BASS LAKE MANAGEMENT PLAN

LE SUEUR RIVER WATERSHED

Faribault County SWCD

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Cover photo: Bass Lake, courtesy of Jon Lore, MDNR. Does anyone have a photo they would like to use for the cover?

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TABLE OF CONTENTS

PROJECT OVERVIEW

Project Background

Bass Lake is a 199 acre lake located in Faribault County. It is one of the most popular recreational lakes in the region. Like many other shallow lakes in the region, Bass Lake has experienced water quality problems associated with frequent algal blooms for decades. The primary cause of Bass Lake's water quality problems is excessive nutrient loading, particularly phosphorus. Since phosphorus is the primary nutrient of concern and the major driver of water quality in Bass Lake, discussions and planning have centered on better understanding the sources, impacts, and management of phosphorus both within the lake and from sources across the watershed. Other pollutants of concern include sediment, nitrogen, and mercury.

Faribault County and SWCD have a long history of working with area residents to study the lake and maintain and improve lake conditions. Area residents and local conservation staff have worked together for decades to manage the lake and control algae blooms. In 2018, a group of residents formed the Bass Lake Coalition. The broad mission of the group is to improve the water quality of Bass Lake.

The purpose of this Lake Management Plan is to develop goals and strategies to improve lake health in both the short and long term based on local input and advice from conservation professionals. Faribault County SWCD has contracted with the MSU Water Resources Center to write the Bass Lake Management Plan. The groups are working collaboratively with area residents, obtaining advice and guidance from local citizens and Bass Lake Coalition members.

WATERSHED OVERVIEW

Location

Bass Lake is located in northwestern Faribault County, Minnesota near the towns of Delevan and Winnebago.

Population

The population estimate for Faribault County is 13,653 with a density estimated at 19.4 people per square mile (2019). This provides a rough idea of the population density within the Bass Lake watershed.

Watershed

The Bass Lake watershed includes all the land that captures and drains water through groundwater, ditches, tile, and directly over the land's surface into the lake. Researchers indicate that this watershed is small relative to its surface water area, meaning it has a very small area that drains directly into the lake. The watershed is comprised of a mix of agricultural and forested land, with a shoreline that is well developed. The land use devoted to agriculture is lower than the typical watershed in the region.

Bass Lake is considered a shallow lake with a very fragile ecosystem that is sensitive to what happens on the land. A lake's pollution problem reflects what is happening throughout the entire watershed. A lake's health is a reflection of its watershed.

Downstream

Bass Lake drains into Rice Creek which drains into the Maple River. The Maple River flows into the Le Sueur River, Blue Earth River which joins the Minnesota River near Mankato, MN. Bass Lake subwatershed is part of the larger Rice Creek subwatershed which is part of the larger Maple River watershed that is part of the Le Sueur River Major Watershed.

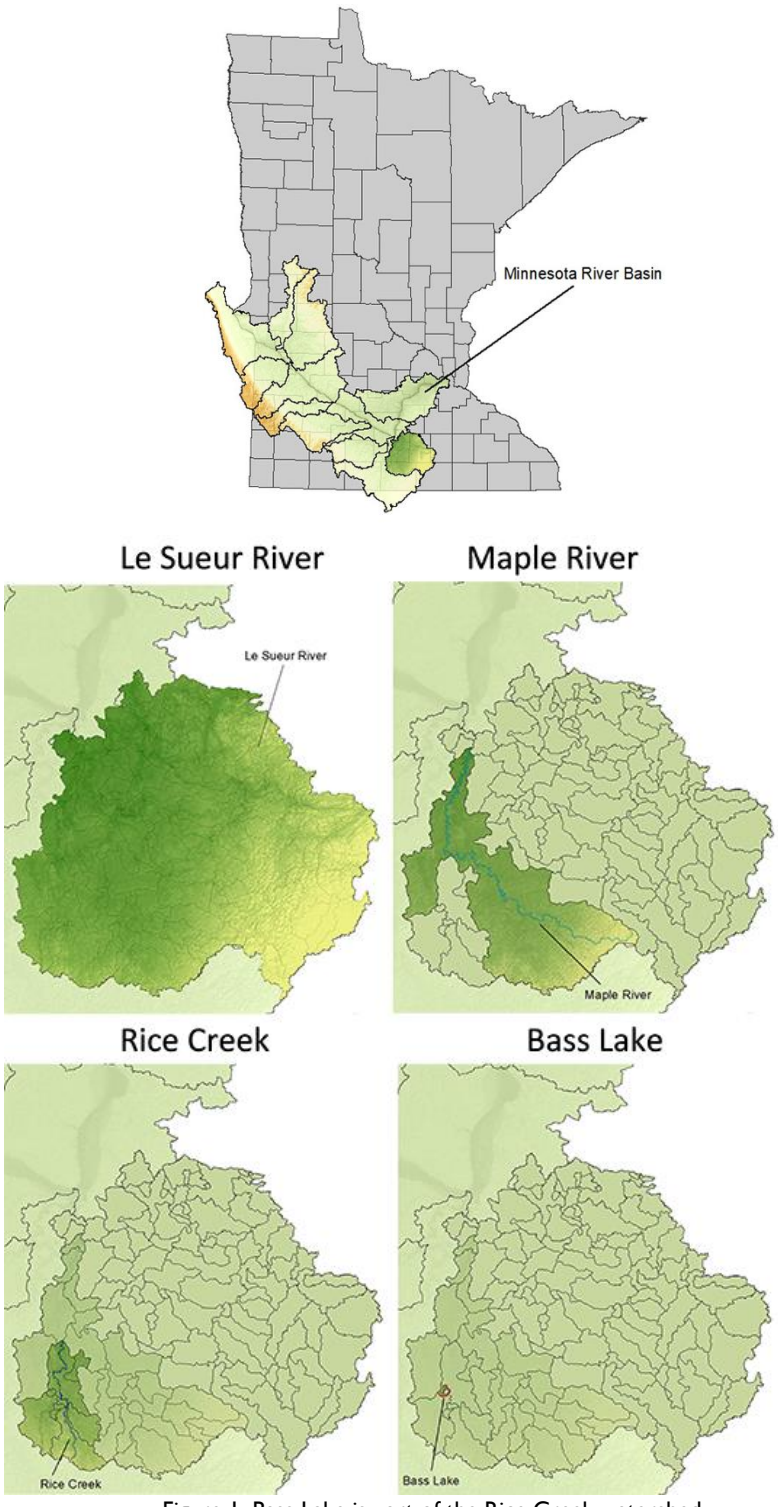

Figure 1. Bass Lake is part of the Rice Creek watershed,
which flows to the Maple River, then the Le Sueur River, and finally, the Minnesota River.
The Le Sueur River watershed (top left), Maple River Huc-10 (top right),
Rice Creek HUC-10 (lower left), and Bass Lake watershed (lower right).

Bass Lake		
LOCATION	Faribault County	
WATERBODY ID	Bass Lake Subwatershed	Rice Creek Subwatershed
WATERSHED AREA	636 acres	52,257 acres
DOMINANT LAND USE	Row Crop Agriculture	
HUC8 WATERSHED	Le Sueur River	
HUC8 ID	07020011	
HUC10 WATERSHED	Rice Creek	
HUC10 ID	0702001104	
HUC12 WATERSHED	Lower Rice Creek (portion of)	Upper Rice Creek, Lower Rice Creek, Rice Lake
HUC12 ID	070200110403	070200110401, 070200110402, 070200110403

Table 1. General watershed data for Bass Lake Subwatershed. The Bass Lake subwatershed is part of the Lower Rice Creek HUC-12, within the Rice Creek watershed.

