 04DM024 | 22.4 | NA | NA | 7.9 | 12.55 | 0.322 | 1 | < 0.05 | 678 | 33 |
| 04DM025 | 24.4 | NA | NA | 8.25 | 7 | 0.198 | 12 | < 0.05 | 970 | 94 |
| 04DM026 | 16.46 | NA | NA | 7.8 | 8.4 | 0.216 | 7.1 | 0.05 | 962 | 33 |
| 04DM027 | 16.52 | NA | NA | 8.02 | 8.25 | 0.147 | 3.3 | < 0.05 | 816 | 59 |
| 04DM028 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 04DM029 | 25 | NA | NA | 7.2 | 7.3 | 0.202 | 1.7 | 0.05 | 771 | 16 |
| 04DM030 | 22 | NA | NA | 7.4 | 3.95 | 0.519 | 0.46 | 0.25 | 786 | 11 |
| 04DM031 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 04DM032 | 19.4 | NA | NA | 7.8 | 7.1 | 0.202 | 13 | < 0.05 | 900 | 42 |
| 04DM033 | 24 | NA | NA | 7.9 | 5.6 | 0.267 | 8.7 | < 0.05 | 1012 | 74 |
| 04DM034 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 04DM035 | 18 | NA | NA | 5.1 | 6.6 | 0.362 | 11 | < 0.05 | 855 | 12 |
| 04DM043 | 22 | NA | NA | 7.9 | 11.75 | 0.281 | 1.8 | < 0.05 | 701 | 28 |
| 04LM001 | 18.7 | NA | NA | 7.81 | 10.6 | 0.104 | 9.5 | 0.07 | 696 | 17 |
| 04LM002 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 04LM003 | 16.73 | NA | NA | 7.85 | 7.9 | 0.079 | 4 | < 0.05 | 591 | 5 |
| 04LM004 | 12.2 | NA | NA | 7.9 | 9 | 0.058 | 9.5 | < 0.05 | 583 | 8 |
| 04LM005 | 11.2 | NA | NA | 7.6 | 11.4 | 0.087 | 15 | < 0.05 | 688 | 7.2 |
| 04LM006 | 19.6 | NA | NA | 4.9 | 8.95 | 0.099 | 7.6 | 0.06 | 567 | 17 |
| 04LM007 | 13.3 | NA | NA | 7.86 | 9.2 | 0.087 | 2.9 | < 0.05 | 585 | 32 |
| 04LM008 | 15.3 | NA | NA | 8 | 8.3 | 0.13 | 5.1 | < 0.05 | 680 | 42 |
| 04LM009 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 04LM010 | 19.16 | NA | NA | 8.22 | 11.7 | 0.015 | 26 | < 0.05 | 536 | 3 |
| 04LM011 | 14.4 | NA | NA | 8 | 10.75 | 0.065 | 7.9 | < 0.05 | 611 | < 1 |
| 04LM012 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

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|---|---|---|---|---|---|---|---|---|---|---|
| 04LM013 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 04LM014 | 19.8 | NA | NA | 8.1 | 8.05 | 0.252 | 4.8 | < 0.05 | 802 | 7.6 |
| 04LM015 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 04LM016 | 15.2 | NA | NA | 8.1 | 8.85 | 0.088 | 1 | < 0.05 | 548 | 18 |
| 04LM017 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 04LM018 | 19.23 | NA | NA | 7.8 | 11.15 | 0.042 | 22 | < 0.05 | 555 | 1.6 |
| 04LM019 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 04LM020 | 16.23 | NA | NA | 7.67 | 9.7 | 0.072 | 16 | < 0.05 | 692 | 6.8 |
| 04LM021 | 13.9 | NA | NA | 8.02 | 10.7 | 0.072 | 6.7 | < 0.05 | 614 | 9.6 |
| 04LM022 | 17.27 | NA | NA | 7.57 | 9.9 | 0.121 | 18 | 0.15 | 727 | 6.8 |
| 04LM023 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 04LM024 | 16.5 | NA | NA | 7.8 | 8.85 | 0.085 | 3.2 | < 0.05 | 606 | 24 |
| 04LM025 | 17.3 | NA | NA | 7.87 | 9.55 | 0.092 | 9.9 | < 0.05 | 581 | 12 |
| 04LM026 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 04LM027 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 04LM028 | 11.2 | NA | NA | 6.93 | 9 | 0.044 | 25 | < 0.05 | 612 | 3.2 |
| 04LM029 | 14.52 | NA | NA | 7.96 | 9 | 0.062 | 5.4 | < 0.05 | 569 | 5.2 |
| 04LM030 | 9.41 | NA | NA | 7.4 | 9.55 | 0.021 | 1.2 | < 0.05 | 488 | 17 |
| 04LM031 | 17 | NA | NA | 8.1 | 8.5 | 0.118 | 3.4 | < 0.05 | 492 | 34 |
| 04LM032 | 11 | NA | NA | 7.7 | 8.65 | 0.174 | 6.4 | < 0.05 | 600 | 25 |
| 04LM033 | 13 | NA | NA | 7.86 | 8.45 | 0.106 | 7.7 | < 0.05 | 742 | 8.4 |
| 04LM034 | 18.9 | NA | NA | 8.15 | 8.65 | 0.131 | 1 | < 0.05 | 517 | 32 |
| 04LM035 | 17 | NA | NA | 8.1 | 8.85 | 0.228 | 6.4 | 0.07 | 583 | 22 |
| 04LM036 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 04LM037 | 12 | NA | NA | 8.1 | 9.75 | 0.076 | 5.4 | < 0.05 | 522 | 10 |
| 04LM038 | 21.45 | NA | NA | 7.66 | 10 | 0.039 | 5.9 | < 0.05 | 599 | 8.4 |
| 04LM039 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 04LM040 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 04LM041 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 04LM042 | 14.2 | NA | NA | 7.4 | 11.75 | 0.041 | 20 | < 0.05 | 579 | 4.4 |

