

2023 SHORELINE INVENTORY

Prepared by Aidan Read

January 2024



Contents

- Introduction 3
- Summary 3
- Methodology 4
- Results: Bone Lake 5
- Results: Comfort Lake 12
- Results: Forest Lake 19
- Conclusion 27
- References 28
- Appendix A – Additional Maps 29
- Appendix B – Natural Cover Examples 36

Introduction

In 2022 staff at Comfort Lake – Forest Lake Watershed District began a reevaluation of shoreline restoration and protection efforts in the context of achieving the goals of the 2022–2031 Watershed Management Plan (WMP). The result of this reevaluation was the creation of a comprehensive shoreline program that leverages the full set of tools available to the District and better allocates resources in pursuit of the goals of the WMP.

- » **Goal 5:** Promote natural, deep rooted, native vegetation buffers to ensure at least 75% of lakeshore parcels have at least 75% natural shoreline condition. For example, in its last shoreline survey 55% of parcels on Bone Lake were covered in at least 75% natural shoreline vegetation; the goal is to ensure 75% of parcels are vegetated thusly. See **Table 3-2, P.62**.

Priority Ranking by Lake Management District (LMD)	Bone LMD: Medium	Little Comfort LMD: Medium	Forest LMD: Medium	Comfort LMD: Medium
--	------------------	----------------------------	--------------------	---------------------

FIGURE 1 – GOAL 5 FROM 2022 – 2031 WMP

One element of the comprehensive shoreline program that is outlined in the WMP is the shoreline/streambank inventory. This inventory is required to be conducted periodically as a “key targeting tool” and must include a complete photo record of the shoreline, as well as details of the shoreland, shoreline, and nearshore areas.

The nine priority waterbodies identified in the WMP are scheduled to have shoreline inventories completed on a five-year cycle. In 2023 inventories were completed for Bone, Comfort, and Forest Lakes. In 2024, Moody, Birch, School, and Shields Lakes will be surveyed; and in 2025 the inventory cycle will be completed with Little Comfort and Keewahtin. The 2023 survey was completed using the Score The Shore methodology developed by the Minnesota Department of Natural Resources as a rapid assessment tool of shoreline habitat. This methodology captures several data points of interest to the District, including the percentage of natural shoreline vegetation which is the metric identified in the WMP. This methodology was used as an inventory (or census) rather than a survey, meaning the complete shoreline was captured in the data. Full details of the methodology can be found in the references of this report.

Summary

Statewide, Minnesota has seen a decline in shoreline habitat. This decline is greatest in areas facing development pressure, and areas where large portions of lakeshore are in private ownership. The data for shorelines in CLFLWD extends back to 2013, giving us a ten-year snapshot of shoreline habitat. Different methodologies were used between the 2013–2014 surveys and 2023 which introduces an opportunity for error, but overall, the data can be interpreted similarly. While none of the inventories met the District’s shoreline goals, the trend in the shoreline data is flat which can be counted as a minor success. Of concern is the fact that large portions of the lakeshore have low to

very low scores, especially on Forest Lake. This data will be used to improve targeting of priority shorelines, and allocation of technical assistance and cost-share resources.

Methodology

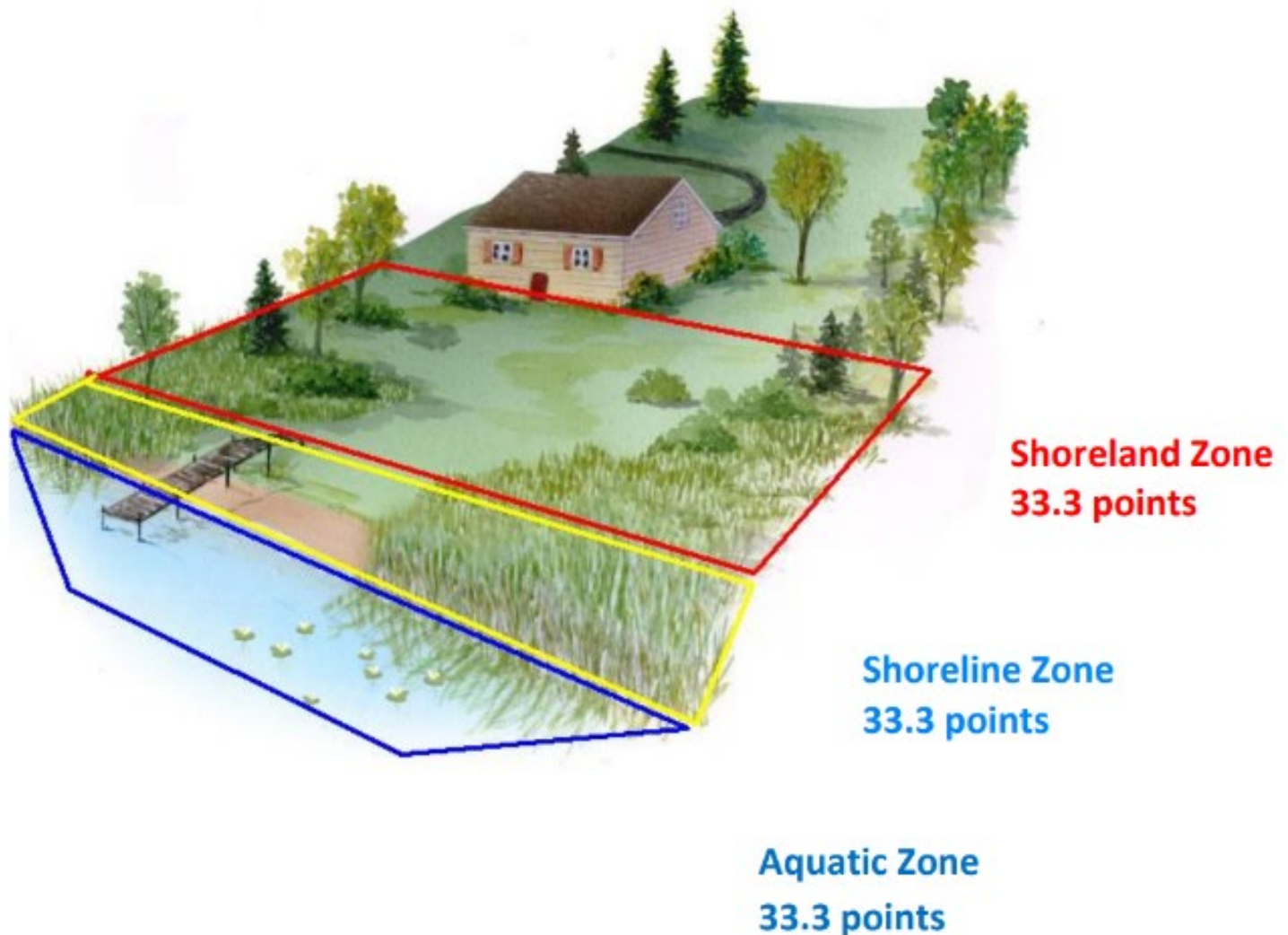


FIGURE 2 – STS ZONES

The 2023 shoreline inventory used the Score the Shore method developed by the Minnesota Department of Natural Resources Fisheries Division. This method was designed for conducting rapid assessments of lake shore habitat and allows for a useful comparison between lakes throughout the region. The method was adapted for the District’s shoreline inventories and captures greater detail for a deeper understanding of the characteristics of the shoreline area.

The STS method breaks out habitat zones into shoreland, shoreline, and aquatic, each with their own score. This allows the data to better inform management decisions about land use and development on the lakes surveyed. The primary focus of this report will be on the shoreland and shoreline zones. While STS has an emphasis on habitat, many of the same characteristics that make quality shoreline habitat also reduce shoreline erosion and improve water quality.

Results: Bone Lake

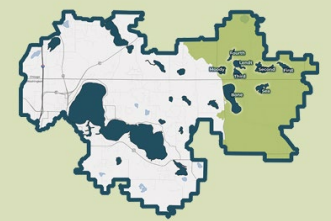
Bone Lake

Lake Area: 221.5 acres

Shoreline: 3.01 miles

Lake Habitat Score: LOW

Natural Shoreline Cover: 53%



**Bone Lake
Management District**

Summary

Bone Lake was the first to be surveyed by the District using STS methods. The total shore length is approximately 3.01 miles, and 149 data points were gathered. In 2013, Bone Lake was surveyed as having 55% shoreline meeting District goals, in 2023 that number had fallen to 53.0%. While the percentage has dropped, the trend appears flat or declining, more data is needed. The Mean Lakewide score for Bone Lake was 63.80 / 100, earning Bone Lake a rating of Low.

Total Habitat

The lakewide score is the combined shoreline, shoreland, and aquatic score, and indicates the relative habitat value of each data point. Looking at the combined scores allows areas of more significant shore and near-shore habitat degradation to be identified. The lakewide score is useful for comparison between lakes of similar development in our area and is standardized across all lakes surveyed with the STS methodology.

Shoreland	Shoreline	Aquatic	Total STS Score
20.98	23.29	19.53	63.80
Low	Moderate	Low	Low

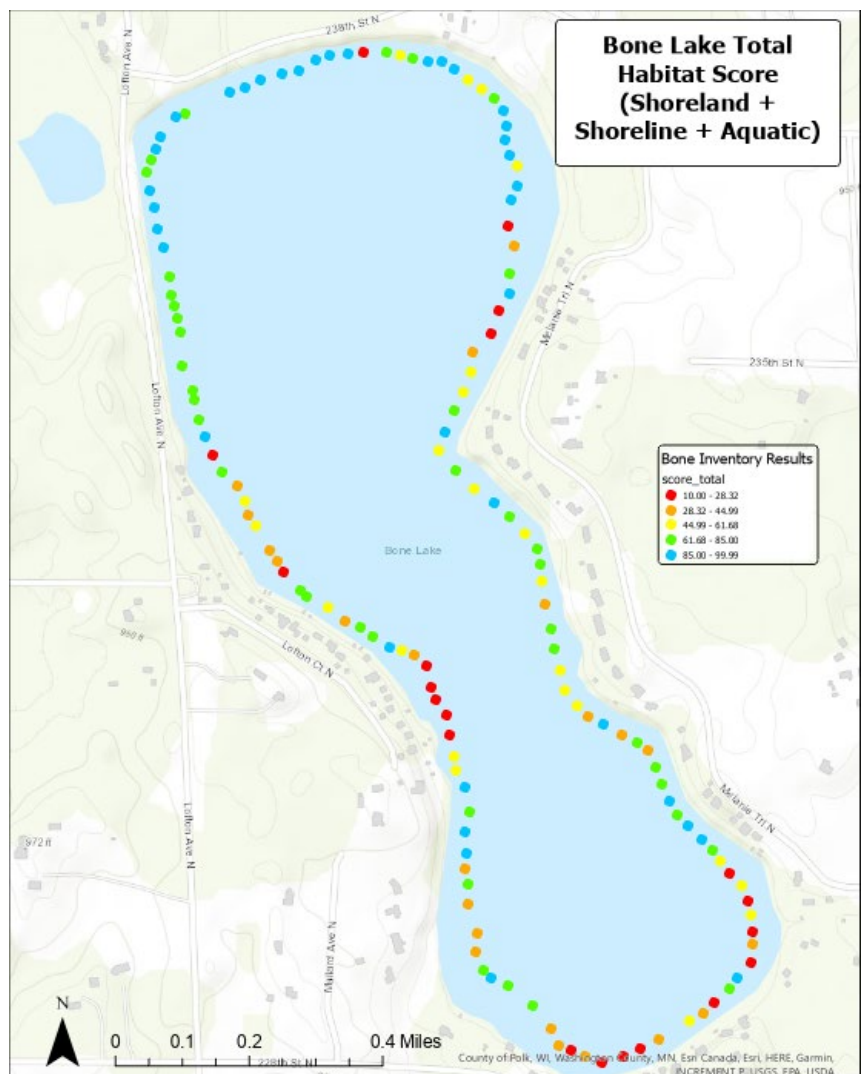


FIGURE 3 – BONE LAKE HABITAT SCORES

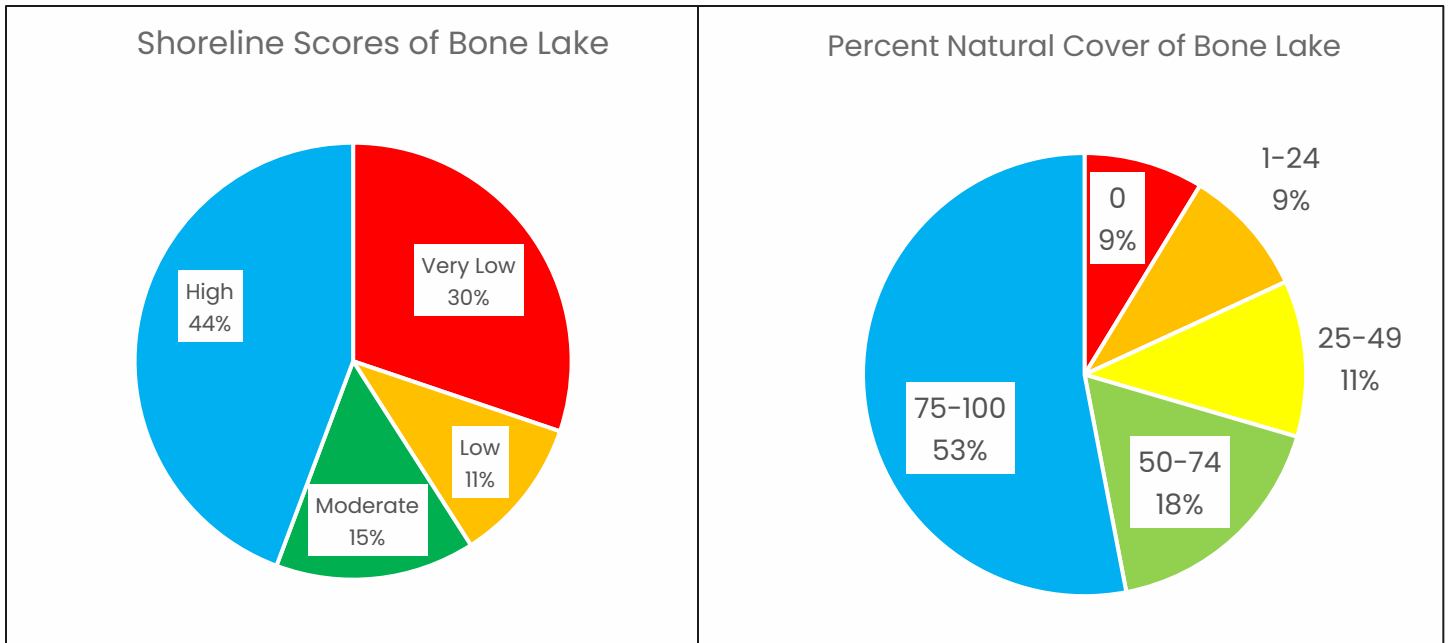


FIGURE 7- BONE LAKE SHORELINE SCORES

FIGURE 6 - BONE LAKE % NATURAL COVER

The shoreline cover metric is useful for assessing the presence of a buffer but does not include characteristics of the rest of the shore area. The total shoreline score includes the percent of natural cover, the presence of trees, shrubs, or wetland, and the presence of overhanging woody habitat, such as fallen trees or branches. It can be noted in Figures 6 & 7 that the percentage of shoreline with a “High” score is lower than the number meeting the natural cover goals. The breakdown of characteristics of each survey point can be viewed in figure 8. Note that 13 points completely lacked natural cover.

