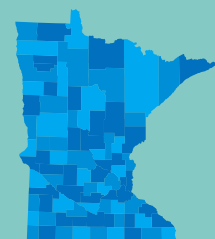
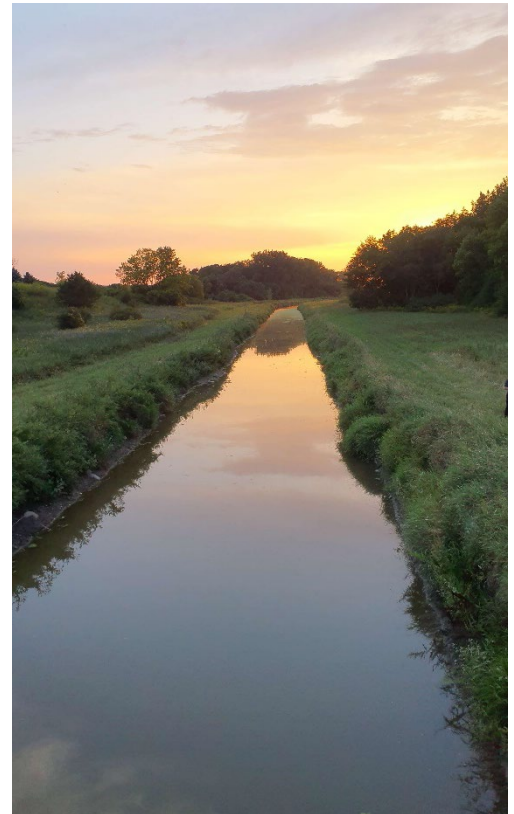


December 2022

Minnesota's 2020 rivers and streams probabilistic survey results

A synopsis on the condition of rivers and streams in Minnesota, based on probabilistic surveys.



Authors

Michael Feist

Contributors/acknowledgements

Minnesota's 2020 Rivers and Streams Assessment was led and conducted by staff of the MPCA's North and South Biological Monitoring Units, John Genet also aided with data analysis. Considerable assistance with the design of this survey was provided by Anthony Olsen, EPA Office of Research and Development. The current round of statewide probabilistic stream monitoring was funded by an EPA 106 Monitoring Initiative grant (Federal Assistance Grant #01E01988). We appreciate the support and technical assistance provided by EPA Project Officer Kristen Faulhaber and project technical contact Mari Nord. Thanks also to the many landowners whose cooperation and willingness to allow us access to stream sites made this survey possible.

Minnesota Pollution Control Agency

520 Lafayette Road North | Saint Paul, MN 55155-4194 |

651-296-6300 | 800-657-3864 | Or use your preferred relay service. | Info.pca@state.mn.us

This report is available in alternative formats upon request, and online at www.pca.state.mn.us.

Document number: wq-bsm1-11

Contents

Executive summary	1
Introduction	2
Methods summary	3
Survey design	3
Sampling protocol	4
Threshold establishment	4
Index of biological integrity	4
Water chemistry	5
Habitat	6
Statistical analysis	6
Results and discussion	7
Site status	8
Habitat	10
Water chemistry	11
Biological integrity	14
Bibliography	18
Appendix 1. Indicator abbreviations and explanations	19
Appendix 2. Categorical data change analysis results	20
Appendix 3. Continuous data change analysis results	28

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. 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 Minnesota.

This report is the third in an ongoing series of status and trend reports on the ecological condition of rivers and streams within Minnesota. Based on data collected during the summer of 2020-2021, this report compares the latest data set to results from two previous statewide probabilistic stream surveys conducted in 2010 (MPCA 2014) and 2015 (MPCA 2018).

Key findings:

- The main differences in indicators were driven by regional differences in land use, as has been documented in past surveys. Results indicate that the condition of Minnesota's rivers and streams generally decline in a north and east to a south and west pattern consistent with the three ecoregions. These patterns followed land-cover characteristics in these regions, with forests and wetlands dominating in the north and agricultural land use in the south and west, with a transition zone in between.
- Significant improvement in biological condition was demonstrated statewide over the 10-year period between surveys as measured by mean index scores for both fish and macroinvertebrate communities. However, improvement in mean index scores has not yet translated to a higher percentage of stream miles meeting aquatic life use expectations.
- Water chemistry results were noticeably mixed. TSS values generally increased but then decreased between surveys while phosphorus did the opposite, decreasing from 2010 to 2015 then increasing in 2020.
- Overall stream habitat remained relatively unchanged between surveys with perhaps more indication that conditions are declining rather than improving.

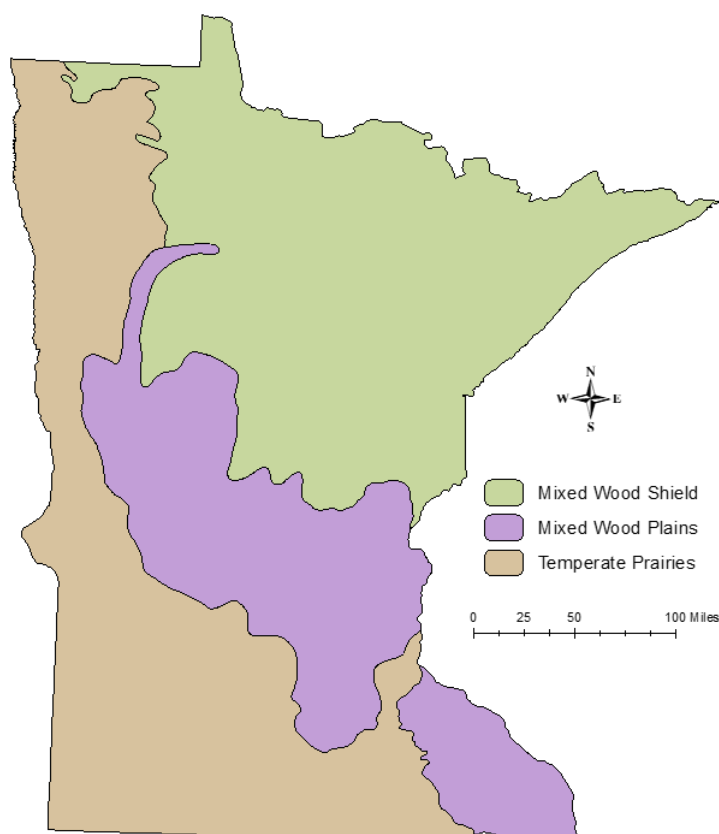
Several more iterations will be required before trends can be sufficiently evaluated, a primary goal of these probabilistic surveys, to clarify whether any pattern is consistent with a long-term trend or merely represents annual variability.

Introduction

Stream probabilistic surveys have been conducted by the Minnesota Pollution Control Agency (MPCA) since 1996. Surveys are conducted in conjunction with the U.S. Environmental Protection Agency's (EPA) National Rivers and Streams Assessment (NRSA), which enables the MPCA to conduct the statewide survey as an enhancement of the national survey once every five years. The original organizing framework for these random surveys was major river basins, or level 6 hydrologic unit code (HUC). Beginning in 2010, the MPCA changed the survey to a statewide design based on Level II ecoregions (Figure 1) (Omernik 1987).

With this design, the survey provides statistically based estimates of river and stream condition statewide as well as by ecoregion. Three major ecoregions converge in Minnesota with the Temperate Prairies (TP) occupying the western and southern portions, the Mixed Wood Plains (MWP) occupying the central and southeastern portions, and the Mixed Wood Shield (MWS) occupying the north central and northeastern portion of the state. The same survey design was utilized again in 2015 and 2020, with an added feature of a 50% revisit rate of sample sites from the previous survey. These revisit sites were added to increase the ability to detect temporal trends in future surveys. Though the design of the survey was developed by the EPA, the sampling protocols and indicators used in the survey were developed by the MPCA to address the unique habitats and stream conditions found in Minnesota.

Figure 1. Level II ecoregions of Minnesota.



This report characterizes the condition of rivers and streams in Minnesota utilizing the datasets collected from the three separate probabilistic surveys. River and stream conditions were analyzed using biological, physical habitat, and chemical attributes from roughly 150 sampleable stream sites in each survey period. The intent was to sample all parameters for the 2020 survey during the summer index period of 2020, however, the COVID-19 pandemic and social distancing requirements caused fish sampling to be delayed until 2021 (but is still referred to as the 2020 survey for the purposes of this report).

Methods summary

Survey design

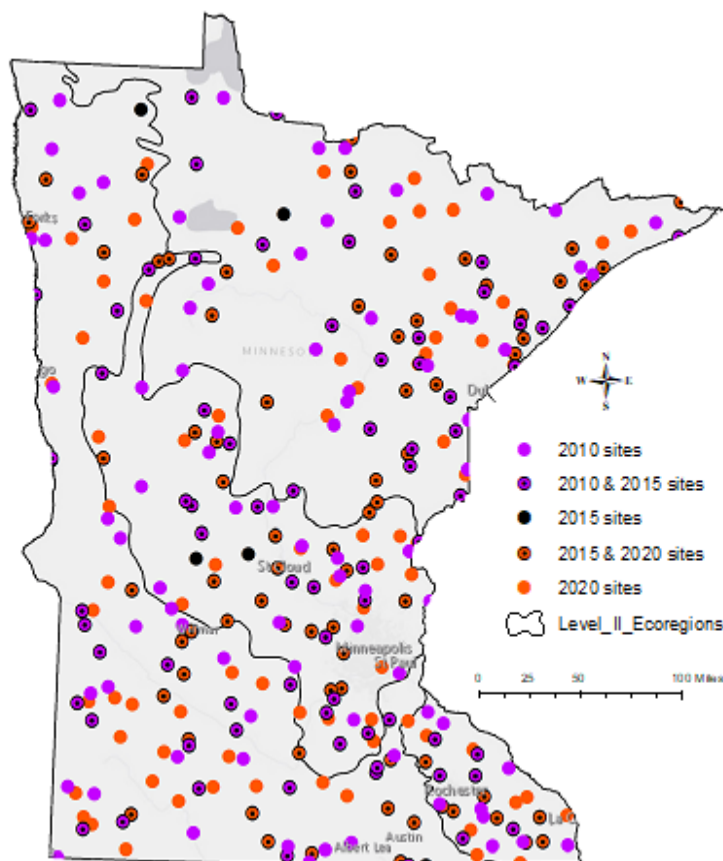
The probabilistic survey design allows unbiased condition estimates (\pm margin of error) to be generated for the entire population of rivers and streams in the state based on results from a comparatively small sample of randomly selected sites. Locations are randomly selected to ensure that derived estimates are unbiased. In addition, unequal probability weighting was used in the random selection process to increase the likelihood of obtaining an equal number of sites in each Level II ecoregion and in each of four stream order categories: 1st, 2nd, 3rd, and 4th order and larger. Potential site locations are selected using the National Hydrography Dataset (NHDplus) linework and a method of generalized random-tessellation stratification (GRTS) (Stevens & Olsen 2004). All linework in NHDplus is assigned a code that indicates channel type (e.g., natural, canal, ditch, pipeline, etc.). For these surveys, channels coded as pipelines and coastlines were excluded; all other channel types were included in the survey design.

Sites are visited sequentially from the list of generated locations, until the desired number is reached. Overdraw sites are provided in anticipation that not all sites will prove to be sampleable. For a site to be considered sampleable, it first must be “target”, meaning it must have a defined stream channel with sufficient water present (i.e., water in more than 50% of the reach). Sites are “non-target” due to discrepancies between NHDplus linework and on the ground channel location or condition. Examples include linework in a wetland, lake, impoundment, where no stream channel or waterbody exists, or if water is insufficient.

In addition, not all target sites are sampleable. Common reasons why target sites cannot be sampled are landowner permission denial, the site is inaccessible, or it is unsafe to sample due to geological features such as waterfalls or rapids. Non-target or non-sampleable sites are replaced with overdraw sites in sequential order until the designated number of target/sampleable sites is reached.

In each of the statewide surveys (2010-2020) the target population of sample sites was 150, with a 50% revisit rate from the previous survey. Figure 2 depicts the general site locations that are target and sampleable from the 2010-2020 surveys.

Figure 2. Distribution of site locations that were target and sampleable in Minnesota for the 2010, 2015, and 2020 statewide surveys.



Sampling protocol

Data collection included fish and aquatic macroinvertebrate community monitoring, habitat assessment, and water chemistry samples. Fish communities were sampled using electrofishing techniques that are dependent on stream width and depth, varying from backpack electrofishing in headwater streams to boat shocking in large rivers (MPCA 2017a). Macroinvertebrates were collected using a multi-habitat collection approach. This methodology utilizes D-frame dip-nets to collect composite benthic macroinvertebrate samples from dominant habitats observed within a given reach (MPCA 2017b). In larger, non-wadeable rivers multi-plate samplers were deployed. Each site was also evaluated qualitatively for habitat condition by completing the MPCA Stream Habitat Assessment (MSHA) (MPCA 2017c). The MSHA evaluates the condition of stream habitat in terms of surrounding land use, riparian, substrate, cover, and channel morphology.

Stream water chemistry was characterized with multiparameter meters following the manufacturer's recommendations for sampling and calibration. One-time water chemistry grab samples were collected and analyzed for phosphorus, total suspended solids (TSS), ammonia, and nitrogen in the lab. 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 current standards/acceptable levels for each parameter, a snapshot of baseline water chemistry conditions can be obtained. Further information and all standard operating procedures for these components can be found on the MPCA website at: [Water monitoring resources | Minnesota Pollution Control Agency \(state.mn.us\)](https://www.mn.gov/Minnesota-Pollution-Control-Agency/state.mn.us).

Threshold establishment

To interpret the results of these surveys, thresholds for each of the sampling parameters were based on MPCA standards and criteria. Individual water chemistry values for each parameter should not be considered a formal assessment of any 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 Index of Biotic Integrity (F-IBI) (Sandberg 2014) and macroinvertebrate (M-IBI) (Chirhart 2014) scores were calculated for each site and compared to biological thresholds designed to protect aquatic life. The Minnesota IBI framework for fish and macroinvertebrates classifies streams into nine classes based on stream size, region, temperature, and gradient (Table 1). Impairment thresholds (Bouchard 2016) 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 (2005) and Bouchard (2016).

Under the TALU framework, streams within a subclass are further classified into Exceptional, General, or Modified aquatic life use tiers based on the biological condition that is attainable and appropriate. Designation of these tiers is based on an assessment of a stream's biological condition and habitat quality. TALU's provide higher expectations for streams with demonstrated exceptional biological quality, maintain current expectations for streams that meet or should meet general use, and set attainable biological expectations for streams modified by historical, human-induced legacy activities (e.g., maintaining channels for drainage). In a TALU framework, streams can be categorized as Modified if they have limited habitat due to legal channelization or ditching of the stream; and high quality water

resources can be assigned a higher level of protection as an Exceptional aquatic life use water. Larger rivers and coldwater streams are not eligible for the lower, Modified aquatic life use class.

Some biological sampling visits are determined to be ‘not assessable’, meaning they are not appropriate for the assessment of aquatic life use support. These determinations are sample-specific, pertain to individual monitoring locations, and reflect both policy decisions and limitations of current bioassessment tools. Examples include conditions which preclude a representative sample from being collected (insufficient capture, low or high flows, natural fish barriers, and proximity to a larger body of water, lake, or impoundment).

Table 1. Fish and invertebrate IBI thresholds by stream class and TALU designation.

Class #	Class Name	Exceptional	General	Modified
Fish criteria				
1	Southern Rivers	71	49	NA
2	Southern Streams	66	50	35
3	Southern Headwaters	74	55	33
4	Northern Rivers	67	38	NA
5	Northern Streams	61	47	35
6	Northern Headwaters	68	42	23
7	Low Gradient Streams	70	42	15
10	Southern Coldwater	82	50	NA
11	Northern Coldwater	60	35	NA
Macroinvertebrate criteria				
1	Northern Forest Rivers	77	49	NA
2	Prairie Forest Rivers	63	31	NA
3	Northern Forest Streams RR	82	53	NA
4	Northern Forest Streams GP	76	51	37
5	Southern Streams RR	62	37	24
6	Southern Forest Streams GP	66	43	30
7	Prairie Streams GP	69	41	22
8	Northern Coldwater	52	32	NA
9	Southern Coldwater	72	43	NA

Water chemistry

All water chemistry samples collected during these surveys were one-time grab samples taken during summer 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 regions of the state. Minnesota’s regional TSS and river eutrophication aquatic life standards were used to evaluate TSS and phosphorus concentrations (Markus 2011, Heiskary et al. 2010). The focus of this survey is to look at baseline conditions and not to make an assessment of impairment. Current regional standards were used to assign the TSS and phosphorus concentrations as good or poor. A site received a rating of good if the concentration was less than or equal to the standard, and a poor rating if it was below. The values in Table 2 are from Minn. R. 7050.0222, subp 2 and 4.

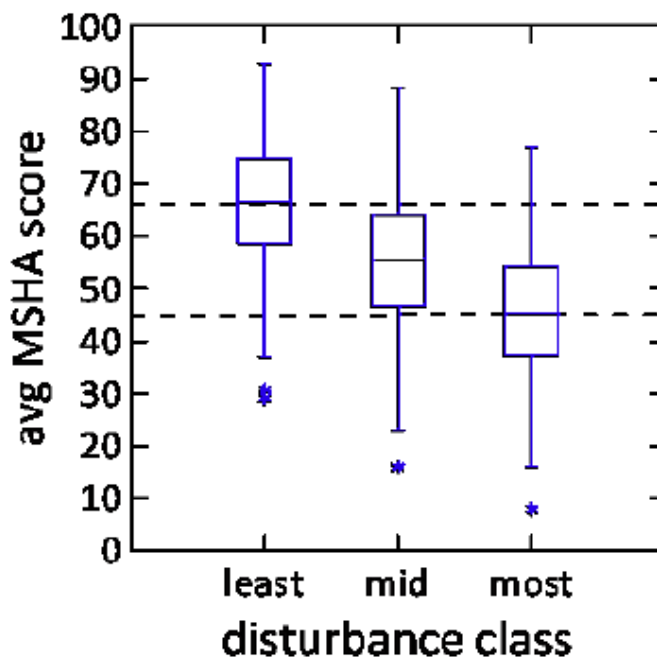
Table 2. Minnesota’s regional phosphorus and TSS aquatic life use standards.