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|---|---|---|---|---|---|---|---|---|---|---|
| 04LM043 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 04LM044 | 23.2 | NA | NA | 7.62 | 6.25 | 0.241 | 0.44 | 0.07 | 322 | 27 |
| 04LM045 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 04LM046 | 17.3 | NA | NA | 7.62 | 8.8 | 0.092 | 9.8 | < 0.05 | 740 | 9.6 |
| 04LM047 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 04LM048 | 16.8 | NA | NA | 7.72 | 10.95 | 0.067 | 10 | < 0.05 | 503 | 10 |
| 04LM049 | 17.2 | NA | NA | 8.18 | 8 | 0.066 | 2.7 | < 0.05 | 531 | 6 |
| 04LM050 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 04LM051 | 22.5 | NA | NA | 7.79 | 6.45 | 0.047 | 18 | < 0.05 | 642 | 5.6 |
| 04LM052 | 15.92 | NA | NA | 8.06 | 8.85 | 0.09 | 1.8 | < 0.05 | 634 | 6 |
| 04LM053 | 18.33 | NA | NA | 6.58 | NA | 0.062 | 16 | < 0.05 | 654 | 7.2 |
| 04LM054 | 24 | NA | NA | 7.4 | 8.200001 | 0.052 | 14 | < 0.05 | 566 | 3.2 |
| 04LM055 | 19.5 | NA | NA | 7.9 | 9 | 0.181 | 4.8 | 0.05 | 567 | 6 |
| 04LM056 | 18.3 | NA | NA | 7.7 | 9.6 | 0.081 | 12 | < 0.1 | 682 | 9.6 |
| 04LM057 | 12 | NA | NA | 8.03 | 9.5 | 0.152 | 14 | < 0.05 | 665 | 42 |
| 04LM058 | 12.75 | NA | NA | 7.89 | 10.5 | 0.1 | 14 | < 0.05 | 603 | 2.4 |
| 04LM059 | 16.09 | NA | NA | 7.52 | 8.3 | 0.078 | 7.5 | < 0.05 | 686 | 25 |
| 04LM060 | 18 | NA | NA | 8.4 | 11.1 | 0.036 | 3.9 | < 0.05 | 496 | 12 |
| 04LM061 | 21.75 | NA | NA | 8.4 | 10.2 | 0.093 | 1 | < 0.05 | 459 | 23 |
| 04LM062 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 04LM063 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 04LM064 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 04LM065 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 04LM066 | 19.68 | NA | NA | 8.71 | 11 | 0.065 | 14 | < 0.05 | 602 | 4 |
| 04LM067 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 04LM068 | 16 | NA | NA | 8.2 | 9.55 | 0.518 | 11 | < 0.05 | 689 | 5.2 |
| 04LM069 | 13.92 | NA | NA | 7.95 | 9.7 | 0.133 | 7.6 | < 0.05 | 629 | 11 |
| 04LM070 | 11.4 | NA | NA | 8 | 10 | 0.083 | 3.5 | < 0.05 | 511 | 26 |
| 04LM071 | 16.4 | NA | NA | 8.1 | 7.9 | 0.142 | 8.7 | < 0.05 | 575 | 1.6 |
| 04LM072 | 15.42 | NA | NA | 8.46 | 8.35 | 0.072 | 7 | < 0.05 | 564 | 4 |

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|---|---|---|---|---|---|---|---|---|---|---|
| 04LM073 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 04LM074 | 13.86 | NA | NA | 7.53 | 8.4 | 0.169 | 8.1 | < 0.05 | 615 | 12 |
| 04LM075 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 04MS001 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 04MS002 | 13.9 | NA | NA | 7.7 | NA | 0.082 | 16 | < 0.05 | 951 | 15 |
| 04MS003 | 16.7 | NA | NA | 7 | 4.65 | 0.477 | 10 | < 0.05 | 517 | 160 |
| 04MS004 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 04MS005 | 18.66 | NA | NA | 8.39 | 10.45 | 0.205 | 0.6 | < 0.19 | 581 | 32 |
| 04MS006 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 04MS007 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 04MS008 | 12.79 | NA | NA | 7.24 | 8.1 | 0.1 | 21 | 0.06 | 992 | 7.2 |
| 04MS009 | 16.5 | NA | NA | 8.4 | 8.55 | 0.258 | 2.2 | < 0.05 | 815 | 63 |
| 04MS010 | 23 | NA | NA | 7.9 | 6.6 | 0.206 | 4.2 | < 0.05 | 709 | 47 |
| 04MS011 | 14.8 | NA | NA | 8.2 | 9.05 | 0.078 | 17 | < 0.05 | 833 | 24 |
| 04MS012 | 26.7 | NA | NA | 8 | 6.5 | 0.111 | 3.6 | 0.1 | 754 | 23 |
| 04MS013 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 04MS014 | 21.28 | NA | NA | 7.34 | 3.95 | 0.169 | 10 | 0.2 | 983 | 54 |
| 04MS015 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 04MS016 | 19 | NA | NA | 8.39 | 7.35 | 0.2 | 5.2 | < 0.05 | 689 | 56 |
| 04MS017 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 04MS018 | 21.1 | NA | NA | 8.09 | 8.75 | 0.101 | 15 | < 0.05 | 812 | 20 |
| 04MS019 | 30 | NA | NA | 8.5 | 7.05 | 0.21 | 5.3 | < 0.05 | 724 | 77 |
| 04MS020 | 25 | NA | NA | 8.1 | 10.45 | 0.08 | 15 | < 0.05 | 744 | 11 |
| 04MS021 | 21 | NA | NA | 7.6 | 6.25 | 0.213 | 9.2 | < 0.13 | 795 | 81 |
| 04MS022 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 04MS023 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 04MS024 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 04MS025 | 20.1 | NA | NA | 6.72 | 9.45 | 0.064 | 16 | < 0.05 | 888 | 8 |
| 04MS026 | 18.85 | NA | NA | 8.22 | 11.15 | 0.104 | 2.3 | < 0.05 | 800 | 11 |
| 04MS027 | 15.12 | NA | NA | 8.31 | 11.15 | 0.153 | 6.4 | < 0.05 | 921 | 23 |

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|---|---|---|---|---|---|---|---|---|---|---|
| 04MS028 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 04MS029 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 04MS030 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 04MS031 | 18.38 | NA | NA | 8.31 | 10.2 | 0.429 | 0.39 | < 0.05 | 975 | 26 |
| 04MS032 | 24.6 | NA | NA | 8.2 | 6.15 | 0.346 | 3.2 | < 0.05 | 684 | 170 |
| 04MS033 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 04MS034 | 21.1 | NA | NA | 7.49 | 9.35 | 0.06 | 22 | < 0.05 | 1078 | 9.6 |
| 04MS035 | 22.7 | NA | NA | 7.5 | 7.8 | 0.158 | 3.2 | 0.05 | 763 | 26 |
| 05RD001 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RD002 | 23.55 | NA | NA | 7.62 | 2.3 | 0.03 | < 0.05 | < 0.05 | 551 | < 1 |
| 05RD003 | 18.8 | NA | NA | 7.82 | 8.1 | 0.256 | < 0.05 | < 0.05 | 505 | 6 |
| 05RD004 | 23 | NA | NA | 6.25 | 9.11 | 0.079 | < 0.05 | < 0.05 | 698 | 12 |
| 05RD005 | 19.64 | NA | NA | 8.16 | 6.9 | 0.12 | < 0.05 | < 0.05 | 596 | 14 |
| 05RD006 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RD007 | 20.79 | NA | NA | 6.12 | 7.14 | 0.068 | < 0.05 | < 0.05 | 171 | 2.8 |
| 05RD008 | 26.7 | NA | NA | 7.91 | 6.25 | 0.211 | < 0.05 | 0.06 | 1497 | 67 |
| 05RD009 | 22.32 | NA | NA | 8 | 10.3 | 0.064 | < 0.05 | < 0.05 | 432 | 1.6 |
| 05RD010 | 12.87 | NA | NA | 8.3 | 9.68 | 0.233 | 0.09 | < 0.05 | 668 | 66 |
| 05RD011 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RD012 | 27.3 | NA | NA | 8.39 | 11.4 | 0.1 | 0.1 | 0.14 | 415 | 13 |
| 05RD013 | 21.4 | NA | NA | 7.57 | 5.6 | 0.453 | 0.36 | 0.1 | 1140 | 9.6 |
| 05RD014 | 22.69 | NA | NA | 7.63 | 6.4 | 0.092 | < 0.05 | < 0.05 | 676 | 22 |
| 05RD015 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RD016 | 25.52 | NA | NA | 8.5 | 9.89 | 0.043 | < 0.05 | 0.09 | 428 | 2 |
| 05RD017 | 19.56 | NA | NA | 8.17 | 9.1 | 0.125 | < 0.05 | < 0.05 | 295 | 8 |
| 05RD018 | 25.26 | NA | NA | 8.17 | 7.36 | 0.126 | 0.1 | < 0.05 | 584 | 50 |
| 05RD019 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RD020 | 24.68 | NA | NA | 7.44 | 3 | 0.052 | < 0.05 | < 0.05 | 425 | < 1 |
| 05RD021 | 24.6 | NA | NA | 6.75 | 6.6 | 0.111 | < 0.05 | < 0.05 | 274 | 4.8 |
| 05RD022 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