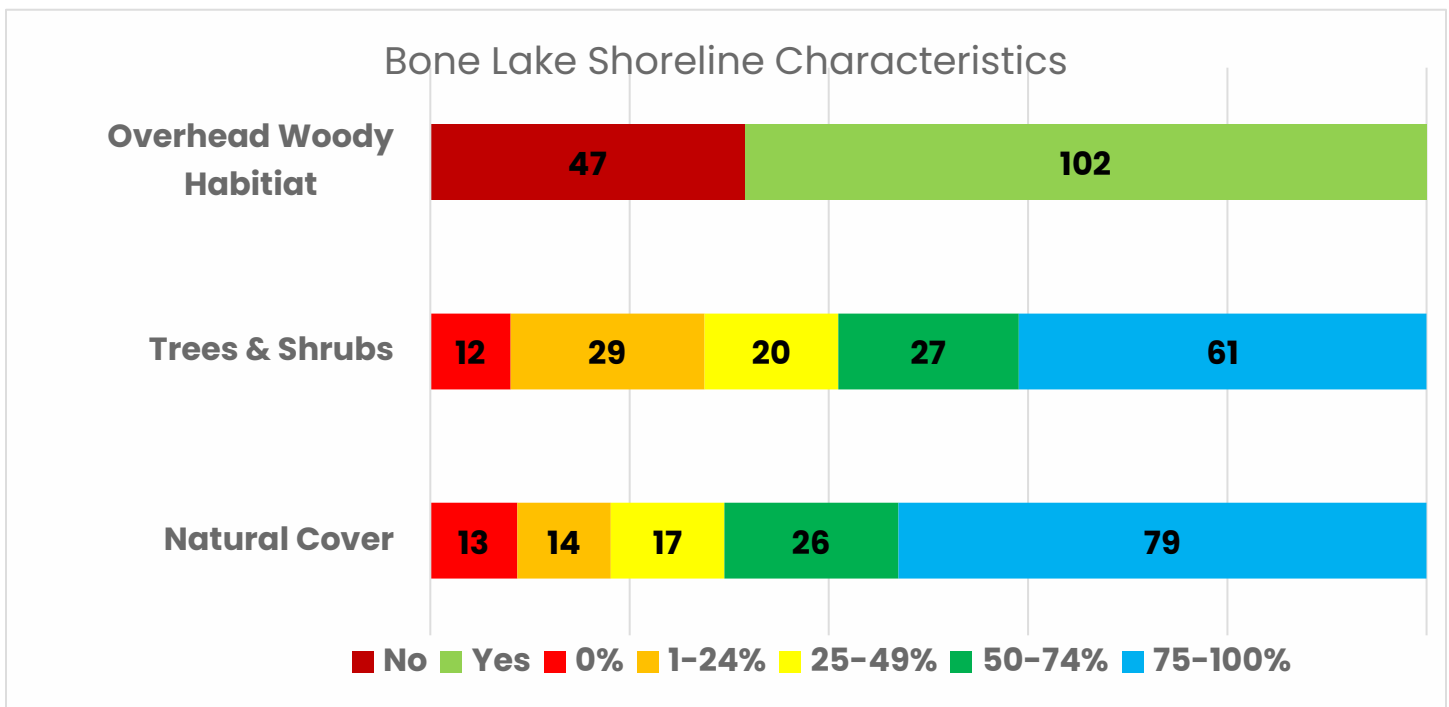


FIGURE 8- CHARACTERISTICS OF BONE LAKE SHORELINE

Shoreland

The shoreland zone extends from the shoreline upslope, as can be viewed in figure 2. The shoreland zone of Bone Lake scored Low with 20.9/33. Notable from the shoreland zone on Bone Lake is the absence of any trees, shrubs, or natural cover on a number of survey points. Areas with a complete lack of natural vegetation and canopy have an outsized impact on runoff and lake water quality.

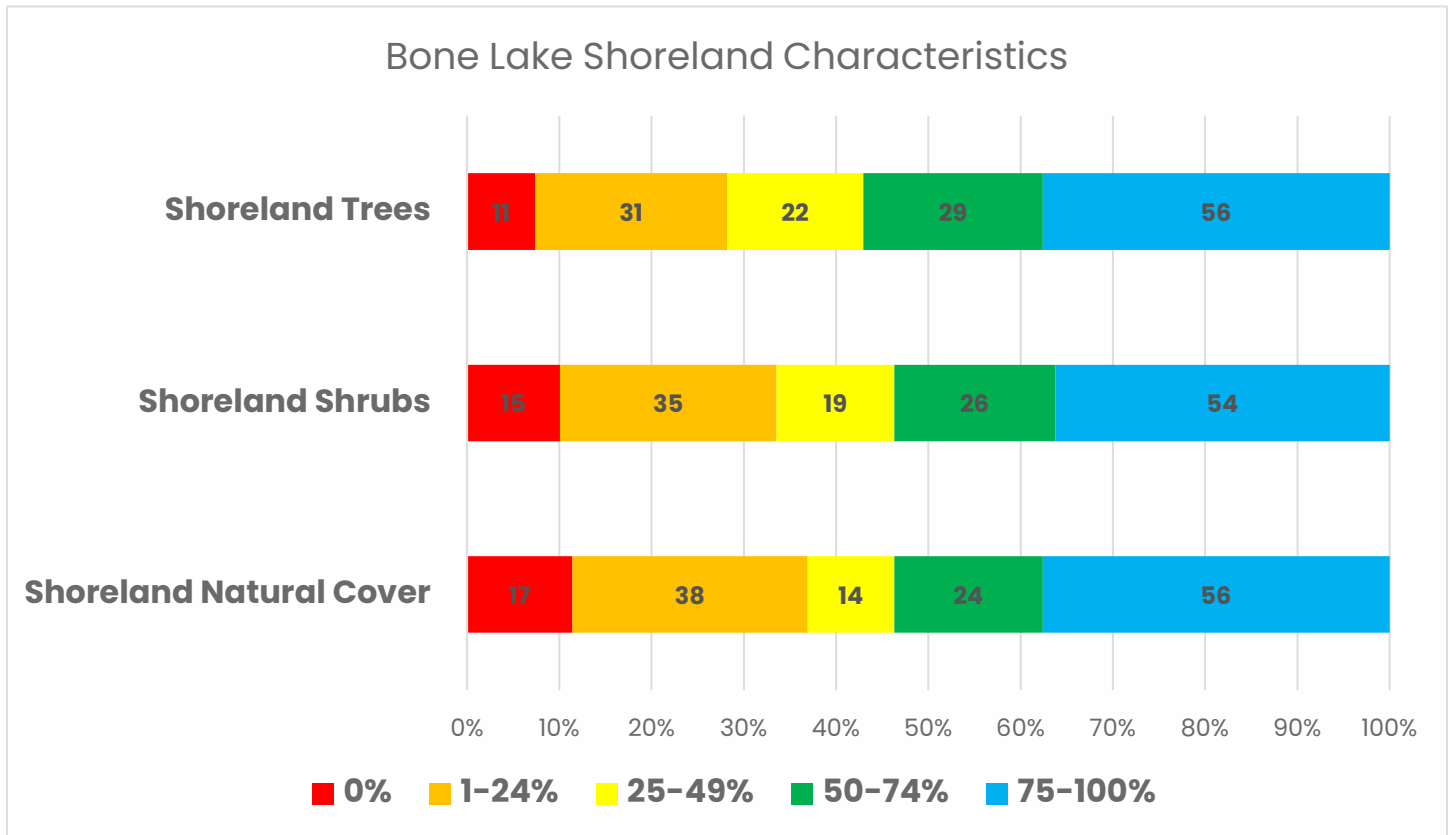


FIGURE 9 – BONE LAKE SHORELAND CHARACTERISTICS



FIGURE 10 – BONE LAKE PROPERTY WITH 75-100% SHORELINE TREES OR SHRUBS, AND SHORELINE NATURAL COVER

Land Use

One of the challenges facing Bone Lake is the high rate of development. More development leads to higher rates of shoreline degradation, and fewer opportunities for conservation and restoration. The land use of Bone Lake can be viewed in the chart below. Note the 20% of the land use characterized as roadway. The roadway area is on the north and west sides and has a high shoreline score due to the lack of shoreline disturbance. Of the rest of Bone Lake, only 5% was recorded as undeveloped, 2% of which is wetland area. The high level of development emphasizes the importance of landowner engagement in improving shoreline habitat.

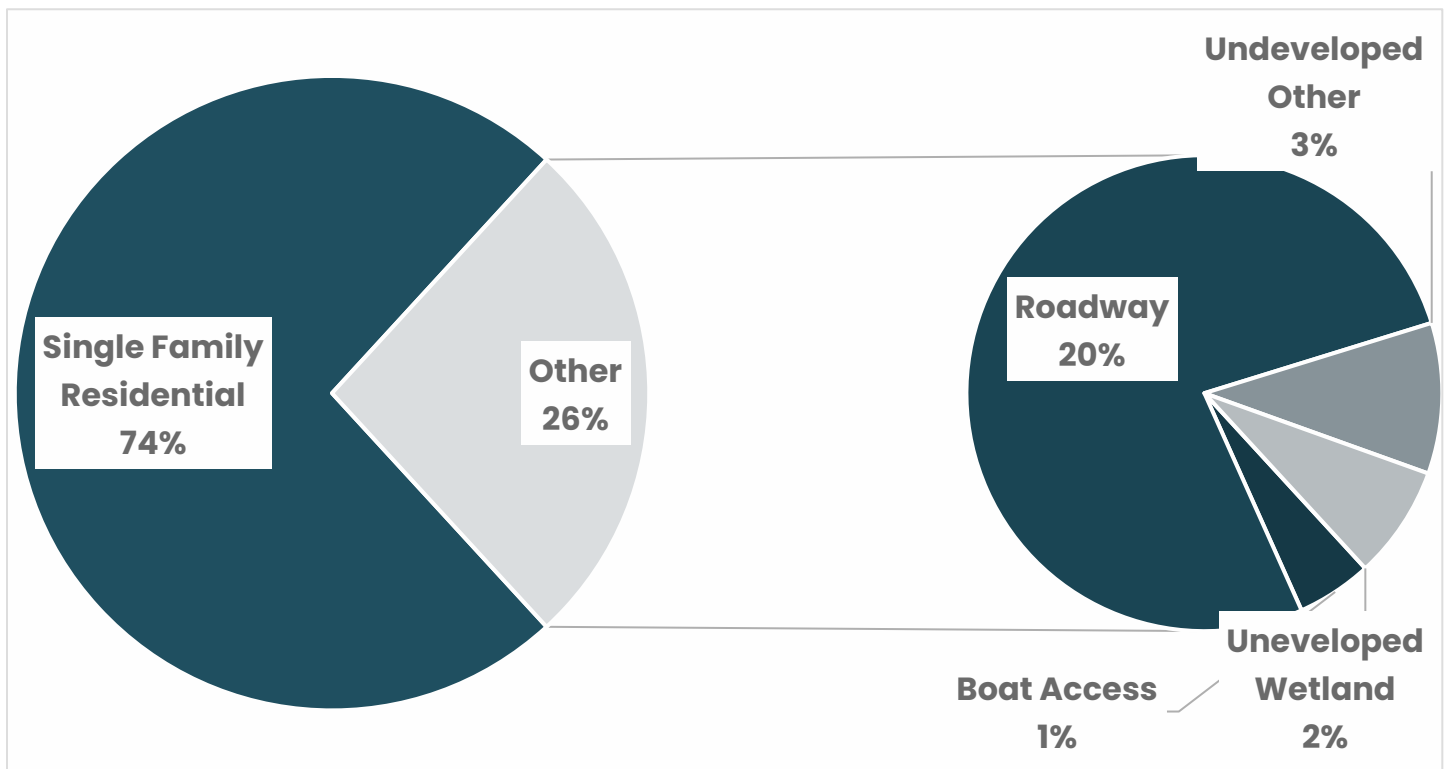


FIGURE 11- LAND USE OF BONE LAKE

Regional Comparison

Using the total habitat score, Bone Lake ranks 463rd of the 824 lakes included in the DNR STS database. This places Bone Lake in the lower 45th percentile.

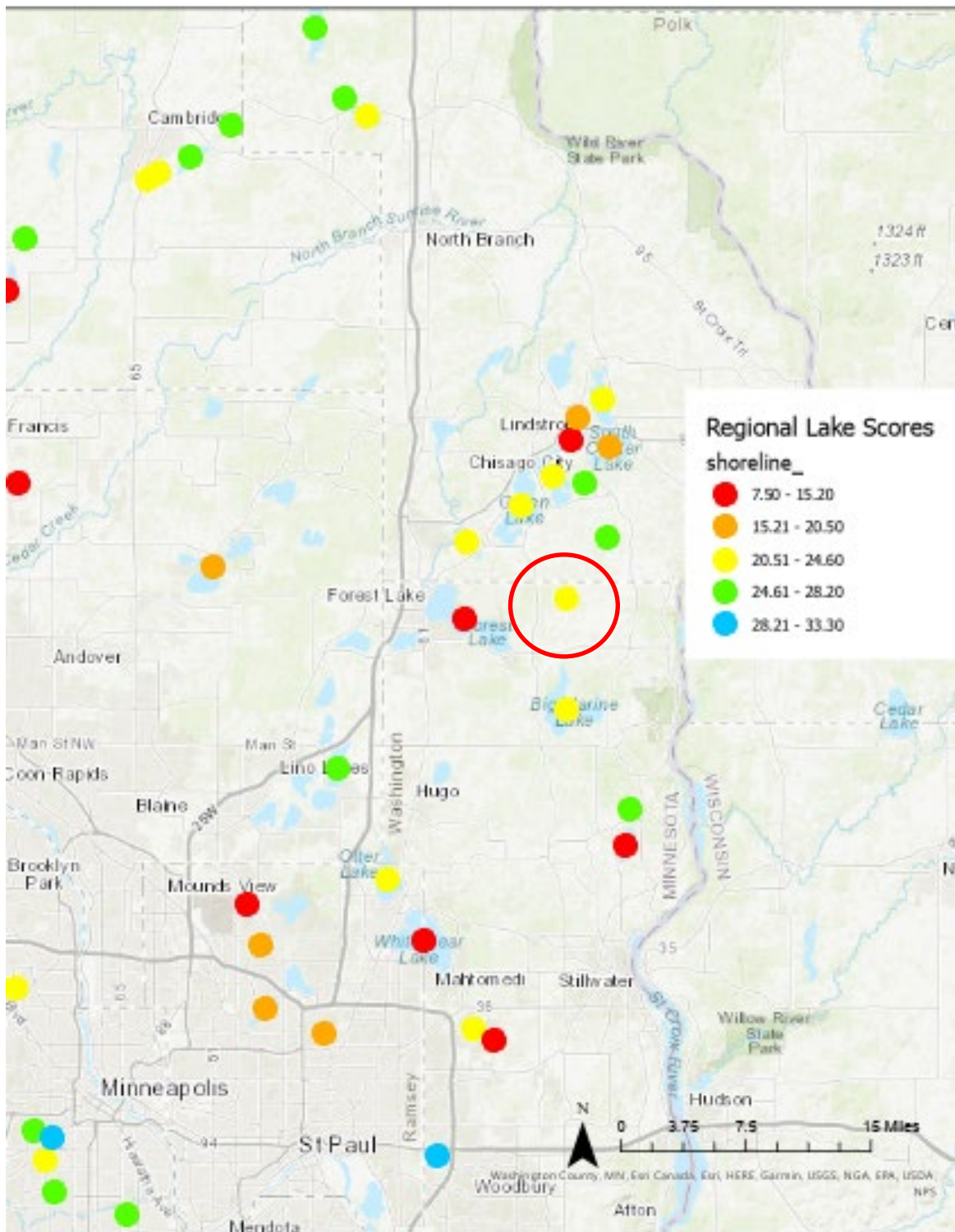


FIGURE 12 – REGIONAL COMPARISON WITH BONE LAKE HIGHLIGHTED

Bone Lake Improvements:

- ❑ Plant a tree! – 12 points without shoreline trees or shrubs
- ❑ Don't go there? Don't mow there! – 27 points with less than 25% natural vegetation
- ❑ If a tree falls in the lake... leave it! – 47 points without overhanging woody habitat

Results: Comfort Lake

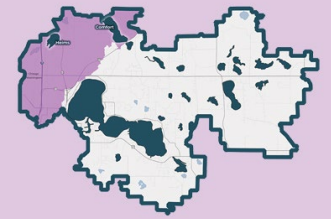
Comfort Lake

Lake Area: 217.8 acres

Shoreline: 3.24 miles

Lake Habitat Score: LOW

Natural Shoreline Cover: 59%



Comfort Lake Management District

Summary

Comfort Lake's shoreline inventory was completed in August of 2023 using the STS methodology. 118 survey points were used and found a decrease in shoreline meeting the District's natural cover goal. Between 2014 and 2023 points meeting the goal of 75% natural cover decreased from 61% to 59%. With a trend that is flat or declining, more efforts are needed to improve Comfort Lake's shoreline.