River Nutrient Regions	Phosphorus (mg/L)	TSS (mg/L)
Northern	0.05	15
Central	0.1	30
Southern	0.15	65
2A Coldwater	---	10

Habitat

Land use percentages were calculated with Geographic Information System land use and watershed area layers. Qualitative habitat data were collected and scored according to MSHA protocol (MPCA 2017c). Good, fair, or poor ratings for the qualitative habitat assessment were developed by examining the MSHA scores at three levels of disturbance: least, mid, and most disturbed. Disturbance levels were quantified using a watershed disturbance index known as the Human Disturbance Score (HDS) developed by the MPCA (MPCA 2013). Over 1,700 sites across the state were used to determine the criteria. MSHA scores above the median for least disturbed sites ($MSHA \geq 66$) received a good habitat rating, MSHA scores below the median for most disturbed sites were rated poor (≤ 45), and MSHA scores falling in between these thresholds were rated fair (Figure 3).

Figure 3. Box plot of MSHA scores by disturbance class.



Statistical analysis

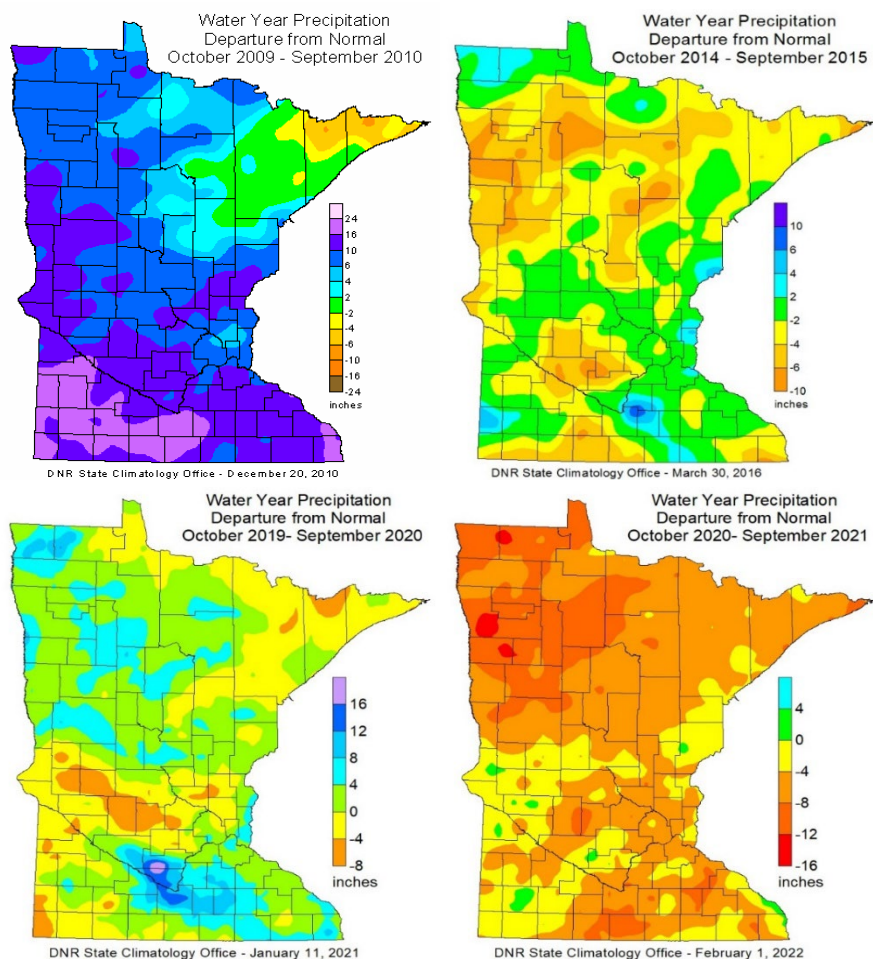
Initial design weights were adjusted to account for the non-target sites. The adjusted design weights were then used to estimate the proportion of stream miles for each parameter of interest. The statistical software R version 4.1.2 (R Core Team 2021) and analysis package spsurvey 5.3.0 (Dumelle et. al. 2022) were used to determine estimated stream mile percentages for both categorical and continuous variables. The categorical variables were summarized either as a percent or total number of stream miles (condition estimates), using bar graphs to visually depict the results. Cumulative distribution functions (CDFs) and percentile estimation were used to summarize the results of the continuous variables. Change analysis was conducted to test for significant differences between survey years using a two tailed Z-test.

Results and discussion

Data collected as part of the 2020 survey provides a snapshot of the current extent and condition of rivers and streams in Minnesota. In addition, the new data set makes it possible to evaluate whether any changes have occurred between previous survey cycles. The focus of this report is to present stream status and extent estimates for each statewide survey for select biological, physical, and water chemistry parameters and to discuss any significant results of the change analysis. 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 Appendices 1-3. Variables that are displayed here were chosen for their ability to adequately summarize conditions.

Figure 4 characterizes the water year basis for each of the three survey periods. Precipitation was considerably above normal for most of the state in 2010 except in the northeast where it was normal or slightly below. 2015 and 2020 experienced relatively normal precipitation levels for much of the state with some restricted areas of below or above normal precipitation. Precipitation in water year 2021 was significantly below normal and a large portion of Minnesota was in drought status for much of the summer.

Figure 4. Water year precipitation departure from normal for each survey year of data collection. Colors indicate the amount of departure from normal precipitation in inches across the state of Minnesota. Blue and purple areas represent areas with higher-than-normal precipitation and yellow and orange represent areas with less than normal precipitation.



Site status

As expected, the percentage of stream miles within each ecoregion (Figure 5) and stream order (Figure 6) have a similar distribution between survey years because unequal probability weighting was used in the random selection process to increase the likelihood of obtaining an equal number of sites in each Level II ecoregion and stream order category. Roughly 35% of statewide stream miles are within the Mixed Wood Shield, 25% within the Mixed Wood Plains, and 40% within the Temperate Prairies.

There were no significant differences statewide in the estimated number of channelized stream miles between survey years, which ranged from 36 to 42% (Figure 7). However, ditched streams significantly decreased within the Mixed Wood Shield in the 2020 survey. It seems unlikely that this change is real and perhaps more an artifact of the low percentage of channelized stream miles in general within this ecoregion, where a small difference in the number of target ditched streams in the survey may result in a significant difference in the estimate. The estimated percentage of ditched stream miles was lowest in the Mixed Wood Shield (1 to 18%), followed by the Mixed Wood Plains (35 to 42%), and the Temperate Prairies (57 to 65%). Stream channelization to promote drainage is conducted for many reasons, including facilitating urban development, but the dominance of agriculture in the Mixed Wood Plains and Temperate Prairies ecoregions means that streams in these regions are disproportionately impacted by drainage practices.

Figure 5. Estimated percentage of statewide stream miles within each ecoregion between survey years. Bracketed lines represent the 95% confidence interval associated with each estimate. Values may not add up to 100% or corresponding totals due to rounding.

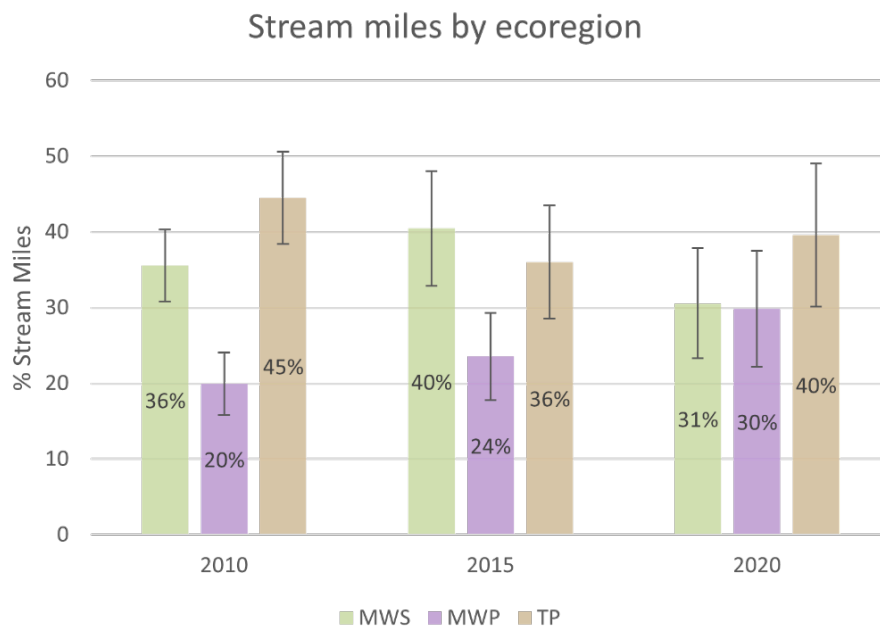


Figure 6. Estimated percentage of stream miles by stream order statewide and within ecoregions between survey years. Bracketed lines represent the 95% confidence interval associated with each estimate. Values may not add up to 100% or corresponding totals due to rounding.

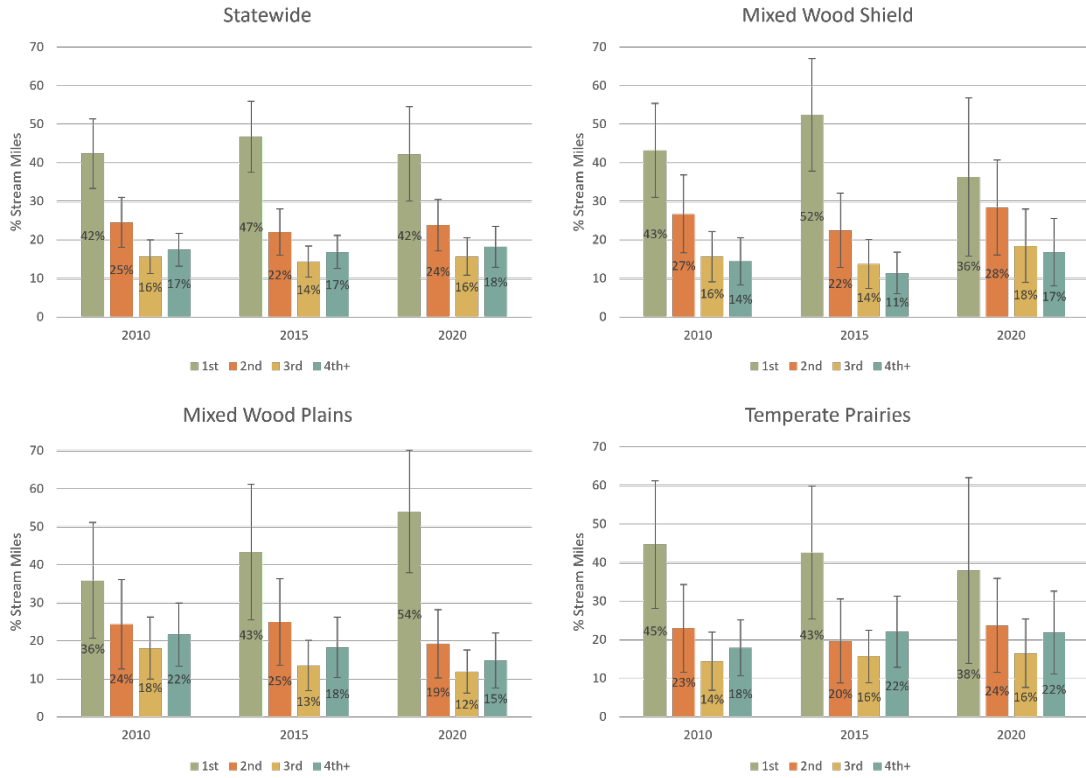
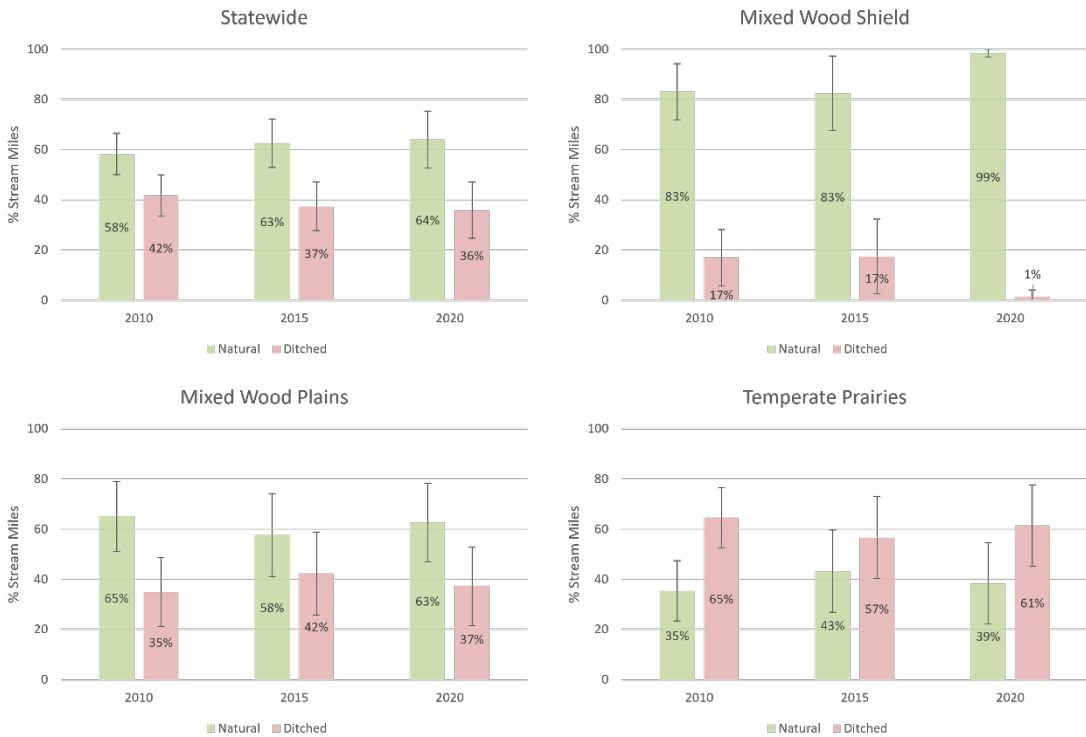


Figure 7. Estimated percentage of natural and ditched stream miles statewide and within ecoregions between survey years. Bracketed lines represent the 95% confidence interval associated with each estimate. Values may not add up to 100% or corresponding totals due to rounding.



Habitat

The MSHA scores summarize and integrate many stream habitat variables, such as substrate types and riparian conditions, into a single score. 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 sampled (target sites that were inaccessible or where permission was denied).

Figure 8 compares mean MSHA scores between survey years and indicates fair habitat conditions statewide and within individual ecoregions, apart from the Temperate Prairies where mean scores are indicative of poor habitat. Mean scores are highest in the Mixed Wood Shield ecoregion. Statewide results exhibit a slight but insignificant decrease in MSHA scores across survey years. The Mixed Wood Shield demonstrates a significant decrease between 2010 and subsequent surveys, as does the Mixed Wood Plains between 2015 and 2020.

Statewide the estimated percentage of stream miles with a good habitat rating decreased significantly between 2010 and 2020, from 22% to 13% (Figure 9). In general, the percentage of stream miles with good habitat within each ecoregion also decreased significantly across survey years except for the Mixed Wood Shield, where it decreased from 2010 to 2015 but rebounded in 2020. Other significant differences in habitat rating categories were less distinct and conclusive over time. Poor habitat increased and fair habitat decreased significantly from 2010 to 2020, but only in the Mixed Wood Shield. The percentage of stream miles that were not sampled also decreased significantly from 2015 to 2020 in the Mixed Wood Plains ecoregion.

As expected, the more northern streams in the Mixed Wood Shield ecoregion have better habitat characteristics than the other ecoregions. The Temperate Prairies ecoregion has the highest percentage of poorly scoring streams, ranging from 48 to 41% and lowest percentage of streams scoring good (2 to 14%) across survey years. Some of the loss of habitat can be explained by the high percentage of streams (approximately 60%) that have been channelized or ditched in the Temperate Prairies ecoregion.

Figure 8. Mean MSHA scores between survey years statewide and within each ecoregion. Bracketed lines represent the 95% confidence interval associated with each value.