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|---|---|---|---|---|---|---|---|---|---|---|
| 05RD023 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RD024 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RD025 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RD026 | 26.2 | NA | NA | 7.78 | 5.72 | 0.199 | < 0.05 | < 0.05 | 482 | 54 |
| 05RD027 | 19.52 | NA | NA | 8.16 | 6.34 | 0.168 | < 0.05 | < 0.05 | 499 | 31 |
| 05RD028 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RD029 | 26.08 | NA | NA | 8.4 | 9.32 | 0.115 | < 0.05 | < 0.05 | 461 | 2.4 |
| 05RD030 | 14.29 | NA | NA | 8.4 | 9.78 | 0.385 | 1.4 | 0.09 | 794 | 53 |
| 05RD031 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RD032 | 22.4 | NA | NA | 7.68 | 7.5 | 0.106 | 0.15 | < 0.05 | 563 | 14 |
| 05RD033 | 22.28 | NA | NA | 7.63 | 8.5 | 0.092 | < 0.05 | < 0.05 | 828 | 32 |
| 05RD034 | 22.7 | NA | NA | 8.32 | 10.15 | 0.033 | < 0.05 | < 0.05 | 254 | 2 |
| 05RD035 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RD036 | 22.91 | NA | NA | 8.36 | 8.49 | 0.066 | < 0.05 | < 0.05 | 569 | 22 |
| 05RD037 | 28.84 | NA | NA | 7.78 | 5.4 | 0.384 | 0.35 | 0.07 | 162 | NA |
| 05RD038 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RD039 | 19.4 | NA | NA | 7.35 | 6.99 | 0.11 | < 0.05 | < 0.05 | 394 | 8 |
| 05RD040 | 22.3 | NA | NA | 7.8 | 1.7 | 0.382 | 0.14 | 0.06 | 511 | 34 |
| 05RD041 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RD042 | 21.2 | NA | NA | 5.6 | 8.09 | 0.066 | < 0.05 | < 0.05 | 445 | 3.6 |
| 05RD043 | 17.29 | NA | NA | 7.28 | 8 | 0.096 | < 0.05 | < 0.05 | 408 | 15 |
| 05RD044 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RD045 | 24.4 | NA | NA | 5.2 | 4.6 | 0.147 | < 0.05 | 0.08 | 598 | 4 |
| 05RD046 | 22.14 | NA | NA | 8.2 | 5.88 | 0.115 | < 0.05 | < 0.05 | 551 | 4.8 |
| 05RD047 | 21.72 | NA | NA | 8.48 | 8.27 | 0.356 | 0.84 | < 0.05 | 714 | 150 |
| 05RD048 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RD049 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RD050 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RD051 | 23.31 | NA | NA | 7.75 | 2 | 0.402 | < 0.05 | < 0.05 | 509 | 24 |
| 05RD052 | 16.4 | NA | NA | 7.95 | 5.8 | 0.177 | 0.32 | 0.11 | 725 | 58 |

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|---|---|---|---|---|---|---|---|---|---|---|
| 05RD053 | 18.58 | NA | NA | 7.98 | 8.45 | 0.063 | < 0.05 | < 0.05 | 693 | 16 |
| 05RD054 | 26.15 | NA | NA | 7.79 | 8.9 | 0.092 | 0.14 | 0.25 | 327 | 5.6 |
| 05RD055 | 24 | NA | NA | 8.2 | 12 | 0.267 | < 0.05 | < 0.05 | 928 | 11 |
| 05RD056 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RD057 | 21.14 | NA | NA | 8.39 | 8.44 | 0.033 | < 0.05 | < 0.05 | 254 | 6.8 |
| 05RD058 | 18.2 | NA | NA | 8.1 | 7.3 | 0.037 | < 0.05 | < 0.05 | 362 | 1.6 |
| 05RD059 | 28.7 | NA | NA | 8.31 | 6.8 | 0.181 | 0.17 | 0.07 | 426 | 46 |
| 05RD060 | 23 | NA | NA | 7.7 | 2.5 | 0.213 | < 0.05 | < 0.05 | 580 | NA |
| 05RD061 | 19 | NA | NA | 7.85 | 7.87 | 0.042 | < 0.05 | < 0.05 | 578 | 3.2 |
| 05RD062 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RD063 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RD064 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RD065 | 17 | NA | NA | 8 | 6.5 | 0.036 | < 0.05 | < 0.05 | 533 | 2.6 |
| 05RD066 | 14.25 | NA | NA | 7.36 | 3.4 | 0.206 | < 0.05 | < 0.05 | 448 | 6.4 |
| 05RD067 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RD068 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RD069 | 22.28 | NA | NA | 7.62 | 7.12 | 0.188 | < 0.05 | < 0.05 | 644 | 6.8 |
| 05RD070 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RD171 | 24.58 | NA | NA | 7.83 | 7.14 | 0.038 | < 0.05 | < 0.05 | 261 | 2.4 |
| 05RD172 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RD173 | 20.2 | NA | NA | 7.9 | 5.24 | 4.47 | < 0.05 | 0.83 | 1843 | 330 |
| 05RD174 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RD175 | 29.9 | NA | NA | 8.41 | 10.48 | 0.089 | < 0.05 | < 0.05 | 765 | 27 |
| 05RD176 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RD177 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RD178 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RD179 | 21 | NA | NA | 7.833 | 7.79 | 0.065 | < 0.05 | < 0.05 | 449 | 11 |
| 05RD180 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RD181 | 25.13 | NA | NA | 7.16 | 11.41 | 0.132 | < 0.05 | 0.07 | 510 | 46 |
| 05RN001 | 20.7 | NA | NA | 8.1 | 8.4 | 0.037 | < 0.05 | < 0.05 | 242 | 3.2 |

