PRIORITY WATERS LIST – TECHNICAL DETAILS

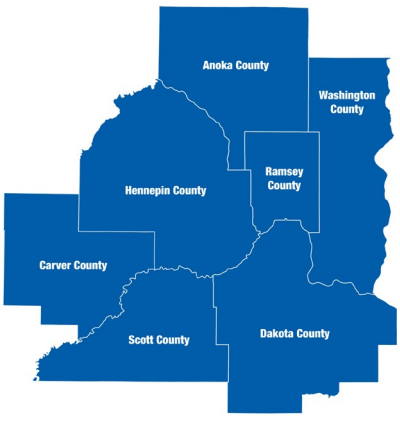
METROPOLITAN COUNCIL

August 2022

The Council's mission is to foster efficient and economic growth for a prosperous metropolitan region

Metropolitan Council Members

Charlie Zelle	Chair	Raymond Zeran	District 9
Judy Johnson	District 1	Peter Lindstrom	District 10
Reva Chamblis	District 2	Susan Vento	District 11
Christopher Ferguson	District 3	Francisco J. Gonzalez	District 12
Deb Barber	District 4	Chai Lee	District 13
Molly Cummings	District 5	Kris Fredson	District 14
John Pacheco Jr.	District 6	Phillip Sterner	District 15
Robert Lilligren	District 7	Wendy Wulff	District 16
Abdirahman Muse	District 8		



The Metropolitan Council is the regional planning organization for the seven-county Twin Cities area. The Council operates the regional bus and rail system, collects and treats wastewater, coordinates regional water resources, plans and helps fund regional parks, and administers federal funds that provide housing opportunities for low- and moderate-income individuals and families. The 17-member Council board is appointed by and serves at the pleasure of the governor.

On request, this publication will be made available in alternative formats to people with disabilities. Call Metropolitan Council information at 651-602-1140 or TTY 651-291-0904.

Document last updated 8/25/2022

Table of Contents

List of Tables

Introduction

Project Overview

The Priority Waters List is a planning tool published in 2022 to help the Metropolitan Council make informed decisions about water management in future projects. The list identifies the lakes, rivers, and streams that provide the most use and benefit for the region. A waterbody's "use and benefit" was quantified using regionally available data. A quantification approach was used so the tool can be utilized in a wider range of future applications and projects.

The project team considered a variety of uses and benefits of waterbodies and regional datasets. After reviewing the available information, the team developed a scoring system to quantify a waterbody's use and benefit in seven categories – ***Science and Education***, ***Drinking Water Protection***, ***Healthy Habitat***, ***Recreation and Tourism***, ***Tranquil Connection***, ***Industry and Utility***, and ***Equity***. Two additional important categories were identified – ***Food Provisioning*** and ***History and Culture*** – but they lacked sufficient data to calculate a score. The scores were then used to select waterbodies for the Priority Waters List.

Document Purpose

This document provides technical details on how the Priority Waters List was created. Specifically, it documents the following:

- Which waterbodies were considered for the Priority Waters List.
- How points were awarded for each waterbody within each use and benefit category.
- How the category scores were used to select waterbodies for the Priority Waters List.

This is not a standalone document – it is a supplemental document supporting the Priority Waters List. Visit the Priority Waters List website to view the list and learn more about the process used to create it. If the link does not work, please contact Emily Resseger at emily.resseger@metc.state.mn.us. The website also hosts another supplemental document called *Priority Waters List Data and Scores*, which has information on datasets used for the analysis and the individual waterbody scores.

Eligible Waterbodies

Lakes, rivers, and streams needed to meet a baseline set of requirements to be considered for the Priority Waters List. Meeting the eligibility criteria did not guarantee a waterbody would be a priority, but a waterbody that did not meet the eligibility criteria was not considered in the assessment for the list.

A lake was included in the assessment if it met the following conditions:

- A named, open water feature of 10 acres or larger. A lake was considered "named" if it had a name in the Minnesota Department of Natural Resources (DNR) Hydrography dataset.
- At least partly located in the Twin Cites seven-county metro area
- Included in the DNR Hydrography dataset
- Had a DNR Basin Identification number

The final baseline dataset of lakes for the Priority Waters List included 683 lakes. Riverine polygons such as portions of the Mississippi and St. Croix Rivers were not included in the lakes baseline dataset because they were instead considered for the rivers and streams list.

A river or stream was included in the assessment if it met the following conditions:

- A named water feature with any length of a clearly defined, above ground channel. A river or stream was considered "named" if it had a name in the DNR Hydrography dataset, in a watershed management plan, or in local surface water management plan. Channel status was assessed using the Minnesota Pollution Control Agency (MPCA) statewide altered watercourse project dataset.
- At least partly located within or touching the Twin Cities seven-county metro area
- Had a drainage area greater than two square miles or was a designated trout stream
- Included in the DNR Hydrography dataset
- Had a valid DNR Kittle Number. Click here for more information about the history of Kittle Numbers (PDF)

In a few instances, the DNR Hydrography dataset included a continuous stream that a watershed or local partner identified as two or more separate streams. An example is Bassett Creek (Kittle number M-057), which was identified by Bassett Creek Watershed Management Commission upstream of Medicine Lake as Plymouth Creek, and downstream of Medicine Lake as Bassett Creek (or Main Stem Bassett Creek). For the Priority Waters List assessment, streams in this situation were given unique identification numbers and evaluated separately. For the Bassett Creek example, Plymouth Creek was designated as M-057S1 and Main Stem Bassett Creek as M-057S2. The final baseline dataset for the Priority Waters List had 195 rivers and streams.

Subdividing rivers and streams

To make rivers and streams more comparable in the analysis, rivers and streams were divided into similar length stretches called reaches. Rivers and streams were divided into reaches based on physical features such as at creek inputs, lakes, or a change in channel modification or stream type. Where possible, stream reaches align with MPCA assessment reaches.

The final dataset of river and stream reaches being considered for the Priority Waters List had 425 reaches. All category scoring was completed on a reach-by-reach basis.

Score Calculations

Overview

Points were awarded to each eligible waterbody in the assessment for seven use and benefit categories - ***Science and Education***, ***Drinking Water Protection***, ***Healthy Habitat***, ***Recreation and Tourism***, ***Tranquil Connection***, ***Industry and Utility***, and ***Equity***. To create these scores, the project team explored and compiled regional datasets, organized that data into metrics within each category, and created a point system to convert the data into category scores. Each category was scored on a scale of 0 to 100 points.

Data

Almost 200 quantitative datasets were considered in establishing the Priority Waters List. Most datasets were already compiled by organizations such as the Met Council or local, regional, state, and national partners. A few datasets were generated as part of the project in cases where the underlying data was straight-forward to organize and compile.

Each original dataset was processed using ESRI geographic information systems (GIS) products to spatially link the data to the waterbodies in the assessment. Those results were then converted into numerical points which were aggregated by metric and then used to calculate category scores.

The datasets are described in the *Priority Waters List Data and Sources* document, which is available to download from the Priority Waters List website. That document also lists the assessment results and scores for each waterbody in the assessment.

Developing the Scores

Priority lists are inherently subjective. Every step of the process – selecting the use and benefit categories, choosing the data, evaluating the quality of the data, deciding how to use the data to represent metrics within each category, and awarding points – required decisions and some level of judgement calls from the project team.

To reduce as much subjectivity as possible, an iterative process was used to develop the scoring framework. After the datasets were collected and compiled, the team went through one category at a time, deciding what datasets to include and how to group them into metrics to assign points. This would happen over several rounds of trying different datasets and point values. Using professional judgement and knowledge of waterbodies in the region, the project team would evaluate the category scores to see if the calculated scores made sense, often using several specific waterbodies as benchmarks to "calibrate" the scoring framework. For example, Lake Minnetonka is one of the most highly visited lakes in the region for recreational activities, so if it did not score high in the Recreation and Tourism category, the team would know the scoring framework was not acceptable yet. The team would then try adjusting the included datasets or assigned point values and evaluate how the scores changed. This was repeated until the project team was satisfied with the calculated scores for each category.

A similar iterative process was used to select waterbodies for the Priority Waters List based on the calculated category scores. Refer to the section **Developing the Qualification Criteria** for more information about this process. Once the list was selected, it underwent two phases of feedback – first from Met Council staff and then from water quality professionals and concerned residents in the region. After each phase of the feedback, the project team went through another round of scoring framework adjustments to address the substantive comments from the reviewers. The final scoring framework for each category are documented in the following sections.

Science and Education

Scoring Overview

Each waterbody's ***Science and Education*** score was generated by looking for specific programs or places that use the waterbody for science and education purposes. Specifically, points were awarded to waterbodies that are used for long-term state or federal scientific studies and to waterbodies used for environmental engagement by having nearby environmental learning centers, youth camps, or by being part of urban fishing outreach efforts. Each of these characteristics awards the waterbody with a different number of points.

The ***Science and Education*** dataset definitions, results, and scores for each waterbody in the assessment that are referenced in this section can be found in the *Priority Waters List Data and Scores* document, which is available on the Priority Waters List website.