Concentrations of low scoring shoreline were identified on the north end, as well as the south and southeast sections.

Shoreland	Shoreline	Aquatic	Total STS Score
21.74	19.15	15.45	56.34
Moderate	Low	Very Low	Low

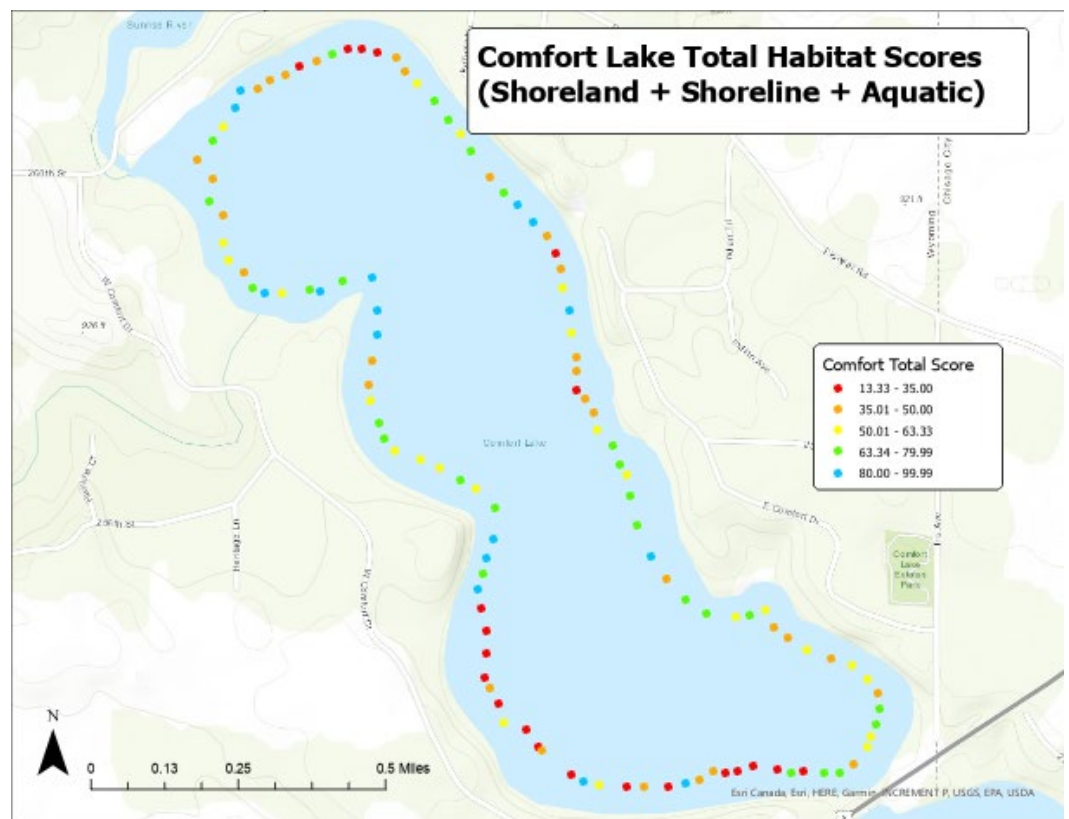


FIGURE 13 – TOTAL HABITAT SCORES FOR COMFORT LAKE

Total Habitat

The lakewide score is the combined shoreline, shoreland, and aquatic score, and indicates the relative habitat value of each data point. Looking at the combined scores allows areas of more significant shore and near-shore habitat degradation to be identified. The lakewide score is useful for comparison between lakes of similar development in our area and is standardized across all

lakes surveyed with the STS methodology. With a total habitat score of 56.34 / 100, Comfort Lake scores “Low”. The total score includes all three zones, shoreland, shoreline, and aquatic.

Shoreline

For data specific to the goals of the WMP, Comfort Lake had 59% of the shoreline with at least 75% natural vegetation. A map of this data can be viewed in figure 14 and shows concentrated areas of low natural cover. These hot spots were identified off West Comfort Drive on the south, and on the northeast corner off 260th St. The map also indicates areas with high levels of natural vegetation throughout the east and west sides of the lake.

While 59% of the shoreline was meeting District goals, 15% of the shoreline was measured as having 0-24% natural cover. The shoreline score of 19.15/33 ranks as “Low”.

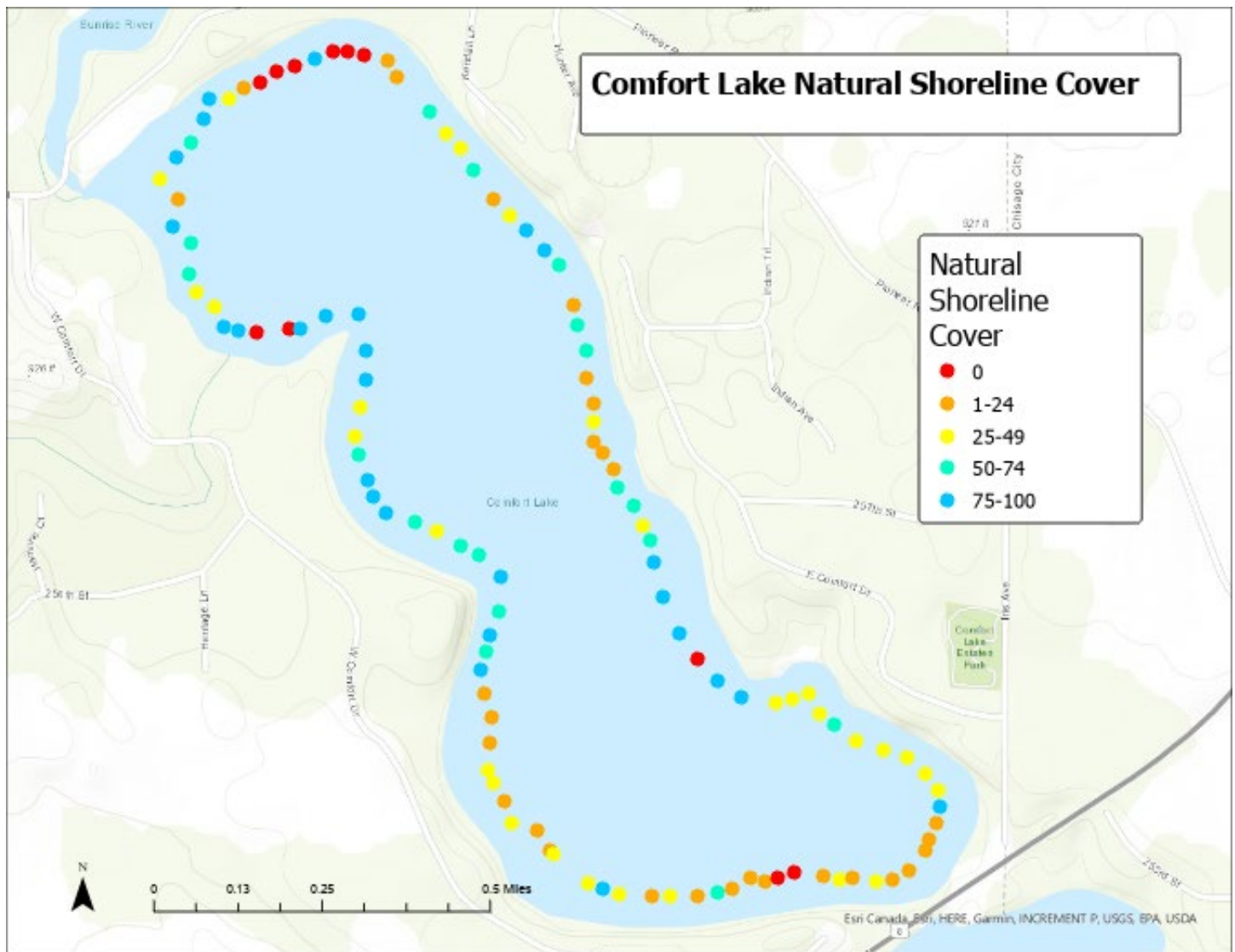


FIGURE 15- COMFORT LAKE NATURAL SHORELINE COVER

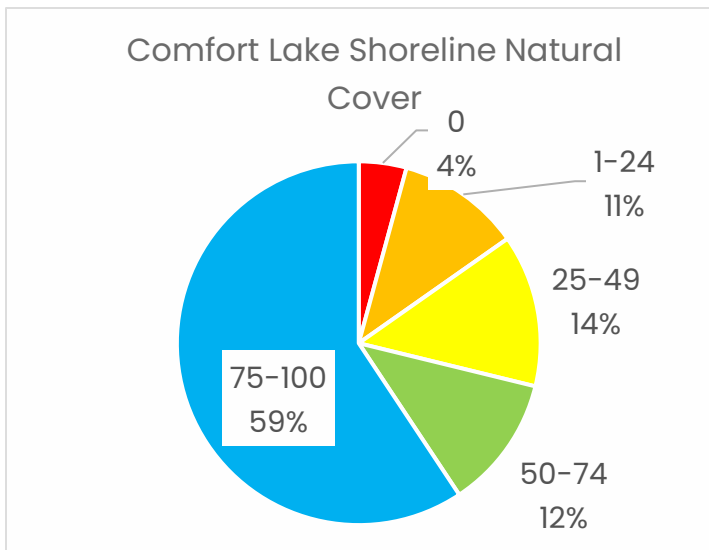


FIGURE 17 – COMFORT SHORELINE NATURAL COVER

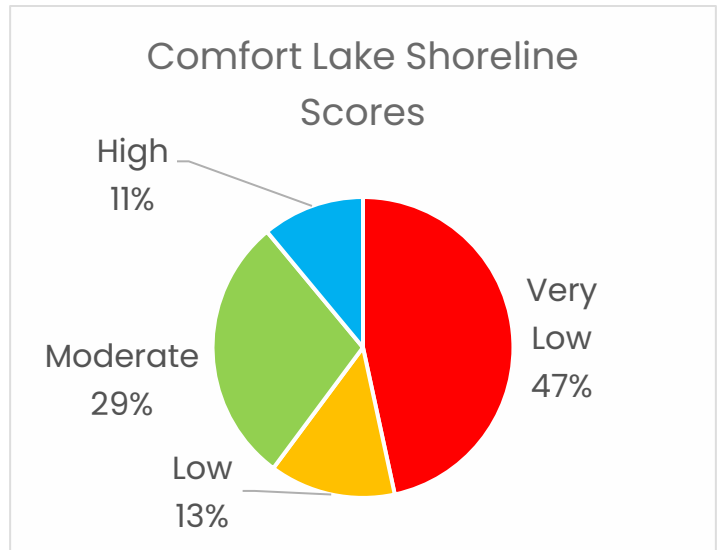


FIGURE 16– COMFORT SHORELINE SCORES

The shoreline cover metric is used by our WMP but does not include characteristics of the rest of the shore area. The total shoreline score includes the percentage of natural cover, the presence of trees, shrubs, or wetland, and the presence of overhanging woody habitat, such as fallen trees or branches. It can be noted in Figures 16 & 17 that the percentage of shoreline with a “High” score is lower than the number meeting the natural cover goals, and that half (47%) of survey points earned a “Very Low” shoreline score. The breakdown of characteristics of each survey point can be viewed in figure 8. Note that five points completely lacked natural cover.

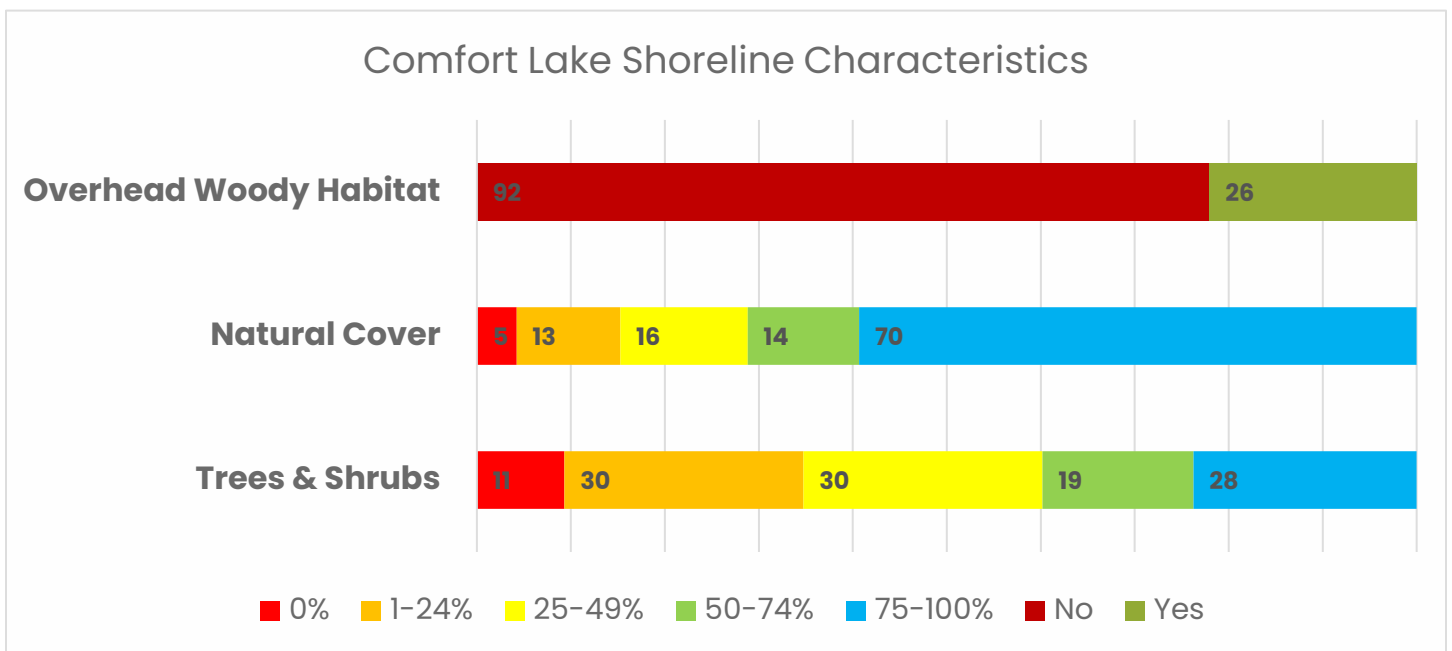


FIGURE 18 – SHORELINE CHARACTERISTICS OF COMFORT

Shoreland

The shoreland zone extends from the shoreline upslope, as can be viewed in figure 2. The shoreland zone of Comfort Lake scored “Moderate” with 21.74/33. Notable from the shoreland zone on Bone Lake is the absence of any shrubs, or natural cover on a number of survey points. Areas with a complete lack of natural vegetation have an outsized impact on runoff and lake water quality.