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|---|---|---|---|---|---|---|---|---|---|---|
| 05RN002 | 27.2 | NA | NA | 7.4 | 4.8 | 0.055 | 0.13 | < 0.05 | 115 | 3.2 |
| 05RN003 | 19.3 | NA | NA | 6.6 | 4.7 | 0.034 | < 0.05 | < 0.05 | 138 | NA |
| 05RN004 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RN005 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RN006 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RN007 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RN008 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RN009 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RN010 | 19.6 | NA | NA | 7.24 | 7.6 | 0.053 | < 0.05 | < 0.05 | 113 | 6.4 |
| 05RN011 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RN012 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RN013 | 15.6 | NA | NA | 7.27 | 6.8 | 0.032 | < 0.05 | < 0.05 | 112 | 7.6 |
| 05RN014 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RN015 | 22.8 | NA | NA | 6.98 | 4.8 | 0.052 | < 0.05 | < 0.05 | 136 | 7.3 |
| 05RN016 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RN017 | 17.25 | NA | NA | 7.71 | 2 | 0.022 | 0.05 | < 0.05 | 326 | 2 |
| 05RN018 | 18.89 | NA | NA | 7.28 | 6.4 | 0.053 | < 0.05 | < 0.05 | 132 | 7.2 |
| 05RN019 | 21.4 | NA | NA | 7 | 4.9 | 0.061 | < 0.05 | < 0.05 | 120 | 2.4 |
| 05RN020 | 24.9 | NA | NA | 7.02 | 7.3 | 0.02 | < 0.05 | < 0.05 | 127 | 1.2 |
| 05RN021 | 19.44 | NA | NA | 6.97 | 8.2 | 0.019 | < 0.05 | < 0.05 | 111 | 2.4 |
| 05RN022 | 21.89 | NA | NA | 7.18 | 6.3 | 0.052 | < 0.05 | 0.05 | 117 | 2.8 |
| 05RN023 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RN024 | 25.51 | NA | NA | 7.12 | 6.2 | 0.027 | 0.08 | 0.05 | 52 | < 1 |
| 05RN025 | 20.53 | NA | NA | 6.95 | 8 | 0.033 | < 0.05 | < 0.05 | 233 | 1.6 |
| 05RN026 | 23.5 | NA | NA | 4.7 | 5.6 | 0.099 | < 0.05 | < 0.05 | 242 | 9.6 |
| 05RN027 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RN028 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RN029 | 19.22 | NA | NA | 5.4 | 2.7 | 0.076 | < 0.05 | 0.1 | 42 | 28 |
| 05RN030 | 25 | NA | NA | 6.9 | 6 | 0.051 | < 0.05 | < 0.05 | 69 | 2.8 |
| 05RN031 | 18.82 | NA | NA | 7.83 | 7.8 | 0.028 | < 0.05 | < 0.05 | 258 | 10 |

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|---|---|---|---|---|---|---|---|---|---|---|
| 05RN032 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RN033 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RN034 | 27.2 | NA | NA | 6.9 | 5.6 | 0.053 | < 0.05 | 0.06 | 124 | 3.2 |
| 05RN035 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RN036 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RN037 | 25.8 | NA | NA | 8.11 | 8.3 | 0.087 | < 0.05 | < 0.05 | 211 | 5.2 |
| 05RN038 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RN039 | 24.43 | NA | NA | 7.69 | 6.4 | 0.075 | < 0.05 | < 0.05 | 226 | 1.2 |
| 05RN040 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RN041 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RN042 | 19.9 | NA | NA | 6.9 | 8.4 | 0.013 | < 0.05 | < 0.05 | 91 | < 1 |
| 05RN043 | 25.45 | NA | NA | 6.9 | 5.5 | 0.085 | < 0.05 | < 0.05 | 293 | 23 |
| 05RN044 | 17.9 | NA | NA | 8.03 | 8.5 | 0.021 | < 0.05 | < 0.05 | 261 | 2 |
| 05RN045 | 25.1 | NA | NA | 6.5 | 4.1 | 0.113 | < 0.05 | < 0.05 | 66 | 4 |
| 05RN046 | 21 | NA | NA | 8.3 | 8.6 | NA | NA | NA | 238 | 1.2 |
| 05RN047 | 19.8 | NA | NA | 7.4 | NA | 0.03 | < 0.05 | < 0.05 | 218 | 5.6 |
| 05RN048 | 26.8 | NA | NA | 6.55 | 7.5 | 0.045 | < 0.05 | < 0.05 | 48 | 3.2 |
| 05RN049 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RN050 | 18.72 | NA | NA | 6.43 | 6.2 | 0.026 | < 0.05 | < 0.05 | 67 | 3.2 |
| 05RN051 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RN052 | 19.1 | NA | NA | 8.2 | 9 | 0.026 | < 0.05 | < 0.05 | 211 | 2 |
| 05RN053 | 22 | NA | NA | 7.1 | 4.6 | 0.039 | < 0.05 | < 0.05 | 109 | 2 |
| 05RN054 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RN055 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RN056 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RN057 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RN058 | 16 | NA | NA | 6.9 | 3 | 0.029 | < 0.05 | < 0.05 | 92 | 1.2 |
| 05RN059 | 23.1 | NA | NA | 7.66 | 6.8 | 0.029 | < 0.05 | < 0.05 | 231 | 5.6 |
| 05RN060 | 25 | NA | NA | 8 | 7.4 | 0.045 | < 0.05 | < 0.05 | 215 | 1.2 |
| 05RN061 | 21.9 | NA | NA | 5.23 | 4.9 | 0.074 | < 0.05 | < 0.05 | 49 | 31 |