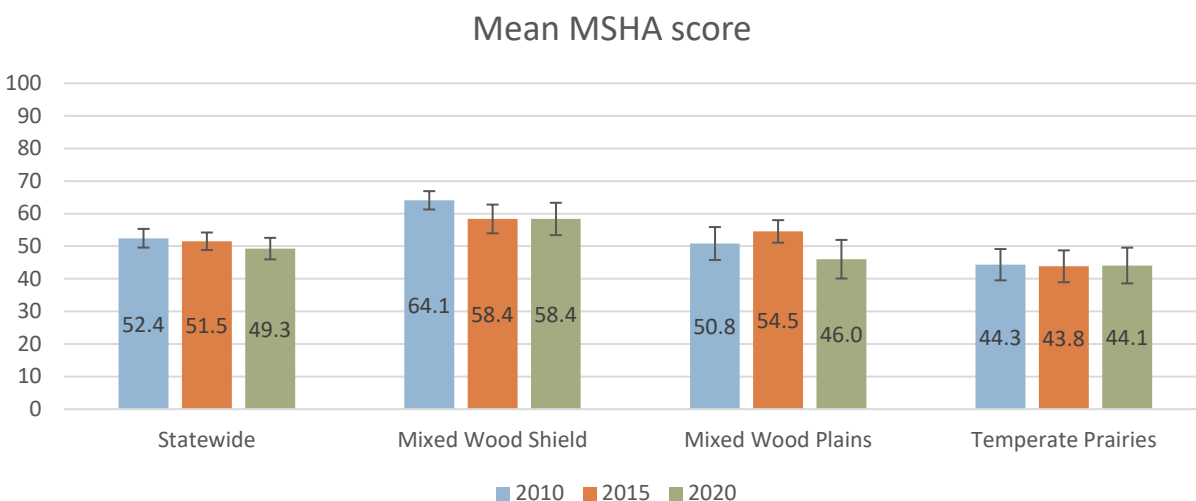
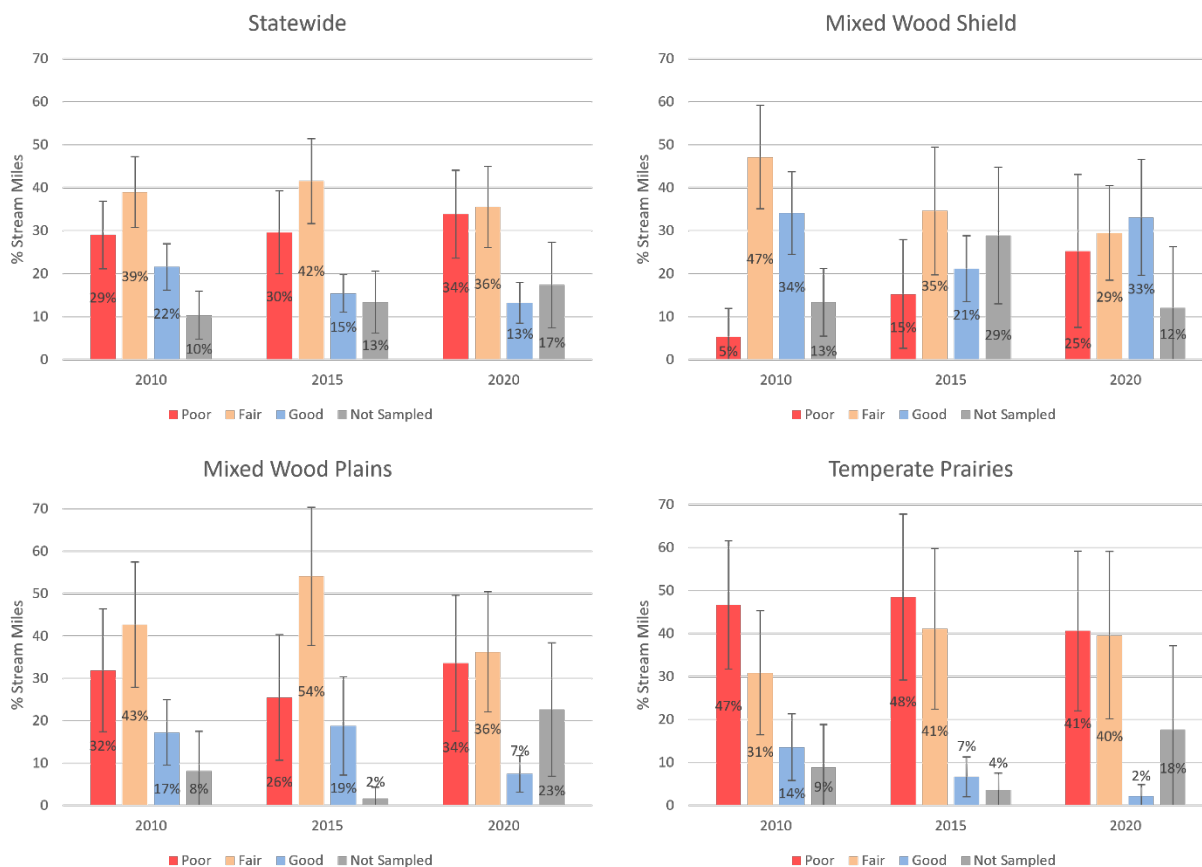


Figure 9. Estimated percentage of stream miles for MSHA habitat ratings statewide and within ecoregions between survey years. Bracketed lines represent the 95% confidence interval associated with each estimate. Values may not add up to 100% or corresponding totals due to rounding.



Water chemistry

Mean TSS concentrations increased significantly between 2010 and 2015 statewide, but then decreased significantly from 2015 to 2020 (Figure 10). A similar pattern was evident within individual ecoregions although the differences were not significant. Conversely, statewide mean phosphorus concentrations decreased significantly from 2010 to 2015 but increased from 2015 to 2020 (Figure 11). Within individual ecoregions mean phosphorus concentrations in the Mixed Wood Shield and Temperate Prairies decreased significantly from 2010 to 2015 and increased in the Temperate Prairies from 2015 to 2020. Mean concentrations for both TSS and phosphorus were lowest in the Mixed Wood Shield and highest in the Temperate Prairies.

Statewide the percentage of stream miles with poor TSS ratings is low, ranging from 2 to 9%, and decreased significantly in 2020 from previous surveys (Figure 12). Good TSS values ranged from 73 to 83% of statewide stream miles and decreased significantly from 2010 to 2015. Within the Mixed Wood Shield there was a significant decrease in the percentage of stream miles (from 75 to 55%) rated as good for TSS from 2010 to 2015, which coincided with a significant increase in the percentage of not sampled stream miles (13 to 34%). Then in 2020 stream miles rated as good increased significantly from 2015 (55 to 84%) and those rated poor decreased to only 1%, which was less than 2015 (10%) and significantly less than 2010 (12%). There was limited change between surveys within the Mixed Wood Plains as only the percentage of stream miles rated good decreased significantly (from 95 to 74%) which can be attributed to an equal but opposite increase in not sampled stream miles (from 2 to 25%). Streams rated

poor were unchanged (2%) across surveys in the Mixed Wood Plains. The Temperate Prairies ecoregion exhibited a significant increase (from 3 to 11%) in poor TSS conditions from 2010 to 2015 but reverted to 3% in 2020. No other changes in TSS between surveys in the Temperate Prairies were significant.

The statewide estimates indicate that phosphorus ratings are considered good 39 to 53% of the time and poor 27 to 50% of the time (Figure 13). Poor ratings were significantly less in both 2015 and 2020 compared to the 2010 survey. Phosphorus ratings considered good also increased significantly from 2010 to 2015. Like the statewide estimates, within the Mixed Wood Shield the percentage of stream miles rated poor for phosphorus were significantly less in 2015 (18%) and 2020 (36%) compared to 2010 (57%). Stream miles not sampled increased significantly from 2010 to 2015 but streams rated as good also increased from 30 to 47%, although this result was not statistically significant. The Mixed Wood Plains saw a significant decrease in streams rated poor from 2010-2020 and a significant increase in not sampled stream miles from 2015-2020. And the only significant result within the Temperate Prairies was a decline (from 61 to 40%) in streams rated good from 2015-2020.

Despite exhibiting some significant differences between survey years no overall trend in either direction is evident statewide or within ecoregions. The ecoregion patterns observed in the estimates for TSS and phosphorus coincide with expectations for these parameters. Values in northern regions are typically lower and increase as you progress south and west across the state. However, because of regional criteria the percentage of stream miles rated as good or poor is not dramatically different between ecoregions.

Figure 10. Mean TSS concentrations between survey years statewide and within each ecoregion. Bracketed lines represent the 95% confidence interval associated with each value.

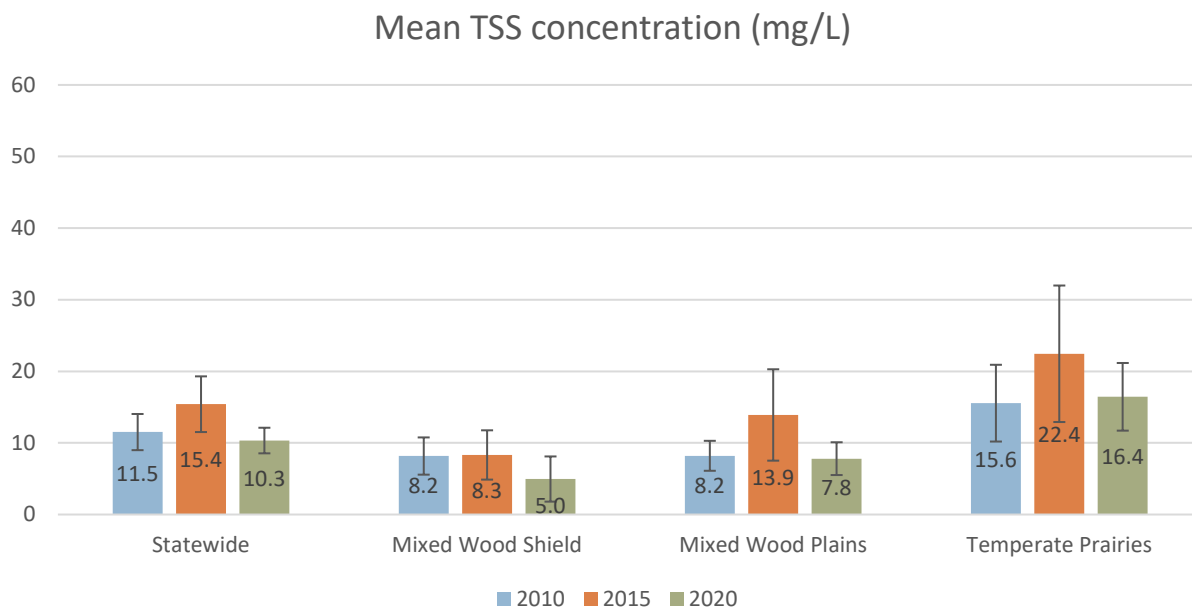


Figure 11. Mean phosphorus concentrations between survey years statewide and within each ecoregion. Bracketed lines represent the 95% confidence interval associated with each value.

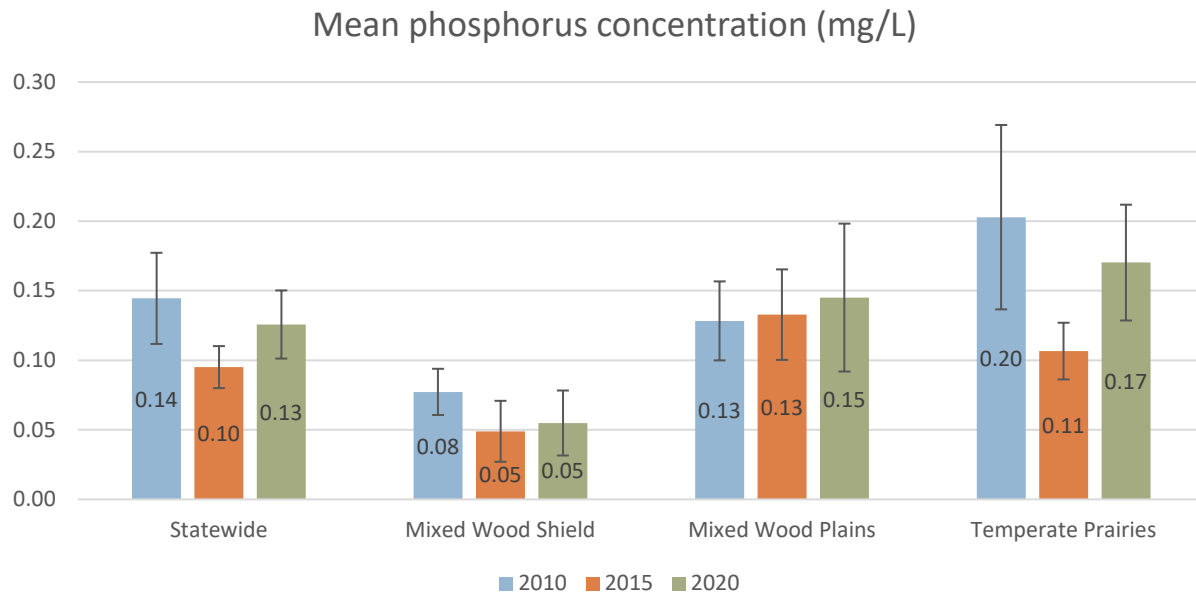


Figure 12. Estimated percentage of stream miles with good or poor TSS ratings statewide and within ecoregions between survey years. Bracketed lines represent the 95% confidence interval associated with each estimate. Values may not add up to 100% or corresponding totals due to rounding.

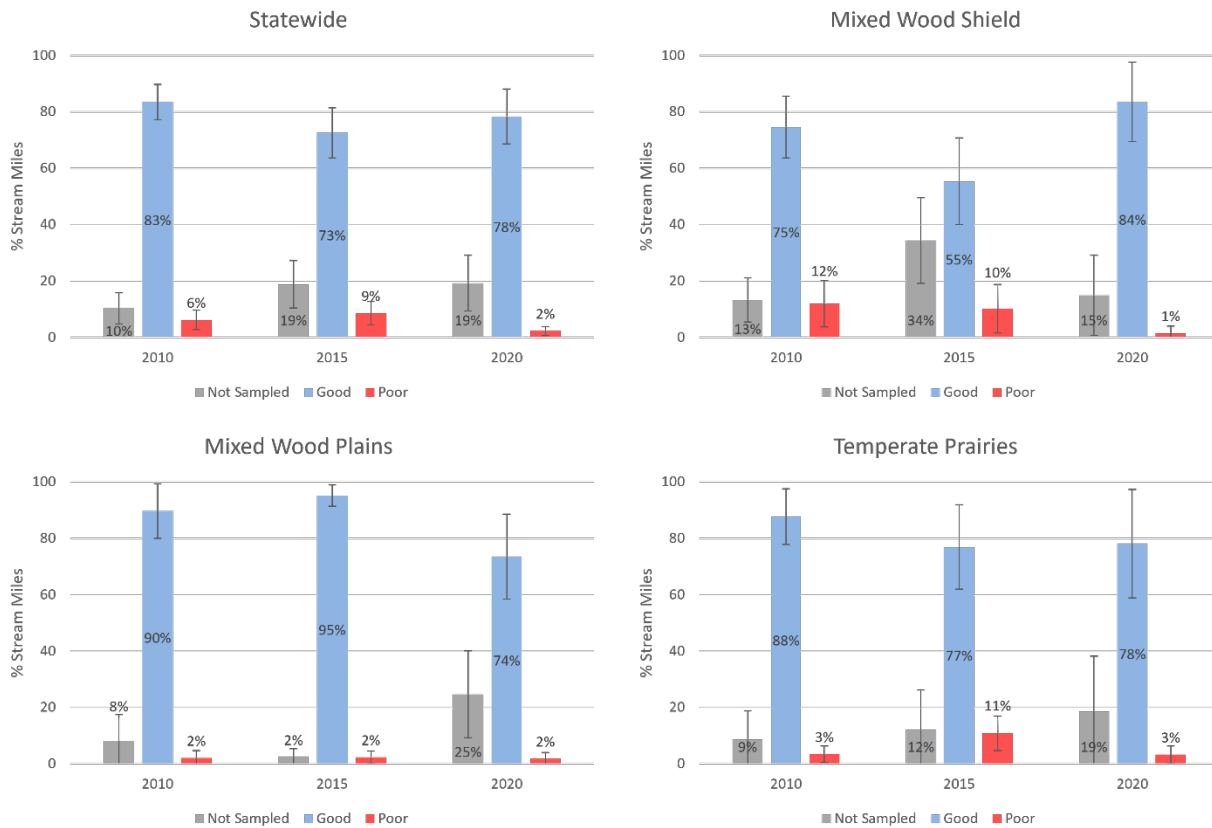
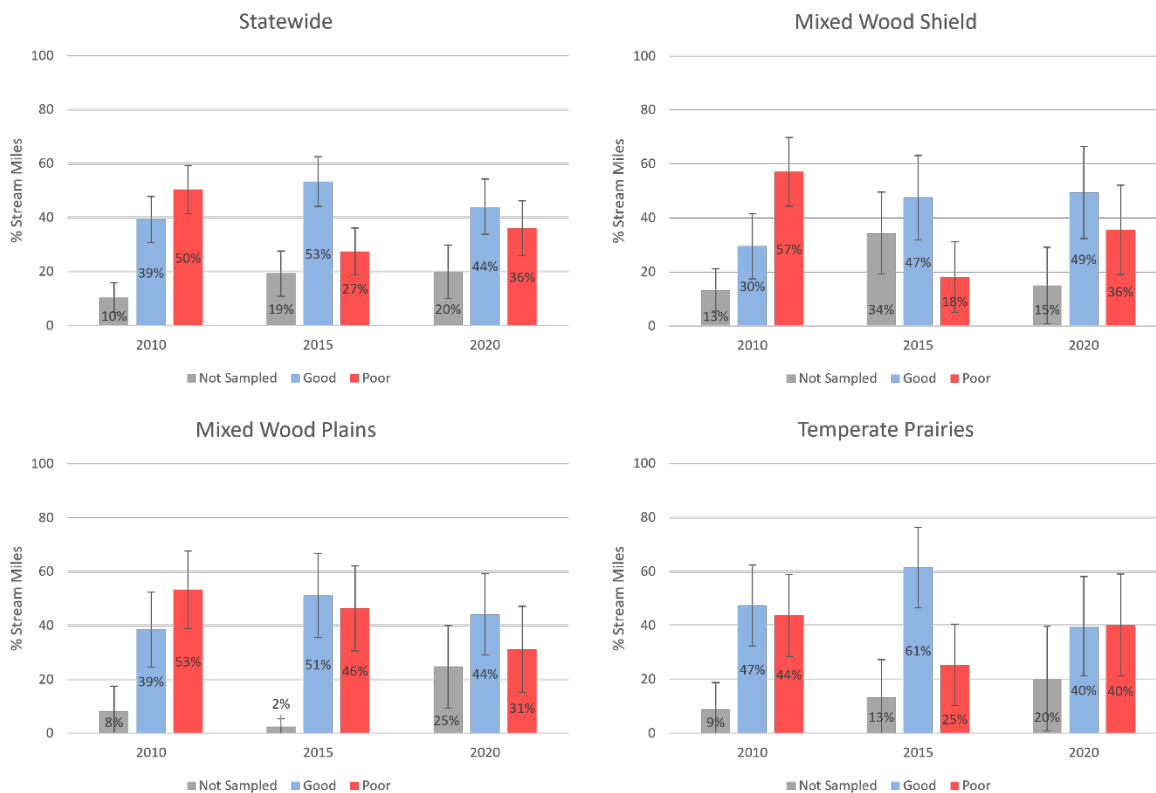


Figure 13. Estimated percentage of stream miles with good or poor phosphorus ratings statewide and within ecoregions between survey years. Bracketed lines represent the 95% confidence interval associated with each estimate. Values may not add up to 100% or corresponding totals due to rounding.



Biological integrity

A significant increase in mean F-IBI score was exhibited statewide between the 2010-2020 and the 2015-2020 surveys (Figure 14). Although mean F-IBI scores generally improved between time periods for all ecoregions, only the Mixed Wood Shield exhibited a significant increase from the 2010-2020 period.