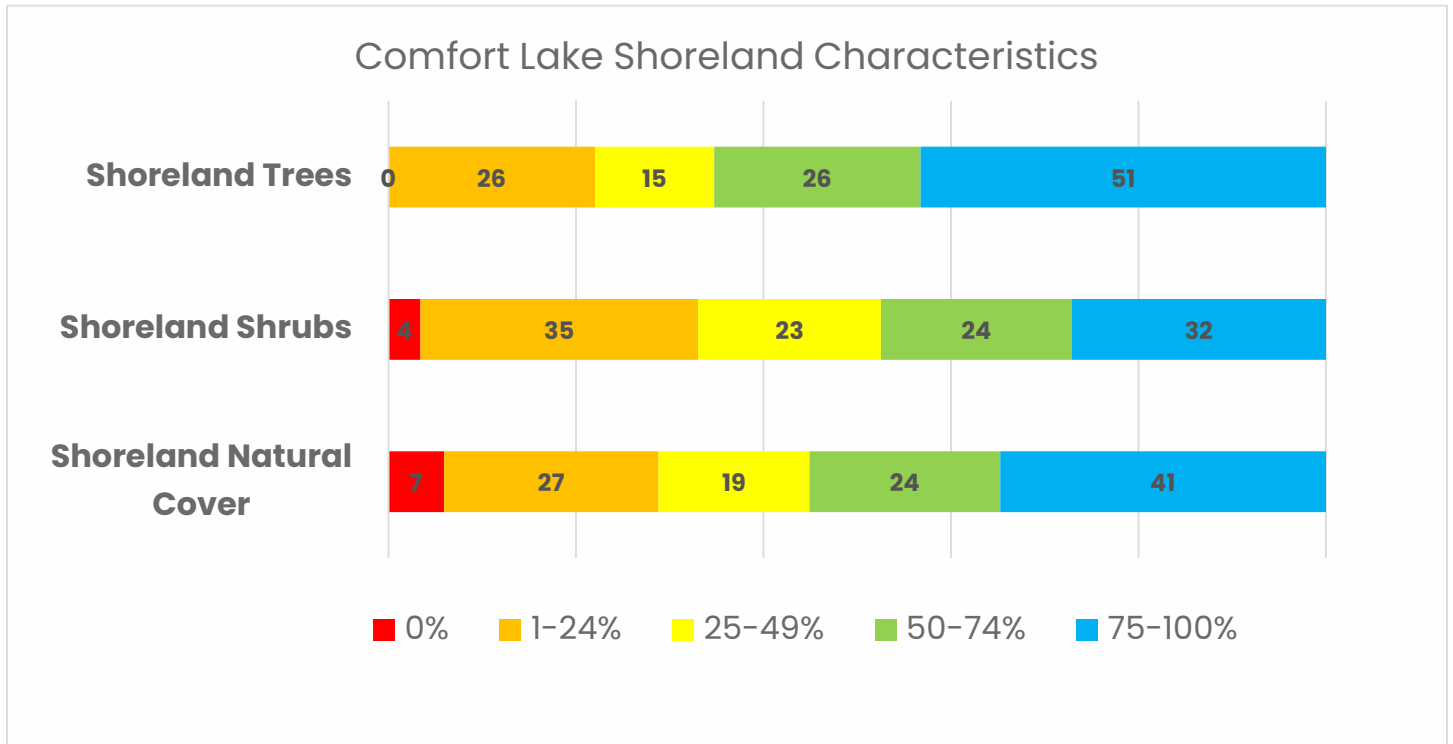


FIGURE 19 – COMFORT LAKE SHORELAND CHARACTERISTICS



FIGURE 20 – COMFORT LAKE SHORELINE WITH 0% NATURAL COVER

Land Use

One of the challenges facing Comfort Lake is the high rate of development. More development leads to higher rates of shoreline degradation, and fewer opportunities for conservation and restoration. The land use of Comfort Lake can be viewed in the chart below. Note that only 2% was recorded as undeveloped. The high level of development emphasizes the importance of landowner engagement in improving shoreline habitat.

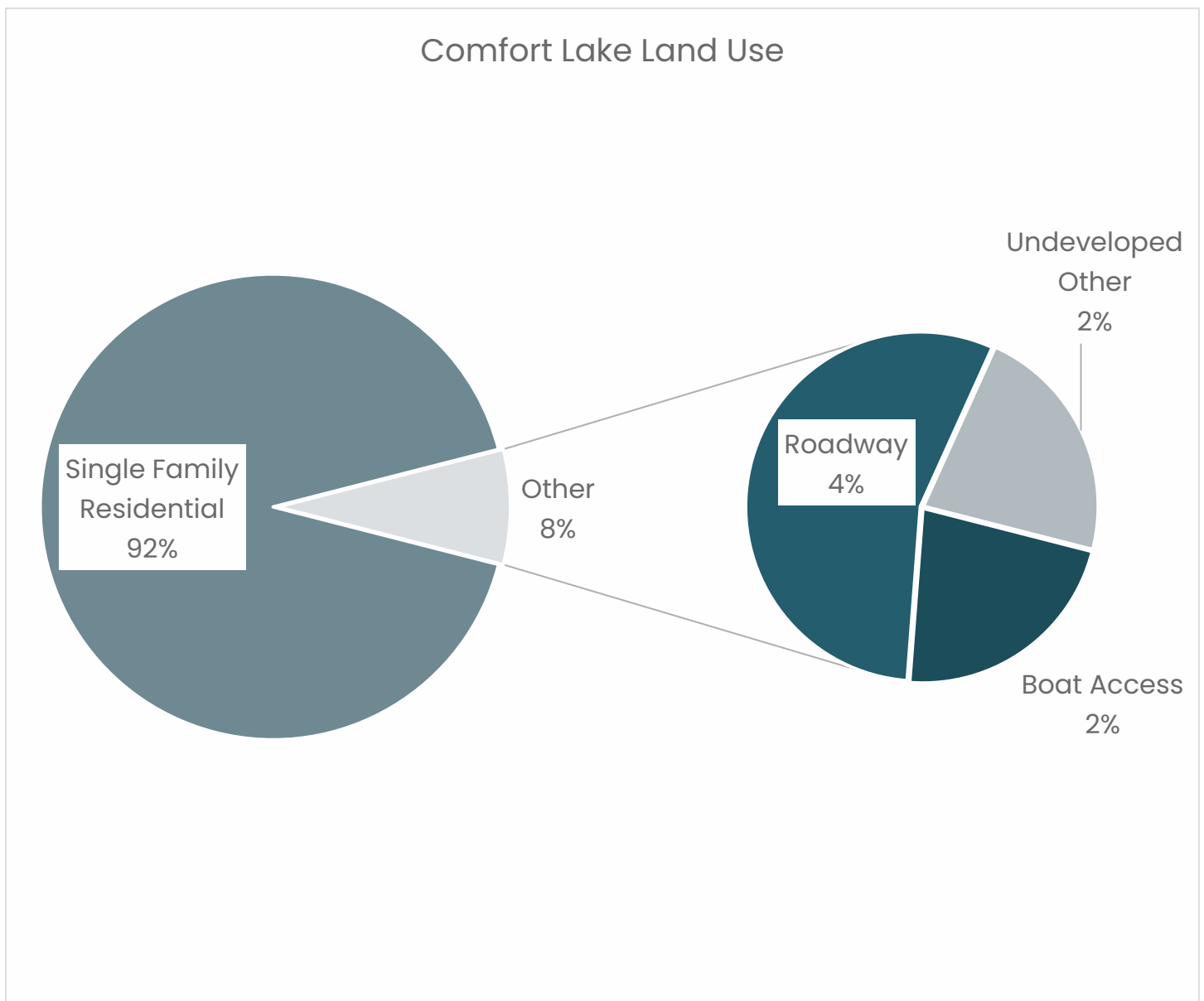


FIGURE 21- LAND USE OF COMFORT LAKE

Regional Comparison

Using the total habitat score, Bone Lake ranks 663rd of the 824 lakes included in the DNR STS database. This places Comfort Lake in the lower 20th percentile.

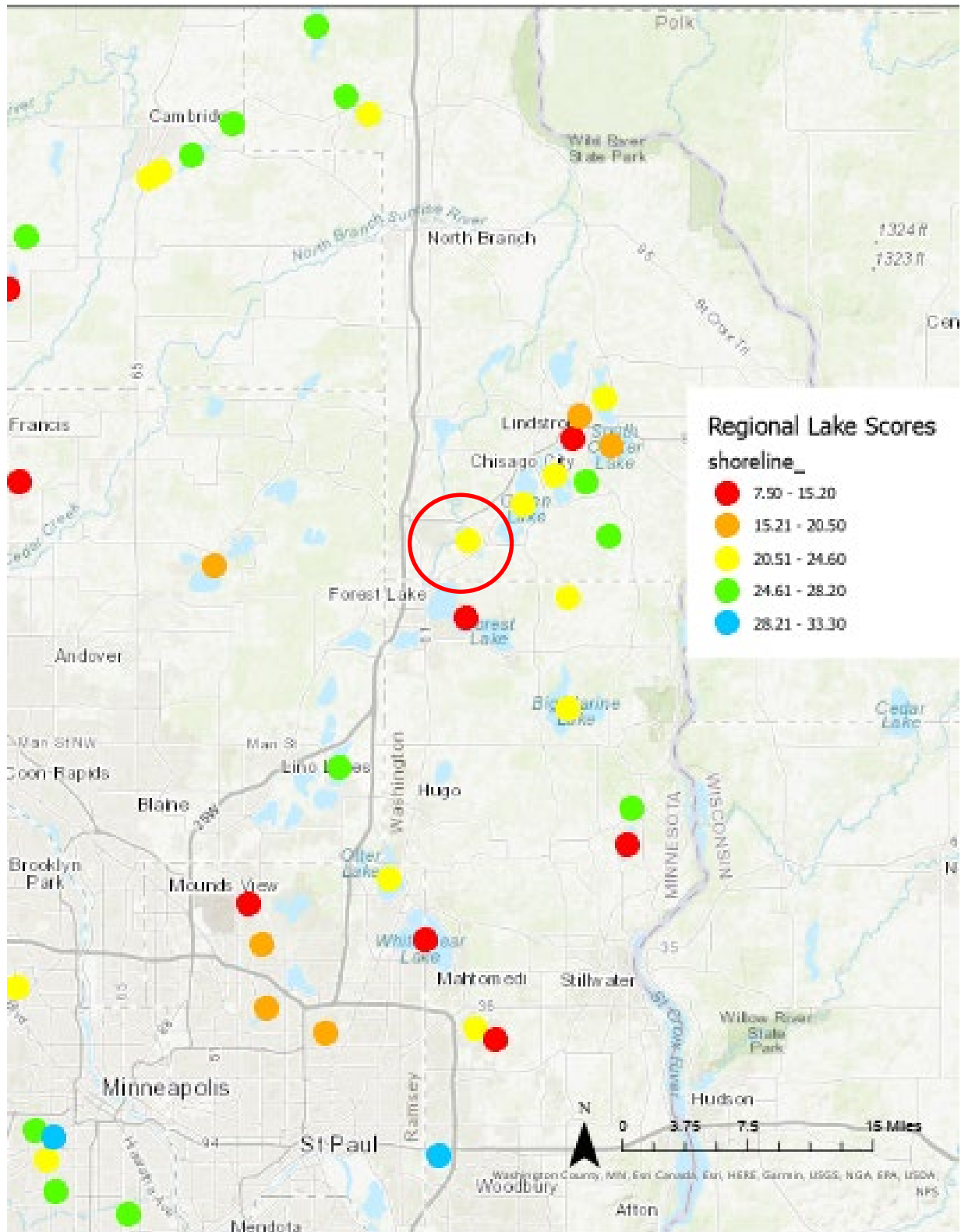


FIGURE 22 – REGIONAL COMPARISON WITH COMFORT LAKE HIGHLIGHTED

Comfort Lake

- Plant a tree! – 11 points without shoreline trees or shrubs
- Don't go there? Don't mow there! – 18 points with less than 25% natural vegetation
- If a tree falls in the lake... leave it! – 92 points without overhanging woody habitat

Results: Forest Lake

Forest Lake

Lake Area: 2,271 acres

Shoreline: 15.7 miles

Lake Habitat Score: **VERY LOW**

Natural Shoreline Cover: 30%



**Forest Lake
Management District**

Summary

Forest Lake's shoreline inventory was completed in September 2023 with 673 survey points collected.