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|---|---|---|---|---|---|---|---|---|---|---|
| 05RN062 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RN063 | 20.78 | NA | NA | 6.99 | 5.5 | 0.069 | < 0.05 | < 0.05 | 102 | 22 |
| 05RN064 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RN065 | 17.9 | NA | NA | 6.71 | 4.4 | 0.025 | < 0.05 | < 0.05 | 97 | 1.2 |
| 05RN066 | 18.9 | NA | NA | 7.9 | 8.8 | 0.029 | < 0.05 | < 0.05 | 249 | 2.8 |
| 05RN067 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RN068 | 23.5 | NA | NA | 6.2 | 4.6 | 0.038 | < 0.05 | < 0.05 | 55 | NA |
| 05RN069 | 16.9 | NA | NA | 5.25 | 3.7 | 0.042 | < 0.05 | 0.18 | 23 | 4.7 |
| 05RN070 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RN171 | 23.9 | NA | NA | 7.51 | 6.6 | 0.077 | < 0.05 | < 0.05 | 243 | 5.6 |
| 05RN172 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RN173 | 15.76 | NA | NA | 7.3 | 6.9 | 0.082 | 0.97 | < 0.05 | 273 | 5.2 |
| 05RN174 | 18.7 | NA | NA | 5.4 | 3.3 | 0.097 | < 0.05 | < 0.05 | 37 | 76 |
| 05RN175 | 26.1 | NA | NA | 7.16 | 5.1 | 0.05 | < 0.05 | < 0.05 | 205 | 1.6 |
| 05RN176 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RN177 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RN178 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RN179 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RN180 | 15.48 | NA | NA | 8.06 | 9.6 | 0.034 | < 0.05 | < 0.05 | 547 | 8.4 |
| 05RN181 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RN182 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RN183 | 15.6 | NA | NA | 5 | NA | 0.055 | 0.06 | 0.07 | 19 | 14 |
| 05RN184 | 14.22 | NA | NA | 6.4 | 7.9 | 0.029 | < 0.05 | < 0.05 | 91 | 6.4 |
| 05RN185 | 24.53 | NA | NA | 8.36 | 9.64 | 0.02 | < 0.05 | < 0.05 | 304 | 5.2 |
| 05RN186 | 20.86 | NA | NA | 7.18 | 3.3 | 0.231 | < 0.05 | 0.16 | 232 | 65 |
| 05RN187 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 05RN188 | 21.8 | NA | NA | 7.33 | 10.14 | 0.296 | < 0.05 | < 0.05 | 348 | 20 |
| 05RN189 | 21.8 | NA | NA | 6.99 | 3.63 | 0.129 | < 0.05 | < 0.05 | 217 | 35 |
| 10EM001 | 22.5 | 2.5 | 2.9 | 7.8 | 8.29 | 0.09 | 19 | < 0.05 | 764 | 47 |
| 10EM002 | 21.5 | 27 | 27.2 | 7.62 | 8.65 | 0.102 | 0.05 | < 0.1 | 305 | 28.8 |

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|---|---|---|---|---|---|---|---|---|---|---|
| 10EM003 | 23.4 | 7.8 | 8.1 | 8.09 | 6.18 | 0.247 | < 0.05 | < 0.05 | 884 | 51 |
| 10EM004 | 17.9 | 28 | 29.2 | 7.91 | 9.14 | 0.084 | < 0.05 | < 0.1 | 139.3 | 12.8 |
| 10EM005 | 24.3 | 12 | 13.1 | 8.23 | 7.81 | 0.149 | < 0.05 | < 0.1 | 394 | 58 |
| 10EM006 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 10EM007 | 27.3 | 5.1 | 4.9 | 7.95 | 8.8 | 0.21 | 9.7 | < 0.05 | 886 | 18 |
| 10EM008 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 10EM009 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 10EM010 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 10EM011 | 22.1 | 4 | 3.8 | 8.31 | 9.5 | 0.259 | 4.3 | < 0.05 | 686 | 8 |
| 10EM012 | 18.4 | 12 | 11.3 | 9.43 | 9.43 | 0.028 | < 0.05 | < 0.1 | 115.3 | < 4 |
| 10EM013 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 10EM014 | 18.2 | 3 | 4 | 8.4 | 7.85 | 0.104 | 5.3 | < 0.05 | 739 | 20 |
| 10EM015 | 13.6 | 1.4 | 1.3 | 7.8 | 9.2 | 0.046 | 9.5 | < 0.05 | 585 | 1.2 |
| 10EM016 | 22.8 | 6 | 6.2 | 8.43 | 9.41 | 0.059 | 0.44 | < 0.05 | 1206 | 5.2 |
| 10EM017 | 19.8 | 22 | 23.6 | 7.87 | 7.67 | 0.063 | < 0.05 | < 0.1 | 271 | < 4 |
| 10EM018 | 11.9 | 66 | 59.8 | 5.45 | 8.08 | 0.03 | < 0.05 | < 0.1 | 37.5 | < 4 |
| 10EM019 | 14.5 | 2.8 | 3.1 | 7.52 | 8.37 | 0.063 | 18 | < 0.05 | 912 | 1.2 |
| 10EM020 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 10EM021 | 19.2 | 30 | 26.6 | 6.52 | 1.94 | 0.243 | 0.112 | < 0.1 | 145 | 4.8 |
| 10EM022 | 27.2 | 18 | 16.2 | 8.04 | 7.92 | 0.146 | 0.072 | < 0.1 | 520 | 4.8 |
| 10EM023 | 16.2 | 12 | 12.6 | 8.36 | 8.83 | 0.055 | 0.05 | < 0.05 | 1312 | 44 |
| 10EM024 | 18.3 | 34 | 33.7 | 7.62 | 8.38 | 0.059 | < 0.07 | < 0.05 | 112.1 | 2.4 |
| 10EM025 | 21.8 | 30 | 31.7 | 7.25 | 5.34 | 0.082 | < 0.05 | < 0.1 | 171.5 | 6.8 |
| 10EM026 | 21.3 | NA | NA | 8.22 | 9.19 | 0.12 | 0.132 | < 0.1 | 546 | 9.2 |
| 10EM027 | 25.1 | 19 | 18.5 | 7.1 | 0.15 | 0.713 | < 0.05 | 0.09 | 415 | < 1 |
| 10EM028 | 23.2 | 4.7 | 5.1 | 8.09 | 8.12 | 0.145 | 7.9 | < 0.05 | 659 | 30 |
| 10EM029 | 19.7 | 14 | 13.9 | 7.34 | 7.79 | 0.137 | < 0.05 | 0.149 | 141.8 | < 4 |
| 10EM030 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 10EM031 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 10EM032 | 24.2 | 8.1 | 8.7 | 8.35 | 7.52 | 0.478 | 0.484 | < 0.1 | 687 | 256 |