The statewide estimates indicate that fish communities meet aquatic life use expectations and are considered healthy about 38 to 45% of the time (Figure 15) and fail to meet expectations 15 to 23% of the time. The Mixed Wood Shield had the highest estimated miles meeting expectations with 44 to 62%. Only about 33 to 38% of streams in the Mixed Wood Plains met the criteria, followed by the Temperate Prairies with 25 to 49%.

When evaluating change statewide in the estimated percentage of stream miles that score above the F-IBI aquatic life use threshold, only the percentage of not sampled stream miles between the 2010-2020 survey increased significantly (from 10 to 26%). This result is partially driven by the increased rate of landowner denial in the 2020 survey as the pandemic precluded in person visits for site access. However, as this same pattern is not observed in the M-IBI data it can also be partially attributed to the drought conditions experienced in 2021 as some sites that were sampleable for invertebrates during the relatively normal water year of 2020 were not sampleable for fish in the drought year of 2021.

Within ecoregions the percentage of stream miles not meeting expectations decreased significantly from 19 to 4% between the 2010-2015 survey within the Mixed Wood Shield, but the difference was not significant between the 2010-2020 survey. There was a significant decrease in the percentage of stream

miles meeting expectations within the Temperate Prairies (from 49 to 25%) and the proportion not meeting (from 29 to 9%) within the Mixed Wood Plains between the 2015-2020 surveys. These results appear to be driven predominantly by parallel significant increases in the percentage of stream miles not sampled rather than any meaningful improvement or decline in biological condition.

Figure 14. Mean fish IBI scores between survey years statewide and within each ecoregion. Bracketed lines represent the 95% confidence interval associated with each value.

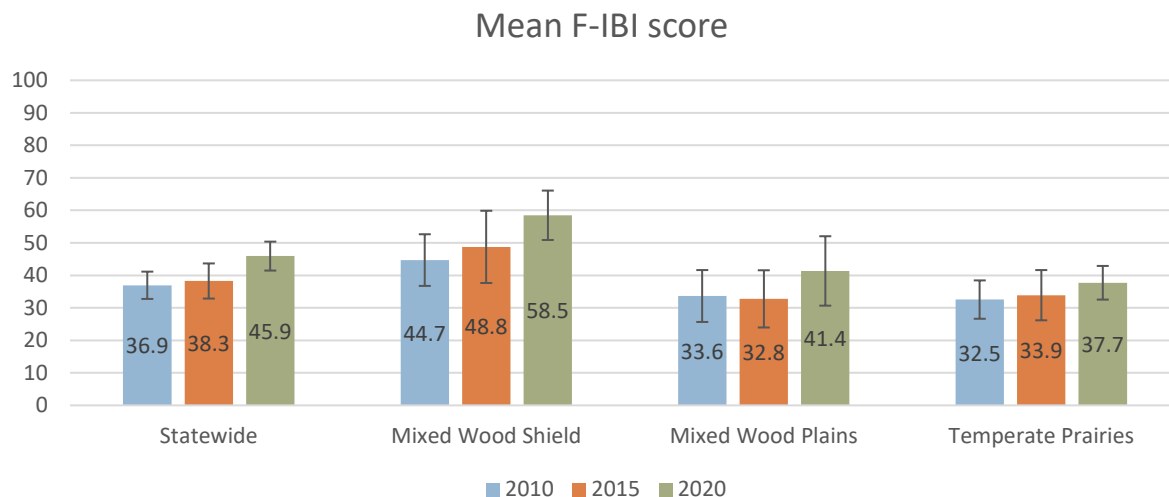
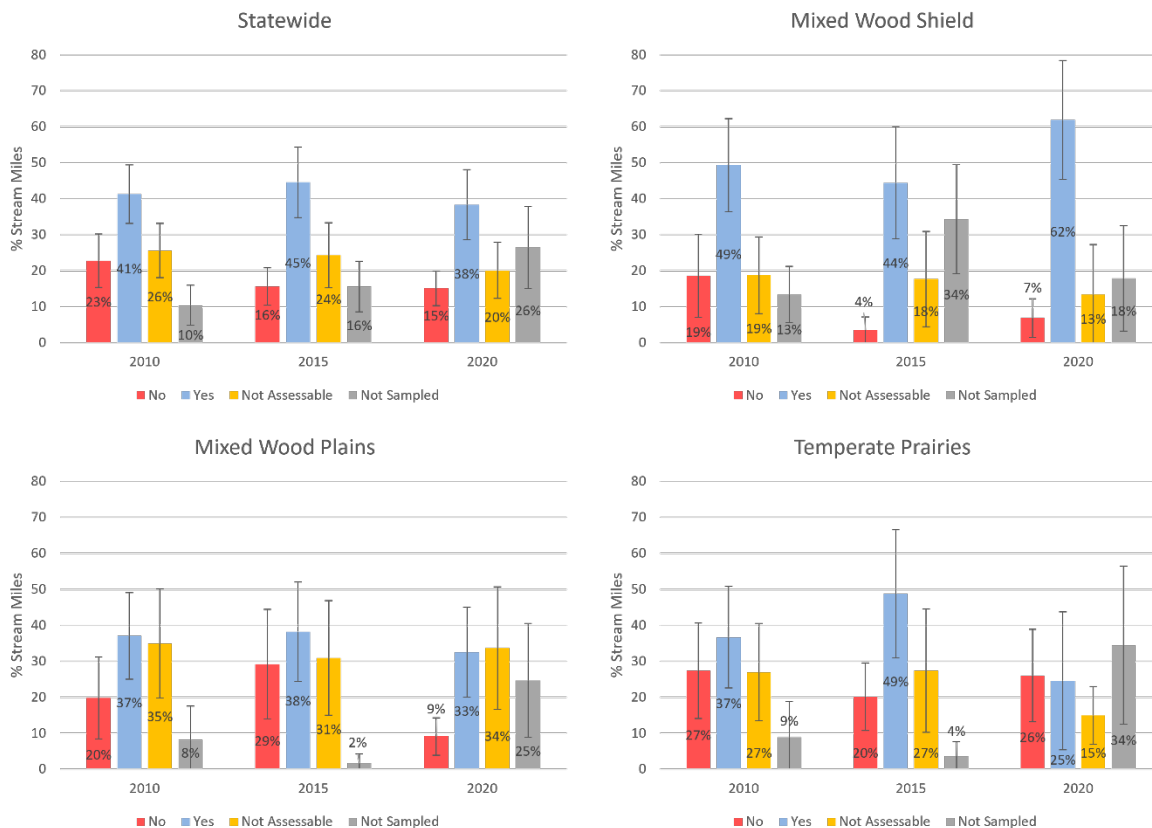


Figure 15. Estimated percentage of stream miles that meet fish IBI aquatic life use expectations statewide and within ecoregions between survey years. Bracketed lines represent the 95% confidence interval associated with each estimate. Values may not add up to 100% or corresponding totals due to rounding.



A significant increase in mean M-IBI score was exhibited statewide between the 2010-2015 and the 2010-2020 surveys (Figure 16). Mean M-IBI scores remained relatively consistent across time periods within the Mixed Wood Plains ecoregion but exhibited a significant increase from 2010 to 2015 in the Mixed Wood Shield and the Temperate Prairies from 2010 to 2020.

The statewide estimates indicate that macroinvertebrate communities meet or exceed the aquatic life criteria and are considered healthy about 30 to 35% of the time (Figure 17) and fail to meet criteria 20 to 32% of the time. The Mixed Wood Shield had the highest estimated miles meeting expectations with 34 to 45%. About 28 to 37% of streams in the Mixed Wood Plains met or exceeded the criteria, followed by the Temperate Prairies with 20 to 33%.

When evaluating change between surveys statewide, the percentage of stream miles that did not meet macroinvertebrate aquatic life use expectations decreased significantly between 2010 and 2015 (from 32 to 20%) but then reverted to 32% in 2020. Otherwise only the proportion of stream miles not sampled increased significantly between 2010 and 2015 (14 to 30%) and not assessable stream miles decreased from 2010 to 2020 (22 to 13%).

There were no significant differences between time periods within the Temperate Prairies ecoregion for M-IBI categories. Within the Mixed Wood Plains only the percentage of not assessable stream miles decreased significantly between the 2010-2015 period (from 30 to 11%), all others remained relatively consistent across survey years. The percent of stream miles within the Mixed Wood Shield not meeting macroinvertebrate expectations dropped significantly in 2015 compared to 2010 (25 to 4%), but then increased substantially in 2020 (37%). This result appears driven by an equal but opposite significant increase, then decrease in the percent of not sampled stream miles from 2010-2015 and 2015-2020. The Mixed Wood Shield also had significantly less stream miles that were not assessable in 2020 than it did in 2010 or 2015.

Figure 16. Mean macroinvertebrate IBI scores between survey years statewide and within each ecoregion. Bracketed lines represent the 95% confidence interval associated with each value.

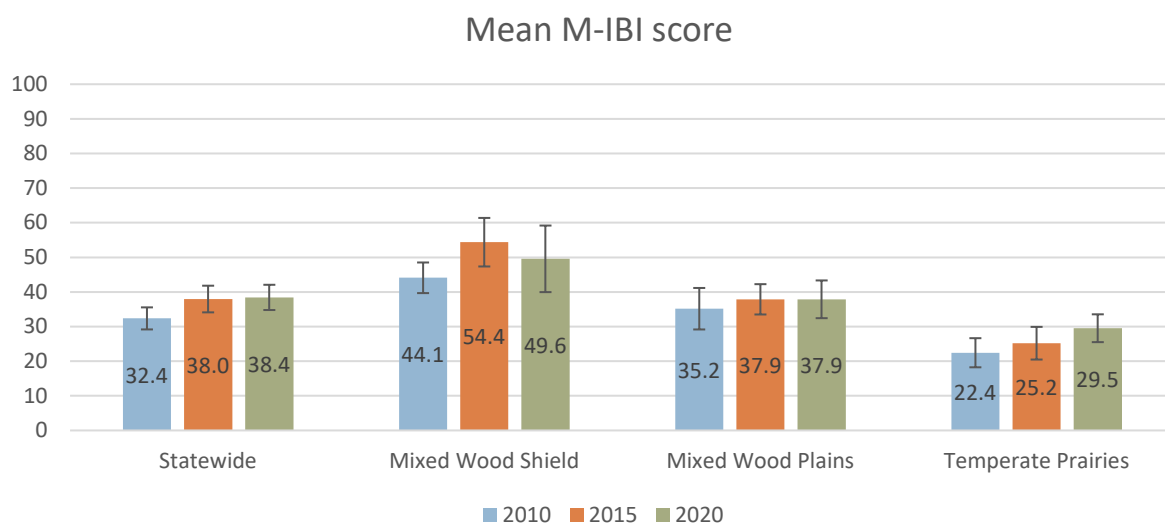
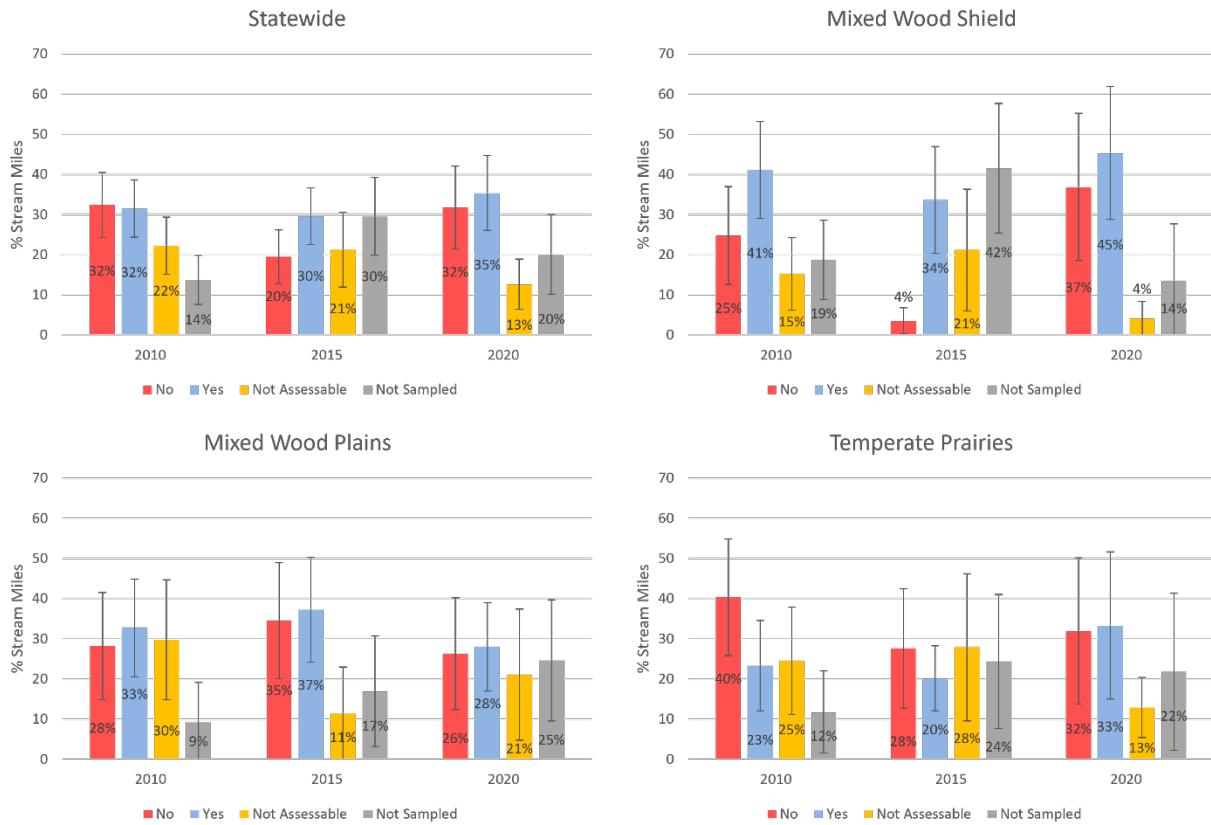


Figure 17. Estimated percentage of stream miles that meet macroinvertebrate IBI aquatic life use expectations statewide and within ecoregions between survey years. Bracketed lines represent the 95% confidence interval associated with each estimate. Values may not add up to 100% or corresponding totals due to rounding.



References

- Bouchard, R.W., Jr. 2016. Development of Biological Criteria for Tiered Aquatic Life Uses: Fish and macroinvertebrate thresholds for attainment of aquatic life use goals in Minnesota streams and rivers. Minnesota Pollution Control Agency, St. Paul, MN. 64 pp.
- Chirhart, J. 2014. Development of a Macroinvertebrate-Based Index of Biological Integrity for Minnesota's Rivers and Streams. Minnesota Pollution Control Agency, St. Paul, MN. 57 pp.
- Heiskary, S., R.W. Bouchard Jr., and H. Markus. 2010. Minnesota Nutrient Criteria Development for Rivers. Minnesota Pollution Control Agency, St. Paul, MN. 197 pp.
- Dumelle, M., T.M. Kincaid, A.R. Olsen, and M.H. Weber. 2022. Spsurvey: Spatial Survey Design and Analysis. R package version 3.3.0.
- Markus, H.D. 2011. Aquatic Life Water Quality Standards Draft Technical Support Document for Total Suspended Solids (Turbidity): 2011 Triennial Water Quality Standard Amendments to Minn. R. chs. 7050 and 7052. Minnesota Pollution Control Agency, St. Paul, MN. 50 pp.
- Minnesota Pollution Control Agency (MPCA). 2014. The Condition of Rivers and Streams in Minnesota: Based on Probabilistic Surveys, 1995-2011. Minnesota Pollution Control Agency, St. Paul, MN. 145 pp.
- Minnesota Pollution Control Agency (MPCA). 2017a. Fish Data Collection Protocols for Lotic Waters in Minnesota: Sample Collection, Sample Processing, and Calculation of Indices of Biotic Integrity. Minnesota Pollution Control Agency, St. Paul, MN. 29 pp.
<https://www.pca.state.mn.us/sites/default/files/wq-bsm3-12b.pdf>
- Minnesota Pollution Control Agency (MPCA). 2017b. Macroinvertebrate Data Collection Protocols for Lotic Waters in Minnesota: Sample Collection, Sample Processing, and Calculation of Indices of Biotic Integrity for Qualitative Multihabitat Samples. Minnesota Pollution Control Agency, St. Paul, MN. 69 pp.
<https://www.pca.state.mn.us/sites/default/files/wq-bsm3-12a.pdf>
- Minnesota Pollution Control Agency (MPCA). 2017c. MPCA Stream Habitat Assessment (MSHA) Protocol for Stream Monitoring Sites. Minnesota Pollution Control Agency, St. Paul, MN. 12 pp.
<https://www.pca.state.mn.us/sites/default/files/wq-bsm3-02.pdf>
- Minnesota Pollution Control Agency (MPCA). 2018. Minnesota's 2015 Rivers and Streams Probabilistic Survey Results. Minnesota Pollution Control Agency, St. Paul, MN. 37 pp.
- Omernik, J.M. 1987. Ecoregions of the conterminous United States (map supplement). *Annals of the Association of American Geographers* 77:118–125.
- R Core Team. 2021. R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. <https://www.R-project.org/>.
- Sandberg, J. 2014. Development of a Fish-Based Index of Biological Integrity for Minnesota's Rivers and Streams. Minnesota Pollution Control Agency, St. Paul, MN. 63 pp.
- Stevens, D.L., Jr. and A.R. Olsen. 2004. Spatially-balanced sampling of natural resources. *Journal of the American Statistical Association* 99:262-277.
- U.S. Environmental Protection Agency (EPA). 2005. Use of Biological Information to Better Define Designated Aquatic Life Uses in State and Tribal Water Quality Standards: Tiered Aquatic Life Uses. Public Science Review Draft. EPA-822-R-05-001. Washington, DC.