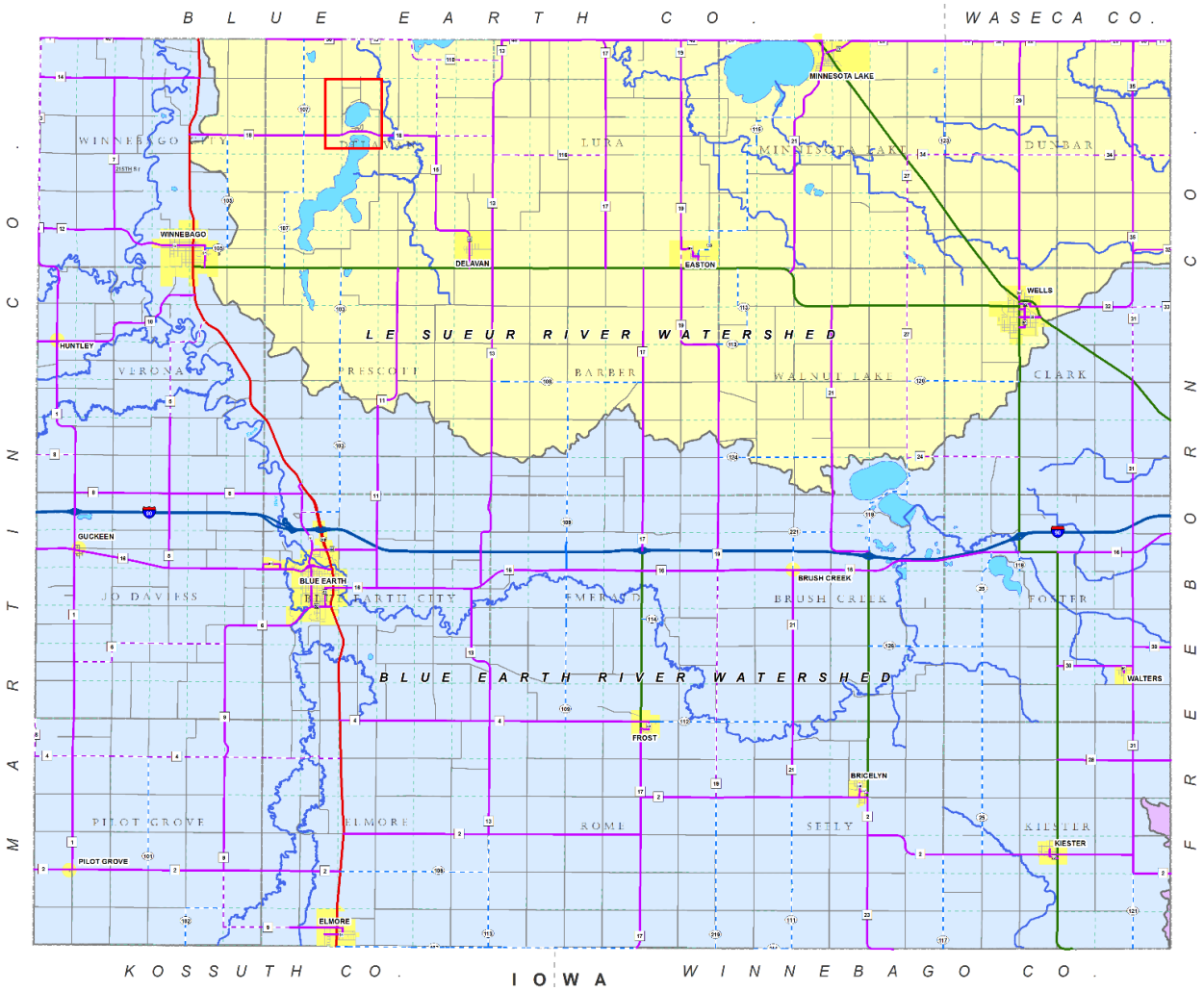

Figure 2. Le Sueur River Watershed - from Fariabult County Water Management Plan 2018-2027.

Rice Creek Subwatershed

Bass Lake Subwatershed is part of the larger Rice Creek Watershed that encompasses 51,790 acres. Rice Creek flows in a northerly direction. A portion of Winnebago (population 1,565), and Delevan (population 245), are incorporated cities located in this subwatershed.

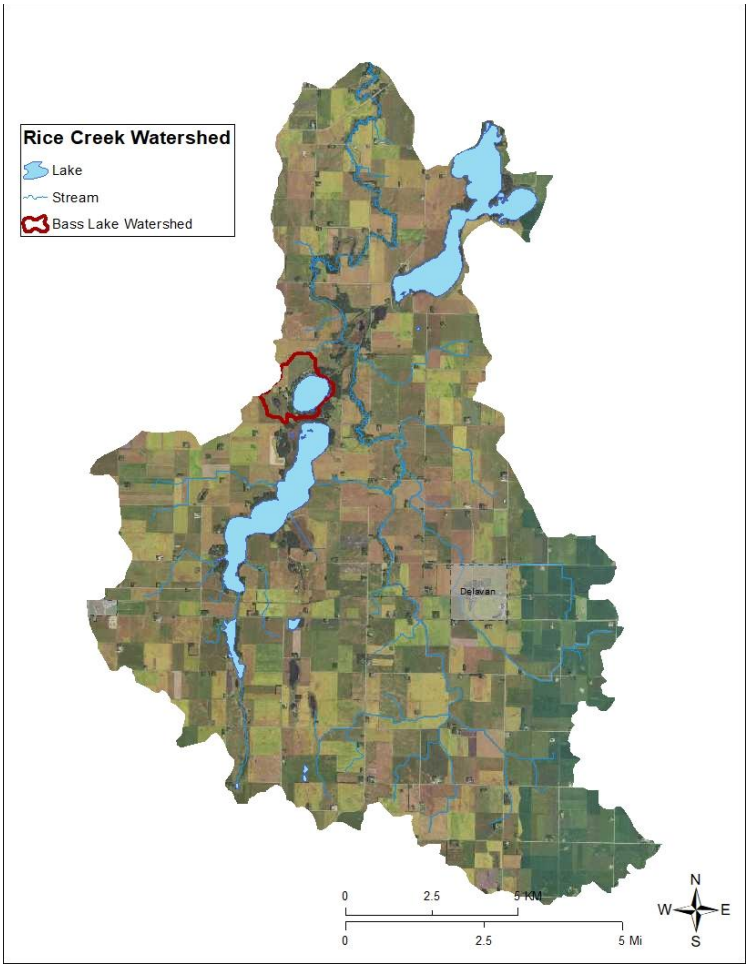

Figure 3. Rice Creek watershed, with Bass Lake subwatershed (red).

Bass Lake Subwatershed - Elevation

The elevation and topography of the subwatershed is shown in Figure 4. The elevation in the Bass Lake subwatershed ranges between 330 meters (1,082 feet) and 310 meters (1,017 feet) above sea level. Elevation was derived from a 3-meter MNTopo DEM.

Bass Lake watershed is located in the prairie pothole region that was created during the Wisconsin glaciation that ended ten thousand years ago. The advancing and retreating glaciers left their legacy with the uneven landscape covered in depressions, thus earning the name prairie pothole region. The lake was formed by the irregular deposition of glacial till from the Des Moines Lobe. Lakes of this type are typically shallow with very gently sloping shoreland areas.

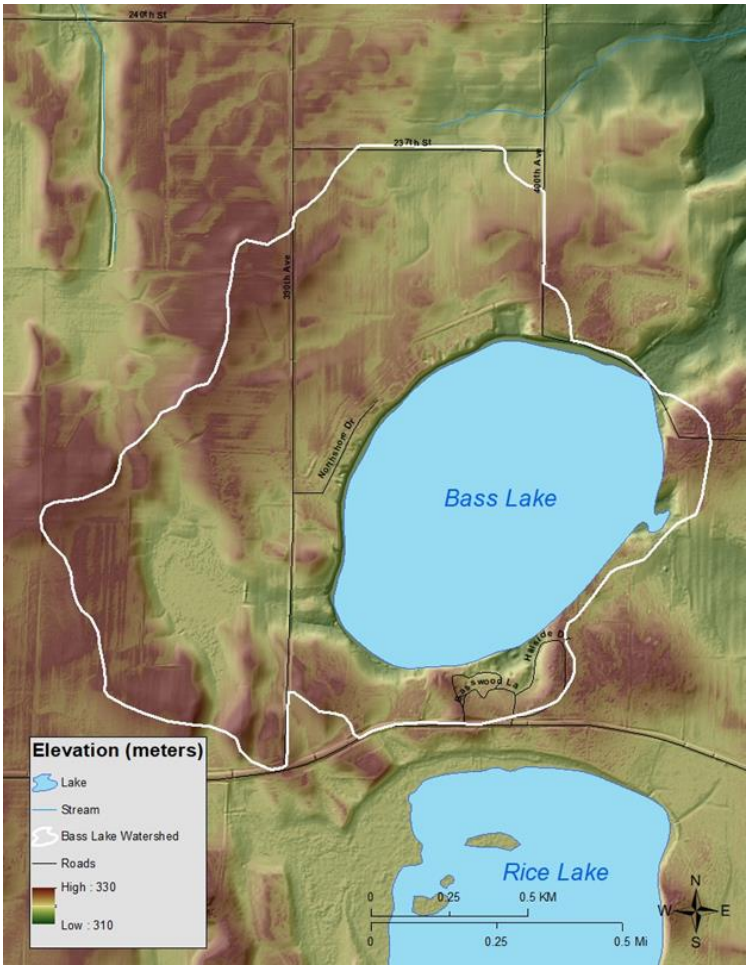

Figure 4. The elevation of Bass Lake Subwatershed.