Shoreland	Shoreline	Aquatic	Total STS Score
13.87	10.57	17.52	41.96
Very Low	Very Low	Low	Very Low

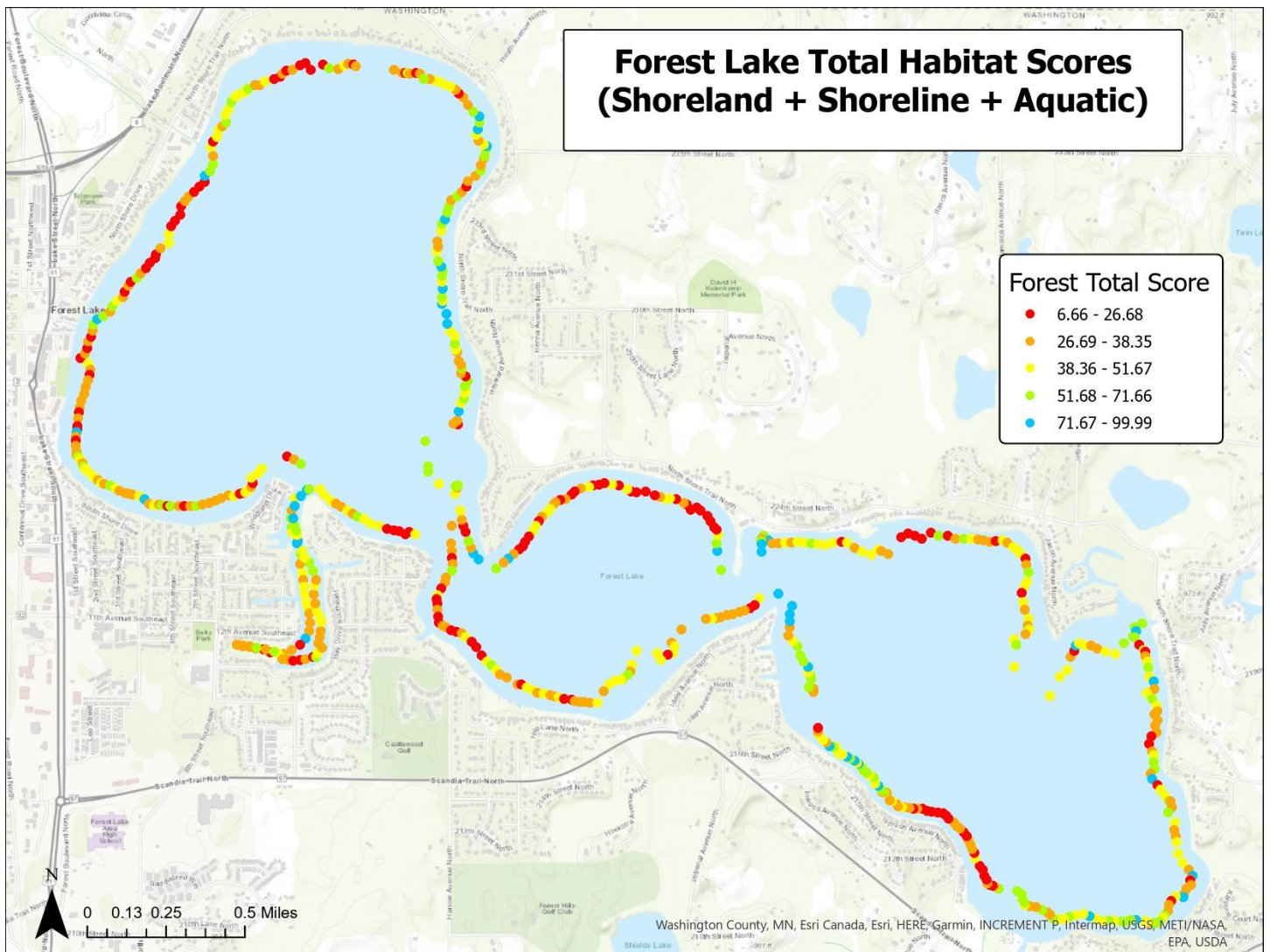
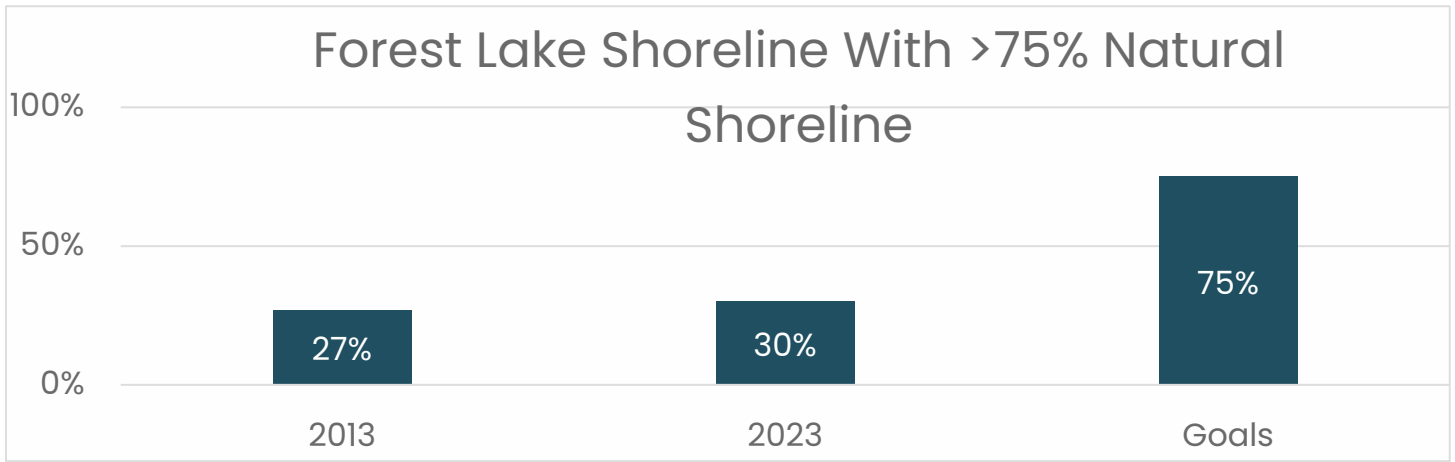


FIGURE 23 – TOTAL HABITAT SCORES OF FOREST LAKE



The amount of natural shoreline cover was found to have increased to 30%, compared to 27% observed in 2013. With only two datapoints and a change in methods, it is hard to determine if this is an upward trend, but it is a positive data point. Concentrations of low scoring shoreline were found throughout the lake but were notably concentrated in the south of 1st and 3rd basins.

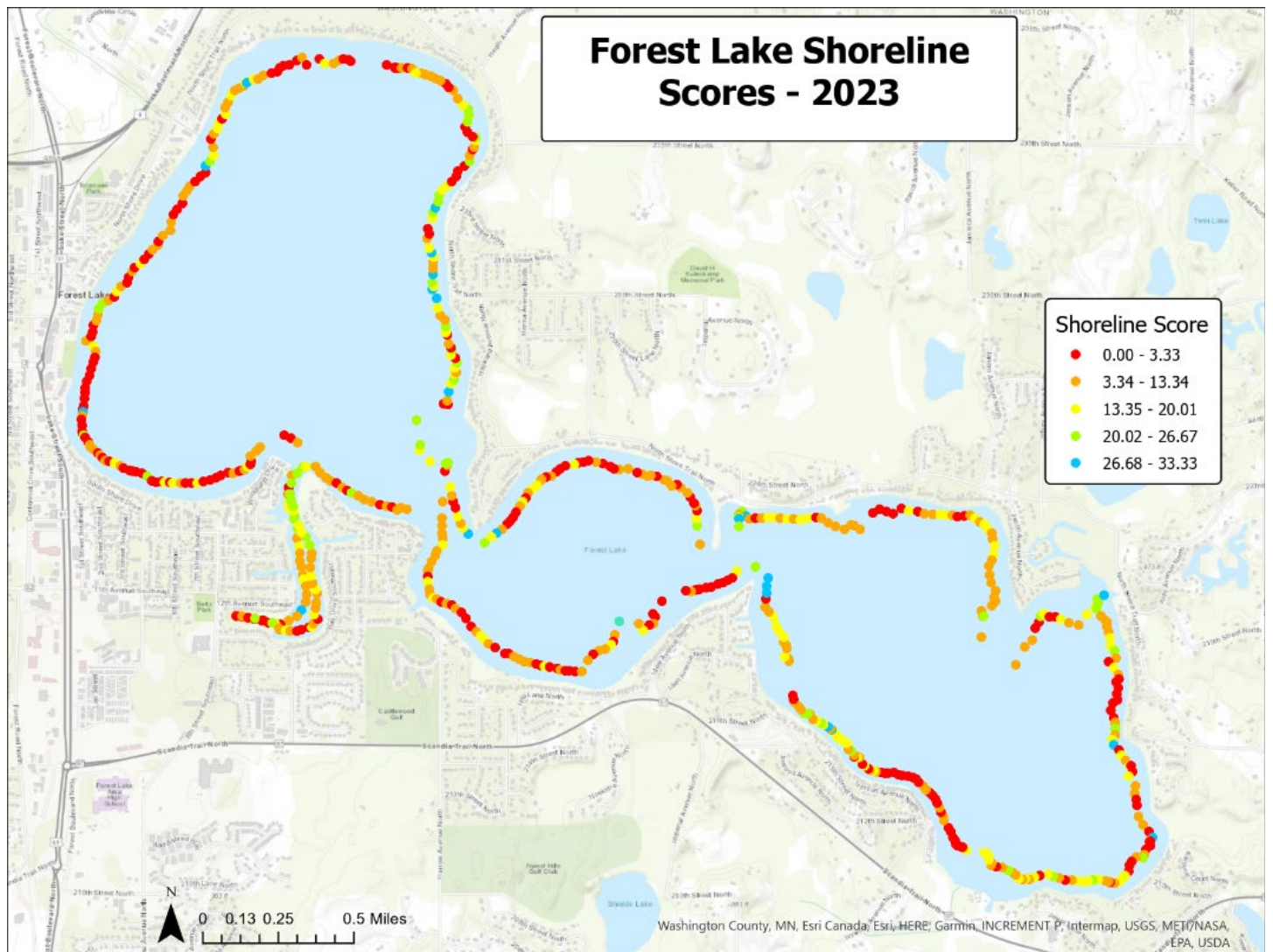


FIGURE 24 – FOREST LAKE SHORELINE SCORES

Total Habitat

The highest score that Forest Lake achieved was in the aquatic zone. The amount of disturbance to aquatic vegetation and the number of docks and lifts are the largest factors in the aquatic score. Overall, Forest Lake's score of 41.96/100 qualifies it as Very Low, with a particularly low shoreline score. Figure 23 shows that most of Forest Lake's shoreline qualifies as having very low habitat value.

Shoreline

For the goals of the WMP, Forest Lake has 30% of data points meeting the goal of at least 75% natural shoreline cover, this can be viewed in figure 26. The distribution of shoreline scores can also be viewed in figure 25, it is notable that 84% of shoreline scored Very Low, despite only 24% having 0% natural cover. This discrepancy is due to the deforested nature of Forest Lake's shoreline. Maps of each basin and the associated natural shoreline cover can be viewed in Appendix A.

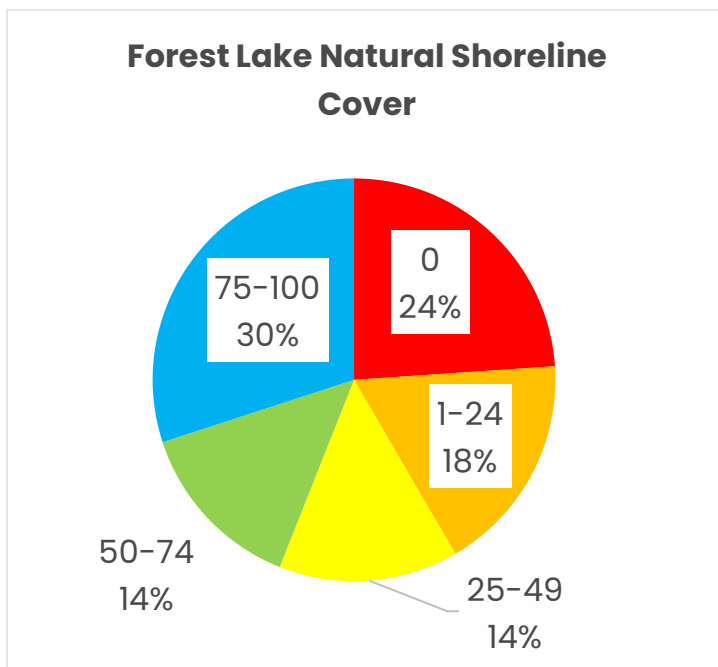


FIGURE 26- FOREST SHORELINE SCORES

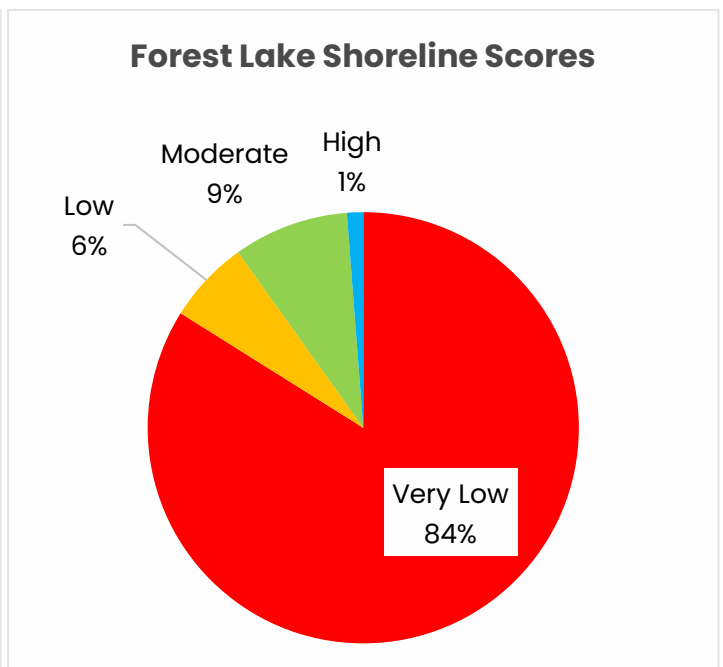


FIGURE 25 - FOREST NATURAL COVER

More details on the characteristics of the shoreline can be viewed in figure 27. Notable in this figure is that there are 161 points that had 0% natural cover, and 345 sites with zero trees, shrubs, or wetland. These sites that have 0% canopy or natural cover are a high priority for addressing shoreline issues and are having a significant impact on water quality and shoreline habitat on Forest Lake. The lack of shoreline canopy can be seen clearly in figure 28 where each red point is a site with zero trees, shrubs, or wetland.