Appendix 1. Indicator abbreviations and explanations

Indicator Name	Explanation
Chan	Channel condition - Natural or Ditched
Conduct	Conductivity ($\mu\text{mhos/cm}$)
DO	Dissolved Oxygen (mg/L)
DrainSqMi	Drainage area in square miles for each site
FishIBI	Fish IBI score (0-100)
Gradient	Gradient (m/km)
MacroIBI	Macroinvertebrate IBI score (0-100)
MeetsFishThreshold	Yes or No, based on thresholds established for each fish class
MeetsInvertThreshold	Yes or No, based on thresholds established for each invert class
MSHA	MPCA Stream Habitat Assessment (MSHA) score
MSHA_Rating	Good, Fair, Poor habitat rating based on distribution of MSHA scores
NH4	Total Ammonia (mg/L)
Nitrogen	Nitrite/Nitrate (mg/L)
pH	Quantitative measure of the acidity or basicity of aqueous or other liquid solutions
Phos	Total Phosphorus (mg/L)
Phos Rating	Good or Poor rating based on concentration above/below standard
SecchiTube	Measure of stream transparency, or water clarity
Sinuosity	Ratio of stream length to valley length (total length/straight-line length)
Site Status	Target Site, Land Owner Permission Denied, Physically Inaccessible
SO Group	Stream order group 1 st , 2 nd , 3 rd , or 4 th plus
Strahler Cat	Strahler category 1 st , 2 nd , 3 rd , or 4 th plus
TALU	Tiered Aquatic Life Use designation – E (exceptional), G (general), M (modified), 7 (class 7)
TempH2O	Water temperature ($^{\circ}\text{C}$) during fish sample
TSS	Total Suspended Solids (mg/L)
TSS Rating	Good or Poor rating based on concentration above/below standard

Appendix 2. Categorical data change analysis results (significant p-values in bold)

Survey_1	Survey_2	Type	Sub-population	Indicator	Category	DiffEst.P	StdError.P	Margin of Error.P	LCB95Pct.P	UCB95Pct.P	Z	Prob Z < 0	Prob Z ≠ 0
EMAP2010	EMAP2015	MNeco2	Mixed Wood Plains	SO Group	1	7.3983	9.4501	18.5218	-11.1235	25.9201	0.7829	0.7832	0.4337
EMAP2010	EMAP2015	MNeco2	Mixed Wood Plains	SO Group	2	0.5927	6.6320	12.9986	-12.4059	13.5912	0.0894	0.5356	0.9288
EMAP2010	EMAP2015	MNeco2	Mixed Wood Plains	SO Group	3	-4.6194	4.0385	7.9154	-12.5348	3.2960	-1.1438	0.1263	0.2527
EMAP2010	EMAP2015	MNeco2	Mixed Wood Plains	SO Group	4th+	-3.3716	4.5070	8.8336	-12.2051	5.4620	-0.7481	0.2272	0.4544
EMAP2010	EMAP2015	MNeco2	Mixed Wood Shield	SO Group	1	9.2217	7.9817	15.6438	-6.4221	24.8655	1.1554	0.8760	0.2479
EMAP2010	EMAP2015	MNeco2	Mixed Wood Shield	SO Group	2	-4.2358	6.3502	12.4462	-16.6820	8.2104	-0.6670	0.2524	0.5048
EMAP2010	EMAP2015	MNeco2	Mixed Wood Shield	SO Group	3	-1.9364	3.5056	6.8709	-8.8073	4.9345	-0.5524	0.2903	0.5807
EMAP2010	EMAP2015	MNeco2	Mixed Wood Shield	SO Group	4th+	-3.0495	2.2755	4.4599	-7.5094	1.4104	-1.3401	0.0901	0.1802
EMAP2010	EMAP2015	MNeco2	Temperate Prairies	SO Group	1	-2.0737	8.8823	17.4089	-19.4827	15.3352	-0.2335	0.4077	0.8154
EMAP2010	EMAP2015	MNeco2	Temperate Prairies	SO Group	2	-3.3455	7.0216	13.7622	-17.1077	10.4166	-0.4765	0.3169	0.6337
EMAP2010	EMAP2015	MNeco2	Temperate Prairies	SO Group	3	1.2588	2.9000	5.6840	-4.4252	6.9427	0.4341	0.6679	0.6642
EMAP2010	EMAP2015	MNeco2	Temperate Prairies	SO Group	4th+	4.1605	3.9819	7.8044	-3.6439	11.9649	1.0448	0.8520	0.2961
EMAP2010	EMAP2015	MNeco2	Mixed Wood Plains	Site Status	Target	1.3805	2.8751	5.6350	-4.2545	7.0156	0.4802	0.6844	0.6311
EMAP2010	EMAP2015	MNeco2	Mixed Wood Plains	Site Status	Target-Permission Denied	-1.3805	2.8751	5.6350	-7.0156	4.2545	-0.4802	0.3156	0.6311
EMAP2010	EMAP2015	MNeco2	Mixed Wood Plains	Site Status	Target-Physically Inaccessible	0.0000	0.0000	0.0000	0.0000	0.0000	#DIV/0!	#DIV/0!	#DIV/0!
EMAP2010	EMAP2015	MNeco2	Mixed Wood Shield	Site Status	Target	-16.7673	8.9802	17.6009	-34.3682	0.8335	-1.8671	0.0309	0.0619
EMAP2010	EMAP2015	MNeco2	Mixed Wood Shield	Site Status	Target-Permission Denied	2.7522	5.4631	10.7074	-7.9552	13.4596	0.5038	0.6928	0.6144
EMAP2010	EMAP2015	MNeco2	Mixed Wood Shield	Site Status	Target-Physically Inaccessible	14.0151	8.1723	16.0175	-2.0024	30.0326	1.7149	0.9568	0.0864
EMAP2010	EMAP2015	MNeco2	Temperate Prairies	Site Status	Target	5.2418	5.4527	10.6871	-5.4453	15.9290	0.9613	0.8318	0.3364
EMAP2010	EMAP2015	MNeco2	Temperate Prairies	Site Status	Target-Permission Denied	-6.5397	5.3019	10.3915	-16.9313	3.8518	-1.2335	0.1087	0.2174
EMAP2010	EMAP2015	MNeco2	Temperate Prairies	Site Status	Target-Physically Inaccessible	1.2979	1.1951	2.3423	-1.0444	3.6402	1.0861	0.8613	0.2775
EMAP2010	EMAP2015	MNeco2	Mixed Wood Plains	MSHA Rating	Fair	11.4088	10.7374	21.0449	-9.6360	32.4537	1.0625	0.8560	0.2880
EMAP2010	EMAP2015	MNeco2	Mixed Wood Plains	MSHA Rating	Good	1.5496	6.8814	13.4873	-11.9377	15.0369	0.2252	0.5891	0.8218
EMAP2010	EMAP2015	MNeco2	Mixed Wood Plains	MSHA Rating	Not Sampled	-6.5073	4.9381	9.6785	-16.1858	3.1712	-1.3178	0.0938	0.1876
EMAP2010	EMAP2015	MNeco2	Mixed Wood Plains	MSHA Rating	Poor	-6.4511	9.3808	18.3861	-24.8373	11.9350	-0.6877	0.2458	0.4916
EMAP2010	EMAP2015	MNeco2	Mixed Wood Shield	MSHA Rating	Fair	-12.5540	9.1182	17.8713	-30.4253	5.3173	-1.3768	0.0843	0.1686
EMAP2010	EMAP2015	MNeco2	Mixed Wood Shield	MSHA Rating	Good	-12.9165	5.6844	11.1412	-24.0577	-1.7754	-2.2723	0.0115	0.0231
EMAP2010	EMAP2015	MNeco2	Mixed Wood Shield	MSHA Rating	Not Sampled	15.5620	9.0467	17.7313	-2.1693	33.2933	1.7202	0.9573	0.0854
EMAP2010	EMAP2015	MNeco2	Mixed Wood Shield	MSHA Rating	Poor	9.9086	6.3769	12.4984	-2.5899	22.4070	1.5538	0.9399	0.1202
EMAP2010	EMAP2015	MNeco2	Temperate Prairies	MSHA Rating	Fair	10.2781	11.5387	22.6153	-12.3372	32.8934	0.8908	0.8135	0.3731
EMAP2010	EMAP2015	MNeco2	Temperate Prairies	MSHA Rating	Good	-6.8530	3.2640	6.3973	-13.2504	-0.4557	-2.0996	0.0179	0.0358
EMAP2010	EMAP2015	MNeco2	Temperate Prairies	MSHA Rating	Not Sampled	-5.2418	5.4527	10.6871	-15.9290	5.4453	-0.9613	0.1682	0.3364
EMAP2010	EMAP2015	MNeco2	Temperate Prairies	MSHA Rating	Poor	1.8168	10.9731	21.5068	-19.6900	23.3236	0.1656	0.5658	0.8685
EMAP2010	EMAP2015	MNeco2	Mixed Wood Plains	Phos Rating	Good	12.6585	9.4464	18.5146	-5.8561	31.1731	1.3400	0.9099	0.1802
EMAP2010	EMAP2015	MNeco2	Mixed Wood Plains	Phos Rating	Not Sampled	-5.7123	4.9863	9.7730	-15.4853	4.0607	-1.1456	0.1260	0.2520
EMAP2010	EMAP2015	MNeco2	Mixed Wood Plains	Phos Rating	Poor	-6.9462	9.7789	19.1663	-26.1125	12.2201	-0.7103	0.2388	0.4775
EMAP2010	EMAP2015	MNeco2	Mixed Wood Shield	Phos Rating	Good	17.8935	9.6955	19.0027	-1.1093	36.8962	1.8456	0.9675	0.0650
EMAP2010	EMAP2015	MNeco2	Mixed Wood Shield	Phos Rating	Not Sampled	20.9797	8.7298	17.1102	3.8696	38.0899	2.4032	0.9919	0.0163
EMAP2010	EMAP2015	MNeco2	Mixed Wood Shield	Phos Rating	Poor	-38.8732	9.1175	17.8699	-56.7431	-21.0033	-4.2636	0.0000	0.0000
EMAP2010	EMAP2015	MNeco2	Temperate Prairies	Phos Rating	Good	14.0044	10.6269	20.8283	-6.8239	34.8327	1.3178	0.9062	0.1876
EMAP2010	EMAP2015	MNeco2	Temperate Prairies	Phos Rating	Not Sampled	4.3311	8.8226	17.2919	-12.9608	21.6231	0.4909	0.6883	0.6235
EMAP2010	EMAP2015	MNeco2	Temperate Prairies	Phos Rating	Poor	-18.3355	10.7793	21.1270	-39.4625	2.7914	-1.7010	0.0445	0.0889
EMAP2010	EMAP2015	MNeco2	Mixed Wood Plains	TSS Rating	Good	5.4757	5.2849	10.3583	-4.8825	15.8340	1.0361	0.8499	0.3002
EMAP2010	EMAP2015	MNeco2	Mixed Wood Plains	TSS Rating	Not Sampled	-5.7123	4.9863	9.7730	-15.4853	4.0607	-1.1456	0.1260	0.2520
EMAP2010	EMAP2015	MNeco2	Mixed Wood Plains	TSS Rating	Poor	0.2366	1.7499	3.4297	-3.1931	3.6663	0.1352	0.5538	0.8925
EMAP2010	EMAP2015	MNeco2	Mixed Wood Shield	TSS Rating	Good	-19.1944	9.4812	18.5829	-37.7773	-0.6116	-2.0245	0.0215	0.0429
EMAP2010	EMAP2015	MNeco2	Mixed Wood Shield	TSS Rating	Not Sampled	20.9797	8.7298	17.1102	3.8696	38.0899	2.4032	0.9919	0.0163
EMAP2010	EMAP2015	MNeco2	Mixed Wood Shield	TSS Rating	Poor	-1.7853	6.0956	11.9471	-13.7324	10.1618	-0.2929	0.3848	0.7696
EMAP2010	EMAP2015	MNeco2	Temperate Prairies	TSS Rating	Good	-10.7465	9.0295	17.6976	-28.4440	6.9511	-1.1901	0.1170	0.2340
EMAP2010	EMAP2015	MNeco2	Temperate Prairies	TSS Rating	Not Sampled	3.2869	8.7746	17.1979	-13.9110	20.4848	0.3746	0.6460	0.7080
EMAP2010	EMAP2015	MNeco2	Temperate Prairies	TSS Rating	Poor	7.4595	3.1132	6.1018	1.3578	13.5613	2.3961	0.9917	0.0166
EMAP2010	EMAP2015	MNeco2	Mixed Wood Plains	Chan	Ditched	7.4092	8.7952	17.2382	-9.8290	24.6474	0.8424	0.8002	0.3996
EMAP2010	EMAP2015	MNeco2	Mixed Wood Plains	Chan	Natural	-7.4092	8.7952	17.2382	-24.6474	9.8290	-0.8424	0.1998	0.3996
EMAP2010	EMAP2015	MNeco2	Mixed Wood Shield	Chan	Ditched	0.4917	7.8971	15.4781	-14.9864	15.9698	0.0623	0.5248	0.9504
EMAP2010	EMAP2015	MNeco2	Mixed Wood Shield	Chan	Natural	-0.4917	7.8971	15.4781	-15.9698	14.9864	-0.0623	0.4752	0.9504