Water and Wetlands

Bass Lake itself is the dominant water feature in the subwatershed along with multiple unnamed streams.

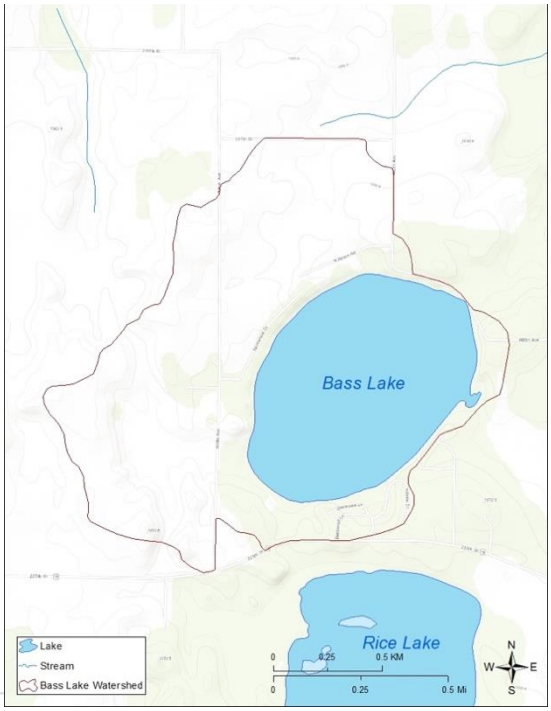

Figure 5. The streams and lakes that are located within Bass Lake Subwatershed

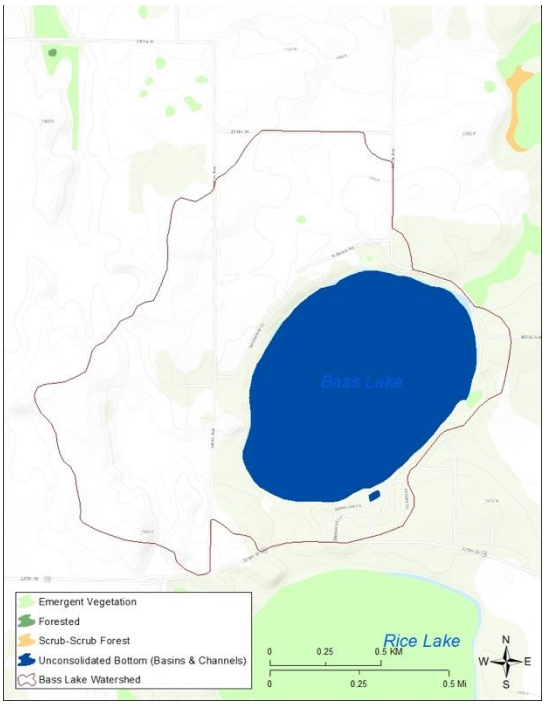

Figure 6. Wetlands of the Bass Lake Subwatershed

Climate

Climate data for the Bass Lake watershed was gathered from NOAA and the DNR, using the nearest weather station in Waseca County as a reference. The annual total precipitation averaged 34.66 inches per year between 2000 and 2017. Annual precipitation ranges from 21.66 to 56.24 inches per year, showing a large variability (Figure 7). The seasonal difference in precipitation is illustrated in the average monthly precipitation (Figure 8), with the highest precipitation levels typically occurring between May and September.

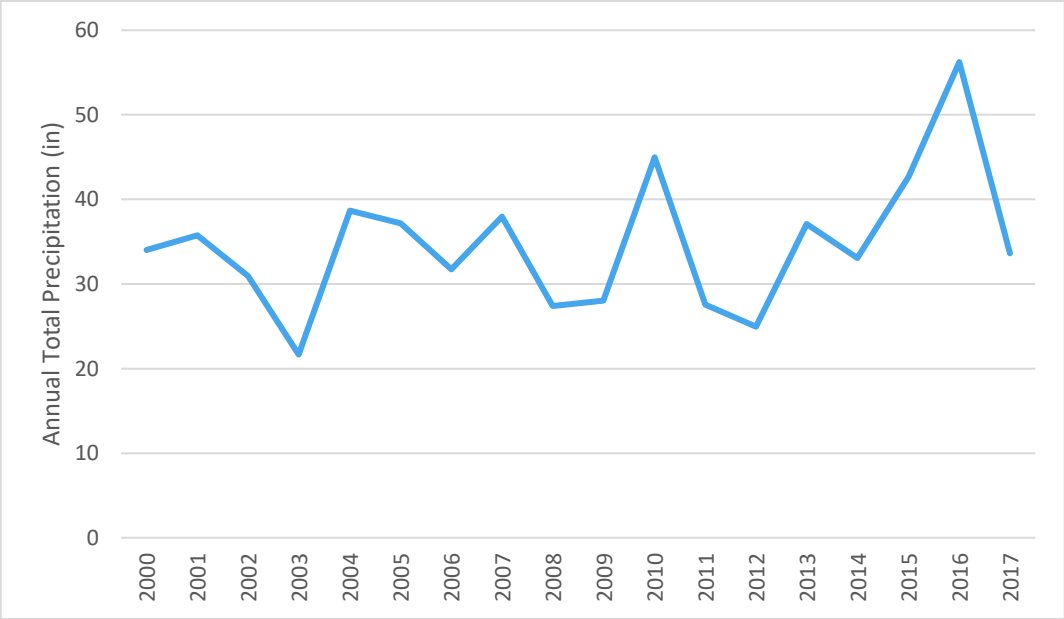

Figure 7. Annual total Precipitation for the Bass Lake watershed between 2000 and 2017

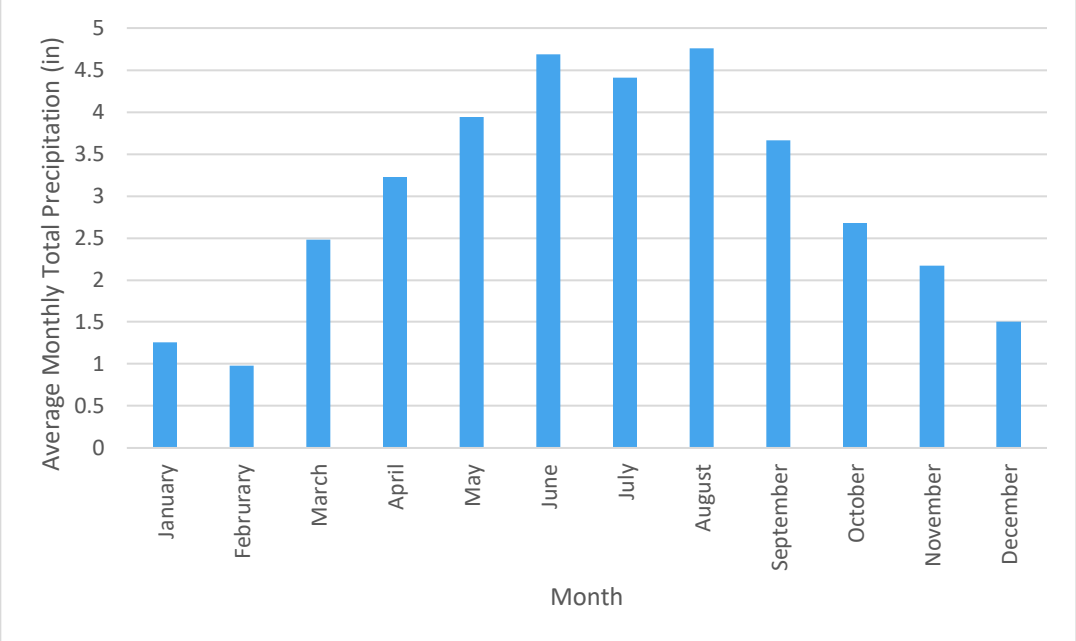

Figure 8. 1981 to 2010 average monthly total precipitation for the Bass Lake watershed

Presettlement Vegetation: Prairies and Big Woods

Historically, much of the land across the Le Sueur River Watershed was prairie and wet prairie and big woods. The maps below are based on detailed maps and notes by surveyors in the 1850s that described the landscape and natural resources in the area. The pre-European settlement landscape of Bass Lake subwatershed based on the General Land Office (GLO) surveys is presented in Figure 9. Historically there were "Big Woods" hardwood woodlands around the lake and prairies.