Forest Lake Shoreline Characteristics

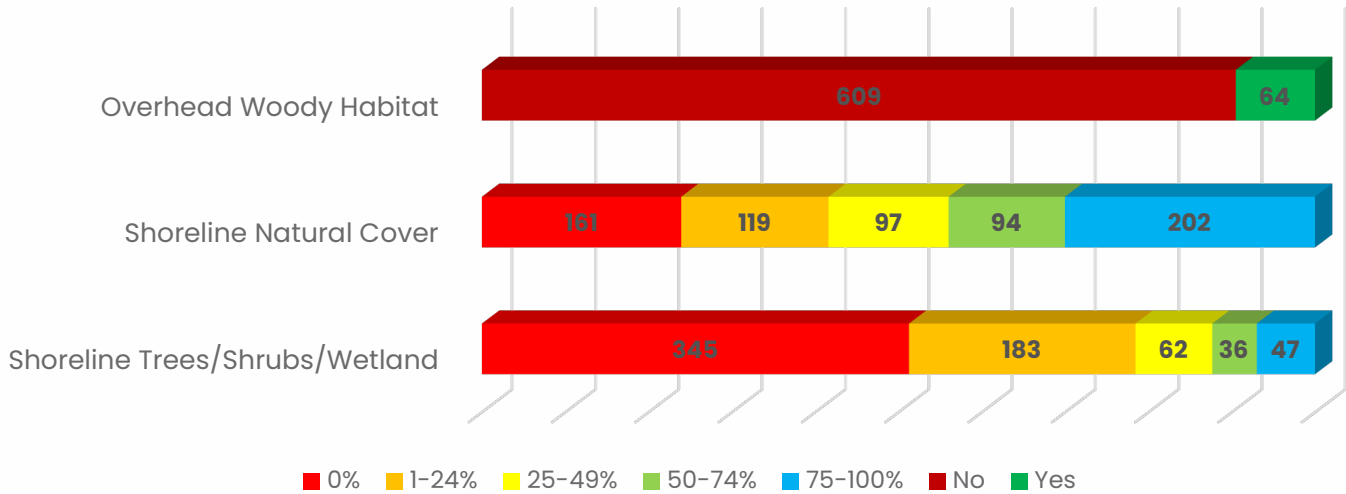


FIGURE 27- FOREST LAKE SHORELINE CHARACTERISTICS

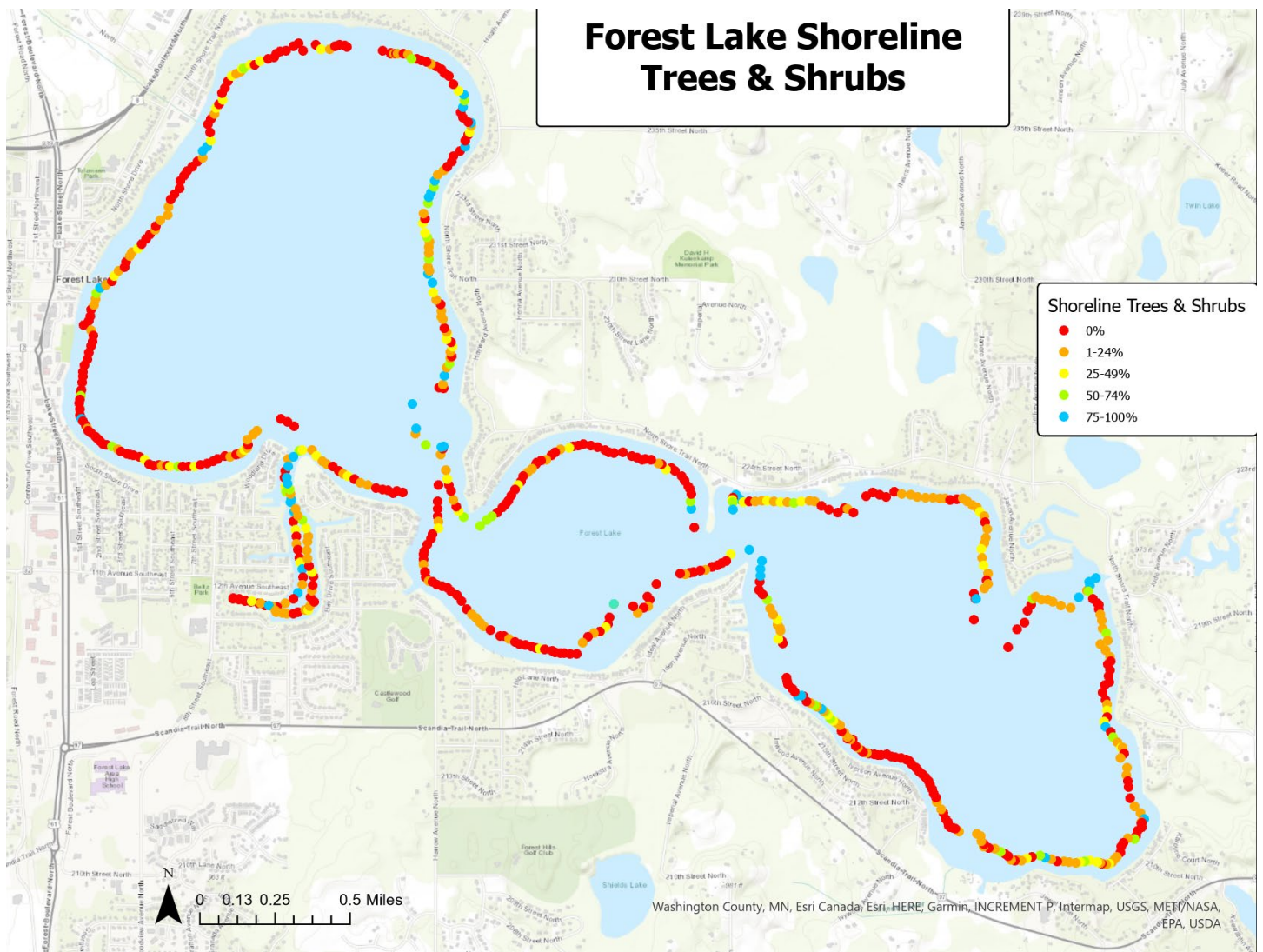


FIGURE 28- FOREST LAKE SHORELINE CANOPY

Shoreland

The shoreland zone of Forest Lake scored 13.87/33, or Very Low. While a higher score than the shoreline zone, there was still a lack of natural cover on 323 points. More details of the shoreland characteristics can be viewed in figure 29. The priority for targeting shoreland areas is improving the 33 points that lack canopy cover, and the 75% of points that have under 25% natural cover.

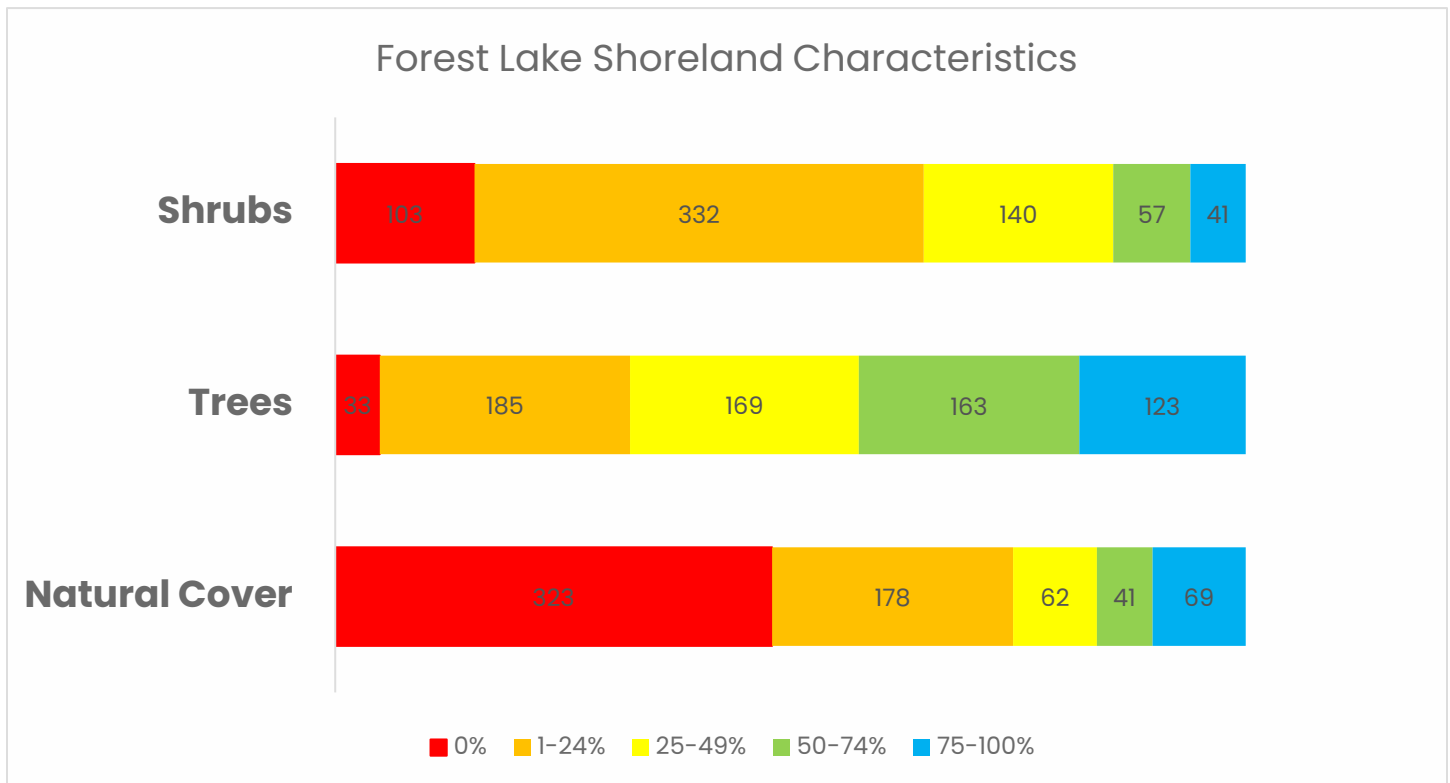


FIGURE 29 – FOREST SHORELAND CHARACTERISTICS



FIGURE 30 – CHARACTERISTIC FOREST LAKE SHORELINE WITH 0% NATURAL COVER AND SPARSE CANOPY.

Land Use

Forest Lake has the highest density of development in the District. The density of development creates challenges for maintaining shoreline habitat and meeting the District's shoreline goals. While there is undeveloped land on Forest Lake, it represents approximately 3% of the shoreline. To meet the District's shoreline goals, single family residential properties will need to be the focus of restoration efforts.

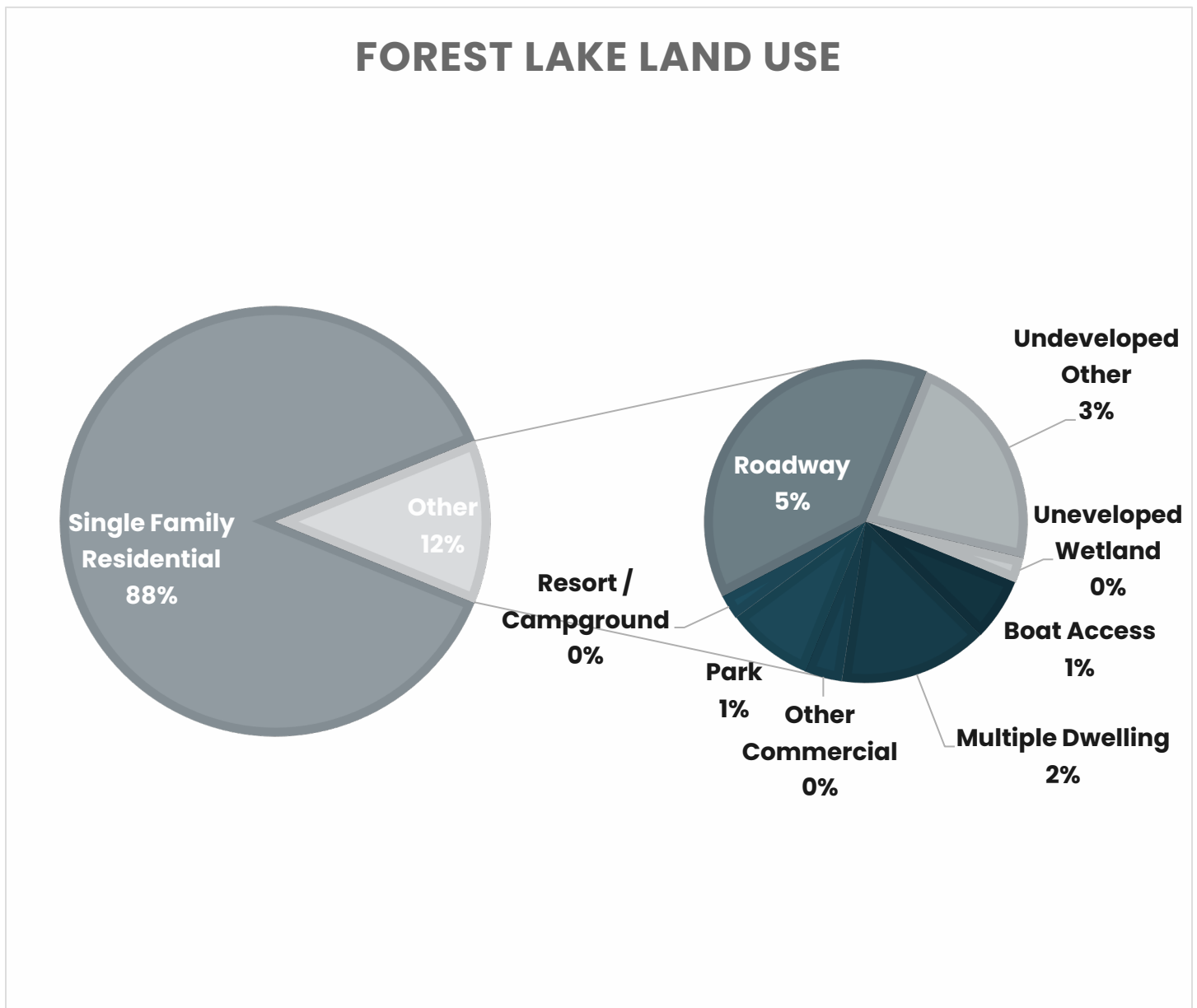


FIGURE 31 – LAND USE OF FOREST LAKE

Regional Comparison

The STS method allows lakes to be compared on a standard metric. Of the 824 lakes in the DNR's STS database, Forest Lake places 817th, placing it in the bottom 1 percentile.

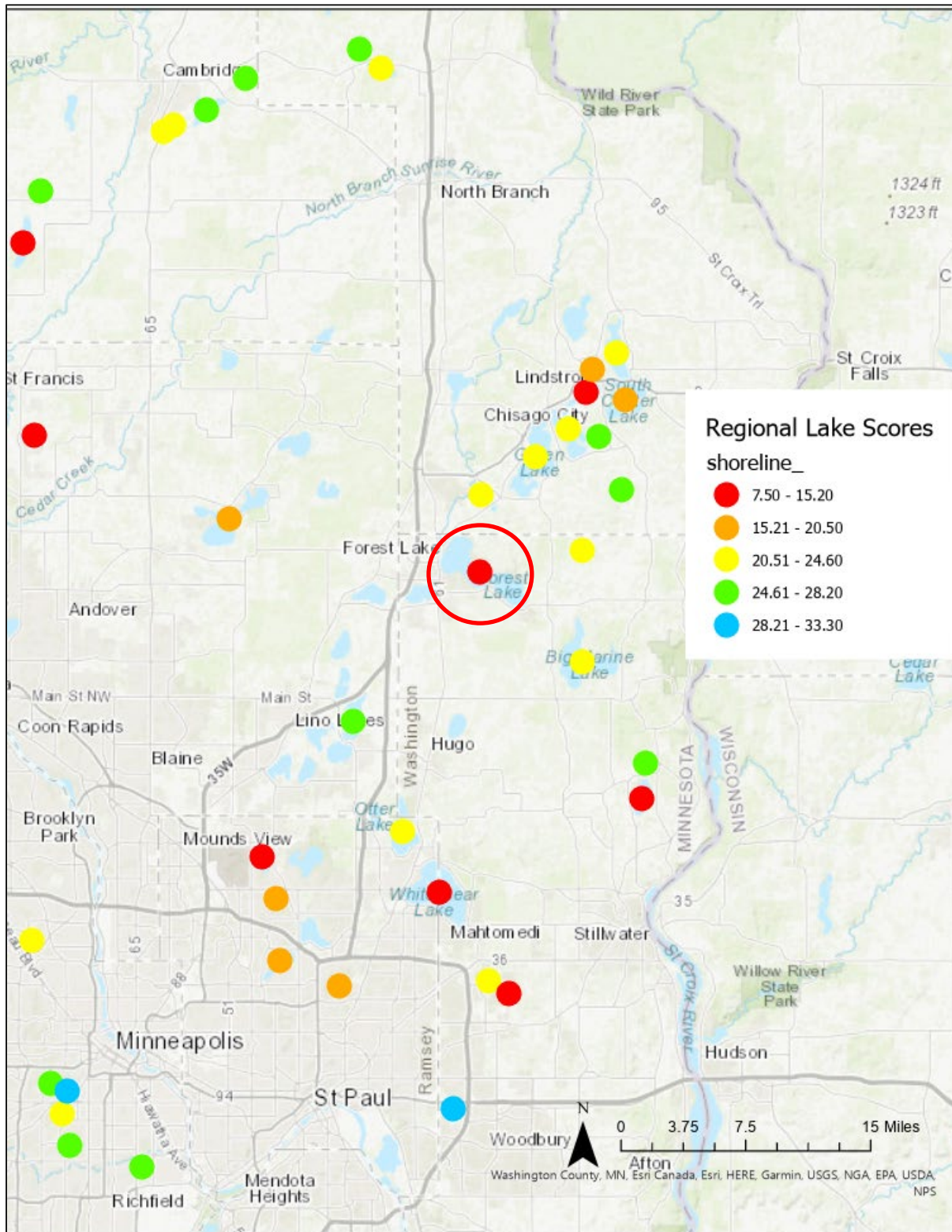


FIGURE 32 – REGIONAL COMPARISON WITH FOREST LAKE HIGHLIGHTED

Forest Lake

- ❑ Plant a tree! – 345 points
without shoreline trees or shrubs
- ❑ Don't go there? Don't mow
there! – 161 points without any
natural vegetation
- ❑ If a tree falls in the lake... leave it!
– 609 points without overhanging
woody habitat

Conclusion

The results of the first shoreline inventory in ten years have revealed the degradation of our shoreline habitat and indicate that the trend is not positive. Comfort and Bone Lake are close to meeting the District’s shoreline goals. With each sample point representing 100’ of shoreline, Comfort requires improvement on 15 points, and Bone requires improvement on 20 points. While Comfort and Bone have shoreline natural cover approaching the District’s goal, both lakes are far from meeting the criteria for “High” or even “Moderate” shoreline habitat. This matters both in terms of water quality, but also for recreational use, fisheries health, property values, and the other ecological services provided by healthy habitat. Bone Lake has the highest shoreline score in the District, a portion of which is due to the amount of shoreline in public ownership.