Survey_1	Survey_2	Type	Sub-population	Indicator	Category	DiffEst.P	StdError.P	Margin of Error.P	LCB95Pct.P	UCB95Pct.P	Z	Prob Z < 0	Prob Z ≠ 0
EMAP2010	EMAP2015	All Sites	All Sites	Site Status	Target-Permission Denied	-1.9394	3.2906	6.4495	-8.3890	4.5101	-0.5894	0.2778	0.5556
EMAP2010	EMAP2015	All Sites	All Sites	Site Status	Target-Physically Inaccessible	6.4589	3.4225	6.7080	-0.2490	13.1669	1.8872	0.9704	0.0591
EMAP2010	EMAP2015	All Sites	All Sites	MSHA Rating	Fair	2.5302	6.1886	12.1295	-9.5993	14.6596	0.4088	0.6587	0.6827
EMAP2010	EMAP2015	All Sites	All Sites	MSHA Rating	Good	-6.1916	3.1679	6.2091	-12.4007	0.0174	-1.9545	0.0253	0.0506
EMAP2010	EMAP2015	All Sites	All Sites	MSHA Rating	Not Sampled	3.0691	4.6573	9.1282	-6.0591	12.1973	0.6590	0.7450	0.5099
EMAP2010	EMAP2015	All Sites	All Sites	MSHA Rating	Poor	0.5924	5.3267	10.4401	-9.8477	11.0324	0.1112	0.5443	0.9115
EMAP2010	EMAP2015	All Sites	All Sites	Phos Rating	Good	14.0653	6.0498	11.8574	2.2079	25.9226	2.3249	0.9900	0.0201
EMAP2010	EMAP2015	All Sites	All Sites	Phos Rating	Not Sampled	8.8951	5.1396	10.0734	-1.1783	18.9685	1.7307	0.9582	0.0835
EMAP2010	EMAP2015	All Sites	All Sites	Phos Rating	Poor	-22.9603	6.0145	11.7881	-34.7485	-11.1722	-3.8175	0.0001	0.0001
EMAP2010	EMAP2015	All Sites	All Sites	TSS Rating	Good	-10.9139	5.4476	10.6771	-21.5910	-0.2367	-2.0034	0.0226	0.0451
EMAP2010	EMAP2015	All Sites	All Sites	TSS Rating	Not Sampled	8.5191	5.1313	10.0572	-1.5382	18.5763	1.6602	0.9516	0.0969
EMAP2010	EMAP2015	All Sites	All Sites	TSS Rating	Poor	2.3948	2.6159	5.1270	-2.7322	7.5218	0.9155	0.8200	0.3599
EMAP2010	EMAP2015	All Sites	All Sites	Chan	Ditched	-4.3017	5.0737	9.9443	-14.2460	5.6427	-0.8478	0.1983	0.3965
EMAP2010	EMAP2015	All Sites	All Sites	Chan	Natural	4.3017	5.0737	9.9443	-5.6427	14.2460	0.8478	0.8017	0.3965
EMAP2010	EMAP2015	All Sites	All Sites	Meets Fish Threshold	No	-7.2078	4.1883	8.2090	-15.4168	1.0012	-1.7209	0.0426	0.0853
EMAP2010	EMAP2015	All Sites	All Sites	Meets Fish Threshold	Not Assessable	-1.3346	4.2682	8.3656	-9.7001	7.0310	-0.3127	0.3773	0.7545
EMAP2010	EMAP2015	All Sites	All Sites	Meets Fish Threshold	Not Sampled	5.2606	4.5662	8.9496	-3.6890	14.2103	1.1521	0.8754	0.2493
EMAP2010	EMAP2015	All Sites	All Sites	Meets Fish Threshold	Yes	3.2818	5.4241	10.6310	-7.3493	13.9128	0.6050	0.7274	0.5452
EMAP2010	EMAP2015	All Sites	All Sites	TALU	7	0.5939	0.7498	1.4696	-0.8758	2.0635	0.7920	0.7858	0.4284
EMAP2010	EMAP2015	All Sites	All Sites	TALU	E	-0.1866	0.7344	1.4394	-1.6260	1.2528	-0.2541	0.3997	0.7994
EMAP2010	EMAP2015	All Sites	All Sites	TALU	G	1.4251	5.0690	9.9351	-8.5100	11.3602	0.2811	0.6107	0.7786
EMAP2010	EMAP2015	All Sites	All Sites	TALU	M	-6.3518	4.8445	9.4951	-15.8469	3.1432	-1.3111	0.0949	0.1898
EMAP2010	EMAP2015	All Sites	All Sites	TALU	Not Sampled	4.5195	4.5784	8.9735	-4.4540	13.4930	0.9871	0.8382	0.3236
EMAP2010	EMAP2015	All Sites	All Sites	Meets Invert Threshold	No	-12.8849	4.8447	9.4954	-22.3803	-3.3895	-2.6596	0.0039	0.0078
EMAP2010	EMAP2015	All Sites	All Sites	Meets Invert Threshold	Not Assessable	-1.0266	5.5447	10.8674	-11.8940	9.8408	-0.1851	0.4266	0.8531
EMAP2010	EMAP2015	All Sites	All Sites	Meets Invert Threshold	Not Sampled	15.7989	5.4319	10.6463	5.1526	26.4453	2.9086	0.9982	0.0036
EMAP2010	EMAP2015	All Sites	All Sites	Meets Invert Threshold	Yes	-1.8874	4.7131	9.2375	-11.1250	7.3501	-0.4005	0.3444	0.6888
EMAP2010	EMAP2015	All Sites	All Sites	Strahler Cat	1st	4.3318	5.0564	9.9104	-5.5787	14.2422	0.8567	0.8042	0.3916
EMAP2010	EMAP2015	All Sites	All Sites	Strahler Cat	2nd	-2.5469	3.8654	7.5761	-10.1231	5.0292	-0.6589	0.2550	0.5100
EMAP2010	EMAP2015	All Sites	All Sites	Strahler Cat	3rd	-1.2216	2.0809	4.0784	-5.3000	2.8569	-0.5870	0.2786	0.5572
EMAP2010	EMAP2015	All Sites	All Sites	Strahler Cat	4th+	-0.5633	1.9453	3.8128	-4.3760	3.2495	-0.2895	0.3861	0.7722
EMAP2010	EMAP2020	MNeco2	Mixed Wood Plains	SO Group	1	18.1290	11.3315	22.2093	-4.0803	40.3383	1.5999	0.9452	0.1096
EMAP2010	EMAP2020	MNeco2	Mixed Wood Plains	SO Group	2	-5.1487	7.5470	14.7919	-19.9406	9.6432	-0.6822	0.2476	0.4951
EMAP2010	EMAP2020	MNeco2	Mixed Wood Plains	SO Group	3	-6.1857	5.0670	9.9311	-16.1167	3.7454	-1.2208	0.1111	0.2222
EMAP2010	EMAP2020	MNeco2	Mixed Wood Plains	SO Group	4th+	-6.7947	5.6281	11.0308	-17.8255	4.2362	-1.2073	0.1137	0.2273
EMAP2010	EMAP2020	MNeco2	Mixed Wood Shield	SO Group	1	-6.8781	12.1970	23.9057	-30.7838	17.0275	-0.5639	0.2864	0.5728
EMAP2010	EMAP2020	MNeco2	Mixed Wood Shield	SO Group	2	1.7343	8.1213	15.9174	-14.1831	17.6517	0.2136	0.5846	0.8309
EMAP2010	EMAP2020	MNeco2	Mixed Wood Shield	SO Group	3	2.7743	5.9004	11.5645	-8.7902	14.3388	0.4702	0.6809	0.6382
EMAP2010	EMAP2020	MNeco2	Mixed Wood Shield	SO Group	4th+	2.3695	5.4474	10.6768	-8.3073	13.0463	0.4350	0.6682	0.6636
EMAP2010	EMAP2020	MNeco2	Temperate Prairies	SO Group	1	-6.7312	14.8973	29.1981	-35.9293	22.4669	-0.4518	0.3257	0.6514
EMAP2010	EMAP2020	MNeco2	Temperate Prairies	SO Group	2	0.7294	8.5261	16.7109	-15.9815	17.4403	0.0856	0.5341	0.9318
EMAP2010	EMAP2020	MNeco2	Temperate Prairies	SO Group	3	2.0673	5.9402	11.6426	-9.5753	13.7099	0.3480	0.6361	0.7278
EMAP2010	EMAP2020	MNeco2	Temperate Prairies	SO Group	4th+	3.9345	6.6100	12.9554	-9.0209	16.8899	0.5952	0.7242	0.5517
EMAP2010	EMAP2020	MNeco2	Mixed Wood Plains	Site Status	Target	-19.5988	8.4364	16.5351	-36.1339	-3.0636	-2.3231	0.0101	0.0202
EMAP2010	EMAP2020	MNeco2	Mixed Wood Plains	Site Status	Target-Permission Denied	19.5988	8.4364	16.5351	3.0636	36.1339	2.3231	0.9899	0.0202
EMAP2010	EMAP2020	MNeco2	Mixed Wood Plains	Site Status	Target-Physically Inaccessible	0.0000	0.0000	0.0000	0.0000	0.0000	#DIV/0!	#DIV/0!	#DIV/0!
EMAP2010	EMAP2020	MNeco2	Mixed Wood Shield	Site Status	Target	0.0808	8.2257	16.1221	-16.0413	16.2030	0.0098	0.5039	0.9922
EMAP2010	EMAP2020	MNeco2	Mixed Wood Shield	Site Status	Target-Permission Denied	-5.5677	2.5132	4.9257	-10.4934	-0.6419	-2.2154	0.0134	0.0267
EMAP2010	EMAP2020	MNeco2	Mixed Wood Shield	Site Status	Target-Physically Inaccessible	5.4868	8.0323	15.7429	-10.2561	21.2298	0.6831	0.7527	0.4945
EMAP2010	EMAP2020	MNeco2	Temperate Prairies	Site Status	Target	-8.6548	11.2170	21.9849	-30.6397	13.3301	-0.7716	0.2202	0.4404
EMAP2010	EMAP2020	MNeco2	Temperate Prairies	Site Status	Target-Permission Denied	8.6548	11.2170	21.9849	-13.3301	30.6397	0.7716	0.7798	0.4404
EMAP2010	EMAP2020	MNeco2	Temperate Prairies	Site Status	Target-Physically Inaccessible	0.0000	0.0000	0.0000	0.0000	0.0000	#DIV/0!	#DIV/0!	#DIV/0!
EMAP2010	EMAP2020	MNeco2	Mixed Wood Plains	MSHA Rating	Fair	-6.3900	10.4492	20.4801	-26.8700	14.0901	-0.6115	0.2704	0.5408
EMAP2010	EMAP2020	MNeco2	Mixed Wood Plains	MSHA Rating	Good	-9.7415	4.5179	8.8549	-18.5964	-0.8867	-2.1562	0.0155	0.0311
EMAP2010	EMAP2020	MNeco2	Mixed Wood Plains	MSHA Rating	Not Sampled	14.4720	9.3430	18.3120	-3.8400	32.7840	1.5490	0.9393	0.1214
EMAP2010	EMAP2020	MNeco2	Mixed Wood Plains	MSHA Rating	Poor	1.6595	11.0120	21.5832	-19.9237	23.2427	0.1507	0.5599	0.8802
EMAP2010	EMAP2020	MNeco2	Mixed Wood Shield	MSHA Rating	Fair	-17.6631	8.3136	16.2944	-33.9575	-1.3687	-2.1246	0.0168	0.0336
EMAP2010	EMAP2020	MNeco2	Mixed Wood Shield	MSHA Rating	Good	-0.9526	8.4496	16.5608	-17.5134	15.6082	-0.1127	0.4551	0.9102

Survey_1	Survey_2	Type	Sub-population	Indicator	Category	DiffEst.P	StdError.P	Margin of Error.P	LCB95Pct.P	UCB95Pct.P	Z	Prob Z < 0	Prob Z ≠ 0
EMAP2010	EMAP2020	MNeco2	Mixed Wood Shield	MSHA Rating	Not Sampled	-1.2862	8.2983	16.2644	-17.5506	14.9782	-0.1550	0.4384	0.8768
EMAP2010	EMAP2020	MNeco2	Mixed Wood Shield	MSHA Rating	Poor	19.9019	9.6681	18.9491	0.9528	38.8510	2.0585	0.9802	0.0395
EMAP2010	EMAP2020	MNeco2	Temperate Prairies	MSHA Rating	Fair	8.7757	12.3558	24.2169	-15.4412	32.9927	0.7103	0.7612	0.4775
EMAP2010	EMAP2020	MNeco2	Temperate Prairies	MSHA Rating	Good	-11.3854	4.1746	8.1821	-19.5675	-3.2032	-2.7273	0.0032	0.0064
EMAP2010	EMAP2020	MNeco2	Temperate Prairies	MSHA Rating	Not Sampled	8.6548	11.2170	21.9849	-13.3301	30.6397	0.7716	0.7798	0.4404
EMAP2010	EMAP2020	MNeco2	Temperate Prairies	MSHA Rating	Poor	-6.0451	12.1714	23.8554	-29.9006	17.8103	-0.4967	0.3097	0.6194
EMAP2010	EMAP2020	MNeco2	Mixed Wood Plains	Phos Rating	Good	5.6462	10.4825	20.5453	-14.8991	26.1914	0.5386	0.7049	0.5901
EMAP2010	EMAP2020	MNeco2	Mixed Wood Plains	Phos Rating	Not Sampled	16.4925	9.1790	17.9905	-1.4980	34.4831	1.7968	0.9638	0.0724
EMAP2010	EMAP2020	MNeco2	Mixed Wood Plains	Phos Rating	Poor	-22.1387	10.9562	21.4738	-43.6125	-0.6650	-2.0207	0.0217	0.0433
EMAP2010	EMAP2020	MNeco2	Mixed Wood Shield	Phos Rating	Good	19.9060	10.6830	20.9382	-1.0322	40.8442	1.8633	0.9688	0.0624
EMAP2010	EMAP2020	MNeco2	Mixed Wood Shield	Phos Rating	Not Sampled	1.6110	8.2834	16.2351	-14.6241	17.8461	0.1945	0.5771	0.8458
EMAP2010	EMAP2020	MNeco2	Mixed Wood Shield	Phos Rating	Poor	-21.5171	10.6413	20.8566	-42.3736	-0.6605	-2.0220	0.0216	0.0432
EMAP2010	EMAP2020	MNeco2	Temperate Prairies	Phos Rating	Good	-7.7776	12.1057	23.7268	-31.5044	15.9492	-0.6425	0.2603	0.5206
EMAP2010	EMAP2020	MNeco2	Temperate Prairies	Phos Rating	Not Sampled	11.3270	11.1314	21.8172	-10.4902	33.1442	1.0176	0.8456	0.3089
EMAP2010	EMAP2020	MNeco2	Temperate Prairies	Phos Rating	Poor	-3.5494	12.3777	24.2599	-27.8092	20.7105	-0.2868	0.3872	0.7743
EMAP2010	EMAP2020	MNeco2	Mixed Wood Plains	TSS Rating	Good	-16.1801	9.1228	17.8803	-34.0604	1.7002	-1.7736	0.0381	0.0761
EMAP2010	EMAP2020	MNeco2	Mixed Wood Plains	TSS Rating	Not Sampled	16.4925	9.1790	17.9905	-1.4980	34.4831	1.7968	0.9638	0.0724
EMAP2010	EMAP2020	MNeco2	Mixed Wood Plains	TSS Rating	Poor	-0.3124	1.7470	3.4240	-3.7365	3.1116	-0.1788	0.4290	0.8581
EMAP2010	EMAP2020	MNeco2	Mixed Wood Shield	TSS Rating	Good	8.8955	9.1195	17.8739	-8.9784	26.7694	0.9754	0.8353	0.3293
EMAP2010	EMAP2020	MNeco2	Mixed Wood Shield	TSS Rating	Not Sampled	1.6110	8.2834	16.2351	-14.6241	17.8461	0.1945	0.5771	0.8458
EMAP2010	EMAP2020	MNeco2	Mixed Wood Shield	TSS Rating	Poor	-10.5065	4.4050	8.6336	-19.1401	-1.8729	-2.3851	0.0085	0.0171
EMAP2010	EMAP2020	MNeco2	Temperate Prairies	TSS Rating	Good	-9.6122	11.0321	21.6225	-31.2348	12.0103	-0.8713	0.1918	0.3836
EMAP2010	EMAP2020	MNeco2	Temperate Prairies	TSS Rating	Not Sampled	9.7467	11.1691	21.8911	-12.1443	31.6378	0.8727	0.8086	0.3829
EMAP2010	EMAP2020	MNeco2	Temperate Prairies	TSS Rating	Poor	-0.1345	2.1728	4.2586	-4.3931	4.1241	-0.0619	0.4753	0.9506
EMAP2010	EMAP2020	MNeco2	Mixed Wood Plains	Chan	Ditched	2.3750	10.6746	20.9219	-18.5469	23.2969	0.2225	0.5880	0.8239
EMAP2010	EMAP2020	MNeco2	Mixed Wood Plains	Chan	Natural	-2.3750	10.6746	20.9219	-23.2969	18.5469	-0.2225	0.4120	0.8239
EMAP2010	EMAP2020	MNeco2	Mixed Wood Shield	Chan	Ditched	-15.4826	5.8717	11.5083	-26.9909	-3.9744	-2.6368	0.0042	0.0084
EMAP2010	EMAP2020	MNeco2	Mixed Wood Shield	Chan	Natural	15.4826	5.8717	11.5083	3.9744	26.9909	2.6368	0.9958	0.0084
EMAP2010	EMAP2020	MNeco2	Temperate Prairies	Chan	Ditched	-3.1229	10.2772	20.1430	-23.2659	17.0200	-0.3039	0.3806	0.7612
EMAP2010	EMAP2020	MNeco2	Temperate Prairies	Chan	Natural	3.1229	10.2772	20.1430	-17.0200	23.2659	0.3039	0.6194	0.7612
EMAP2010	EMAP2020	MNeco2	Mixed Wood Plains	Meets Fish Threshold	No	-10.6711	6.3842	12.5129	-23.1839	1.8418	-1.6715	0.0473	0.0946
EMAP2010	EMAP2020	MNeco2	Mixed Wood Plains	Meets Fish Threshold	Not Assessable	-1.2867	11.6550	22.8433	-24.1300	21.5567	-0.1104	0.4560	0.9121
EMAP2010	EMAP2020	MNeco2	Mixed Wood Plains	Meets Fish Threshold	Not Sampled	16.4925	9.3586	18.3425	-1.8500	34.8350	1.7623	0.9610	0.0780
EMAP2010	EMAP2020	MNeco2	Mixed Wood Plains	Meets Fish Threshold	Yes	-4.5348	8.8425	17.3310	-21.8658	12.7962	-0.5128	0.3040	0.6081
EMAP2010	EMAP2020	MNeco2	Mixed Wood Shield	Meets Fish Threshold	No	-11.7384	6.4948	12.7296	-24.4680	0.9912	-1.8073	0.0354	0.0707
EMAP2010	EMAP2020	MNeco2	Mixed Wood Shield	Meets Fish Threshold	Not Assessable	-5.3482	8.9158	17.4746	-22.8228	12.1264	-0.5999	0.2743	0.5486
EMAP2010	EMAP2020	MNeco2	Mixed Wood Shield	Meets Fish Threshold	Not Sampled	4.5211	8.4852	16.6306	-12.1095	21.1517	0.5328	0.7029	0.5942
EMAP2010	EMAP2020	MNeco2	Mixed Wood Shield	Meets Fish Threshold	Yes	12.5654	10.7248	21.0203	-8.4549	33.5858	1.1716	0.8793	0.2413
EMAP2010	EMAP2020	MNeco2	Temperate Prairies	Meets Fish Threshold	No	-1.4030	9.4346	18.4916	-19.8946	17.0886	-0.1487	0.4409	0.8818
EMAP2010	EMAP2020	MNeco2	Temperate Prairies	Meets Fish Threshold	Not Assessable	-11.9986	8.0235	15.7257	-27.7243	3.7271	-1.4954	0.0674	0.1348
EMAP2010	EMAP2020	MNeco2	Temperate Prairies	Meets Fish Threshold	Not Sampled	25.5756	12.3057	24.1188	1.4567	49.6944	2.0783	0.9812	0.0377
EMAP2010	EMAP2020	MNeco2	Temperate Prairies	Meets Fish Threshold	Yes	-12.1739	12.1659	23.8447	-36.0186	11.6707	-1.0007	0.1585	0.3170
EMAP2010	EMAP2020	MNeco2	Mixed Wood Plains	TALU	7	0.0000	0.0000	0.0000	0.0000	0.0000	#DIV/0!	#DIV/0!	#DIV/0!
EMAP2010	EMAP2020	MNeco2	Mixed Wood Plains	TALU	E	0.5964	0.5317	1.0421	-0.4457	1.6385	1.1217	0.8690	0.2620
EMAP2010	EMAP2020	MNeco2	Mixed Wood Plains	TALU	G	-13.7212	11.3739	22.2924	-36.0137	8.5712	-1.2064	0.1138	0.2277
EMAP2010	EMAP2020	MNeco2	Mixed Wood Plains	TALU	M	-6.4739	10.5295	20.6375	-27.1114	14.1636	-0.6148	0.2693	0.5387
EMAP2010	EMAP2020	MNeco2	Mixed Wood Plains	TALU	Not Sampled	19.5988	8.4364	16.5351	3.0636	36.1339	2.3231	0.9899	0.0202
EMAP2010	EMAP2020	MNeco2	Mixed Wood Shield	TALU	7	0.0000	0.0000	0.0000	0.0000	0.0000	#DIV/0!	#DIV/0!	#DIV/0!
EMAP2010	EMAP2020	MNeco2	Mixed Wood Shield	TALU	E	0.8303	2.9742	5.8293	-4.9989	6.6596	0.2792	0.6099	0.7801
EMAP2010	EMAP2020	MNeco2	Mixed Wood Shield	TALU	G	3.1332	9.1853	18.0028	-14.8695	21.1360	0.3411	0.6335	0.7330
EMAP2010	EMAP2020	MNeco2	Mixed Wood Shield	TALU	M	-3.8827	3.6050	7.0658	-10.9485	3.1830	-1.0770	0.1407	0.2815
EMAP2010	EMAP2020	MNeco2	Mixed Wood Shield	TALU	Not Sampled	-0.0808	8.2257	16.1221	-16.2030	16.0413	-0.0098	0.4961	0.9922
EMAP2010	EMAP2020	MNeco2	Temperate Prairies	TALU	7	1.1806	2.8408	5.5678	-4.3872	6.7484	0.4156	0.6611	0.6777
EMAP2010	EMAP2020	MNeco2	Temperate Prairies	TALU	E	0.0000	0.0000	0.0000	0.0000	0.0000	#DIV/0!	#DIV/0!	#DIV/0!
EMAP2010	EMAP2020	MNeco2	Temperate Prairies	TALU	G	6.5707	10.1643	19.9217	-13.3510	26.4924	0.6464	0.7410	0.5180
EMAP2010	EMAP2020	MNeco2	Temperate Prairies	TALU	M	-16.4061	12.9534	25.3882	-41.7943	8.9821	-1.2665	0.1027	0.2053
EMAP2010	EMAP2020	MNeco2	Temperate Prairies	TALU	Not Sampled	8.6548	11.2170	21.9849	-13.3301	30.6397	0.7716	0.7798	0.4404
EMAP2010	EMAP2020	MNeco2	Mixed Wood Plains	Meets Invert Threshold	No	-1.9449	9.8446	19.2951	-21.2400	17.3503	-0.1976	0.4217	0.8434