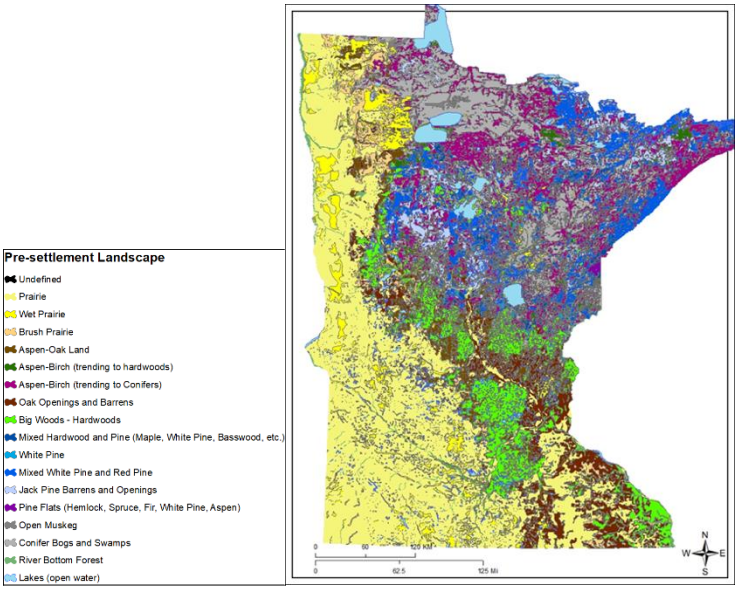

Figure 9. Presettlement Vegetation Map for State of Minnesota

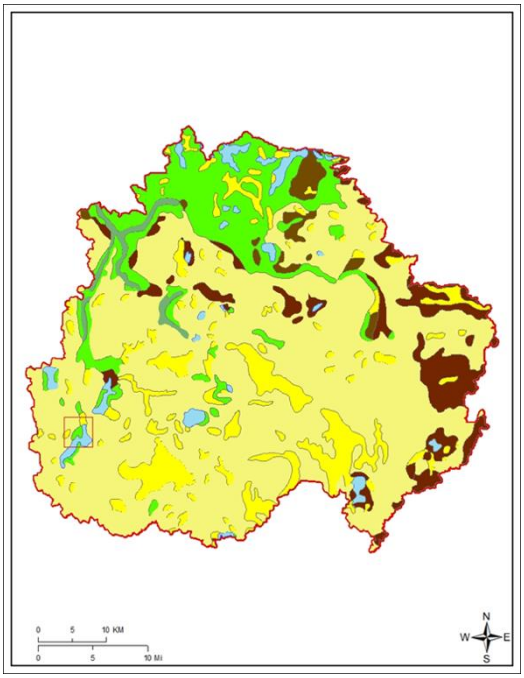

Figure 10. Presettlement Vegetation Map for the Le Sueur River Watershed. Red square outlines the Bass Lake area.

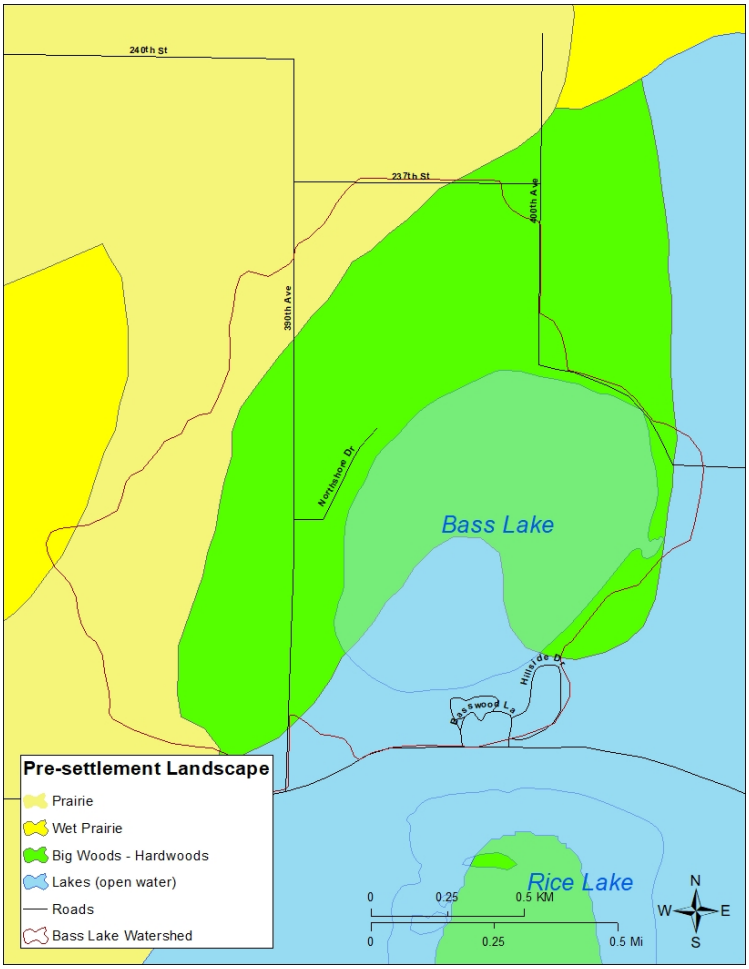

Figure 11. Presettlement Vegetation Map for the Bass Lake watershed.

Wetlands

Historically, the Le Sueur River Watershed was dotted with wetlands as shown in the map below that depicts probable historic wetlands based on MPCA analysis of soils and elevation. Approximately 90 percent of prairie wetlands across Minnesota have been lost.

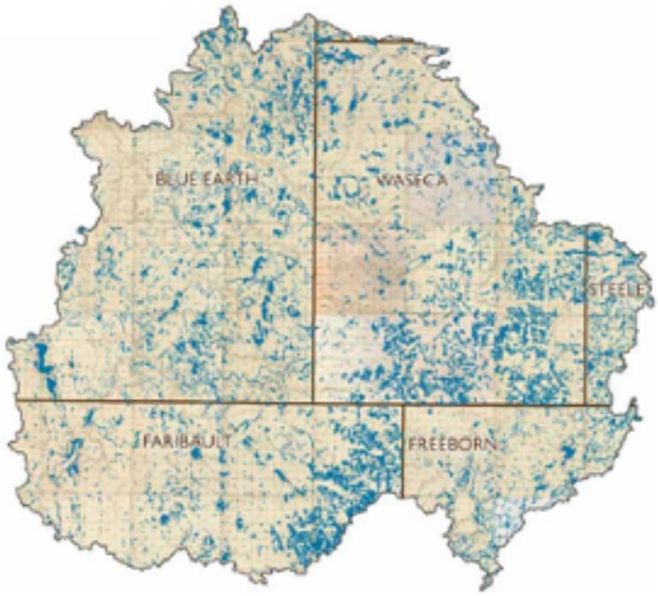

Figure 12. Probable historic wetlands in the Le Sueur River Watershed based on soils and elevation. The base layer is the Public Land Survey Plats from 1853-1870.

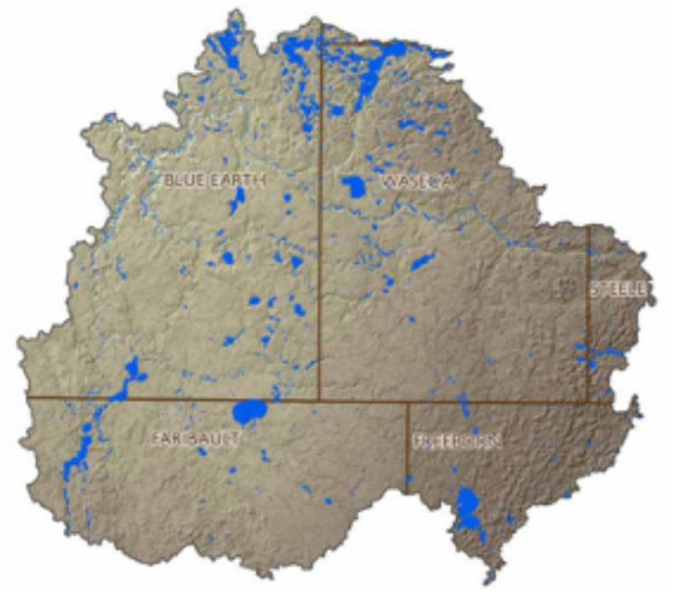

Figure 13. Current wetlands in the Le Sueur River Watershed.

Figure 14 shows that there are no wetlands in the subwatershed according to the U.S. Fish and Wildlife Service's National Wetlands Inventory (NWI) (1980-1986).