Technical Scoring Details

Four metrics were used to award points in the ***Science and Education*** category: **Nearby Youth Camps**, **Nearby Learning Centers**, **Scientific Monitoring** and **Fishing in the Neighborhood (FiN) Lakes** (lakes only).

The **Scientific Monitoring** metric considered a combination of academic and government scientific monitoring programs as well as Scientific and Natural Areas (SNAs), which are protected areas of exceptional scientific or educational value. For this metric, only long-term state or federal level studies were considered. The *Academic Scientific Monitoring* dataset was defined as waterbodies in a Long-Term Ecological Research (LTER) site. When this version of the Priority Waters List was created in 2022, the Minneapolis-Saint Paul (MSP) LTER, covering the entire seven county area, was only just commencing, so it was not included in this assessment. The MSP LTER may eventually have designated long-term monitoring sites that could be included for future iterations of the Priority Waters List.

The *Government Scientific Monitoring* dataset was defined as waterbodies in the Minnesota Pollution Control Agency (MPCA) Long-Term Biological Monitoring Program, the MPCA Chloride Monitoring Program, the United States Geological Survey (USGS) National Water Quality Assessment (NAWQA) program, or the Minnesota Department of Natural Resources (MN DNR) Sentinel Lakes program. Each waterbody was awarded points for the **Scientific Monitoring** metric as described in Table 1.

Table 1. Scientific Monitoring Points

Metric	**If the waterbody…**	**Award the following points:**
Scientific Monitoring	Is monitored as part of an ongoing long-term state or national academic-led scientific study: - LTER site	100
	Else, is monitored as part of an ongoing long-term state or national government-led scientific study: - DNR Sentinel Lakes long term monitoring program - MPCA long-term lake chloride monitoring program - MPCA long-term biological monitoring sites - USGS NAWQA program	75
	Else, is in a Scientific and Natural Area (SNA)	25

Additionally, each waterbody was awarded points for the **Nearby Youth Camps**, **Nearby Learning Centers**, and/or **Fishing in the Neighborhood (FiN) Lakes** metrics as described in Table 2.

Table 2. Youth Camps, Learning Centers, and Fishing in the Neighborhood Points

Metric	**If the waterbody…**	**Award the following points:**
Nearby Youth Camps	Is within 500 meters of a youth camp without any obvious barriers that would block access between the camp and the waterbody, such as major roadways	50
Nearby Learning Centers	Is within 500 meters of an environmental learning center without any obvious barriers that would block access between the camp and the waterbody, such as major roadways.	75
Fishing in the Neighborhood (FiN) Lakes	Is part of the Fishing in the Neighborhood (FiN) program (lakes only)	10

Final Science and Education Score Calculation

The final ***Science and Education*** score for each waterbody was a sum of the points earned from the **Scientific Monitoring**, **Nearby Youth Camps**, **Nearby Learning Centers**, and **Fishing in the Neighborhood (FiN) Lakes** metrics, capped at 100 points and rounded to the nearest 10th of a point. Having more than 100 points available from all metrics together and then capping the final score allowed waterbodies to potentially score well from one metric or a combination of metrics, instead of needing points from all metrics to score well in the category.

Drinking Water Protection

Scoring Overview

Access to clean drinking water is critically important for all communities. Waterbodies that are direct sources of drinking water or reserve drinking water sources are vital to the region. These waterbodies automatically qualified as Priority Waters. Separately, a ***Drinking Water Protection*** score for each waterbody was calculated, representing its regional importance for drinking water protection, even if a waterbody was not a direct source of drinking water.

The ***Drinking Water Protection*** scores were calculated using a two-step process to evaluate the waterbody's importance for drinking water protection. First, a waterbody was awarded points based on the likelihood that surface activities in the area may impact the quality of a drinking water source, for example by contamination through groundwater infiltration or watershed runoff. More points were given to waterbodies in areas where that likelihood was estimated to be higher. Then, those points were multiplied by a factor representing the number of people who use that source water. The result is a score that prioritizes waterbodies in areas where source waters are more vulnerable to effects from surface activities and are used by a larger number of people.

In the Twin Cities and surrounding communities, both groundwater and surface water are used as drinking water sources. To reflect that, the two-step calculation described above was performed for surface water sources and then again for groundwater sources, and the two results were added together to produce the final ***Drinking Water Protection*** score.

The ***Drinking Water Protection*** dataset definitions, results, and scores for each waterbody in the assessment that are referenced in this section can be found in the *Priority Waters List Data and Scores* document, which is available on the Priority Waters List website.

Technical Scoring Details

Due to the critical importance of safe drinking water for the region, the **Regional Surface Water Sources** metric was used as a selection criterion for the Priority Waters list. Any surface waterbody identified as a direct source of drinking water or a reserve source of drinking water in the *Principal Drinking Water Source* and *Reserve Drinking Water Source* datasets automatically qualified for the list, regardless of calculated scores.

Four additional metrics were used to generate a ***Drinking Water Protection*** score for each waterbody: **Vulnerable Areas for Groundwater Sources**, **Usage of Groundwater Sources**, **Vulnerable Areas for Surface Water Sources**, and **Usage of Surface Water Sources**.

Vulnerable Areas for Groundwater Sources

Several datasets were used in combination to identify the waterbodies located in areas where there is higher likelihood that groundwater sources could be affected by activities in an area: *Emergency Response Area (ERA), Drinking Water Management Supply Area (DWSMA) Vulnerability*, *Pollution Sensitivity* of near-surface materials. *Number of Nearby Domestic Wells*, and *Number of Nearby Non-Municipal Public Supply Wells*. Each waterbody was assigned points as described in Table 3.

Table 3. Vulnerable Areas for Groundwater Sources Points

Metric	**If a waterbody is…**	**Award the following points:**
Vulnerable Areas for Groundwater Sources	In an ERA	100
	Else, in a DWSMA with Very High, High, or Moderate vulnerability	90
	Else, in a DWSMA with Low or Very Low vulnerability	60
	Else, meets any of the following: • Within 100 meters of at least 15 private domestic wells, • Within 100 meters of at least one non-municipal, transient, or non-transient public supply system well • In an area with higher pollution sensitivity of near-surface materials	30
	Else, not in any of the groups above	5

Usage of Groundwater Sources

Instead of awarding points, this metric was used to assign a multiplication factor to modify the points a waterbody gained from the **Vulnerable Areas for Groundwater Sources** metric. This prioritizes the waterbodies in vulnerable areas that have the potential to impact more people. The multiplication factor was determined by the number of people estimated to use the groundwater source, as described in Table 4, which uses the *DWSMA Population Served*, *Number of Nearby Domestic Wells*, and *Number of Nearby Non-Municipal Public Supply Wells* datasets. The population ranges used to determine a multiplication factor are based on the Environmental Protection Agency's (EPA) classification of public water system sizes.

Table 4. Usage of Groundwater Sources Multiplication Factor

Metric	**If a waterbody is…**	**Use a multiplication factor of:**
Usage of Groundwater Sources	In a DWSMA that serves >100,000 people	1.00
	Else, in a DWSMA that serves 50,001-100,000 people	0.75
	Else, in a DWSMA that serves 10,001-50,000 people	0.50
	Else, in a DWSMA that serves 3,301-10,000 people	0.25
	Else, in a DWSMA that serves 501-3,300 people	0.15
	Else, in a DWSMA that serves 500 or less people	0.10
	Else, meets either of the following: • Within 100 meters of at least 15 private domestic wells • Within 100 meters of at least one non-municipal, transient, or non-transient public supply system well	0.05
	Else, not in any of the groups above	0.01

Vulnerable Areas for Surface Water Sources

The *Surface Water Drinking Water Supply Management Areas (DWSMA-SW) Priority Area* dataset was used to identify the waterbodies in areas where there is higher likelihood that a surface water source could be affected by activities in an area. Each waterbody received points as described in Table 5.

Table 5. Vulnerable Areas for Surface Water Sources Points

Metric	**If a waterbody is…**	**Award the following points:**
Vulnerable Areas for Surface Water Sources	In a DWSMA-SW Priority Area A	90
	Else, in a DWSMA-SW Priority Area B	60
	Else, not in a DWSMA-SW	0

Usage of Surface Water Sources

Instead of awarding points, this metric was used to assign a multiplication factor to modify the points a waterbody gained from the **Vulnerable Areas for Surface Water Sources** metric. The multiplication factor was determined by the number of people estimated to use surface water protected by its respective DWSMA-SW, using the *DWSMA-SW Population Served* dataset, as described in Table 6. Each DWSMA-SW in the metro is estimated to serve over 100,000 people, so Table 6 is simple.

Table 6. Usage of Surface Water Sources Multiplication Factor

Metric	**If a waterbody is…**	**Use a multiplication factor of:**
Usage of Surface Water Sources	In a DWSMA-SW that serves >100,000 people	1.00
	Else, not in a DWSMA-SW	0

Final Drinking Water Protection Score Calculation

The ***Drinking Water Protection*** Score for each waterbody was calculated by multiplying the **Vulnerable Areas for Groundwater Sources** points with the **Usage of Groundwater Sources** factor, then multiplying together the **Vulnerable Areas for Surface Water Sources** points with the **Usage of Surface Water Sources** factor. These two products were added together, up to a maximum of 100 points and rounded to the nearest 10^{th} of a point. Having more than 100 points available from all metrics together and then capping the final score allowed waterbodies that are important for protecting one source - groundwater or surface water - to score well in the category, instead of needing to be in an area important for protecting both sources to score well.