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|---|---|---|---|---|---|---|---|---|---|---|
| 10EM033 | 20.9 | 14 | 13.2 | 7.66 | 8.73 | 0.039 | < 0.05 | < 0.1 | 87 | 8 |
| 10EM034 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 10EM035 | 21.4 | 17 | 15.4 | 7.58 | 0.24 | 0.119 | 0.18 | 1.3 | 804 | 6.4 |
| 10EM036 | 24 | 12 | 10.9 | 7.96 | 7 | 0.105 | 0.15 | < 0.05 | 246 | 12 |
| 10EM037 | 18.7 | 48 | 47.9 | 7.18 | 1.11 | 0.08 | < 0.05 | < 0.1 | 324 | < 4 |
| 10EM038 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 10EM039 | 22 | 13 | 14.1 | 7.97 | 4.58 | 0.299 | 2.7 | < 0.05 | 759 | 18 |
| 10EM040 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 10EM041 | 21 | 34 | 30.3 | 7.48 | 7.64 | 0.068 | 0.196 | < 0.1 | 183.5 | < 4 |
| 10EM042 | 20.1 | 7.2 | 6.8 | 8.43 | 7.1 | 0.063 | < 0.05 | < 0.05 | 492 | 18 |
| 10EM043 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 10EM044 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 10EM045 | 22.4 | 41 | 41.9 | 6.89 | 3.32 | 0.081 | < 0.05 | < 0.1 | 209.9 | 14.4 |
| 10EM046 | 20.2 | 7.7 | 8 | 8.1 | 6.93 | 0.209 | 11 | < 0.05 | 1102 | 33 |
| 10EM047 | 16.8 | 5.3 | 5.7 | 8.25 | 6.99 | 0.18 | 1.6 | < 0.05 | 659 | 1.6 |
| 10EM048 | 15.1 | NA | NA | 8.56 | 10.65 | 0.052 | < 0.05 | < 0.1 | 342 | 6.6 |
| 10EM049 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 10EM050 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 10EM051 | 21.5 | 5.1 | 4.6 | 8.23 | 8.96 | 0.121 | 1.3 | < 0.05 | 541 | 49 |
| 10EM052 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 10EM053 | 17.7 | NA | NA | 7.67 | 7.69 | 0.076 | < 0.05 | < 0.1 | 289 | < 4 |
| 10EM054 | 15.6 | 9.6 | 10.8 | 7.79 | 7.38 | 0.083 | 2.26 | < 0.1 | 728 | 8.8 |
| 10EM055 | 14 | NA | NA | 7.99 | 8.42 | 0.13 | 0.59 | < 0.05 | 539 | 30 |
| 10EM056 | 19 | 8.3 | 8.9 | 7.3 | 9.36 | 0.047 | < 0.05 | < 0.1 | 59.5 | < 4 |
| 10EM057 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 10EM058 | 26.7 | 9.3 | 8.3 | 8.27 | 5.68 | 0.312 | 0.05 | < 0.05 | 1104 | 36 |
| 10EM059 | 19.2 | 2.4 | 2.2 | 8.17 | 8.63 | 0.14 | 8.5 | < 0.05 | 563 | 30 |
| 10EM060 | 11.9 | NA | NA | 8.5 | 10.06 | 0.034 | 0.084 | < 0.1 | 425 | 35.5 |
| 10EM061 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 10EM062 | 19 | 4.4 | 4.2 | 8.24 | 9.81 | 0.029 | 0.26 | < 0.05 | 944 | 4.4 |

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|---|---|---|---|---|---|---|---|---|---|---|
| 10EM063 | 22.8 | 32 | 30.6 | 7.55 | 7.96 | 0.066 | < 0.07 | < 0.05 | 84.3 | 4.8 |
| 10EM064 | 24.4 | 14 | 15 | 8.3 | 8.39 | 0.461 | 0.06 | < 0.1 | 1514 | 59.6 |
| 10EM065 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 10EM066 | 22.5 | 21 | 21.1 | 7.6 | 6.5 | 0.089 | < 0.05 | < 0.1 | 263 | 4.8 |
| 10EM067 | 22.6 | 6.9 | 7.6 | 8 | 8.49 | 0.502 | 0.87 | 0.39 | 2121 | 6.4 |
| 10EM068 | 25.8 | 12 | 12.4 | 8.35 | 8.74 | 0.053 | 0.08 | < 0.05 | 130 | 6.4 |
| 10EM069 | 16.9 | 14 | 15.4 | 7.73 | 6.12 | 0.181 | < 0.05 | < 0.1 | 593 | < 4 |
| 10EM070 | 24.7 | 6.9 | 6.2 | 8.78 | 12.7 | 0.027 | < 0.05 | < 0.05 | 469 | 3.2 |
| 10EM071 | 21.2 | 4.1 | 3.9 | 7.97 | 7.27 | 0.088 | 8.8 | < 0.05 | 757 | 5.6 |
| 10EM072 | 18.3 | 22 | 21.1 | 7.51 | 8.02 | 0.071 | < 0.05 | < 0.05 | 141.8 | 2 |
| 10EM073 | 21.8 | 41 | 44.8 | 7.4 | 7.1 | 0.101 | 0.056 | < 0.1 | 151.3 | 16.8 |
| 10EM074 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 10EM075 | 22.3 | 3.5 | 3.4 | 8.44 | 8.28 | 0.084 | 12 | < 0.05 | 603 | 2.4 |
| 10EM076 | 16.9 | 12 | 10.8 | 8.19 | 9.77 | 0.037 | < 0.05 | < 0.1 | 228 | 4.4 |
| 10EM077 | 25.4 | 15 | 15.9 | 8.5 | 8.2 | 0.071 | < 0.05 | < 0.1 | 141.6 | < 4 |
| 10EM078 | 22 | 6.4 | 6.8 | 8.1 | 8.17 | 0.239 | 2.9 | < 0.05 | 798 | 26 |
| 10EM079 | 21.6 | 1.5 | 3.4 | 8.24 | 7.64 | 0.055 | 5.2 | < 0.05 | 509 | 10 |
| 10EM080 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 10EM081 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 10EM082 | 22.5 | 11 | 11.9 | 7.49 | 6.3 | 0.059 | 0.05 | < 0.1 | 280 | < 4 |
| 10EM083 | 14.7 | 4.1 | 4.5 | 8 | 9.93 | 0.051 | 21 | < 0.05 | 944 | 4 |
| 10EM084 | 24.6 | 9.2 | 9.6 | 8.42 | 8.42 | 0.115 | 0.57 | < 0.05 | 349 | 26 |
| 10EM085 | 24.6 | NA | NA | 8.52 | 8.8 | 0.055 | < 0.05 | < 0.1 | 468 | < 4 |
| 10EM086 | 21.8 | 14 | 14.1 | 7.78 | 6.6 | 0.067 | 0.05 | < 0.05 | 333 | 4 |
| 10EM087 | 25 | 13 | 12.2 | 8.13 | 6.9 | 0.04 | 1.5 | < 0.05 | 558 | 15 |
| 10EM088 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 10EM089 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 10EM090 | 27.5 | 9.7 | 9.2 | 8.38 | 8.77 | 0.062 | 0.21 | < 0.05 | 324 | 4 |
| 10EM091 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 10EM092 | 20.4 | 2 | 2 | 8.03 | 8.02 | 0.066 | 7 | < 0.05 | 422 | 2.8 |