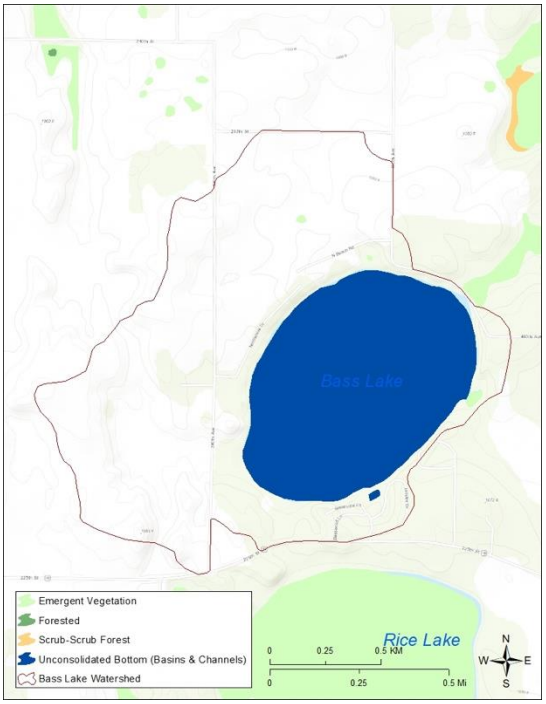

Figure 14. Wetlands of the Bass Lake Subwatershed

Historic Land Use

The following historic aerial images depict historic land use from 1938, 1954, and 1985 and 2019. The 1938 and 1954 images show primarily agricultural land use with limited lakeshore development. The 1985 images shows more residential development along the shoreland. The 2019 image illustrates more dense shoreland development, larger homes, and more impervious surfaces adjacent to the lake. It also shows the large CREP wetland restoration in the south western portion of the watershed.

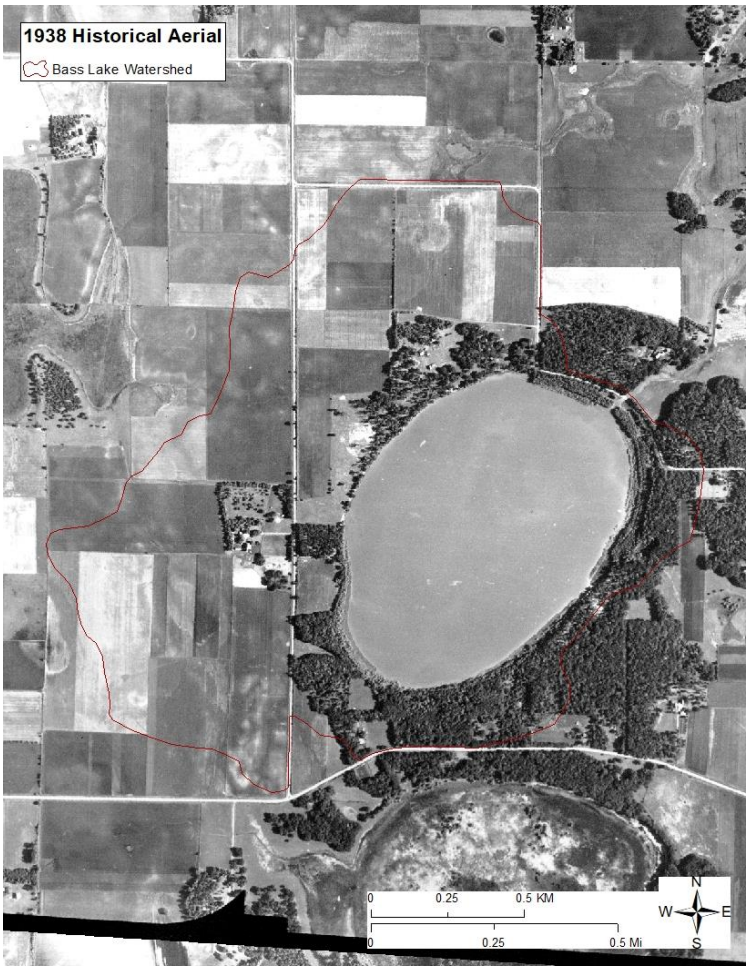

Figure 15. Bass Lake Subwatershed, 1938 Historical Aerial
(Source: http://maps.dnr.state.mn.us/airphotos/usda/biv/y1938/biv06026.jpg)

Figure 16. Bass Lake Subwatershed, 1954 Historical Aerial
(Source: http://maps.dnr.state.mn.us/airphotos/usda/biv/y1954/biv05n039.jpg)

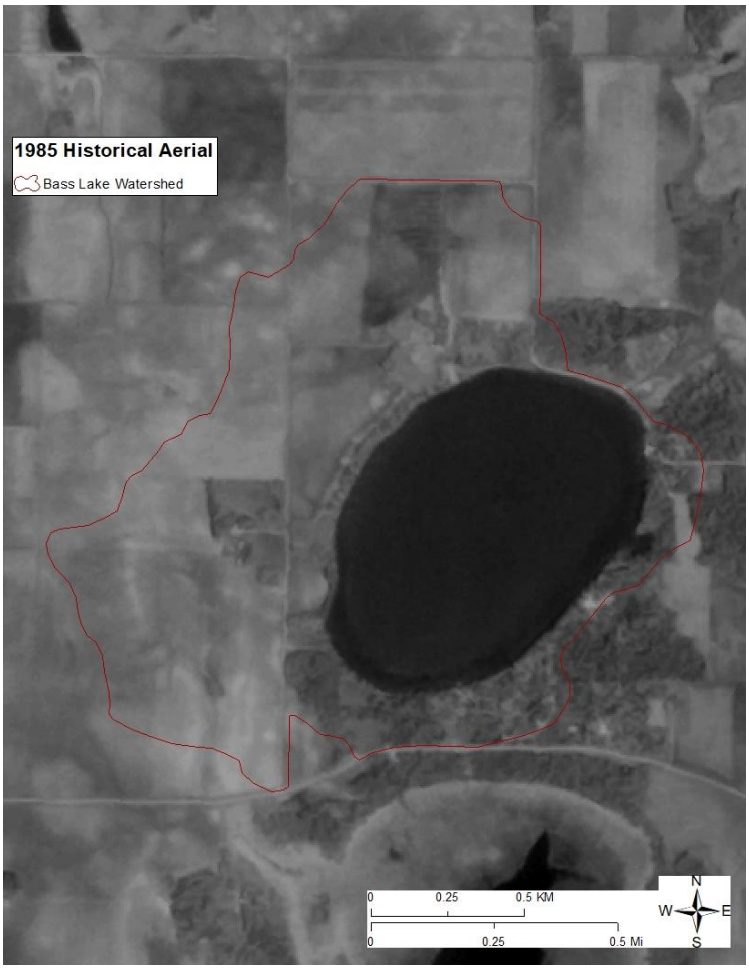

Figure 17. Bass Lake Subwatershed, 1985 Historical Aerial (Source: NHAP)

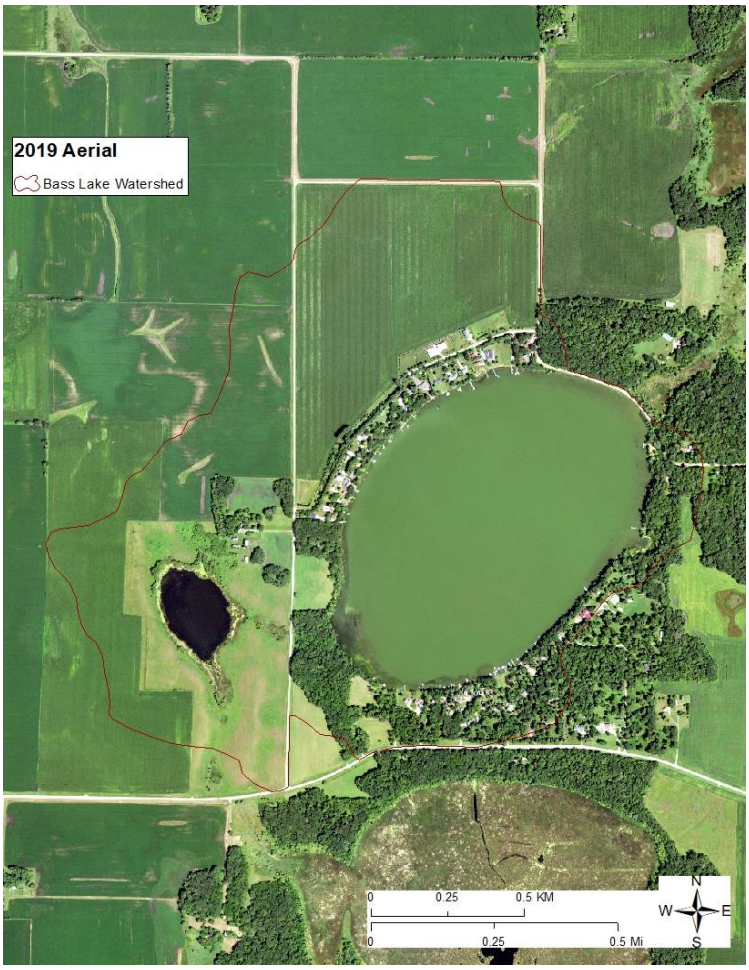

Figure 18. Bass Lake Subwatershed, 2019 Aerial (Source: NAIP)

Current Land Use

Today, land use in the Bass Lake subwatershed is primarily row crop agriculture (corn and soybean production) and developed land as shown in the detailed map of land use practices (Figure 19) and pie chart (Figure 20) and table (Table 2). Recent and current land use practices are based on the USDA National Agricultural Statistics Service (NASS) Cropland Data Layer.