Healthy Habitat

Scoring Overview

A ***Healthy Habitat*** score was calculated for each waterbody based on the types of species observed at the waterbody and the characteristics and designations of the waterbody and its shore.

The species that live in and around a waterbody can indicate how healthy it is, since some species require very natural conditions, while others can live in degraded conditions. However, not all waterbodies in the region have species observation data, so other characteristics and designations of the waterbody and nearby shore were also used to evaluate the potential presence of healthy habitat.

A higher ***Healthy Habitat*** score indicates that a healthy community of species has been observed at the waterbody or there are many designations and characteristics that might indicate the waterbody supports a healthy habitat.

The ***Healthy Habitat*** dataset definitions, results, and scores for each waterbody in the assessment that are referenced in this section can be found in the *Priority Waters List Data and Scores* document, which is available on the Priority Waters List website.

Technical Scoring Details

Several metrics were used to award points for the ***Healthy Habitat*** category: **Biological Communities**, **Water Quality** (lakes only), **Channel Status** (rivers/streams only), **Waterbody Habitat Designations**, **Unique Habitat Features**, and **Shore Habitat Characteristics**.

The scoring criteria within some metrics are described separately for lakes versus rivers and streams due to the differences in the data available for both waterbody types.

Biological Communities

One of the best ways to determine if a waterbody provides healthy habitat is to look at the species living there. If it supports a community of diverse or rare species, then it likely is providing habitat sufficient for wildlife to thrive. Points are therefore awarded to waterbodies with evidence of healthy biological communities.

Lakes

The primary dataset used to award points for biological communities in lakes was the *MN DNR's Lakes of Biological Significance* dataset, which estimates a lake's value for *Plant*, *Fish*, *Amphibian*, and *Bird* communities. A lake earned points for having Outstanding, High, or Moderate value for these groups.

Not all lakes in the region were included in the *Lakes of Biological Significance* dataset, so additional datasets were incorporated for a broader assessment. The *Plant Richness Index of Biological Integrity (IBI)*, *Plant Floristic Quality IBI, Wild Rice Lakes,* and *Shallow Lakes* datasets were used in combination to supplement the aquatic plant data. Fish IBI scores were used to supplement the fish data. No additional datasets were identified that could supplement the bird or amphibian data. If a waterbody had multiple IBI scores, the newest result from 2010-2020 was used.

The criteria used to develop *the Lakes of Biological Significance* dataset were referenced when determining how to incorporate the supplemental datasets. Additionally, a small handful of lakes were in the *Lakes of Biological Significance* dataset and had IBI scores. These lakes were used to help calibrate the ranges of IBI scores when integrating the supplemental datasets.

Points were awarded for a lake's estimated value for each of the four species groups, and then those points were added together to determine the points earned from the **Biological Communities** metric. Lakes received points for aquatic plants as described in Table 7, for fish as described in Table 8, and for amphibians and birds as described in Table 9.

Table 7. Plant Community Points for Lakes

Metric	**If the lake…**	**Award the following points:**
Biological Communities *(Lakes) – Plants*	Meets either of the following: • Has a Biological Significance rating of "Outstanding" • Is considered Shallow (maximum depth is 15 feet or less) and has a plant richness IBI more than 100% above the impairment threshold	70
	Else, meets any of the following: • Has a Biological Significance rating of "High" • Designated wild rice lake with known wild rice acreage • Has a plant richness IBI more that 100% above the impairment threshold AND a floristic quality IBI more than 70% above the impairment threshold	50
	Else, meets any of the following: • Has a Biological Significance rating of "Moderate" • Has a plant richness IBI more that 100% above the impairment threshold • Has a floristic quality IBI more than 70% above the impairment threshold	30
	Else, has a plant richness IBI more that 50% above the impairment threshold AND a floristic quality IBI more than 35% above the impairment threshold	20
	Else, has a plant richness IBI AND a floristic quality IBI at or above the impairment thresholds	10
	Else: • Has a Biological Significance rating of "None," • Does not meet any criteria from the groups above • Was not evaluated for any of these datasets	0

Table 8. Fish Community Points for Lakes

Metric	**If the lake…**	**Award the following points:**
Biological Communities *(Lakes) – Fish*	Meets either of the following: • Has a Biological Significance rating of "Outstanding" • Has a fish IBI status of "Exceptional"	70
	Else, meets either of the following: • Has a Biological Significance rating of "High" • Has a fish IBI status of "At or Above Impairment Threshold" with a fish IBI score more than 40% above the impairment threshold	50
	Else, meets either of the following: • Has a Biological Significance rating of "Moderate" • Has a fish IBI status of "At or Above Impairment Threshold" with a fish IBI score between 20-40% above the impairment threshold	30
	Else, has a fish IBI status of "At or Above Impairment Threshold" with a fish IBI score between 0-20% above the impairment threshold	10
	Else: • Has a Biological Significance rating of "None," • Has a fish IBI status of "Below Impairment Threshold" • Was not evaluated for any of these datasets	0

Table 9. Amphibian and Bird Community Points for Lakes

Metric	**If the lake has a Biological Significance for amphibians/birds rating of…**	**Award the following points:**
Biological Communities *(Lakes) – Amphibians, Birds*	Outstanding	70
	High	50
	Moderate	30
	None (or was not evaluated)	0

Rivers and Streams

The datasets used to award points for biological communities in rivers and streams were *Fish IBI* and *Macroinvertebrate IBI* scores. If a waterbody had multiple IBI scores, the newest result from 2010-2020 was used. Points were awarded for both groups based on the IBI score relative to their respective impairment thresholds. The ranges of IBI scores used to award points parallel the ranges determined for the *Fish IBI* scores in the lake assessment. Each river or stream received points for their fish and/or macroinvertebrate scores as described in Table 10. Then, the points awarded for both fish and macroinvertebrate IBIs were added together to determine the points earned from the *Biological Communities* metric.

Table 10. Fish and Macroinvertebrate Community Points for Rivers and Streams

Metric	**If the macroinvertebrate/fish IBI was…**	**Award the following points:**
Biological Communities *(River/Stream) – Fish, Macroinvertebrates*	More than 40% above the impairment threshold	50
	Else, between 20-40% above the impairment threshold	30
	Else, between 0-20% above the impairment threshold	10
	Else, below the impairment threshold or not evaluated	0

Water Quality (lakes only)

The *Trophic State Index (TSI)* dataset was used to award points to lakes that have good water quality. Points were awarded to any lake with a TSI result of 60 or lower. TSI is not directly equivalent to the concept of water quality and there is not a universally used system of TSI score classifications. However, many consider a TSI value of 60 to be mid-eutrophic – for example the North American Lake Management Society. For scoring purposes, the project team decided to use a TSI value of 60 as a cutoff representing conditions that are more likely to support a healthy habitat versus conditions that might be degraded. More points are awarded to lakes with lower TSI scores, as described in Table 11.

Table 11. Water Quality Points for Lakes

Metric	**If the Trophic State Index (TSI) of the lake was…**	**Award the following points:**
Water Quality *(lakes only)*	40 or lower	40
	Between 60 and 40	Linearly scaled from 0 to 40
	60 or higher	0

Channel Status (rivers and streams only)

Streams and rivers were awarded points based on proportion of channel length classified as natural, altered, impounded, or undefined, using the *Percent Natural Channel*, *Percent Impounded Channel*, *Percent Altered Channel*, and *Percent Undefined Channel* datasets. More points were given to natural channels, and some points were given to altered channels, as described in Table 12.

Table 12. Channel Status Points for Rivers and Streams

Metric	**If the channel length is…**	**Award the following points**
Channel Status *(river/stream only)*	100% natural	40
	100% altered	10
	100% impounded	0
	100% undefinable	0
	A mix of natural, altered, impounded, or undefinable	Weighted average of the points listed above based on the % of each channel type (e.g. a reach that is 75% natural and 25% altered would score: 40*0.75+10*0.25 = 32.5)

Waterbody Habitat Designations

Several datasets were used to award points for waterbody designations, which may indicate the presence of healthy habitat that is worth protecting.

Lakes

A lake was awarded points if it is designated as a Wildlife Lake, Migratory Waterfowl Feeding and Resting area, or a historical wild rice lake, using the *Wildlife Lake*, *Waterfowl Protection*, and *Wild Rice Lakes* datasets, as described in Table 13.

Table 13. Waterbody Habitat Designations Points for Lakes

Metric	**If the lake has any of the following designations:**	**Award the following points:**
Waterbody Habitat Designations *(Lakes)*	Either: • Wildlife Lake • Migratory Waterfowl Feeding and Resting Area • Known historical wild rice acreage (current wild rice stands are awarded credit in the **Biological Communities** metric)	25
	Else, none of the above designations	0

Rivers and Streams

A river or stream was awarded points if it is designated as coldwater habitat or a trout stream, using the *Coldwater Habitat* and *Trout Designation* datasets, as described in Table 14.