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|---|---|---|---|---|---|---|---|---|---|---|
| 10EM093 | 24.6 | 28 | 28.3 | 6.87 | 6.43 | 0.043 | < 0.05 | < 0.1 | 61.6 | < 4 |
| 10EM094 | 23.5 | 5.4 | 6.8 | 8.23 | 9.58 | 0.15 | 3.6 | < 0.05 | 1180 | 23 |
| 10EM095 | 18.1 | 3.6 | 3.9 | 8.4 | 8.5 | 0.178 | 3.7 | < 0.05 | 618 | 20 |
| 10EM096 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 10EM097 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 10EM098 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 10EM099 | 23.2 | 11 | 11.2 | 7.82 | 14.58 | 0.121 | 16 | < 0.05 | 985 | 2.4 |
| 10EM100 | 24.6 | 12 | 10.4 | 7.91 | 6.42 | 0.115 | 0.25 | < 0.05 | 265 | 2.4 |
| 10EM101 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 10EM102 | 24.5 | 15 | 14.8 | 8.43 | 9.77 | 0.049 | 0.05 | < 0.05 | 152 | 1.2 |
| 10EM103 | 19 | 6.1 | 5.9 | 8.4 | 9.72 | 0.106 | 8.8 | < 0.05 | 674 | 4 |
| 10EM104 | 12 | 5.5 | 6.5 | 7.6 | 10.37 | 0.064 | < 0.05 | < 0.1 | 56.1 | 13 |
| 10EM105 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 10EM106 | 18.3 | 8.5 | 9.7 | 8.23 | 7.22 | 0.1 | 0.09 | < 0.05 | 601 | 22 |
| 10EM107 | 24.5 | 2.4 | 3.2 | 8.16 | 8.43 | 0.102 | 4.4 | < 0.05 | 530 | 13 |
| 10EM108 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 10EM109 | 14.8 | 21 | 21.7 | 6.58 | 10.04 | 0.042 | < 0.05 | < 0.1 | 23.3 | < 4 |
| 10EM110 | 18 | 5.3 | 6.1 | 7.63 | 1.92 | 0.197 | 6 | < 0.05 | 890 | 1.2 |
| 10EM111 | 18.1 | 1 | 1 | 8.6 | 14.09 | 0.049 | 3.9 | < 0.05 | 582 | 3.2 |
| 10EM112 | 23.6 | 13 | 14.1 | 8.31 | 7.8 | 0.196 | < 0.05 | < 0.1 | 637 | 8 |
| 10EM113 | 19.8 | NA | NA | 8.22 | 8.16 | 0.062 | 0.06 | < 0.1 | 380 | < 4 |
| 10EM114 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 10EM115 | 24.7 | 4.8 | 5.9 | 8.19 | 9.03 | 0.192 | 2 | < 0.05 | 697 | 2.8 |
| 10EM116 | 15.1 | 27 | 26.6 | 7.12 | 2.34 | 0.163 | 0.61 | < 0.05 | 329 | < 1 |
| 10EM117 | 22.8 | 21 | 20.3 | 6.93 | 0.19 | 0.103 | < 0.05 | < 0.1 | 308 | < 4 |
| 10EM118 | 20.4 | 13 | 14.4 | 7.83 | 8.37 | 0.095 | 0.193 | 0.129 | 387 | 9.6 |
| 10EM119 | 19 | 2.3 | 2.2 | 7.77 | 6.05 | 0.053 | 13 | < 0.05 | 655 | 8 |
| 10EM120 | 21.5 | 7.8 | 7.5 | 7.72 | 9.08 | 0.033 | < 0.05 | < 0.1 | 44.8 | < 4 |
| 10EM121 | 21.3 | 28 | 24.5 | 7.31 | 8.33 | 0.035 | < 0.05 | < 0.1 | 124 | < 4 |
| 10EM122 | 15.2 | NA | NA | 8.06 | 8.85 | 0.041 | 0.08 | < 0.05 | 489 | 4.4 |

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|---|---|---|---|---|---|---|---|---|---|---|
| 10EM123 | 17.2 | 1.7 | 1.9 | 8.17 | 8.78 | 0.124 | 4.5 | < 0.05 | 607 | 12 |
| 10EM124 | 18.1 | 2.7 | 2.6 | 7.87 | 13.17 | 0.015 | 10 | < 0.05 | 824 | 2 |
| 10EM125 | 19 | 21 | 19.1 | 7.02 | 5.79 | 0.092 | < 0.05 | < 0.1 | 316 | 10 |
| 10EM126 | 26.1 | 6 | 5.6 | 8.06 | 13.41 | 0.241 | 1.7 | < 0.05 | 1750 | 10 |
| 10EM127 | 21.4 | 38 | 38.9 | 6.75 | 6.29 | 0.089 | < 0.05 | < 0.05 | 62.9 | 5.6 |
| 10EM128 | 20 | 22 | 21.1 | 7.98 | 5.22 | 0.363 | 0.076 | < 0.1 | 674 | 8.4 |
| 10EM129 | 17.5 | 34 | 32.4 | 7 | 7.61 | 0.049 | < 0.05 | < 0.1 | 89.8 | 6.6 |
| 10EM130 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 10EM131 | 15.8 | 8.7 | 8.5 | 8.11 | 8.55 | 0.1 | 0.89 | < 0.05 | 500 | 17 |
| 10EM132 | 25.1 | 16 | 14.9 | 7.64 | 6.42 | 0.061 | 0.11 | < 0.05 | 139.8 | 4.4 |
| 10EM133 | 18.8 | 8.9 | 8.8 | 7.96 | 8.38 | 0.048 | < 0.05 | < 0.1 | 337 | < 4 |
| 10EM134 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 10EM135 | 26 | 7.7 | 7.2 | 8.37 | 7.98 | 0.178 | 3.1 | < 0.05 | 595 | 26 |
| 10EM136 | 23 | 18 | 24.1 | 7.73 | 7.44 | 0.06 | 0.092 | < 0.1 | 254 | < 4 |
| 10EM137 | 12.3 | 22 | 22.8 | 7.83 | 9.2 | 0.061 | < 0.05 | < 0.1 | 202.6 | 8.8 |
| 10EM138 | 19.9 | 22 | 21.9 | 7.75 | 5.66 | 0.125 | 0.26 | < 0.05 | 379 | 2.8 |
| 10EM139 | 18.3 | 2.8 | 2.9 | 8.7 | 8.9 | 0.052 | 7.8 | < 0.05 | 696 | 9.2 |
| 10EM140 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 10EM141 | 16.4 | 20 | 20 | 7.46 | 6.95 | 0.04 | 0.05 | < 0.1 | 152 | < 4 |
| 10EM142 | 19.4 | 3.2 | 5.6 | 7.91 | 7.32 | 0.159 | 6.6 | < 0.05 | 754 | 64 |
| 10EM143 | 17.4 | 1.3 | 1.3 | 8.38 | 10.79 | 0.051 | 11 | < 0.05 | 598 | 4.4 |
| 10EM144 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 10EM145 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 10EM146 | 16.7 | 1.2 | 1.3 | 8.34 | 8.51 | 0.065 | 4.8 | < 0.05 | 514 | 11 |
| 10EM147 | 19.4 | 8.7 | 7.8 | 7.71 | 2.11 | 0.697 | 0.3 | 0.23 | 885 | 15 |
| 10EM148 | 15.8 | 12 | 11.6 | 7.98 | 8.47 | 0.101 | 0.16 | < 0.05 | 327 | 8.8 |
| 10EM149 | 13.5 | NA | NA | 8.49 | 9.19 | 0.036 | < 0.05 | < 0.1 | 282 | 6 |
| 10EM150 | 21.9 | 19 | 19.3 | 7.8 | 5.97 | 0.16 | 0.05 | < 0.05 | 579 | 5.6 |
| 10EM151 | 23 | 19 | 18.2 | 7.33 | 0.38 | 0.02 | 0.17 | 0.12 | 736 | 4.4 |
| 10EM152 | 20.1 | 34 | 28.9 | 7.19 | 6.06 | 0.069 | < 0.05 | < 0.1 | 85.5 | 5.33 |