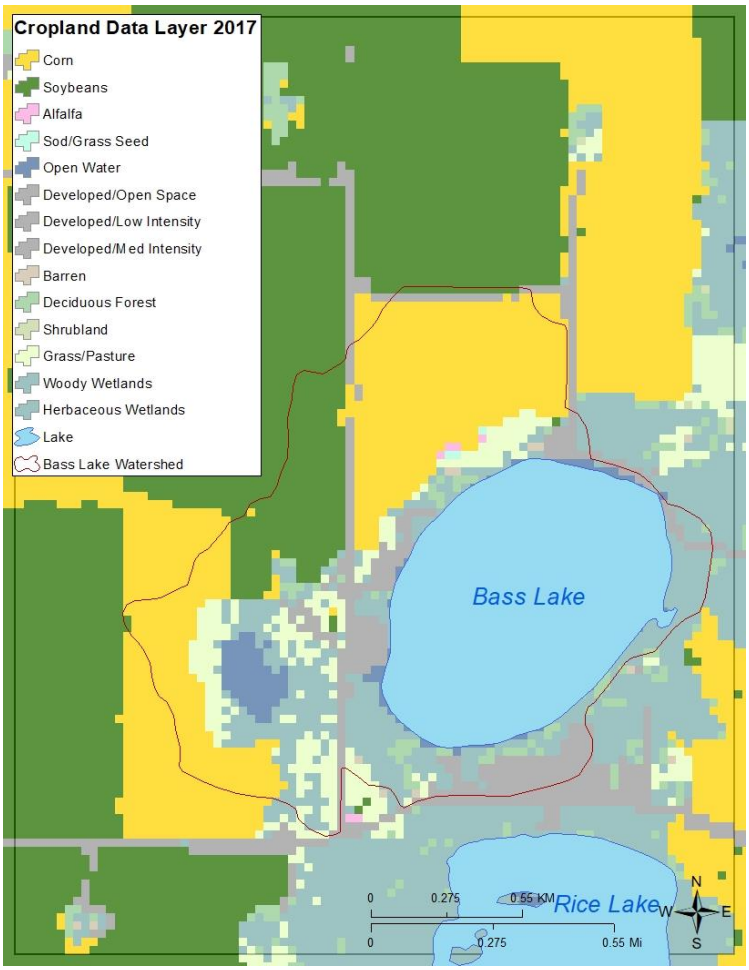

Figure 19. Land use map for the Bass Lake Subwatershed (NASS Cropland Data Layer 2017)

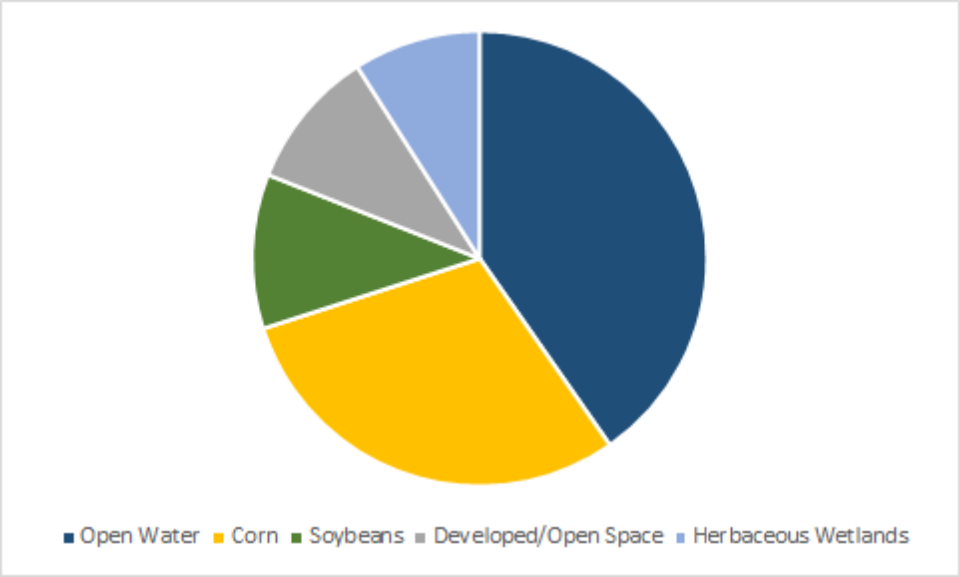

Figure 20. Land Use Pie chart for Bass Lake Subwatershed (NASS 2017 Cropland Data Layer)

Table 2. Land Use Data for the Bass Lake Subwatershed (NASS 2017 Cropland Data Layer)

Land Use	Acres	Percent
Open Water	210.32	40.29%
Corn	155.17	29.73%
Soybeans	57.33	10.98%
Developed/Open Space	52.03	9.97%
Herbaceous Wetlands	47.15	9.03%

Protected Lands

A large 86.66 acre CREP easement was secured in the south western portion of the Bass Lake Watershed. The large wetland was funded through the Conservation Reserve Enhancement (CREP) Program and started in 2002.

Table 3. Total number and acreage of protected land in the Bass Lake Subwatershed