Table 14. Waterbody Habitat Designations Points for Rivers and Streams

Metric	**If the river or stream has the following designations:**	**Award the following points:**
Waterbody Habitat Designations *(Rivers/Streams)*	Either: • Coldwater habitat • Trout stream	25
	Else, none of the above designations	0

Unique Habitat Features

Waterbody features that are unique within the region can provide a refuge of habitat that is worth protecting.

Lakes

Lakes were awarded points for being shallow with great water quality (maximum depth of 15 feet with a TSI score of 50 or lower), for having characteristics that could support a coldwater fishery (defined as having a trout lake designation or a specific combination of lake depth, ratio of lake area to depth, and average phosphorus concentrations), and for being in a fen or having a nearby spring. This information was compiled from the *TSI*, *Shallow Lakes*, *Coldwater Fishery*, and *Fens and Springs* datasets. Points were awarded as described in Table 15.

Table 15. Unique Habitat Features Points for Lakes

Metric	**If the lake:**	**Award the following points:**
Unique Habitat Features *(Lakes)*	Is shallow with great water quality (less than 15 feet deep with a TSI score of 50 or lower)	25
	Has the potential to support a coldwater fishery (a designated trout lake or a specific combination of lake depth, ratio of lake area to depth, and average phosphorus concentrations)	25
	Is in a fen	10
	Has a spring within 50 feet of the shore (no fen)	5

Rivers and Streams

Rivers and streams were awarded points for being in a fen or having a nearby spring, as described in Table 16. This information was compiled from the *Fens and Springs* dataset.

Table 16. Unique Habitat Features Points for Rivers and Streams

Metric	**If the river or stream:**	**Award the following points:**
Unique Habitat Features *(Rivers/Streams)*	Is in a fen	10
	Has a spring within 50 feet of the shore (no fen)	5

Shore Habitat Characteristics

Points were awarded to waterbodies based on the characteristics of the land within 100 meters from its shoreline. This information can identify waterbodies in areas that might support healthy habitat where there otherwise is little to no information about the waterbody. Four different concepts were considered – naturally vegetated shore, protected shore, ecologically significant areas, and areas of biodiversity significance. There is correlation between these datasets, so instead of awarding points for each dataset, a waterbody receives points for the one that scores that highest out of the four.

Naturally Vegetated Shore

The *Percent of Shore that is Naturally Vegetated* dataset was generated by calculating the percent of the land within 100 meters of the waterbody's shore that is classified as a land cover of forest, shrubland, herbaceous, or wetlands. These naturally vegetated areas are more likely to provide good habitat compared to land cover that has been altered by human activity. Points were awarded to each waterbody as described in Table 17.

Table 17. Naturally Vegetated Shore Points

Metric	**If the percent of shore that is naturally vegetated is…**	**Award the following points:**
Shore Habitat Characteristics – *Naturally Vegetated Shore*	100%	25
	Between 0% and 100%	Linearly scaled from 0 to 25
	0%	0

Fewer points were awarded for natural vegetation compared to protected shore, ecologically significant areas, and areas of biodiversity significance, as described in the next sections, because there is no indication if the natural vegetation cover is healthy or degraded (for example, presence of invasive species).

Protected Shore

The *Percent of Shore that is Protected* dataset was generated by calculating the percent of the land within 100 meters of the waterbody's shore that is in a National Wildlife Refuge, Waterfowl Production Area, National Park Service area, Wildlife Management Area, Scientific and Natural Area, State Aquatic Management Area, Wildlife Refuge, and/or local conservation area. The proportion of the land meeting that criteria was also identified as being closed or open to the public in the datasets *Proportion of the Protected Shore that is Not Open to the Public* and *Proportion of the Protected Shore that is Open to the Public*.

Points were awarded to a waterbody using a two-step process. First, points were assigned based on the percent of shore in a protect area, as described Table 18. Then, those assigned points were multiplied by a factor determined by the proportion of the protected area that is open to the public versus closed to the public, as described in Table 19. This prioritizes protected land that is closed to public access, under the assumption that areas free from human activity or disturbance might provide better habitat.

Table 18. Protected Shore Points

Metric	**If the percentage of shore in a protected area is…**	**Award the following points:**
Shore Habitat Characteristics – *Protected Shore*	100	50
	Between 0 and 100	Linearly scaled from 0 to 50
	0	0

Table 19. Protected Shore Multiplication Factor

Metric	**If the protected area is…**	**Use a multiplication factor of:**
Shore Habitat Characteristics – *Protected Shore Modifier*	Closed to the public	1.00
	Open to the public	0.75
	A mix of open or closed	Weighted average of the factors listed above using the proportion of closed vs. open. (e.g. a protected area that is 60% closed and 40% open would produce a factor of: 1.00*0.60+0.75*0.40 = 0.90)

Ecologically Significant Areas

The *Percent of Shore in an Ecologically Significant Area* dataset was generated by calculating the percent of the land within 100 meters of the waterbody's shore that is in an MN DNR's Regionally Ecological Significant Area. These areas are classified as having either outstanding, high, or moderate ecological significance. For each waterbody, the proportion of the shore in an ecological significance area that was rated as Outstanding, High, or Moderate was tabulated in the following datasets: *Proportion of the Shore in an Ecologically Significant Area Rated as Outstanding*, *Proportion of the Shore in an Ecologically Significant Area Rated as High*, and *Proportion of the Shore in an Ecologically Significant Area Rated as Moderate*.

Points were awarded to a waterbody using a two-step process. First, points were assigned based on the percent of shore in an ecologically significant area, as described in Table 20. Then, those points were multiplied by a factor determined by the proportion of the area that is rated as having outstanding, high, or moderate ecological significance, as described in Table 21. This prioritizes areas that are estimated to have higher ecological significance.

Table 20. Ecologically Significant Areas Points

Metric	**If the percentage of shore in an ecologically significant area is …**	**Award the following points:**
Shore Habitat Characteristics – *Ecologically Significant Areas*	100	50
	Between 0 and 100	Linearly scaled from 0 to 50
	0	0

Table 21. Ecologically Significant Areas Multiplication Factor

Metric	**If the ecologically significant area has…**	**Use a multiplication factor of:**
Shore Habitat Characteristics – *Ecologically Significant Areas Modifier*	Outstanding ecological value	1.00
	High ecological value	0.75
	Moderate ecological value	0.50
	A mix of Outstanding, High, or Moderate ecological value	Weighted average of the factors listed above using the proportion of each classification. (e.g. an ecologically significant area that is 45% outstanding, 35% high, and 20% moderate would produce a factor of: 1.00*0.45+0.75*0.35*0.50*0.20 = 0.81)

Areas of Biodiversity Significance

The *Percent of shore in an Area of Biodiversity Significance* dataset was generated by calculating the percent of the land within 100 meters of the waterbody's shore that is in an MN DNR Minnesota Biological Survey Sites of Biodiversity Significance. These areas are classified as having either outstanding, high, or moderate biodiversity significance. For each waterbody, the proportion of shore in an area of biodiversity significance that was rated as Outstanding, High, or Moderate was tabulated in the following datasets: *Proportion of the Shore in an Area of Biodiversity Significance Rated as Outstanding*, *Proportion of the Shore in an Area of Biodiversity Significance Rated as High*, and *Proportion of the Shore in an Area of Biodiversity Significance Rated as Moderate*.

Points were awarded to a waterbody using a two-step process. First, points were assigned based on the percent of shore in an area of biodiversity significance, as described in Table 22. Then, those points were multiplied by a factor determined by the proportion of the area that is rated as having outstanding, high, or moderate biodiversity significance, as described in Table 23. This prioritizes areas that are estimated to have higher biodiversity significance.

Table 22. Areas of Biodiversity Significance Points

Metric	**If the percentage of shore in an area of biodiversity significance is…**	**Award the following points:**
Shore Habitat Characteristics – *Areas of Biodiversity Significance*	100	50
	Between 0 and 100	Linearly scaled from 0 to 50
	0	0

Table 23. Areas of Biodiversity Significance Multiplication Factor

Metric	**If the area of biodiversity significance has…**	**Use a multiplication factor of:**
Shore Habitat Characteristics – *Areas of Biodiversity Significance Modifier*	Outstanding biodiversity value	1.00
	High biodiversity value	0.75
	Moderate biodiversity value	0.50
	A mix of Outstanding, High, or Moderate biodiversity value	Weighted average of the factors listed above using the proportion of each classification. (e.g. an area that is 45% outstanding, 35% high, and 20% moderate would produce a factor of: 1.00*0.45+0.75*0.35*0.50*0.20 = 0.81)

Determining the Shore Habitat Characteristics Points

The maximum value of points from the four concepts - naturally vegetated shore, protected shore, ecologically significant areas, and areas of biodiversity significance datasets - was used to award points for the **Shore Habitat Characteristics** metric. This was done because the four concepts all represent shore habitat and have some correlation with one another. However, each concept represents a slightly different approach to estimating healthy shoreland habitat, so only selecting one would have limited the assessment.