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|---|---|---|---|---|---|---|---|---|---|---|
| 10EM153 | 19.7 | 30 | 28.8 | 6.8 | 7.65 | 0.051 | < 0.05 | < 0.1 | 90.3 | < 4 |
| 10EM154 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 10EM155 | 21.6 | 1.8 | 1.9 | 8.41 | 9.68 | 0.055 | 5.7 | < 0.05 | 554 | 10 |
| 10EM156 | 19.9 | 2.8 | 2.7 | 7.88 | 7.91 | 0.048 | 14 | < 0.05 | 656 | 11 |
| 10EM157 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 10EM158 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 10EM159 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 10EM160 | 12.2 | 11 | 12.1 | 8.08 | 7.35 | 0.528 | 0.193 | < 0.1 | 1224 | 7.8 |
| 10EM161 | 21.1 | 21 | 20.7 | 8.45 | 11.49 | 0.049 | < 0.05 | < 0.1 | 432 | < 4 |
| 10EM162 | 23.2 | 1.1 | 1.3 | 8.75 | 10.62 | 0.028 | 1.3 | < 0.05 | 430 | 3.2 |
| 10EM163 | 24.3 | 4.3 | 6.6 | 8.23 | 7.62 | 0.152 | 3.4 | < 0.05 | 688 | 16 |
| 10EM164 | 26.2 | 12 | 10.6 | 8.03 | 7.38 | 0.109 | 0.24 | < 0.05 | 267 | 4 |
| 10EM165 | 19.8 | 13 | 10 | 7.72 | 6.38 | 0.073 | < 0.05 | < 0.1 | 386 | < 4 |
| 10EM166 | 14 | NA | NA | 6.97 | 1.92 | 0.084 | NA | 0.07 | 374 | 2.8 |
| 10EM167 | 18.1 | 12 | 12.7 | 7.86 | 7.84 | 0.209 | 0.06 | < 0.05 | 544 | 6.8 |
| 10EM168 | 21.9 | 19 | 20 | 6.47 | 7.64 | 0.027 | < 0.05 | < 0.1 | 52.2 | < 4 |
| 10EM169 | 15.1 | NA | NA | 7.52 | 5.5 | 0.167 | < 0.05 | 0.106 | 283 | 34 |
| 10EM170 | 19 | 11 | 12.5 | 8 | 8.84 | 0.176 | 1.4 | < 0.1 | 2300 | 4 |
| 10EM171 | 12.6 | 1 | 1 | 8.06 | 9.84 | 0.054 | 2 | < 0.05 | 526 | 12 |
| 10EM172 | 23 | NA | NA | 8.34 | 7.68 | 0.133 | < 0.05 | < 0.1 | 643 | 18 |
| 10EM173 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 10EM174 | 21.1 | 7.3 | 7.1 | 7.34 | 1.91 | 0.04 | 1.8 | < 0.05 | 2046 | 2.4 |
| 10EM175 | 19.6 | 6.1 | 5.7 | 8.44 | 7.97 | 0.217 | 2.8 | < 0.05 | 594 | 12 |
| 10EM176 | 19.8 | 15 | 16.7 | 8.36 | 9.57 | 0.121 | 0.084 | < 0.1 | 566 | < 4 |
| 10EM177 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 10EM178 | 23.4 | NA | NA | 7.9 | 9.02 | 0.032 | < 0.05 | < 0.1 | 294 | < 4 |
| 10EM179 | 22.9 | NA | NA | 8.47 | 8.43 | 0.315 | < 0.05 | < 0.05 | 609 | 52 |
| 10EM180 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 10EM181 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 10EM182 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

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|---|---|---|---|---|---|---|---|---|---|---|
| 10EM183 | 20.2 | 4 | 3.8 | 7.84 | 11.34 | 0.092 | 14 | < 0.05 | 630 | 1.6 |
| 10EM184 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 10EM185 | 27.2 | 32 | 31.7 | 6.7 | 0.66 | 0.096 | < 0.05 | 0.128 | 180.8 | 5.2 |
| 10EM186 | 20.4 | 22 | 21.9 | 7.55 | 3.46 | 0.32 | < 0.05 | < 0.05 | 736 | 2.4 |
| 10EM187 | 15 | 1.7 | 1.6 | 7.95 | 7.6 | 0.132 | 6.2 | < 0.05 | 624 | 3.6 |
| 10EM188 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 10EM189 | 15.8 | 30 | 27.2 | 6.11 | 4.7 | 0.042 | < 0.05 | < 0.05 | 309 | 1.6 |
| 10EM190 | 22.5 | 10 | 10.4 | 7.88 | 8.42 | 0.331 | 3.6 | < 0.05 | 1860 | 2.8 |
| 10EM191 | 20.9 | 16 | 16.5 | 7.49 | 6.33 | 0.291 | 0.056 | < 0.1 | 328 | 30 |
| 10EM192 | 26.1 | 18 | 18.7 | 8.53 | 11.77 | 0.23 | < 0.05 | < 0.1 | 485 | < 4 |
| 10EM193 | 21.4 | 52 | 12.1 | 7.17 | 7.29 | 0.089 | < 0.05 | < 0.1 | 114.8 | 5.4 |
| 10EM194 | 24.4 | 12 | 11.7 | 7.78 | 6.31 | 0.085 | < 0.05 | < 0.1 | 310 | < 4 |
| 10EM195 | 16.7 | 11 | 10.1 | 8.42 | 8.93 | 0.29 | 2.1 | < 0.05 | 752 | 52 |
| 10EM196 | 23 | 6.5 | 6.3 | 7.66 | 7.83 | 0.11 | NA | < 0.05 | 307 | 7.6 |
| 10EM197 | 23.5 | 22 | 23.7 | 8.87 | 8.15 | 0.116 | < 0.05 | < 0.1 | 329 | 38.8 |
| 10EM198 | 16.3 | 33 | 31.6 | 8.09 | 8.06 | 0.054 | 0.1 | < 0.05 | 442 | 6.8 |
| 10EM199 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 10EM200 | 24.9 | NA | NA | 8.38 | 8.68 | 0.075 | 0.132 | < 0.1 | 225 | < 4 |
| | | | | | | | | | | |