Bass Lake Subwatershed Area	Total	Acres
CREP I	1	86.66

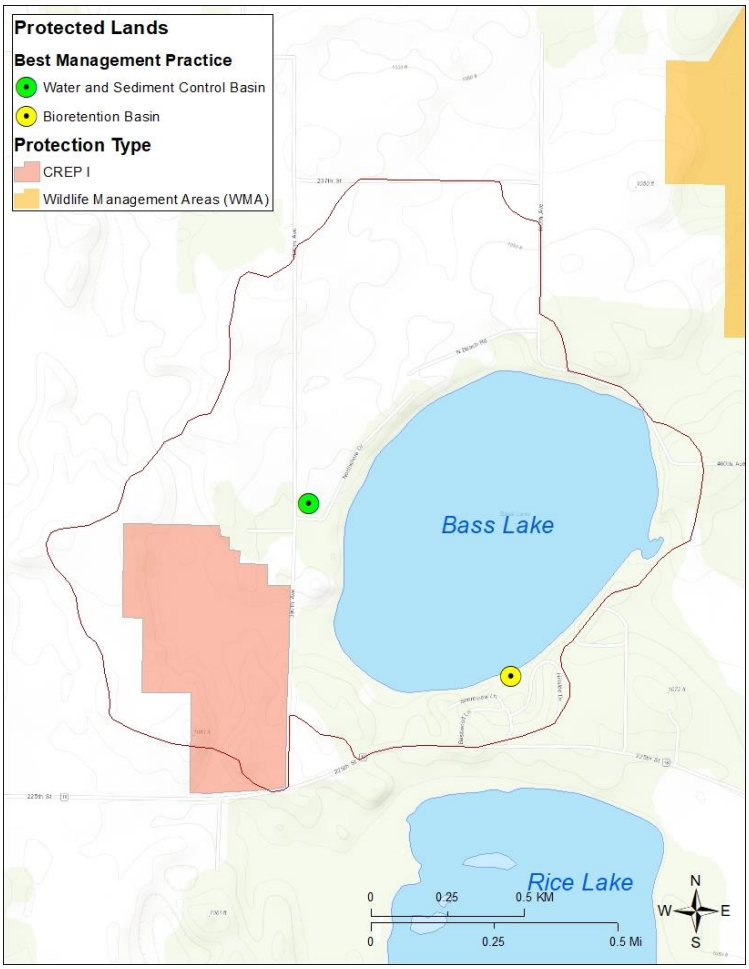

Figure 21. Federal and State Easements in the Bass Lake Subwatershed

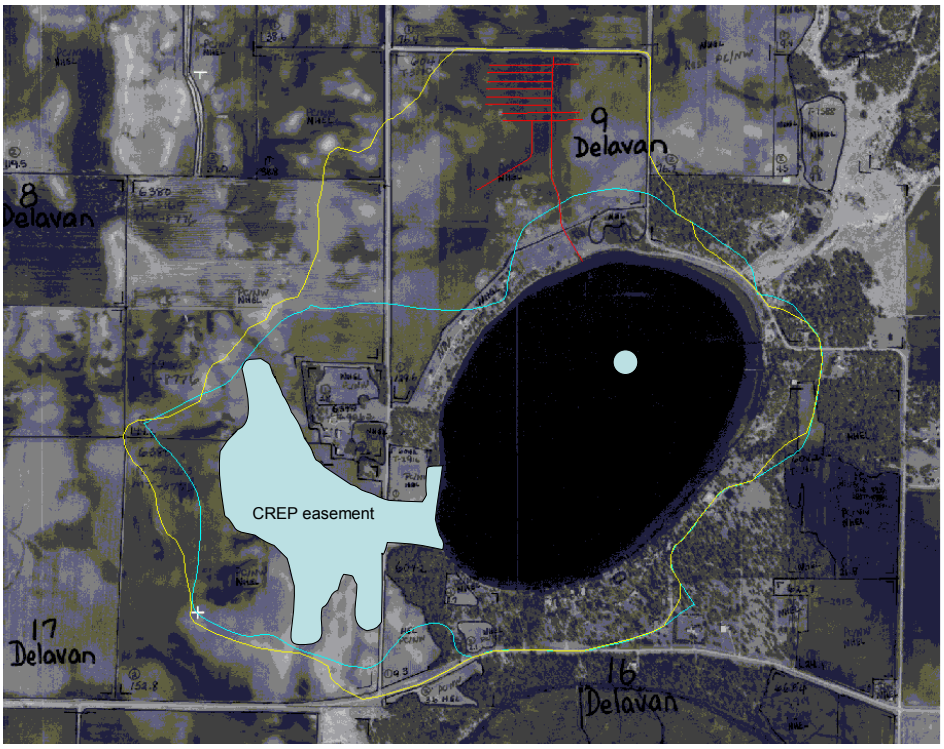

Figure 22. CREP Easement in the Bass Lake Subwatershed (MPCA, 2004)

A large Conservation Reserve Enhancement Program (CREP) wetland restoration easement was secured on a cropped area on the west side of the lake. In addition, virtually all septic systems on the lake and in the watershed have been upgraded. In 2003, the Bass Lake Homeowners Association applied for a re-assessment of Bass Lake, in part as a means of documenting if there has been a water quality response to the CREP easement and the septic system upgrades. Water sampling was completed in 2004 as part of a larger project that also included aquatic vegetation assessment and education of watershed residents. Staff of the Faribault County Soil and Water Conservation District assisted with water sampling and provided information contained in the 2004 MPCA Lake Assessment Update Report.

Feedlots, Surface Water Stations, and Water Permits

Figure 23 below shows the spatial relationship of feedlots, surface water stations, and water permits in the Bass Lake Subwatershed. Feedlots that are in red have a spatial representation that is within the regulated distance from a stream (300 ft) or lake (1,000 ft) (https://www.pca.state.mn.us/sites/default/files/wq-f8-30.pdf).

Table 4. Total numbers of feedlots, surface water stations, and water permits in the Bass Lake Subwatershed.

Category	Total
Feedlots	2
Surface Water Stations	2
Wells	7
Permit – Water Level Maintenance	1

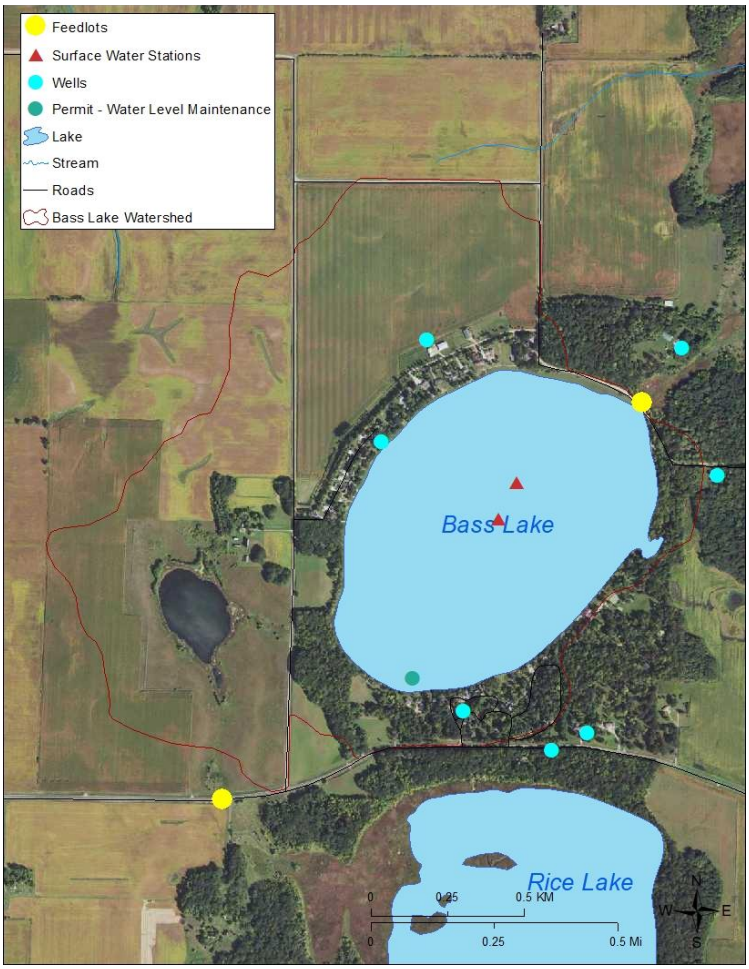

Figure 23. Feedlots, surface water stations, wells, and water permit within the Bass Lake Subwatershed

Soils

The predominant soil series in the Bass Lake subwatershed are Webster, Okoboji, Clarion, Canisteo, and Glencoe. The pie chart below (Figure 26) shows the most common soil types in the Bass Lake subwatershed. Table 5 is a short description of the five major soil types. Figure 24 and 25 are maps showing the common soil series in the area according to the Soil Survey Geographic Database (SSURGO).