Final Healthy Habitat Score Calculation

The ***Healthy Habitat*** score for each waterbody was calculated by summing the points earned from each metric - **Biological Communities**, **Water Quality** (lakes only), **Channel Status** (rivers and streams only), **Waterbody Habitat Designations**, **Unique Habitat Features**, and **Shore Habitat Characteristics**, up to a maximum of 100 points and rounded to the nearest 10^{th} of a point.

Having more than 100 points available from all metrics together and then capping the final score allowed waterbodies to potentially score well from one metric or a combination of metrics, instead of needing points from all metrics to score well in the category. This is especially important for the ***Healthy Habitat*** category, where data is not available for all waterbodies for all metrics.

Recreation and Tourism

Scoring Overview

Each waterbody received a ***Recreation and Tourism*** score using information about public access, recreational features, and visitation data.

Waterbodies received points for how accessible they are to the public. Public access was determined by the availability of public boat launches and nearby parks and trails, which provide access to recreational activities on-water and on shore, respectively. Points were awarded based on the type of boat launch, park, or and/or trail on the waterbody. For example, a state or regional park generally provides more infrastructure to encourage recreation, like restrooms, visitor centers, and picnic shelters, compared to a small local park or trail.

Waterbodies also received points for having recreational features. A “recreational feature” refers to any infrastructure or characteristic of the waterbody that encourages recreation or tourism. This includes features such as public beaches, fishing piers, hunting areas, and more. A waterbody received more points for having more of these features.

Finally, an assessment using cell phone data was used to estimate how many people visit each waterbody relative to other waterbodies in the region. This assessment estimated which waterbodies are the most popular to visit. More points were given to the waterbodies that were more popular.

The points earned from each of the three sections — public access, recreational features, and visitation — were summed together to calculate a waterbody's final ***Recreation and Tourism*** score. The highest scoring waterbodies are those that are accessible to the public, have features that promote recreational use, and are popular to visit.

The ***Recreation and Tourism*** dataset definitions, results, and scores for each waterbody in the assessment that are referenced in this section can be found in the *Priority Waters List Data and Scores* document, which is available on the Priority Waters List website.

Technical Scoring Details

Four metrics were used to calculate points in the ***Recreation and Tourism*** category – **Shore Access**, **On-Water Access**, **Recreation Features**, and **Regional Visitation**.

Shore Access

Shore access was estimated using information about state parks, regional parks, local parks, state trails, regional trails, local trails, and natural recreation areas. This information was taken from the datasets called *State/Regional Park*, *Local Park*, *Natural Recreation Area*, *State/Regional Trail*, and *Any Trail*. More points are given to the parks and trails which may offer more opportunities to access recreation near the waterbody, like parking, restrooms, and visitor centers. Each waterbody received points as described in Table 24. Rivers and Streams received more **Shore Access** points compared to lakes, because except for a few larger rivers and streams, many channels physically can’t support on-water access. Shore access is the main method by which many people will recreate at the many rivers and streams in the region.

Table 24. Shore Access Points

Metric	**If the waterbody…**	**Award the following points (lakes):**	**Award the following points (rivers and streams):**
Shore Access	Meets any of the following: • Has an adjacent state park • Has an adjacent regional park • Has an adjacent local park larger than 100 acres	40	50
	Else, meets either of the following: • Has an adjacent natural recreation area • Has an adjacent local park between 25-100 acres	30	40
	Else, has an adjacent local park smaller than 25 acres	20	30
	Else, meets either of the following: • Has a state trail that passes within 50 meters of the waterbody • Has a regional trail that passes within 50 meters of the waterbody	15	25
	Else, has a local trail that passes within 50 meters of the waterbody	10	20
	Else, meets either of the following: • Has a planned adjacent state park • Has a planned adjacent regional park	5	15
	Else, meets either of the following: • Has a planned state trail that will pass within 50 meters of the waterbody • Has a planned regional trail that will pass within 50 meters of the waterbody	3	10
	Else, has a planned local trail that will pass within 50 meters of the waterbody	1	5
	Else, does not meet criteria of any of the above groups	0	0

On-Water Access

On-water access was determined using information about public trailer and designated carry-in launches from the *Public Boat Access* dataset. Waterbodies with non-motorized boat rentals or canoe storage racks to rent were also considered to have carry-in launches. Each waterbody received points as described in Table 25. Since many smaller rivers and streams in the region physically cannot support on-water boat access, fewer points were awarded to rivers and streams for this metric compared to lakes.

Table 25. On-Water Access Points

Metric	**If the waterbody has a…**	**Award the following points (lakes):**	**Award the following points (rivers and streams):**
On-Water Access	Public trailer boat launch	40	20
	Else, a designated carry-in launch (or non-motorized boat rentals or canoe rack rentals)	20	10

Recreation Features

Waterbodies received points for having features which might promote recreation or tourism. Information about recreational features was taken from the following datasets: *Public Beach*, *Fishing Pier*, *Public Hunting Area*, *Water Trail*, *Trophic State Index (TSI)*, *Spring or Waterfall*, *Trout Designation*, *Scenic Byway*, *Fish Stocking*, *Campsite*, and *Golf Course*. Points were awarded as described in Table 26.

Table 26. Recreational Features Points

Metric	**If the waterbody…**	**Award the following points:**
Recreational Features	Has a public beach	10
	Has a public fishing pier	5
	Is in an area that allows seasonal hunting	5
	Is a designated water trail (rivers and streams only)	5
	Has good water quality, TSI <= 60 (lakes only)	Linearly scaled from 0-5 points for TSI scores of 60 to 40 (e.g. a TSI of 50 receives 2.5 points). TSI scores better than 40 received 5 points.
	Has a spring or waterfall	3
	Is a designated trout stream or lake	3
	Has an adjacent scenic byway	3
	Has fish stocking	2
	Has nearby camp sites	1
	Has a nearby golf course	1
	Is a tributary to a trout stream (rivers and streams only)	1

Regional Visitation

The **Regional Visitation** metric was determined using a *Visitation Index* dataset derived from smartphone data from the summer of 2019, using a data service called Street Light. A higher index value indicates the waterbody was visited more often compared to other waterbodies in the region. This index was developed separately for lakes versus rivers and streams. The index results were right skewed, meaning a small handful of waterbodies had very high visitation. Assigning points based on the index would have resulted in only a few very popular waterbodies getting significant points based on visitation. Instead, the index was logged before assigning points, to produce a more even distribution of points.

Additionally, at the low end of the index scale, some waterbodies had an index of null or "No visits recorded in the assessment" while others had an index result of 0. An index result of 0 meant there was very low, but non-zero, visitation. A "No visits recorded in the assessment" index result meant no visits were recorded in the assessment period. To account for this in the scoring, a value of two was added to the index result before logging so that an index result of 0 would receive some points. A "No visits recorded in the assessment" index result did not receive any points.

More points were awarded to the waterbodies with more visitation, as described in Table 27.

Table 27. Regional Visitation Points

Metric	**If the log(*Visitation Index* + 2) is…**	**Award the following points:**
Regional Visitation	At or above the 99th percentile* of results	30
	Between the 1st and 99th percentiles* of results	Linearly scaled from 0 to 30
	At or below the 1st percentile* of results	0

* **Percentile calculations were separated for lakes versus rivers and streams.**

Final Recreation and Tourism Score Calculation

The ***Recreation and Tourism*** score for each waterbody was calculated by first adding the points from the **Shore Access** and **On-Water Access** metrics together to determine the Access points. This sum was capped at 60 points. The Access points were capped at 60 points so that waterbodies also needed to earn points from **Recreational Features** and/or **Regional Visitation** to have a high ***Recreation and Tourism*** score. This ensured that the waterbodies with the highest ***Recreation and Tourism*** scores were those which have both the infrastructure to support recreation and the data to show they are being visited.

Then, the Access points were added together with the **Recreation Features** and **Regional Visitation** points, up to a maximum of 100 points and rounded to the nearest 10th of a point. Having more than 100 points available from all metrics together and then capping the final score allowed waterbodies to potentially score well from one metric or a combination of metrics, instead of needing points from all metrics to score well in the category.

Tranquil Connection

Scoring Overview

Each waterbody received a ***Tranquil Connection*** score estimating its potential to provide a person with a tranquil outdoor experience, free from distractions of human activity. Calculating the score was a two-step process. First, points were awarded for four concepts which might affect the tranquility of a waterbody: public boat use, noise pollution from road and air traffic, the amount of natural shore, and the surrounding community type (for example, city center vs. rural). More points were given to waterbodies with restricted public motorboat use, less noise from road and air traffic, more natural shore, and located outside of urban centers.

Then, the earned points were multiplied by a factor representing how accessible the waterbody is. While the most remote and hard-to-reach waterbodies likely provide an environment with limited human disturbance, the intent of this assessment was to identify the waterbodies that can provide a tranquil experience for residents and visitors in the region. The ability to get to a waterbody is essential to that, so the project team decided to use a multiplication factor to prioritize the waterbodies that were accessible through a public park, natural recreation area, trail, or boat launch. Waterbodies accessible by shore or by boat were prioritized over waterbodies that don't have any public access.