Survey_1	Survey_2	Type	Sub-population	Indicator	Category	DiffEst.P	StdError.P	Margin of Error.P	LCB95Pct.P	UCB95Pct.P	Z	Prob Z < 0	Prob Z ≠ 0
EMAP2010	EMAP2020	MNeco2	Mixed Wood Plains	Meets Invert Threshold	Not Assessable	-8.7250	11.2842	22.1166	-30.8416	13.3916	-0.7732	0.2197	0.4394
EMAP2010	EMAP2020	MNeco2	Mixed Wood Plains	Meets Invert Threshold	Not Sampled	15.4098	9.2172	18.0654	-2.6556	33.4751	1.6719	0.9527	0.0946
EMAP2010	EMAP2020	MNeco2	Mixed Wood Plains	Meets Invert Threshold	Yes	-4.7399	8.3771	16.4189	-21.1588	11.6790	-0.5658	0.2858	0.5715
EMAP2010	EMAP2020	MNeco2	Mixed Wood Shield	Meets Invert Threshold	No	12.0820	11.2261	22.0028	-9.9207	34.0848	1.0762	0.8591	0.2818
EMAP2010	EMAP2020	MNeco2	Mixed Wood Shield	Meets Invert Threshold	Not Assessable	-11.1076	5.0818	9.9602	-21.0678	-1.1473	-2.1857	0.0144	0.0288
EMAP2010	EMAP2020	MNeco2	Mixed Wood Shield	Meets Invert Threshold	Not Sampled	-5.1689	8.7909	17.2299	-22.3988	12.0610	-0.5880	0.2783	0.5565
EMAP2010	EMAP2020	MNeco2	Mixed Wood Shield	Meets Invert Threshold	Yes	4.1945	10.4457	20.4732	-16.2787	24.6677	0.4016	0.6560	0.6880
EMAP2010	EMAP2020	MNeco2	Temperate Prairies	Meets Invert Threshold	No	-8.3373	11.8735	23.2716	-31.6089	14.9343	-0.7022	0.2413	0.4826
EMAP2010	EMAP2020	MNeco2	Temperate Prairies	Meets Invert Threshold	Not Assessable	-11.6727	7.8198	15.3266	-26.9993	3.6539	-1.4927	0.0678	0.1355
EMAP2010	EMAP2020	MNeco2	Temperate Prairies	Meets Invert Threshold	Not Sampled	10.0018	11.2847	22.1177	-12.1159	32.1195	0.8863	0.8123	0.3754
EMAP2010	EMAP2020	MNeco2	Temperate Prairies	Meets Invert Threshold	Yes	10.0083	10.9868	21.5337	-11.5255	31.5420	0.9109	0.8188	0.3623
EMAP2010	EMAP2020	MNeco2	Mixed Wood Plains	Strahler Cat	1st	18.1290	11.3315	22.2093	-4.0803	40.3383	1.5999	0.9452	0.1096
EMAP2010	EMAP2020	MNeco2	Mixed Wood Plains	Strahler Cat	2nd	-5.1487	7.5470	14.7919	-19.9406	9.6432	-0.6822	0.2476	0.4951
EMAP2010	EMAP2020	MNeco2	Mixed Wood Plains	Strahler Cat	3rd	-6.1857	5.0670	9.9311	-16.1167	3.7454	-1.2208	0.1111	0.2222
EMAP2010	EMAP2020	MNeco2	Mixed Wood Plains	Strahler Cat	4th+	-6.7947	5.6281	11.0308	-17.8255	4.2362	-1.2073	0.1137	0.2273
EMAP2010	EMAP2020	MNeco2	Mixed Wood Shield	Strahler Cat	1st	-6.8781	12.1970	23.9057	-30.7838	17.0275	-0.5639	0.2864	0.5728
EMAP2010	EMAP2020	MNeco2	Mixed Wood Shield	Strahler Cat	2nd	1.7343	8.1213	15.9174	-14.1831	17.6517	0.2136	0.5846	0.8309
EMAP2010	EMAP2020	MNeco2	Mixed Wood Shield	Strahler Cat	3rd	2.7743	5.9004	11.5645	-8.7902	14.3388	0.4702	0.6809	0.6382
EMAP2010	EMAP2020	MNeco2	Mixed Wood Shield	Strahler Cat	4th+	2.3695	5.4474	10.6768	-8.3073	13.0463	0.4350	0.6682	0.6636
EMAP2010	EMAP2020	MNeco2	Temperate Prairies	Strahler Cat	1st	-6.7312	14.8973	29.1981	-35.9293	22.4669	-0.4518	0.3257	0.6514
EMAP2010	EMAP2020	MNeco2	Temperate Prairies	Strahler Cat	2nd	0.7294	8.5261	16.7109	-15.9815	17.4403	0.0856	0.5341	0.9318
EMAP2010	EMAP2020	MNeco2	Temperate Prairies	Strahler Cat	3rd	2.0673	5.9402	11.6426	-9.5753	13.7099	0.3480	0.6361	0.7278
EMAP2010	EMAP2020	MNeco2	Temperate Prairies	Strahler Cat	4th+	3.9345	6.6100	12.9554	-9.0209	16.8899	0.5952	0.7242	0.5517
EMAP2010	EMAP2020	All Sites	All Sites	SO Group	1	-0.1563	7.7421	15.1743	-15.3305	15.0180	-0.0202	0.4919	0.9839
EMAP2010	EMAP2020	All Sites	All Sites	SO Group	2	-0.7674	4.7343	9.2790	-10.0464	8.5117	-0.1621	0.4356	0.8712
EMAP2010	EMAP2020	All Sites	All Sites	SO Group	3	0.1252	3.3466	6.5592	-6.4339	6.6844	0.0374	0.5149	0.9701
EMAP2010	EMAP2020	All Sites	All Sites	SO Group	4th+	0.7984	3.4736	6.8081	-6.0097	7.6065	0.2298	0.5909	0.8182
EMAP2010	EMAP2020	All Sites	All Sites	Site Status	Target	-8.5080	5.7641	11.2974	-19.8054	2.7894	-1.4760	0.0700	0.1399
EMAP2010	EMAP2020	All Sites	All Sites	Site Status	Target-Permission Denied	7.1580	5.3861	10.5566	-3.3987	17.7146	1.3290	0.9081	0.1839
EMAP2010	EMAP2020	All Sites	All Sites	Site Status	Target-Physically Inaccessible	1.3500	2.6761	5.2451	-3.8951	6.5951	0.5045	0.6930	0.6139
EMAP2010	EMAP2020	All Sites	All Sites	MSHA Rating	Fair	-3.4775	6.4014	12.5465	-16.0241	9.0690	-0.5432	0.2935	0.5870
EMAP2010	EMAP2020	All Sites	All Sites	MSHA Rating	Good	-8.3655	3.6516	7.1571	-15.5225	-1.2084	-2.2909	0.0110	0.0220
EMAP2010	EMAP2020	All Sites	All Sites	MSHA Rating	Not Sampled	7.0576	5.8270	11.4207	-4.3631	18.4783	1.2112	0.8871	0.2258
EMAP2010	EMAP2020	All Sites	All Sites	MSHA Rating	Poor	4.7854	6.5833	12.9031	-8.1177	17.6885	0.7269	0.7664	0.4673
EMAP2010	EMAP2020	All Sites	All Sites	Phos Rating	Good	4.6999	6.7847	13.2977	-8.5978	17.9976	0.6927	0.7558	0.4885
EMAP2010	EMAP2020	All Sites	All Sites	Phos Rating	Not Sampled	9.6041	5.7811	11.3308	-1.7267	20.9349	1.6613	0.9517	0.0967
EMAP2010	EMAP2020	All Sites	All Sites	Phos Rating	Poor	-14.3040	6.8566	13.4386	-27.7426	-0.8654	-2.0862	0.0185	0.0370
EMAP2010	EMAP2020	All Sites	All Sites	TSS Rating	Good	-5.0665	5.9331	11.6287	-16.6952	6.5622	-0.8539	0.1966	0.3931
EMAP2010	EMAP2020	All Sites	All Sites	TSS Rating	Not Sampled	8.9787	5.7814	11.3313	-2.3527	20.3100	1.5530	0.9398	0.1204
EMAP2010	EMAP2020	All Sites	All Sites	TSS Rating	Poor	-3.9121	1.9004	3.7247	-7.6369	-0.1874	-2.0586	0.0198	0.0395
EMAP2010	EMAP2020	All Sites	All Sites	Chan	Ditched	-5.8328	7.1015	13.9186	-19.7514	8.0858	-0.8213	0.2057	0.4114
EMAP2010	EMAP2020	All Sites	All Sites	Chan	Natural	5.8328	7.1015	13.9186	-8.0858	19.7514	0.8213	0.7943	0.4114
EMAP2010	EMAP2020	All Sites	All Sites	Meets Fish Threshold	No	-7.6442	4.5087	8.8369	-16.4811	1.1928	-1.6954	0.0450	0.0900
EMAP2010	EMAP2020	All Sites	All Sites	Meets Fish Threshold	Not Assessable	-5.5671	5.5340	10.8465	-16.4136	5.2795	-1.0060	0.1572	0.3144
EMAP2010	EMAP2020	All Sites	All Sites	Meets Fish Threshold	Not Sampled	16.1332	6.4945	12.7290	3.4042	28.8622	2.4841	0.9935	0.0130
EMAP2010	EMAP2020	All Sites	All Sites	Meets Fish Threshold	Yes	-2.9220	6.4907	12.7215	-15.6435	9.7995	-0.4502	0.3263	0.6526
EMAP2010	EMAP2020	All Sites	All Sites	TALU	7	0.2850	1.1320	2.2188	-1.9338	2.5038	0.2518	0.5994	0.8012
EMAP2010	EMAP2020	All Sites	All Sites	TALU	E	0.2634	0.9646	1.8907	-1.6272	2.1541	0.2731	0.6076	0.7848
EMAP2010	EMAP2020	All Sites	All Sites	TALU	G	1.1206	7.1966	14.1051	-12.9845	15.2257	0.1557	0.5619	0.8763
EMAP2010	EMAP2020	All Sites	All Sites	TALU	M	-10.1771	7.1592	14.0318	-24.2089	3.8548	-1.4215	0.0776	0.1552
EMAP2010	EMAP2020	All Sites	All Sites	TALU	Not Sampled	8.5080	5.7641	11.2974	-2.7894	19.8054	1.4760	0.9300	0.1399
EMAP2010	EMAP2020	All Sites	All Sites	Meets Invert Threshold	No	-0.6149	6.6781	13.0888	-13.7036	12.4739	-0.0921	0.4633	0.9266
EMAP2010	EMAP2020	All Sites	All Sites	Meets Invert Threshold	Not Assessable	-9.6399	4.8185	9.4440	-19.0839	-0.1958	-2.0006	0.0227	0.0454
EMAP2010	EMAP2020	All Sites	All Sites	Meets Invert Threshold	Not Sampled	6.3794	5.9445	11.6510	-5.2716	18.0304	1.0732	0.8584	0.2832
EMAP2010	EMAP2020	All Sites	All Sites	Meets Invert Threshold	Yes	3.8753	5.9810	11.7226	-7.8472	15.5979	0.6479	0.7415	0.5170
EMAP2010	EMAP2020	All Sites	All Sites	Strahler Cat	1st	-0.1563	7.7421	15.1743	-15.3305	15.0180	-0.0202	0.4919	0.9839
EMAP2010	EMAP2020	All Sites	All Sites	Strahler Cat	2nd	-0.7674	4.7343	9.2790	-10.0464	8.5117	-0.1621	0.4356	0.8712
EMAP2010	EMAP2020	All Sites	All Sites	Strahler Cat	3rd	0.1252	3.3466	6.5592	-6.4339	6.6844	0.0374	0.5149	0.9701

Survey_1	Survey_2	Type	Sub-population	Indicator	Category	DiffEst.P	StdError.P	Margin of Error.P	LCB95Pct.P	UCB95Pct.P	Z	Prob Z < 0	Prob Z ≠ 0
EMAP2015	EMAP2020	All Sites	All Sites	MSHA Rating	Fair	-6.0077	5.9251	11.6130	-17.6207	5.6053	-1.0139	0.1553	0.3106
EMAP2015	EMAP2020	All Sites	All Sites	MSHA Rating	Good	-2.1738	2.7859	5.4603	-7.6341	3.2865	-0.7803	0.2176	0.4352
EMAP2015	EMAP2020	All Sites	All Sites	MSHA Rating	Not Sampled	3.9885	6.2894	12.3270	-8.3385	16.3154	0.6342	0.7370	0.5260
EMAP2015	EMAP2020	All Sites	All Sites	MSHA Rating	Poor	4.1931	5.9205	11.6039	-7.4109	15.7970	0.7082	0.7606	0.4788
EMAP2015	EMAP2020	All Sites	All Sites	Phos Rating	Good	-9.3653	6.5128	12.7648	-22.1301	3.3995	-1.4380	0.0752	0.1504
EMAP2015	EMAP2020	All Sites	All Sites	Phos Rating	Not Sampled	0.7090	6.6460	13.0260	-12.3170	13.7350	0.1067	0.5425	0.9150
EMAP2015	EMAP2020	All Sites	All Sites	Phos Rating	Poor	8.6563	6.4404	12.6229	-3.9666	21.2792	1.3441	0.9105	0.1789
EMAP2015	EMAP2020	All Sites	All Sites	TSS Rating	Good	5.8473	6.8297	13.3859	-7.5386	19.2333	0.8562	0.8040	0.3919
EMAP2015	EMAP2020	All Sites	All Sites	TSS Rating	Not Sampled	0.4596	6.6399	13.0141	-12.5545	13.4736	0.0692	0.5276	0.9448
EMAP2015	EMAP2020	All Sites	All Sites	TSS Rating	Poor	-6.3069	2.2387	4.3879	-10.6948	-1.9191	-2.8172	0.0024	0.0048
EMAP2015	EMAP2020	All Sites	All Sites	Chan	Ditched	-1.5311	6.1314	12.0173	-13.5484	10.4862	-0.2497	0.4014	0.8028
EMAP2015	EMAP2020	All Sites	All Sites	Chan	Natural	1.5311	6.1314	12.0173	-10.4862	13.5484	0.2497	0.5986	0.8028
EMAP2015	EMAP2020	All Sites	All Sites	Meets Fish Threshold	No	-0.4364	3.3070	6.4815	-6.9179	6.0452	-0.1320	0.4475	0.8950
EMAP2015	EMAP2020	All Sites	All Sites	Meets Fish Threshold	Not Assessable	-4.2325	5.6324	11.0393	-15.2718	6.8068	-0.7514	0.2262	0.4524
EMAP2015	EMAP2020	All Sites	All Sites	Meets Fish Threshold	Not Sampled	10.8726	6.6614	13.0562	-2.1836	23.9288	1.6322	0.9487	0.1026
EMAP2015	EMAP2020	All Sites	All Sites	Meets Fish Threshold	Yes	-6.2037	6.3150	12.3772	-18.5810	6.1735	-0.9824	0.1630	0.3259
EMAP2015	EMAP2020	All Sites	All Sites	TALU	7	-0.3089	0.3536	0.6930	-1.0018	0.3841	-0.8736	0.1912	0.3824
EMAP2015	EMAP2020	All Sites	All Sites	TALU	E	0.4501	0.6305	1.2358	-0.7857	1.6859	0.7138	0.7623	0.4753
EMAP2015	EMAP2020	All Sites	All Sites	TALU	G	-0.3045	6.2733	12.2954	-12.5998	11.9909	-0.0485	0.4806	0.9613
EMAP2015	EMAP2020	All Sites	All Sites	TALU	M	-3.8252	5.8259	11.4186	-15.2438	7.5934	-0.6566	0.2557	0.5114
EMAP2015	EMAP2020	All Sites	All Sites	TALU	Not Sampled	3.9885	6.2894	12.3270	-8.3385	16.3154	0.6342	0.7370	0.5260
EMAP2015	EMAP2020	All Sites	All Sites	Meets Invert Threshold	No	12.2700	5.7294	11.2295	1.0405	23.4995	2.1416	0.9839	0.0322
EMAP2015	EMAP2020	All Sites	All Sites	Meets Invert Threshold	Not Assessable	-8.6133	5.6407	11.0555	-19.6688	2.4423	-1.5270	0.0634	0.1268
EMAP2015	EMAP2020	All Sites	All Sites	Meets Invert Threshold	Not Sampled	-9.4195	7.0247	13.7681	-23.1876	4.3485	-1.3409	0.0900	0.1799
EMAP2015	EMAP2020	All Sites	All Sites	Meets Invert Threshold	Yes	5.7628	5.0659	9.9289	-4.1662	15.6917	1.1376	0.8723	0.2553
EMAP2015	EMAP2020	All Sites	All Sites	Strahler Cat	1st	-4.4881	5.7019	11.1755	-15.6635	6.6874	-0.7871	0.2156	0.4312
EMAP2015	EMAP2020	All Sites	All Sites	Strahler Cat	2nd	1.7796	2.5895	5.0752	-3.2956	6.8548	0.6872	0.7540	0.4919
EMAP2015	EMAP2020	All Sites	All Sites	Strahler Cat	3rd	1.3468	2.4325	4.7677	-3.4209	6.1145	0.5537	0.7101	0.5798
EMAP2015	EMAP2020	All Sites	All Sites	Strahler Cat	4th+	1.3617	2.7863	5.4611	-4.0995	6.8228	0.4887	0.6875	0.6251