Forest Lake, while furthest from meeting District goals, is the only lake that indicated an increase in shoreline natural cover (27% to 30%). While the difference is not significant for a ten-year period, and two data points do not make a trend, this is encouraging news. The rest of the data for Forest Lake is negative. Of particular concern is the absence of shoreline canopy, and the absence of nearly any quality shoreline on the lake. Of the 673 survey points, only eight were found that scored High for shoreline habitat. More than half the survey points on Forest Lake lacked any shoreline trees, shrubs, or wetland.

To achieve the District’s shoreline goals, a continued investment in education and cost-share funding is required. Beyond monetary and technical resources, education, and outreach from the



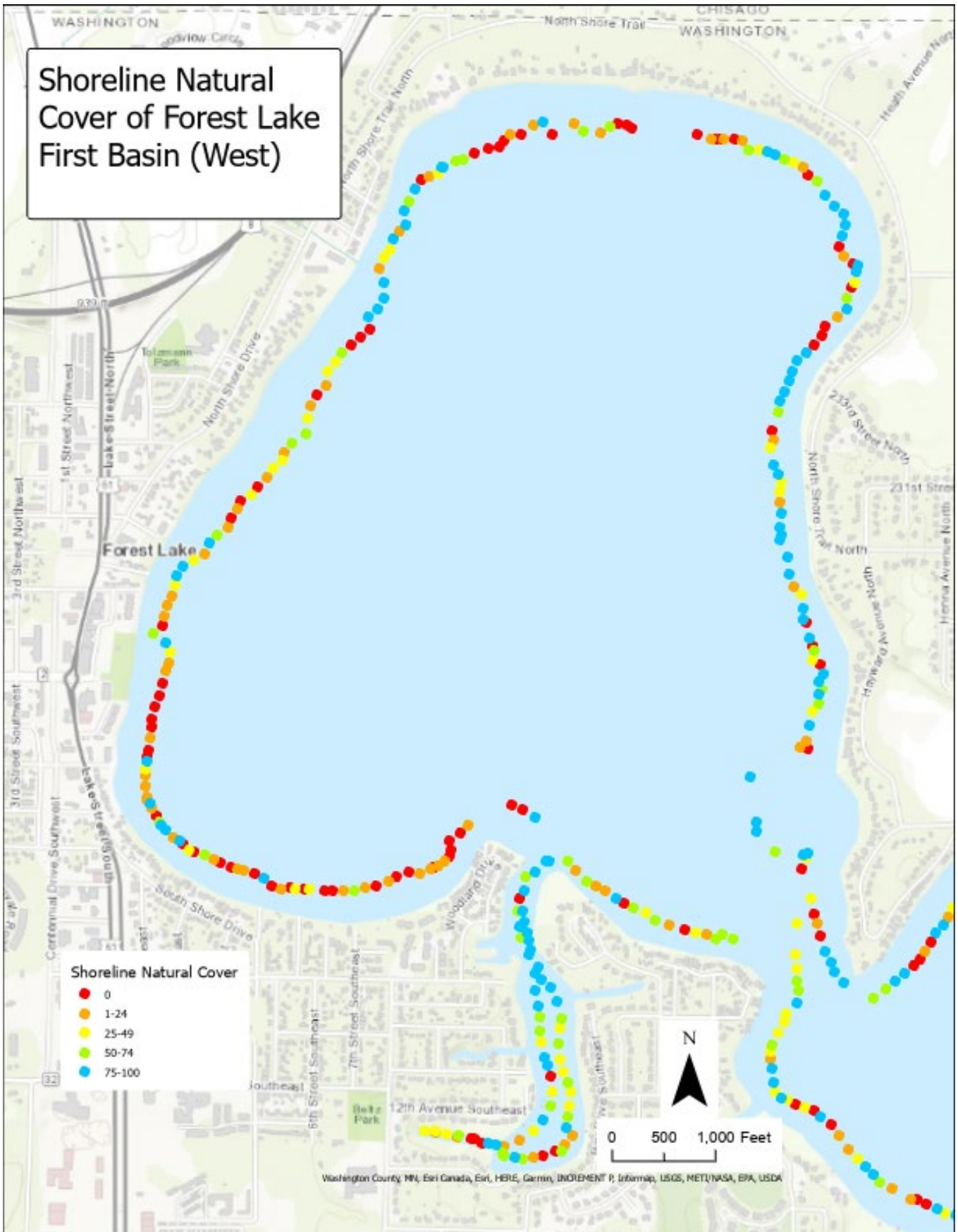
District and other partners is needed to alter the norm of acceptable shorelines. Regulatory solutions offer the least sustainability but should be considered as part of a wholistic approach to shoreline restoration and protection. Improving shorelines will require a sustained and coordinated effort from the District and its partners.