The result of the two-step scoring process was the final ***Tranquil Connection*** score. A higher score represents the waterbodies that are likely to provide a person with tranquil experience in nature and are accessible.

The ***Tranquil Connection*** dataset definitions, results, and scores for each waterbody in the assessment that are referenced in this section can be found in the *Priority Waters List Data and Scores* document, which is available on the Priority Waters List website.

Technical Scoring Details

Five metrics were used to calculate a score in the ***Tranquil Connection*** category: **Public Boat Use**, **Natural Surroundings**, **Traffic Noise**, **Community Designation**, and **Public Access**.

Public Boat Use

This metric represents the potential disturbance caused by public motorized boat use. It uses information about public boat launches, speed restrictions, and lake depth from the *Public Boat Access*, *Speed Restrictions*, and *Shallow Lakes* datasets to determine the likelihood that a waterbody may have disturbance from public motorboat use. Private motorized boat use (such as boat use by property owners with private docks) was not considered because waters with no public boat access are expected to have significantly less boat use of any kind than waters with a public launch. More points are awarded to waterbodies with features that limit public motorboat use, as described in Table 28.

Table 28. Public Boat Use Points

Metric	**If the waterbody…**	**Award the following points:**
Public Boat Use	Meets any of the following: • Does not have a public trailer launch • Has a public trailer launch, but motorboats are prohibited • Has a public trailer launch, but only electric motors are allowed • Has a public trailer launch, but the lake is less than 15 feet deep (lakes only)	30
	Else, has a public trailer launch, but boats are restricted to a maximum of 10 hp or speeds of 20 mph or less	15
	Else, all other waters (has a public trailer launch without any motor or speed restrictions)	0

Natural Surroundings

This metric represents the type of environment a person might encounter when visiting the waterbody by using information about the surrounding area. Waterbodies with a more “natural” surrounding, free from human infrastructure, can generally provide a more tranquil experience.

Two characteristics were used to characterize the tranquility of a waterbody’s surrounding area:

- the percent of the shore around the waterbody that is parkland or undeveloped land, from the *Percent of Shore that is Park or Undeveloped* dataset
- the lake shoreland classification or river classification, from the *Shoreland Classification* and *River Classification* datasets

For lakes, the shoreland classification was obtained from the MN DNR’s Minnesota Public Waters dataset, which classifies lakeshore as Natural, Recreational, or General. For rivers and streams, the MN DNR’s Wild, Scenic, and Recreational River dataset was used to obtain the river classification.

Both characteristics were used in combination to award the **Natural Surrounding** points. First, the percent of the land within 100 meters of the waterbody's shore that has a land use of “Park,” “Undeveloped,” or a selection of "Institutional" sub-types that include areas with minimal development was calculated. This represents the amount of the area surrounding the waterbody that is more natural and freer from signs of human development such as housing, commercial areas, and agriculture. This percentage was then rescaled, as described in Table 29. Percentages of 25% or lower were rescaled to a 0 because the project team decided that a waterbody with 25% or less parks or undeveloped shoreland is unlikely to support an experience free from human development.

Then, the rescaled park and undeveloped land value was multiplied by a number determined by the lake shoreland or river classification, as described in Table 30. More points were available to the more natural classifications. Multiplying the two values together awarded more **Natural Surrounding** points to waterbodies with a higher percentage of parks and undeveloped shoreland with a shoreland classification indicating less human development.

Table 29. Percent of Shore that is Parks or Undeveloped Rescaled Value

Metric	**If the *Percent of Shore that is Parks or Undeveloped* is…**	**Rescale to the following value:**
Natural Surrounding – *Percent of Shore that is Park or Undeveloped*	25 to 100	Linearly scaled from 0 to 1
	Below 25	0

Table 30. Natural Surroundings Classification Point Multiplier

Metric	**If the waterbody…**	**Use the following points for multiplication:**
Natural Surrounding – *Lake Shoreland or River Classification*	Meets any of the following: • Has a lake shoreland classification of Natural Environment (lakes only) • Has a river classification of Scenic (rivers and streams only) • Classification is unknown	40
	Else, meets either of the following: • Has a lake shoreland classification of Recreational Development (lakes only) • Has a river classification of Recreational (rivers and streams only)	35
	Else, meets either of the following: • Has a lake shoreland classification of General Development (lakes only) • Has a river classification of None (rivers and streams only)	30

Traffic Noise

Points were awarded to a waterbody based on the *Noise Pollution* dataset, which is an estimate of the amount of noise pollution from highways and air traffic routes. More points were awarded to waterbodies estimated to have less noise pollution from these sources, as described in Table 31.

Table 31. Traffic Noise Points

Metric	**If the 24-hour equivalent sound level (LAEQ) was…**	**Award the following points:**
Traffic Noise	<35 decibels	25
	>=35 and <45 decibels	20
	>=45 and <55 decibels	15
	>=55 and <60 decibels	10
	>=60 and <65 decibels	5
	>=65 decibels	0

Community Designation

Points were awarded to a waterbody based on the *Community Designation* dataset, which is derived from the Met Council's Thrive 2040 Community Designations data. The community designation was used as a proxy for how developed and densely populated an area surrounding a waterbody might be, which could impact the ability to have a tranquil connection in the environment. More points are awarded to waterbodies in communities where development is generally more spread out with less people, as described in Table 32.

Table 32. Community Designation Points

Metric	**If the waterbody is in an area that is…**	**Award the following points:**
Community Designation	Either, • Diversified Rural • Rural Residential • Agricultural	10
	Either, • Emerging Suburban Edge • Rural Center	6
	Either, • Suburban • Suburban Edge	3
	Either, • Urban Center • Urban	0

Public Access

Instead of awarding points, this metric was used to assign a multiplication factor to modify the points a waterbody gained from the other metrics in this category, because public access is required for a person to be able to benefit from the tranquil environment a waterbody might provide. Two types of access were considered, shore access and on-water access. Shore access was defined as having an adjacent park, trail, or natural recreation area, compiled in the *Shore Access* dataset. On-water access was defined by having a public trailer boat launch or a designated carry-in boat launch, compiled in the *On-Water Access* dataset. On-water access was also credited to waterbodies that offer non-motorized boat rentals or canoe rack storage rentals.

A multiplication factor was assigned to each waterbody as described in Table 33. Waterbodies with both shore and on-water access were assigned the highest multiplication factor since they can support more ways to interact with the waterbody – on land and on the water. For lakes, having only on-water access was assigned a slightly higher factor than only shore access, since being on-water allows a person access to seek out more remote sections of the lake, compared to being limited to on-shore activities. For rivers and streams, on-water and shore access were treated the same since most reaches are not wide enough such that being on-water provides a significantly different experience than being on shore. Waterbodies without either type of access were assigned a low factor for being difficult to visit.

Table 33. Tranquil Connection Public Access Multiplication Factor

Metric	**If the waterbody has…**	**Assign the following factor (lakes):**	**Assign the following factor (rivers and streams):**
Public Access	Shore access and on-water access	1.00	1.00
	Only on-water access	0.95	0.95
	Only shore access	0.85	0.95
	Neither shore access nor on-water access	0.25	0.25

Final Tranquil Connection Score Calculation

The ***Tranquil Connection*** score was calculated by summing together the points a waterbody was awarded from the **Public Boat Use**, **Natural Surroundings**, **Traffic Noise**, and **Community Designation** metrics, up to a maximum of 100 points. Having more than 100 points available from all metrics together and then capping the final score allowed waterbodies to potentially score well from one metric or a combination of metrics, instead of needing points from all metrics to score well in the category.

That sum was then multiplied by the **Public Access** factor and rounded to the nearest 10th of a point to create a final ***Tranquil Connection*** score.

Industry and Utility

Scoring Overview

Each waterbody received a score based on ***Industry and Utility*** uses. The uses considered were significant water withdrawal for non-drinking water purposes (for example, for irrigation or to cool equipment), hydroelectric power generation, receiving treated water from wastewater treatment facilities (the waterbody is used to dilute the treated wastewater and integrate it back into the environment), and barge navigation. A waterbody received points for each use it currently has. Higher scores indicate waterbodies that have multiple industry and utility uses.

The ***Industry and Utility*** dataset definitions, results, and scores for each waterbody in the assessment that are referenced in this section can be found in the *Priority Waters List Data and Scores* document, which is available on the Priority Waters List website.

Technical Scoring Details

Several metrics were used to award points for the **Industry and Utility** category: **Non-Drinking Water Usage**, **Wastewater Discharge Receiving Waters**, **Active Hydroelectric Dams**, and **Transportation of Commercial Goods** (rivers and streams only). Respectively, these were represented with the following datasets: *Water Use*, *Wastewater Discharge*, *Hydroelectric Dam*, *Navigable Water*, and *Barge Terminal*. Waterbodies received points for each of the metrics as described in Table 34. Point distributions differed between lakes compared to rivers and streams because rivers and streams used an extra metric – **Transportation of Commercial Goods**.