Survey_1	Survey_2	Type	Subpopulation	Indicator	DiffEst	StdError	MarginofError	LCB95Pct	UCB95Pct	Z	Prob Z < 0	Prob Z ≠ 0
EMAP2010	EMAP2020	MNeco2	Mixed Wood Plains	NH4	0.051173364	0.011133963	0.021822166	0.029351198	0.07299553	4.596150113	0.999997848	4.30369E-06
EMAP2010	EMAP2020	MNeco2	Mixed Wood Shield	NH4	0.000380638	0.002064475	0.004046296	-0.003665658	0.004426934	0.184375201	0.573140439	0.853719123
EMAP2010	EMAP2020	MNeco2	Temperate Prairies	NH4	0.055257246	0.031726359	0.062182521	-0.006925275	0.117439766	1.74168255	0.959217996	0.081564008
EMAP2010	EMAP2020	MNeco2	Mixed Wood Plains	Conduct	5.557425775	41.60041743	81.5353199	-75.97789412	87.09274567	0.133590625	0.553136851	0.893726298
EMAP2010	EMAP2020	MNeco2	Mixed Wood Shield	Conduct	3.093730422	26.20761545	51.36598241	-48.27225199	54.45971283	0.118047002	0.546984792	0.906030416
EMAP2010	EMAP2020	MNeco2	Temperate Prairies	Conduct	-55.37914803	66.79646303	130.9186618	-186.2978099	75.53951381	-0.82907306	0.203531533	0.407063067
EMAP2010	EMAP2020	MNeco2	Mixed Wood Plains	SecchiTube	-16.80087018	5.843652277	11.453348	-28.25421818	-5.34752218	-2.875063297	0.002019733	0.004039465
EMAP2010	EMAP2020	MNeco2	Mixed Wood Shield	SecchiTube	-9.25007335	8.135873069	15.9460182	-25.19609155	6.695944848	-1.136949074	0.127779788	0.255559576
EMAP2010	EMAP2020	MNeco2	Temperate Prairies	SecchiTube	-6.75058534	7.882915086	15.45022966	-22.200815	8.699644322	-0.85635647	0.195900317	0.391800634
EMAP2010	EMAP2020	MNeco2	Mixed Wood Plains	FishIBI	7.712977734	6.802444037	13.33254532	-5.619567586	21.04552305	1.133853905	0.871572082	0.256855835
EMAP2010	EMAP2020	MNeco2	Mixed Wood Shield	FishIBI	13.7832472	5.609649455	10.9947109	2.788536307	24.7779581	2.457060341	0.992996042	0.014007916
EMAP2010	EMAP2020	MNeco2	Temperate Prairies	FishIBI	5.174621684	4.005813565	7.851250316	-2.676628632	13.025872	1.291777962	0.901782975	0.196434049
EMAP2010	EMAP2020	MNeco2	Mixed Wood Plains	MacroIBI	2.717277855	4.132275416	8.09911099	-5.381833135	10.81638885	0.657574237	0.744594123	0.510811753
EMAP2010	EMAP2020	MNeco2	Mixed Wood Shield	MacroIBI	5.475920817	5.398686128	10.58123037	-5.105309558	16.05715119	1.014306201	0.844781667	0.310436666
EMAP2010	EMAP2020	MNeco2	Temperate Prairies	MacroIBI	7.079880501	2.967464317	5.816123187	1.263757315	12.89600369	2.385835092	0.991479805	0.01704039
EMAP2010	EMAP2020	All_Sites	All Sites	DrainSqMi	-15.87202466	154.386693	302.5923579	-318.4643826	286.7203333	-0.102806948	0.459058096	0.918116191
EMAP2010	EMAP2020	All_Sites	All Sites	Gradient	0.732655531	0.526316981	1.031562327	-0.298906796	1.764217858	1.392042357	0.918045214	0.163909572
EMAP2010	EMAP2020	All_Sites	All Sites	Sinuosity	-0.005338401	0.03985882	0.078121851	-0.083460252	0.072783451	-0.133932735	0.446727882	0.893455765
EMAP2010	EMAP2020	All_Sites	All Sites	MSHA	-3.179373675	2.23373282	4.378035878	-7.557409554	1.198662203	-1.423345553	0.077318004	0.154636008
EMAP2010	EMAP2020	All_Sites	All Sites	TempH2O	0.45255898	0.952779687	1.867413872	-1.414854892	2.319972852	0.474988065	0.68260226	0.63479548
EMAP2010	EMAP2020	All_Sites	All Sites	pH	0.12994007	0.080084748	0.156963222	-0.027023152	0.286903292	1.622532047	0.947655261	0.104689477
EMAP2010	EMAP2020	All_Sites	All Sites	DO	0.473962335	0.474795464	0.930582009	-0.456619674	1.404544345	0.998245289	0.840919785	0.31816043
EMAP2010	EMAP2020	All_Sites	All Sites	Phos	-0.0187918	0.020875251	0.04091474	-0.05970654	0.02212294	-0.900195149	0.184008204	0.368016407
EMAP2010	EMAP2020	All_Sites	All Sites	TSS	-1.182448275	1.57871174	3.094218153	-4.27666428	1.911769878	-0.748995681	0.226929904	0.453859809
EMAP2010	EMAP2020	All_Sites	All Sites	Nitrogen	-2.162971103	0.637171131	1.248832468	-3.411803571	-0.914138636	-3.394647058	0.000343586	0.000687171
EMAP2010	EMAP2020	All_Sites	All Sites	NH4	0.033823321	0.012783338	0.025054883	0.008768438	0.058878204	2.645891056	0.995926197	0.008147605
EMAP2010	EMAP2020	All_Sites	All Sites	Conduct	-33.71014528	40.1211141	78.63593866	-112.3460839	44.92579337	-0.840209601	0.200395438	0.400790876
EMAP2010	EMAP2020	All_Sites	All Sites	SecchiTube	-9.519069099	4.529320758	8.87730556	-18.39637466	-0.641763539	-2.101654886	0.017791759	0.035583518
EMAP2010	EMAP2020	All_Sites	All Sites	FishIBI	8.976992473	3.122266781	6.119530442	2.857462032	15.09652292	2.875152286	0.997980837	0.004038327
EMAP2010	EMAP2020	All_Sites	All Sites	MacroIBI	6.063940845	2.469325815	4.839789663	1.224151182	10.90373051	2.455707063	0.992969614	0.014060772
EMAP2015	EMAP2020	MNeco2	Mixed Wood Plains	DrainSqMi	25.19749622	186.56375	365.6582307	-340.4607345	390.855727	0.135061051	0.553718198	0.892563604
EMAP2015	EMAP2020	MNeco2	Mixed Wood Shield	DrainSqMi	-31.02907709	222.4257249	435.94641	-466.9754871	404.9173329	-0.139503095	0.444526305	0.88905261
EMAP2015	EMAP2020	MNeco2	Temperate Prairies	DrainSqMi	-180.3645679	224.6741788	440.3532988	-620.7178667	259.9887309	-0.802782807	0.211050141	0.422100281
EMAP2015	EMAP2020	MNeco2	Mixed Wood Plains	Gradient	0.466751682	0.957239652	1.876155242	-1.40940356	2.342906924	0.487601701	0.687084005	0.625831991
EMAP2015	EMAP2020	MNeco2	Mixed Wood Shield	Gradient	0.94036052	0.902076587	1.768037621	-0.827677102	2.708398141	1.042439781	0.851396085	0.297207831
EMAP2015	EMAP2020	MNeco2	Temperate Prairies	Gradient	-0.147715457	0.389414093	0.763237598	-0.910953055	0.61552214	-0.379327456	0.352222357	0.704444713
EMAP2015	EMAP2020	MNeco2	Mixed Wood Plains	Sinuosity	0.0114343	0.05512153	0.108036214	-0.096601914	0.119470514	0.207437995	0.582166094	0.835667812
EMAP2015	EMAP2020	MNeco2	Mixed Wood Shield	Sinuosity	-0.004614309	0.061856203	0.12123593	-0.125850239	0.116621621	-0.074597355	0.470267539	0.940535079
EMAP2015	EMAP2020	MNeco2	Temperate Prairies	Sinuosity	-0.018538636	0.060909869	0.119381149	-0.137919785	0.100842513	-0.304361785	0.380426139	0.760852278
EMAP2015	EMAP2020	MNeco2	Mixed Wood Plains	MSHA	-8.538412868	3.347049534	6.560096541	-15.09850941	-1.978316327	-2.551026742	0.005370304	0.010740608
EMAP2015	EMAP2020	MNeco2	Mixed Wood Shield	MSHA	-0.000796264	3.022409181	5.923813142	-5.924609406	5.923016878	-0.000263453	0.499894897	0.999789795
EMAP2015	EMAP2020	MNeco2	Temperate Prairies	MSHA	0.241107426	2.885903371	5.65626667	-5.415159244	5.897374096	0.083546604	0.533291539	0.933416922
EMAP2015	EMAP2020	MNeco2	Mixed Wood Plains	TempH2O	1.875569562	0.960209439	1.881975917	-0.006406355	3.757545479	1.953292154	0.974607507	0.050784987
EMAP2015	EMAP2020	MNeco2	Mixed Wood Shield	TempH2O	1.279881919	0.957967323	1.877581452	-0.597699533	3.157463371	1.336039224	0.909231773	0.181536453
EMAP2015	EMAP2020	MNeco2	Temperate Prairies	TempH2O	0.219881463	2.015350277	3.95001396	-3.730132497	4.169895422	0.109103348	0.54343974	0.913120519
EMAP2015	EMAP2020	MNeco2	Mixed Wood Plains	pH	-0.27822823	0.123469608	0.241995985	-0.520224215	-0.036232245	-2.2534147	0.012116507	0.024233014

Survey_1	Survey_2	Type	Subpopulation	Indicator	DiffEst	StdError	MarginofError	LCB95Pct	UCB95Pct	Z	Prob Z < 0	Prob Z ≠ 0
EMAP2015	EMAP2020	MNeco2	Mixed Wood Shield	pH	0.53244675	0.236146789	0.462839201	0.069607549	0.995285951	2.254727886	0.987924793	0.024150414
EMAP2015	EMAP2020	MNeco2	Temperate Prairies	pH	0.04271509	0.123968424	0.242973645	-0.200258556	0.285688735	0.344564271	0.634789015	0.73042197
EMAP2015	EMAP2020	MNeco2	Mixed Wood Plains	DO	-0.322360788	0.843646221	1.65351621	-1.975876998	1.331155422	-0.382104228	0.351192028	0.702384056
EMAP2015	EMAP2020	MNeco2	Mixed Wood Shield	DO	-1.224405819	0.814270238	1.595940341	-2.82034616	0.371534522	-1.503684847	0.066331266	0.132662533
EMAP2015	EMAP2020	MNeco2	Temperate Prairies	DO	0.158725038	0.902614083	1.769091095	-1.610366057	1.927816133	0.175850389	0.569794259	0.860411481
EMAP2015	EMAP2020	MNeco2	Mixed Wood Plains	Phos	0.012270073	0.031542221	0.061821618	-0.049551545	0.074091691	0.389004712	0.65136367	0.697272661
EMAP2015	EMAP2020	MNeco2	Mixed Wood Shield	Phos	0.005969901	0.016174819	0.031702062	-0.025732161	0.037671962	0.36908609	0.643968222	0.712063557
EMAP2015	EMAP2020	MNeco2	Temperate Prairies	Phos	0.063613894	0.019620015	0.038454523	0.025159371	0.102068416	3.242295902	0.999407146	0.001185708
EMAP2015	EMAP2020	MNeco2	Mixed Wood Plains	TSS	-6.102007118	3.251860066	6.373528612	-12.47553573	0.271521494	-1.876466697	0.030295612	0.060591224
EMAP2015	EMAP2020	MNeco2	Mixed Wood Shield	TSS	-3.363107858	2.409330104	4.722200231	-8.085308089	1.359092373	-1.395868442	0.081377058	0.162754116
EMAP2015	EMAP2020	MNeco2	Temperate Prairies	TSS	-6.009458811	5.402296286	10.58830616	-16.59776497	4.578847345	-1.112389712	0.132985313	0.265970626
EMAP2015	EMAP2020	MNeco2	Mixed Wood Plains	Nitrogen	-1.376745783	0.736038792	1.442609524	-2.819355308	0.065863741	-1.870479923	0.030708601	0.061417203
EMAP2015	EMAP2020	MNeco2	Mixed Wood Shield	Nitrogen	-0.02107904	0.013169212	0.025811182	-0.046890222	0.004732142	-1.600630236	0.054729421	0.109458841
EMAP2015	EMAP2020	MNeco2	Temperate Prairies	Nitrogen	-8.68522807	2.08464094	4.085821163	-12.77104923	-4.599406907	-4.166294494	1.54795E-05	3.09591E-05
EMAP2015	EMAP2020	MNeco2	Mixed Wood Plains	NH4	0.043003784	0.011158458	0.021870176	0.021133608	0.06487396	3.853918161	0.999941879	0.000116242
EMAP2015	EMAP2020	MNeco2	Mixed Wood Shield	NH4	0.001837928	0.001099263	0.002154517	-0.000316589	0.003992445	1.671963043	0.952734195	0.09453161
EMAP2015	EMAP2020	MNeco2	Temperate Prairies	NH4	0.084909118	0.022158772	0.043430395	0.041478722	0.128339513	3.831851216	0.999936409	0.000127183
EMAP2015	EMAP2020	MNeco2	Mixed Wood Plains	Conduct	15.43103567	51.23991295	100.428384	-84.99734829	115.8594196	0.301152652	0.618350953	0.763298093
EMAP2015	EMAP2020	MNeco2	Mixed Wood Shield	Conduct	38.42674688	31.42666423	61.59513005	-23.16838317	100.0218769	1.222743419	0.889286689	0.221426622
EMAP2015	EMAP2020	MNeco2	Temperate Prairies	Conduct	-88.71022124	82.03502699	160.7856984	-249.4959196	72.07547714	-1.08137005	0.139766269	0.279532539
EMAP2015	EMAP2020	MNeco2	Mixed Wood Plains	SecchiTube	-15.38563917	6.583424404	12.90327473	-28.28891389	-2.482364438	-2.337026784	0.009718896	0.019437791
EMAP2015	EMAP2020	MNeco2	Mixed Wood Shield	SecchiTube	-13.31172955	7.805028615	15.29757498	-28.60930453	1.985845437	-1.705532446	0.044047583	0.088095166
EMAP2015	EMAP2020	MNeco2	Temperate Prairies	SecchiTube	-12.89528053	7.061860887	13.840993	-26.73627353	0.945712473	-1.826045675	0.033921691	0.067843382
EMAP2015	EMAP2020	MNeco2	Mixed Wood Plains	FishIBI	8.593791787	5.96625441	11.69364377	-3.099851979	20.28743555	1.440399821	0.925122843	0.149754314
EMAP2015	EMAP2020	MNeco2	Mixed Wood Shield	FishIBI	9.721029283	6.56940388	12.875795	-3.154765722	22.59682429	1.479742981	0.930529075	0.13894185
EMAP2015	EMAP2020	MNeco2	Temperate Prairies	FishIBI	3.823276042	4.073277487	7.983477174	-4.160201132	11.80675322	0.938624008	0.826038089	0.347923822
EMAP2015	EMAP2020	MNeco2	Mixed Wood Plains	MacroIBI	0.004118673	3.082700081	6.041981135	-6.037862461	6.046099808	0.00133606	0.500533011	0.998933978
EMAP2015	EMAP2020	MNeco2	Mixed Wood Shield	MacroIBI	-4.80623703	5.75976652	11.28893494	-16.09517197	6.482697908	-0.834449975	0.202013733	0.404027466
EMAP2015	EMAP2020	MNeco2	Temperate Prairies	MacroIBI	4.32739019	3.085300643	6.047078143	-1.719687952	10.37446833	1.402582986	0.919629386	0.160741228
EMAP2015	EMAP2020	All_Sites	All Sites	DrainSqMi	-70.91682977	113.2060836	221.8798466	-292.7966764	150.9630169	-0.626440095	0.265513159	0.531026318
EMAP2015	EMAP2020	All_Sites	All Sites	Gradient	0.44088945	0.399187083	0.782392306	-0.341502856	1.223281757	1.104468227	0.865304961	0.269390079
EMAP2015	EMAP2020	All_Sites	All Sites	Sinuosity	-0.007860217	0.033800546	0.066247852	-0.074108069	0.058387635	-0.232547041	0.408056577	0.816113155
EMAP2015	EMAP2020	All_Sites	All Sites	MSHA	-2.255740739	1.84659865	3.619266849	-5.875007587	1.36352611	-1.221565248	0.110936039	0.221872077
EMAP2015	EMAP2020	All_Sites	All Sites	TempH2O	1.023426166	0.906755598	1.777208316	-0.75378215	2.800634482	1.128668153	0.870481076	0.259037849
EMAP2015	EMAP2020	All_Sites	All Sites	pH	0.11529253	0.11498189	0.225360364	-0.110067834	0.340652894	1.002701641	0.841997581	0.316004838
EMAP2015	EMAP2020	All_Sites	All Sites	DO	-0.432890903	0.552773773	1.083416686	-1.516307589	0.650525784	-0.783124895	0.216776887	0.433553773
EMAP2015	EMAP2020	All_Sites	All Sites	Phos	0.030620499	0.013732146	0.026914512	0.003705987	0.057535012	2.22984073	0.987120991	0.025758018
EMAP2015	EMAP2020	All_Sites	All Sites	TSS	-5.074223386	2.142086222	4.198411847	-9.272635232	-0.875811539	-2.368823128	0.008922392	0.017844785
EMAP2015	EMAP2020	All_Sites	All Sites	Nitrogen	-3.754305513	0.920280252	1.803716149	-5.558021662	-1.950589364	-4.079524151	2.2564E-05	4.5128E-05
EMAP2015	EMAP2020	All_Sites	All Sites	NH4	0.04602899	0.008590659	0.016837383	0.029191607	0.062866373	5.358027574	0.999999958	8.41354E-08
EMAP2015	EMAP2020	All_Sites	All Sites	Conduct	-22.03875366	46.98979661	92.09830901	-114.1370627	70.05955535	-0.469011472	0.319530718	0.639061436
EMAP2015	EMAP2020	All_Sites	All Sites	SecchiTube	-13.59085767	4.068806209	7.97471363	-21.56557131	-5.616144045	-3.340256816	0.000418505	0.000837009
EMAP2015	EMAP2020	All_Sites	All Sites	FishIBI	7.6587885	3.191467079	6.255160533	1.403627967	13.91394903	2.399770485	0.991797323	0.016405354
EMAP2015	EMAP2020	All_Sites	All Sites	MacroIBI	0.469348785	2.330410774	4.567521187	-4.098172402	5.036869972	0.20140174	0.579807773	0.840384455