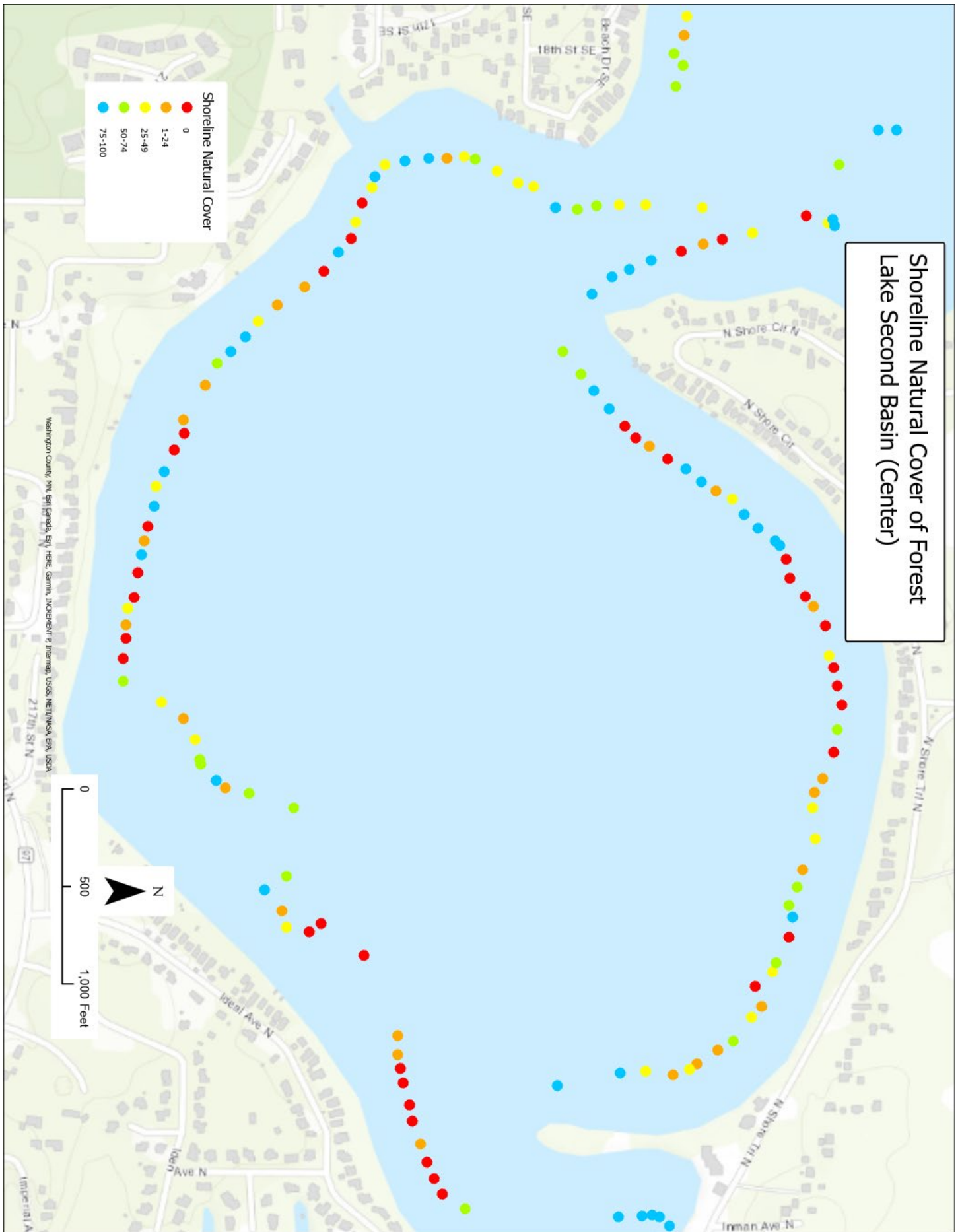
FIGURE 33 – FOREST LAKE SHORELINE WITH 100% NATURAL COVER

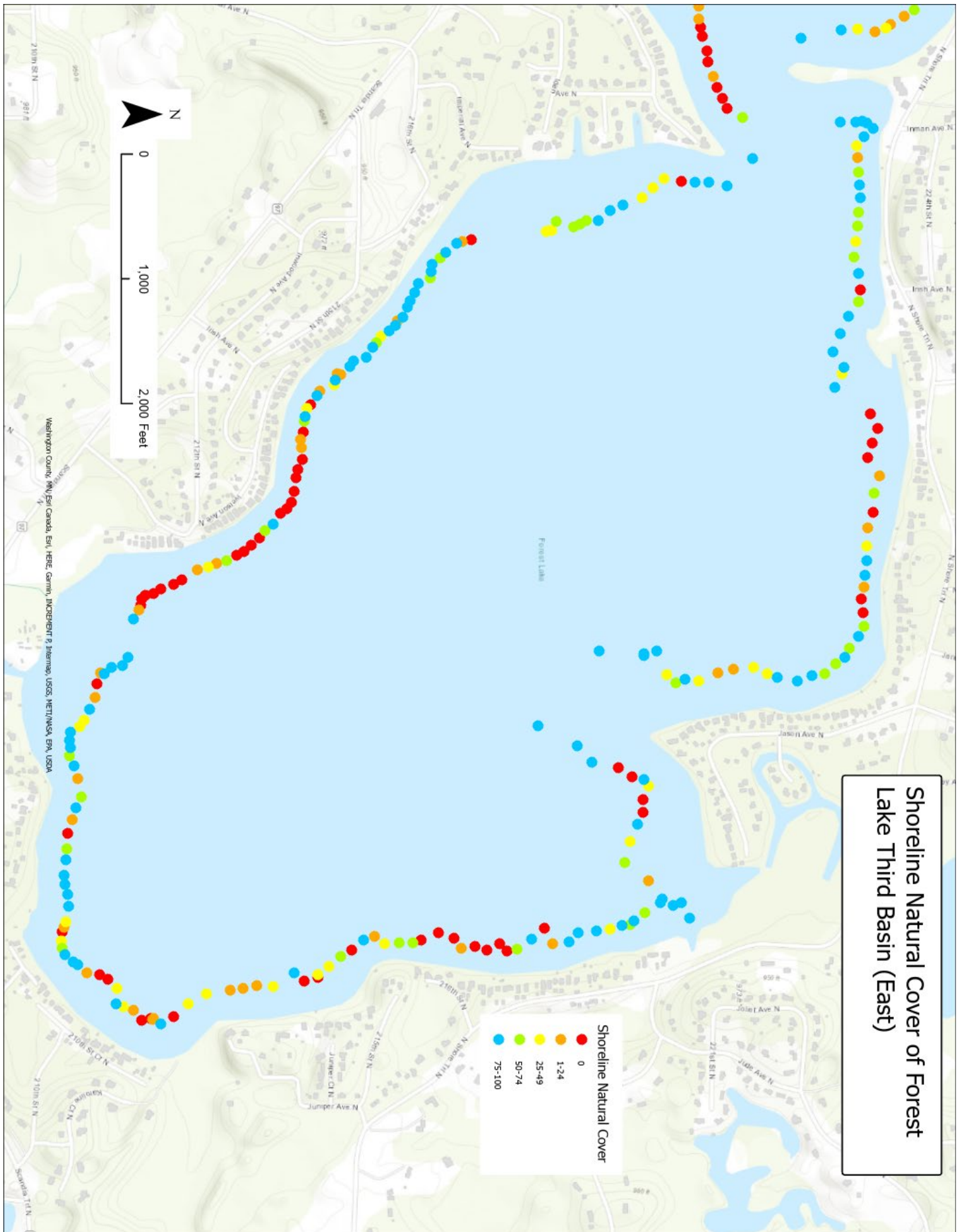
References

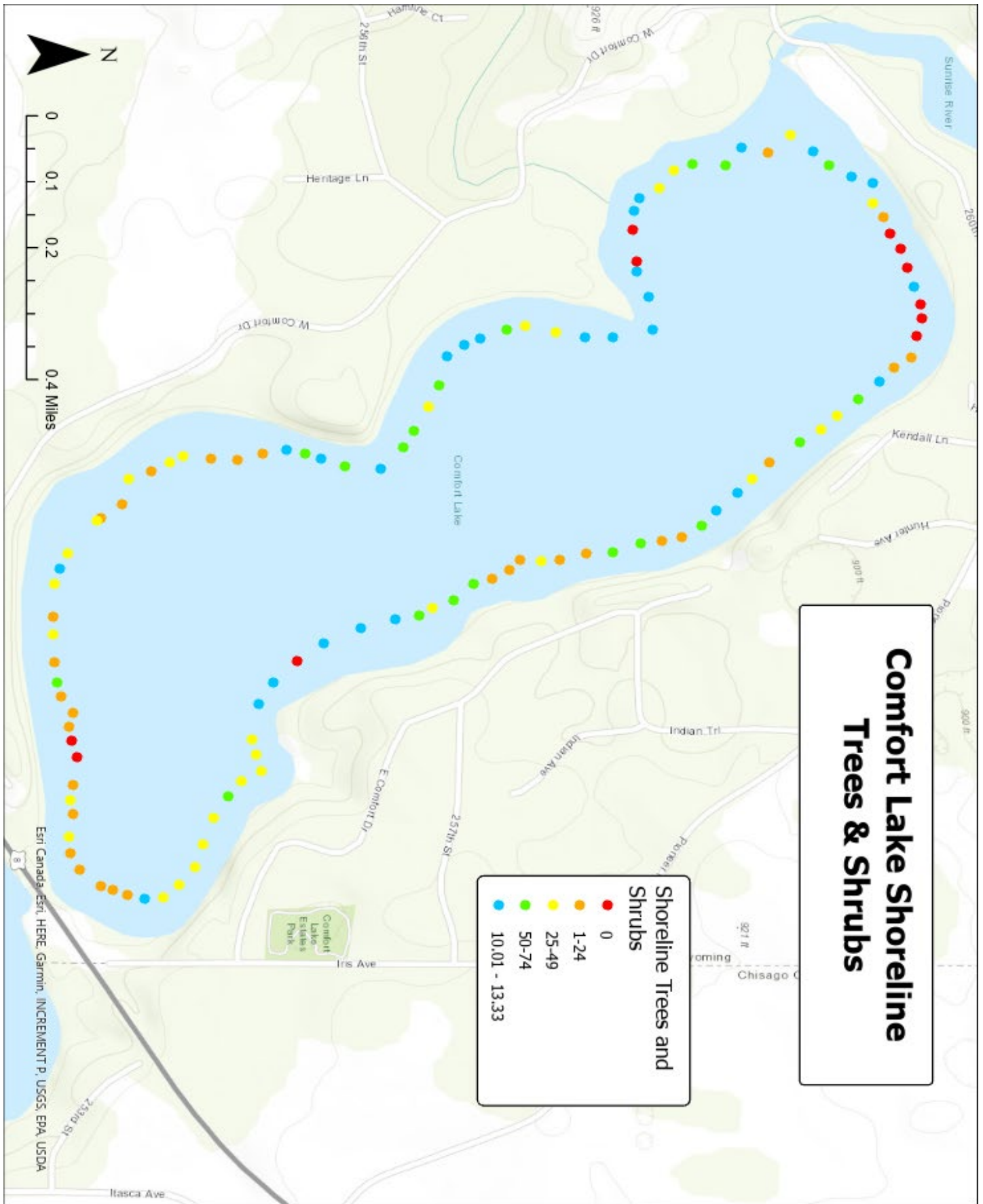
- Comfort Lake – Forest Lake Watershed District. 2021. 2022-2031 Watershed Management Plan. https://www.cflwd.org/document/2022-2031cflwdwatershedmanagementplan_full/
- Perleberg, Donna & Radomski, Paul & Simon, Stephanie & Carlson, Kristin & Millaway, Courtney & Knopik, Joshua & Holbrook, Beth. (2019). MINNESOTA LAKE PLANT SURVEY MANUAL VERSION 3. FOR USE BY MNDNR FISHERIES SECTION, EWR LAKE UNIT AND EWR MINNESOTA BIOLOGICAL SURVEY UNIT. 10.13140/RG.2.2.34673.74084.

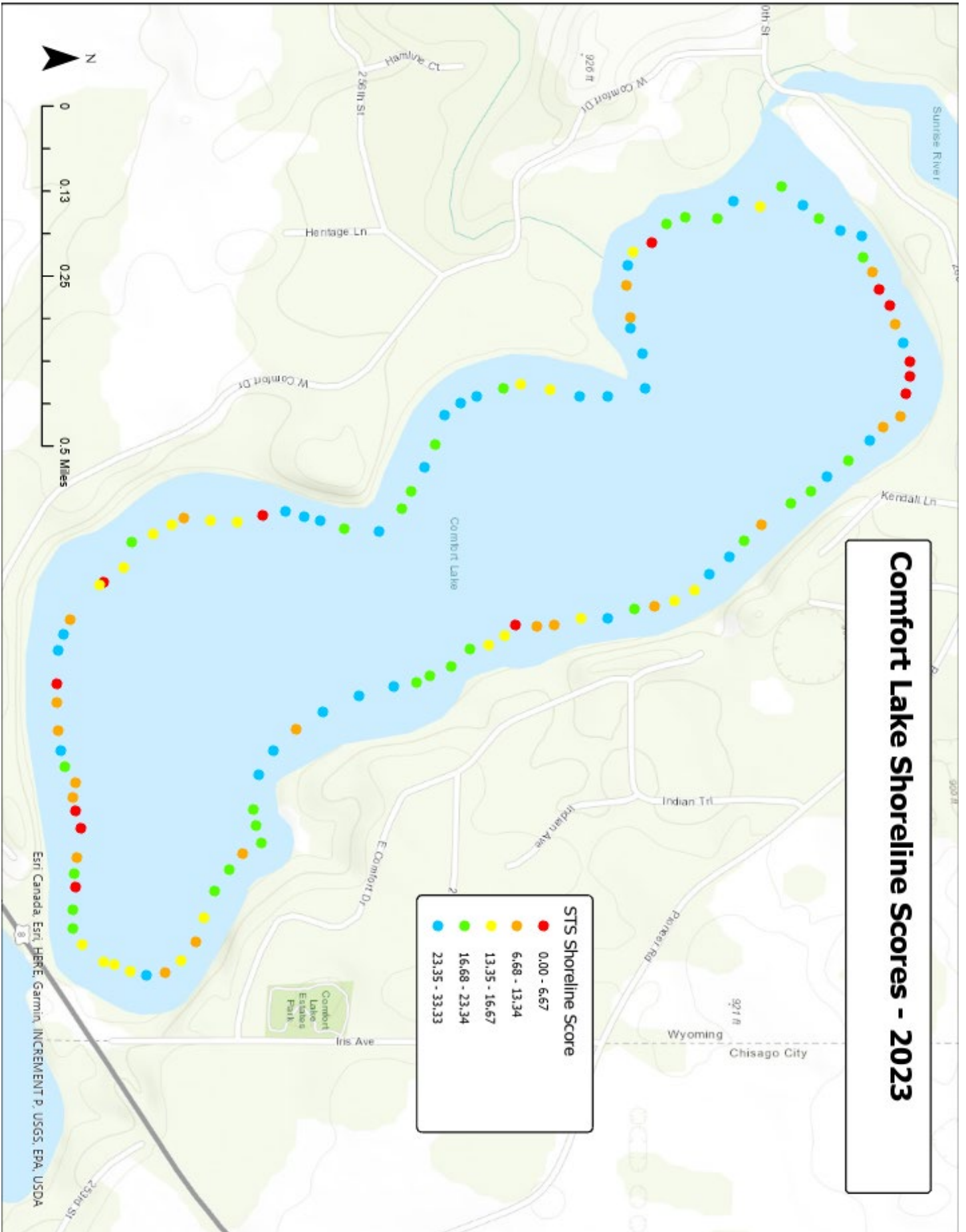
Appendix A – Additional Maps

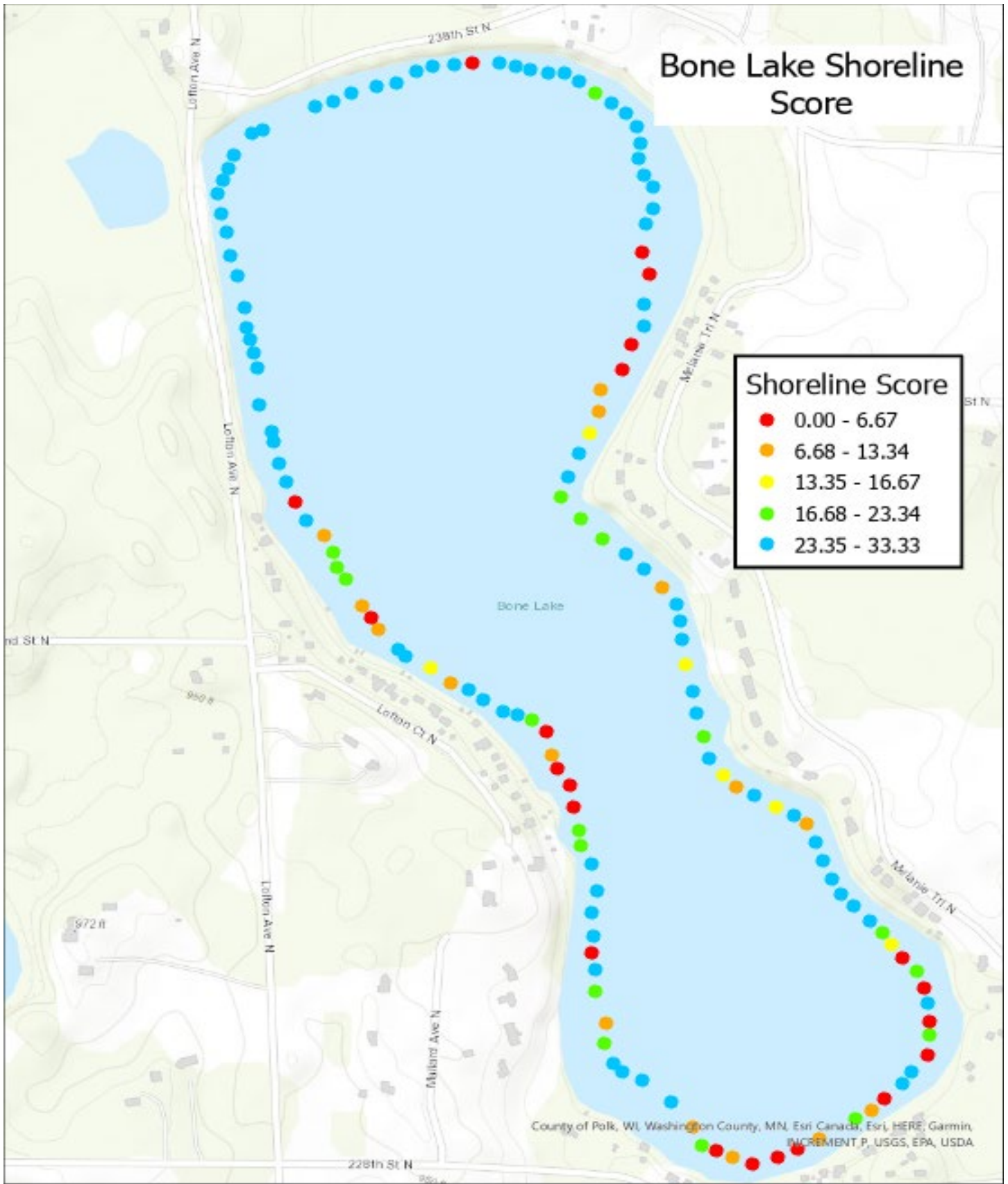




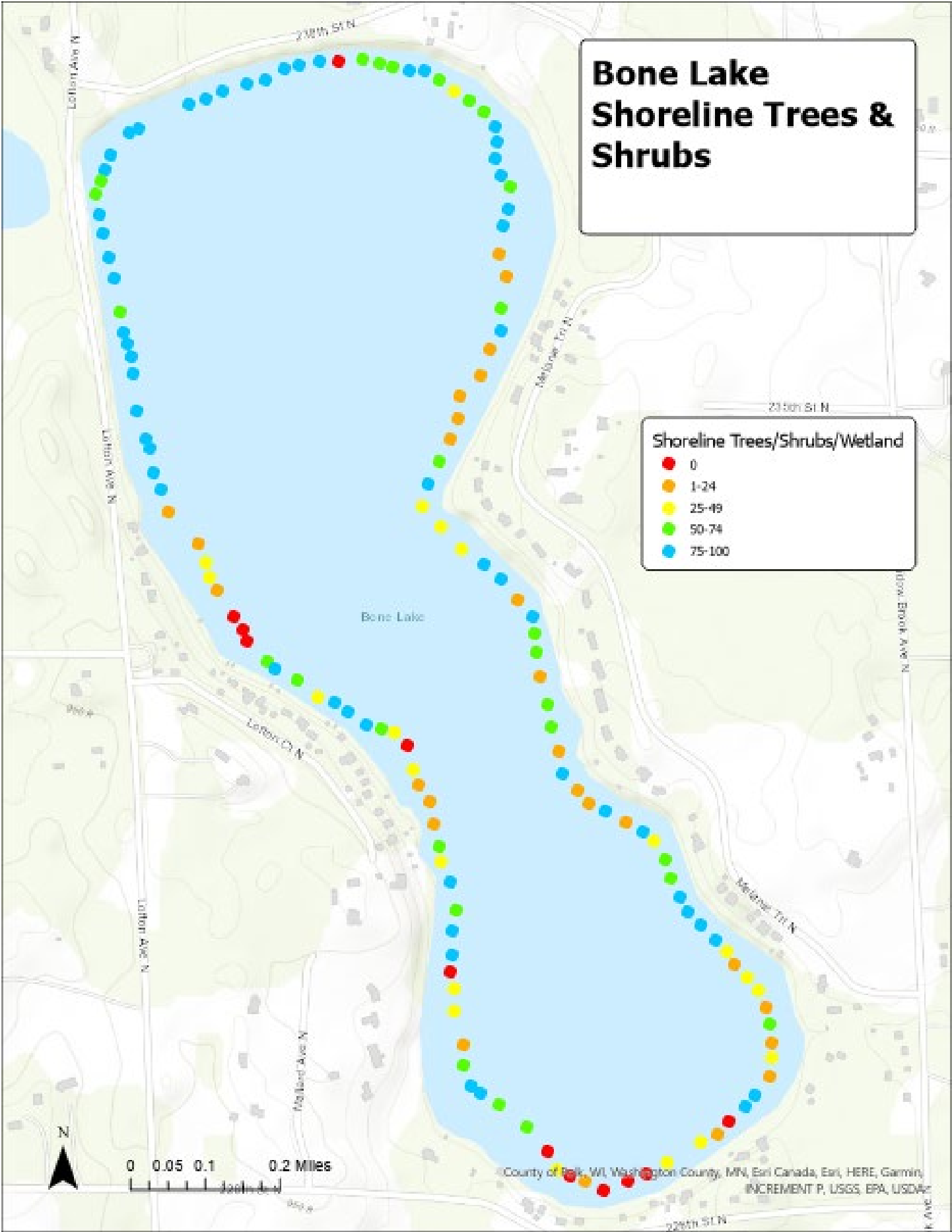
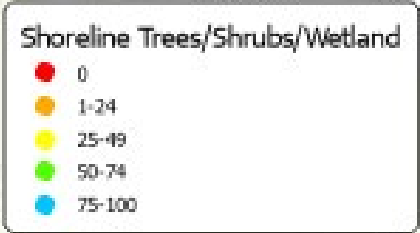








Bone Lake Shoreline Trees & Shrubs



Appendix B – Natural Cover Examples



Defining natural cover

Lake Keewahtin Example:
100% natural shoreline cover
100% shoreline trees or shrubs

*And yes [there's a house there
, with canoe access«*



Defining natural cover

Bone Lake Example:
75-100% natural shoreline
cover
75-100% shoreline trees or
shrubs

*Note the overhanging woody
habitat*





Defining natural cover

Bone Lake Example:
50-74% natural shoreline
cover
1-24% shoreline trees or
shrubs



Defining natural cover

Bone Lake Example:
25-49% natural shoreline
cover
25-49% shoreline trees,
shrubs, or wetland





Defining natural cover

Bone Lake Example:
0% natural shoreline cover

1-24% shoreline trees, shrubs,
or wetland