Table 34. Industry and Utility Points

Metric	**If the waterbody…**	**Award the following points (lakes):**	**Award the following points (rivers and streams):**
Non-Drinking Water Usage	Has over one million gallons of water extracted per year for non-drinking water use	50	33.3
Wastewater Discharge Receiving Waters	Receives treated wastewater discharge from an EPA “major” facility	50	33.3
Active Hydroelectric Dams	Has an active hydroelectric dam	50	33.3
Transportation of Commercial Goods (rivers and streams only)	Has an active barge terminal	NA	33.3
	Else, does not have an active barge terminal but is dredged to maintain navigation channels	NA	10

Final Industry and Utility Score Calculation

The ***Industry and Utility*** score was calculated by summing together the points a waterbody was awarded from each metric in the category, up to a maximum of 100 points and rounded to the nearest 10th of a point. Having more than 100 points available from all metrics together and then capping the final score allowed waterbodies to potentially score well from one metric or a combination of metrics, instead of needing points from all metrics to score well in the category.

Equity

Scoring Overview

The Met Council's long-range policy plan, Thrive 2040, identifies equity as a desired outcome for the region, stating: "Equity connects all residents to opportunity and creates viable housing and transportation options for people of all races, ethnicities, incomes and abilities so that all communities share the opportunities and challenges of growth and change. For our region to reach its full economic potential, all of our residents must be able to access opportunity that leads to success, prosperity, and a high quality of life."

The abundant waterbodies in the Twin Cities area provide a variety of benefits to residents. Ensuring equal access to these benefits for all residents is important to achieve a more equitable outcome for the region.

Calculating the ***Equity*** score was a two-step process. First, waterbodies were awarded points for three metrics representing different concepts of equity – Transportation, Environmental, and Social:

- **Transportation Equity** within this assessment refers to the ability to access a waterbody without a personal vehicle. Points were awarded to the waterbodies that are accessible to a greater number of people through public transit. Points were also awarded to waterbodies in areas that have higher percentages of households without a personal vehicle, because these waterbodies may have more value for communities that are less able to travel outside their immediate neighborhood to visit other waterbodies.
- **Environmental Equity** within this assessment refers to the benefits of the waterbody as a natural space. Points are awarded to waterbodies in areas that suffer from higher temperatures on summer days, representing the "heat island effect". In these areas, the waterbody would be especially valuable as a cooling feature. Points are also awarded to waterbodies in areas that otherwise don't have many other natural spaces such as open water, parks, or forests. These waterbodies may be more valuable to communities because they have few alternatives to enjoy natural spaces.
- **Social Equity** within this assessment refers to demographics that the Met Council has identified as important for promoting equity in the region – race, ethnicity, age, income, and ability. Points are awarded to waterbodies near communities with higher percentages of residents who identify as Black, Indigenous, or a Person of Color (BIPOC), have recently immigrated, report lower English-speaking proficiency, are housing cost burdened, report having a disability, are age 18 or younger, and are age 65 or older. Points were also awarded for waterbodies near communities that have been listed as areas of concentrated poverty throughout the 2010s. This methodology prioritizes the waterbodies near these communities, some of which may also have historical or current barriers preventing the use of nearby waterbodies, such as the lack of resources, infrastructure, and environmental justice.

In the second step of calculating the ***Equity*** score, the points earned from the **Transportation**, **Environmental**, and **Social Equity** metrics were multiplied by a factor representing how accessible the waterbody is, similar to the ***Tranquil Connection*** category. The purpose of the category is to identify waterbodies that can be utilized by communities, so being able to access the waterbody is a necessary component. Waterbodies accessible by shore or by boat were prioritized over waterbodies that don't have any public access.

The result was the final ***Equity*** score. A higher score represents a waterbody that is accessible and near a community with more equity-related characteristics compared to others in the region.

The ***Equity*** dataset definitions, results, and scores for each waterbody in the assessment that are referenced in this section can be found in the *Priority Waters List Data and Scores* document, which is available on the Priority Waters List website.

Technical Scoring Details

Four metrics were used to calculate a score in the ***Equity*** category: **Transportation Equity**, **Environmental Equity**, **Social Equity**, and **Public Access**.

Transportation Equity

This metric was used to identify the waterbodies in the region that are accessible to more people without the use of a personal vehicle. This concept was estimated using two datasets – *Public Transportation Access Index* and *Percent of Households Without a Vehicle*.

The *Public Transportation Access Index* was developed using information from an assessment run by the Metro Transit research group. The index was calculated using route information from March 2020 (pre-COVID-19) on a typical weekday midday, Saturday midday, and weekday evening. Results from those three periods were combined into one index using a weighted average based on the ratio of average ridership. A higher index represents a waterbody that can be accessed by more people through existing public transit routes.

To award points, the *Public Transportation Access Index* was first logged, except for index results of 0, which remained 0. The index was logged because the dataset was right-skewed, meaning a small handful of waters had a high index value. Assigning points based on the index would have resulted in only a few waterbodies getting significant points based on public transit access. Instead, the index was logged before assigning points.to produce a more even distribution of points. Points were then awarded to each waterbody based on the logged index relative to other waterbodies in the region, as described in Table 35.

Table 35. Public Transportation Access Points

Metric	**If the log(*Public Transportation Access Index)* was…**	**Award the following points:**
Transportation Equity – *Public Transportation Access Index*	At or above the 99th percentile* of results	20
	Between 0 and the 99th percentile* of results	Linearly scaled from 0 to 20
	0	0

* **Percentile calculations were separated for lakes versus rivers and streams.**

The *Percent of Households Without a Vehicle* dataset was derived from the Met Council's Equity Considerations for Place-Based Advocacy and Decisions in the Twin Cities Region data, which lists the percentage of households without a vehicle for each census tract in the region. A waterbody was assigned the percentage from the tract it intersected with. If a waterbody intersected with multiple census tracts, the percentages from each tract were averaged.

Points were awarded to each waterbody based on the *Percent of Households Without a Vehicle* dataset, relative to other waterbodies in the region, as described in Table 36. More points were awarded to waterbodies in tracts that have a higher percentage of households without a vehicle.

Table 36. Percent of Households Without a Vehicle Points

Metric	**If the *Percent of Households Without a Vehicle* is…**	**Award the following points:**
Transportation Equity – *Percent of Households Without a Vehicle*	At or above the 99th percentile* of results	15
	Between the 50th and 99th percentiles* of results	Linearly scaled from 0 to 15
	At or below the 50th percentile* of results	0

* **Percentile calculations were separated for lakes versus rivers and streams.**

The points awarded to each waterbody for the **Transportation Equity** metric was the sum of points earned from the *Public Transportation Access Index* and *Percent of Households Without a Vehicle* datasets.

Environmental Equity

This metric was used to identify the waterbodies in the region that have importance as natural spaces within developed areas. This was estimated using two datasets – *Percent of Adjacent Area that is Natural Space* and *Average Land Surface Temperature on a Hot Summer Day.* Both datasets were derived from the Met Council's Equity Considerations for Place-Based Advocacy and Decisions in the Twin Cities Region data.

The *Percent of Adjacent Area that is Natural Space* dataset was created using information about the proportion of green space, such as parks or nature preserves, and blue space, open water, in each census tract in the region. A waterbody was assigned the percentage from the tract it intersected with. If a waterbody intersected with multiple census tracts, the percentages from each tract were averaged.

Points were awarded to each waterbody based on the *Percent of Adjacent Area that is Natural Space* dataset relative to other waterbodies in the region, as described in Table 37. More points were awarded to waterbodies in tracts that have less natural space.

Table 37. Percent of Adjacent Area that is Natural Space Points

Metric	**If the *Percent of Adjacent Area that is Natural Space* is…**	**Award the following points:**
Environmental Equity – *Percent of Adjacent Area that is Natural Space*	At or above the 50th percentile* of results	0
	Between the 1st and 50th percentiles* of results	Linearly scaled from 15 to 0
	At or below the 1st percentile* of results	15

* **Percentile calculations were separated for lakes versus rivers and streams.**

The *Average Land Surface Temperature on a Hot Summer Day* dataset was created using information about the how hot the ground was to touch on a hot summer day in degrees Fahrenheit for each census tract in the region. A waterbody was assigned the average from the tract it intersected with. If a waterbody intersected with multiple census tracts, the averages from each tract were averaged.

Points were awarded to each waterbody based on the *Average Land Surface Temperature on a Hot Summer Day* dataset relative to other waterbodies in the region, as described in Table 38. More points were awarded to waterbodies in tracts with hotter land surface temperatures in the summer.

Table 38. Average Land Surface Temperature on a Hot Summer Day Points

Metric	**If the *Average Land Surface Temperature on a Hot Summer Day* is…**	**Award the following points:**
Environmental Equity – *Average Land Surface Temperature on a Hot Summer Day*	At or above the 99th percentile* of results	10
	Between the 50th and 99th percentiles* of results	Linearly scaled from 0 to 10
	At or below the 50th percentile* of results	0

* **Percentile calculations were separated for lakes versus rivers and streams.**

The points awarded to each waterbody for the **Environmental Equity** metric was the sum of points earned from the *Percent of Adjacent Area that is Natural Space* and *Average Land Surface Temperature on a Hot Summer Day* datasets.

Social Equity

This metric was used to identify the waterbodies in the region that are near communities that have demographics which the Met Council has identified as important for promoting equity in the region – race, ethnicity, age, income, and ability. This was estimated using eight datasets – *Number of Times Tract has been Listed as an Area of Concentrated Poverty, Percent of Residents Who Identify as Black, Indigenous, or a Person of Color (BIPOC), Percent of Residents Who have Recently Immigrated, Percent of Residents Who Report Speaking English Less than Very Well, Percent of Residents with a Disability, Percent of Residents Under Age 18, and Percent of Residents Age 65 and Older*. All datasets were derived from the Met Council's Equity Considerations for Place-Based Advocacy and Decisions in the Twin Cities Region data.

Each dataset was created by using demographic information from census tracts. For each dataset except for *Number of Times Tract has been Listed as an Area of Concentrated Poverty*, a waterbody was assigned the percentage from the tract it intersected with. If a waterbody intersected with multiple census tracts, the percentages from each tract were averaged.

For four of the **Social Equity** datasets – *Percent of Residents Who Identify as Black, Indigenous, or a Person of Color (BIPOC), Percent of Residents Who have Recently Immigrated, Percent of Residents Who Report Speaking English Less than Very Well, and Percent of Residents with a Disability* – points were awarded to each waterbody as described in Table 39. More points were awarded to waterbodies in tracts with a higher percentage of each demographic.

Table 39. BIPOC, Immigration, English Proficiency, and Disability Points

Metric	**If the percent is…**	**Award the following points:**
Social Equity – *BIPOC, Recently Immigrated, English Proficiency, Disability*	At or above the 99th percentile* of results	20
	Between the 50th and 99th percentiles* of results	Linearly scaled from 0 to 20
	At or below the 50th percentile* of results	0

*** Percentile calculations were separated for lakes versus rivers and streams.**

For the *Percent of Residents Under Age 18* and *Percent of Residents Age 65 and Older* datasets, points were awarded to each waterbody as described in Table 40. More points were awarded to waterbodies in tracts with a higher percentage of each demographic.

Table 40. Youth and Seniors Points

Metric	**If the percent is…**	**Award the following points:**
Social Equity – *Under 18, Over 65*	At or above the 99th percentile* of results	10
	Between the 50th and 99th percentiles* of results	Linearly scaled from 0 to 10
	At or below the 50th percentile* of results	0

*** Percentile calculations were separated for lakes versus rivers and streams.**

The *Number of Times Tract has been Listed as an Area of Concentrated Poverty* dataset was created using information about the number of times in which the census tract that the waterbody intersects has been declared an Area of Concentrated Poverty (ACP), out of ten 5-year periods (2006-2010 through 2015-2019) If a waterbody intersected with multiple census tracts, the number of times from each tract were averaged.

Then, points were awarded based on the *Number of Times Tract has been Listed as an Area of Concentrated Poverty* dataset as described in Table 41. More points were awarded to waterbodies in tracts that have been listed as an area of concentrated poverty more frequently.

Table 41. Areas of Concentrated Poverty Points

Metric	**If the *Years Tract has been Listed as an Area of Concentrated Poverty* is…**	**Award the following points:**
Social Equity – *Areas of Concentrated Poverty*	10	20
	Between 0 and 10	Linearly scaled from 0 to 20
	0	0

The points awarded to each waterbody for the **Social Equity** metric was the sum of points earned from the eight social demographics datasets, capped at 60 points. This ensured that the highest scoring waters in the category were those which had a combination of points from the **Social Equity** metric as well as the **Transportation Equity** and/or **Environmental Equity** metrics.

Public Access

Instead of awarding points, this metric was used to assign a multiplication factor to modify the points a waterbody gained from the other metrics in this category because existing access is required to promote equitable use of a waterbody. Two types of access were considered, shore access and on-water access. Shore access was defined as having an adjacent park, trail, or natural recreation area, compiled in the *Shore Access* dataset. On-water access was defined by having a public trailer boat launch or a designated carry-in boat launch, compiled in the *On-Water Access* dataset. On-water access was also credited to waterbodies that offer non-motorized boat rentals or canoe rack storage rentals.

A multiplication factor was assigned to each waterbody as described in Table 42. Waterbodies with both shore and on-water access were assigned the highest multiplication factor since they can support more ways to interact with the waterbody – on land and on the water. Having only shore access awarded a high multiplication factor compared to only on-water access because on-water access requires some type of boat, which not all people have access to. Waterbodies without either type of access were assigned a low factor for being difficult to visit.

Table 42. Equity Public Access Multiplication Factor

Metric	**If the waterbody has…**	**Assign the following factor:**
Public Access	Shore access and on-water access	1.00
	Only on-water access	0.85
	Only shore access	0.95
	Neither shore access nor on-water access	0.25

Final Equity Score Calculation

To calculate the final ***Equity*** score for each waterbody, the points earned from the **Transportation Equity**, **Environmental Equity**, and **Social Equity** metrics were added together, up to a maximum of 100 points. Having more than 100 points available from all metrics together and then capping the final score allowed waterbodies to potentially score well from one metric or a combination of metrics, instead of needing points from all metrics to score well in the category.

Then, those points were multiplied by the factor determined by the **Public Access** metric and rounded to the nearest 10th of a point to produce the final ***Equity*** score.

Qualification for the List

Developing the Qualification Criteria

An iterative process was used to develop the criteria for a waterbody to qualify for the Priority Waters List, similar to the development of the scoring framework. The project team developed an initial set of criteria based on the calculated category scores. These criteria underwent several rounds of review and editing by the project team, to ensure that the criteria aligned with the Met Council's overall approach to Water Resources management in the region. Then, the criteria were further reviewed and edited using feedback from other Met Council staff plus additional water quality professionals and engaged residents in the region.

Qualification Criteria Description

Waterbodies were selected for the Priority Waters List if they were identified as having significant importance for drinking water, recreation and tourism, healthy habitat, or a range of well-rounded benefits. A waterbody qualified for the list by meeting one or more of these four conditions, as detailed in the following sections.

This process was done separately for lakes versus rivers and streams, so that there are two parts to the Priority Waters List. The selection of lakes did not impact the selection of rivers and streams, and vice versa. Additionally, the qualification criteria used different numeric thresholds for lakes versus rivers and streams because of differences in the available datasets and scoring framework for the different waterbody types.

For rivers and streams, the entire length of the waterbody qualified for the list, even though the scores were calculated on a reach basis. Some rivers and streams may have only one reach meeting prioritization criteria, and others may have several.

Drinking Water Sources

Any waterbody in the assessment used as a drinking water source or reserved as a backup drinking water source qualified for the Priority Waters List.

Recreation and Tourism

Any waterbody in the assessment found to support significant recreation and tourism in the region was selected for the Priority Waters List. This was defined as a waterbody with a high ***Recreation and Tourism*** score meeting a minimum size threshold. Specifically, this included:

- Lakes with a ***Recreation and Tourism*** score of 80 or above and are 40 acres or larger (rounded up from 39.95 acres).
- Rivers and streams with at least one reach with a ***Recreation and Tourism*** score of 70 or above and a clearly defined above ground channel of two miles or longer (round up from 1.95 miles).

Healthy Habitat

Any waterbody in the assessment found to support significant healthy habitat in the region was selected for the Priority Waters List. This was defined as a waterbody with a high ***Healthy Habitat*** score meeting a minimum size threshold. Specifically, this included:

- Lakes with a ***Healthy Habitat*** score of 80 or above and are 10 acres or larger (the minimum size for a lake to be considered in the assessment).
- Rivers and streams with at least one reach with a ***Healthy Habitat*** score of 70 or above and a clearly defined above ground channel of one mile or longer (rounded up from 0.95 miles).

Well-Rounded

Any waterbody in the assessment found to support a balance of well-rounded uses and benefits in the region was selected for the Priority Waters List. This was represented by a ***Well-Rounded*** score, which is an average of all seven use and benefit category scores, rounded to the nearest 10^{th} of a point. Waterbodies with one of the top ***Well-Rounded*** scores meeting a minimum size threshold were selected for the list. Specifically, this included:

- Lakes with the top 70 ***Well-Rounded*** scores, out of all lakes 40 acres or larger (rounded up from 39.95 acres).
- River and streams with the top 20 ***Well-Rounded*** scores, out of all rivers and stream with a clearly defined above ground channel of 2 miles or longer (rounded up from 1.95 miles). For rivers and streams with multiple reaches, the highest ***Well-Rounded*** score was used.

390 Robert Street North
St Paul, MN 55101-1805

651.602.1000
TTY 651.291.0904
public.info@metc.state.mn.us
metrocouncil.org

Follow us on:
twitter.com/metcouncilnews
facebook.com/MetropolitanCouncil
youtube.com/MetropolitanCouncil