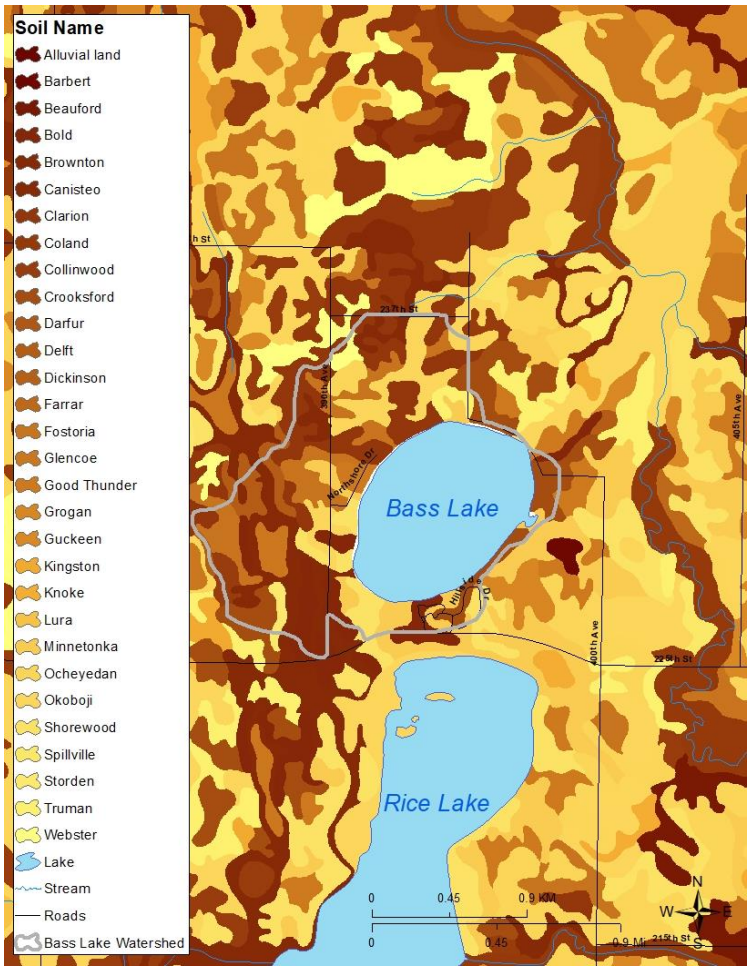

Figure 24. Soil Series map for the common soils in Bass Lake area

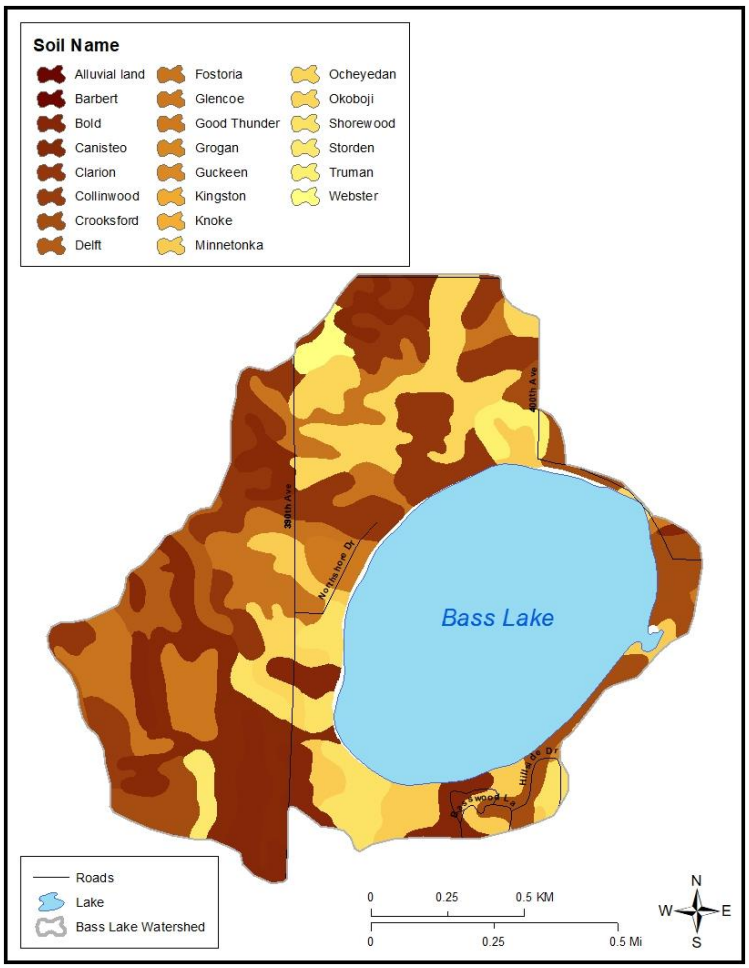

Figure 25. Soil Series map for the common soils in Bass Lake Watershed

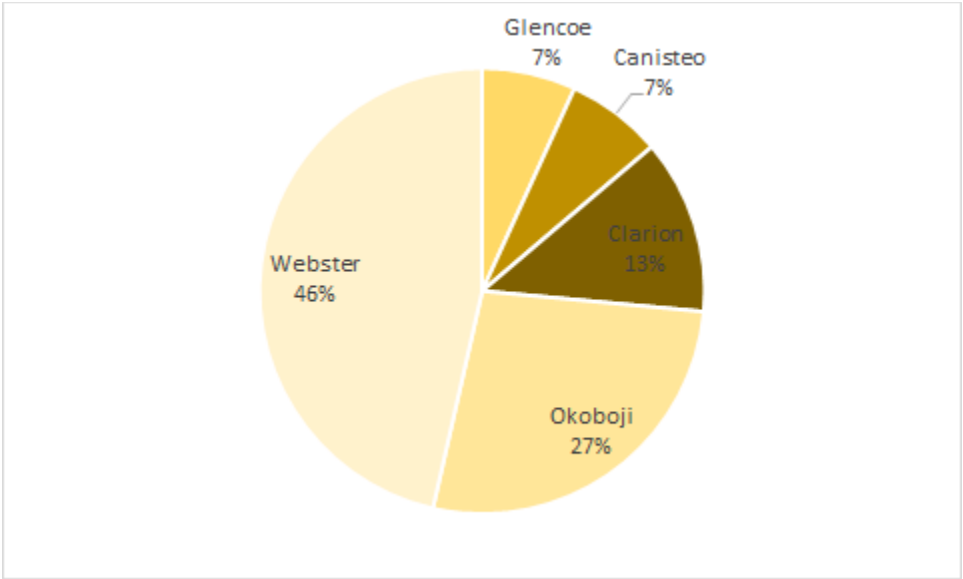

Figure 26. Pie chart showing percentage of the top five common soil types in Bass Lake Subwatershed

Table 5. Description of the most common soil series of the Bass Lake Subwatershed

SOILS SERIES	DESCRIPTION
Webster	The Webster series consists of very deep, poorly drained, moderately permeable soils formed in glacial till or local alluvium derived from till on uplands. Slope ranges from 0 to 3 percent.
Okoboji	The Okoboji series consists of very deep, very poorly drained **soils** formed in alluvium or lacustrine sediments. These **soils** are in closed depressions on till plains and moraines. Slope ranges from 0 to 1 percent.
Clarion	The Clarion series consists of very deep, moderately well drained soils on uplands. These soils formed in glacial till. Slop range from 1 to 9 percent.
Canisteo	The Canisteo series consists of very deep and very poorly drained soils that formed in calcareous, loamy till or in a thin mantle of loamy or silty sediments and the underlying calcareous, loamy till. These soils are on rims of depressions, depressions and flats on moraines or till plains. Slope ranges from 0 to 2 percent.
Glencoe	The Glencoe series consists of very deep, very poorly drained **soils** that formed in loamy sediments from till. These **soils** are in closed depressions on moraines. Slope ranges from 0 to 1 percent.

The drainage class and hydrologic soil group of the soils in the area is summarized in Table 6. Drainage class depicts the effect water will have within this area. Most of the soils are classified as poorly or very poorly drained. Only Clarion is classified as moderately or well drained soils. This means that most soils in the Bass Lake watershed drain very slowly.

Table 7 lists the characteristics of each drainage class. Figure 27 shows the map of the drainage class for the soils in Bass Lake.

Table 6. Drainage characteristics of predominate soils in the Bass Lake Subwatershed

SOIL	DRAINAGE CLASS	HYDROLOGIC SOIL GROUP
Webster	Poorly Drained	C/D
Okoboji	Very Poorly Drained	C/D
Canisteo	Poorly Drained	B/D, C/D
Clarion	Moderately Well Drained/Well Drained	B, C
Glencoe	Very Poorly Drained	B/D, C/D

Table 7. Drainage Class types and descriptions

SOILS	DESCRIPTION
Excessively Drained	Water is removed very rapidly. The occurrence of internal free water commonly is very rare or very deep. The soils are commonly coarse-textured and have very high hydraulic conductivity or are very shallow.
Well Drained	Water is removed from the soil readily but not rapidly. Internal free water occurrence commonly is deep or very deep; annual duration is not specified. The soils are mainly free of features that are related to wetness
Moderately Well Drained	Water is removed from the soil somewhat slowly during some periods of the year. Internal free water occurrence commonly is moderately deep and transitory through permanent. The soils are wet for only a short time within the rooting depth during the growing season, but long enough that most mesophytic crops are affected.

Somewhat Poorly Drained	Water is removed slowly so that the soil is wet at a shallow depth for significant periods during the growing season. The occurrence of internal free water commonly is shallow to moderately deep and transitory to permanent. The soils commonly have one or more of the following characteristics: low or very low saturated hydraulic conductivity, a high water table, additional water from seepage, or nearly continuous rainfall.
Poorly Drained	Water is removed so slowly that the soil is wet at shallow depths periodically during the growing season or remains wet for long periods. The occurrence of internal free water is shallow or very shallow and common persistent. Free water is commonly at or near the surface long enough during the growing season so that most mesophytic crops cannot be grown, unless the soil is artificially drained. The soil, however, is not continuously wet directly below plow-depth.
Very Poorly Drained	Water is removed from the soil so slowly that free water remains at or very near the ground surface during much of the growing season. The occurrence of internal free water is very shallow and persistent or permanent. Unless the soil is artificially drained, most mesophytic crops cannot be grown. The soils are commonly level or depressed and frequently ponded. If rainfall is high or nearly continuous, slope gradients may be greater.

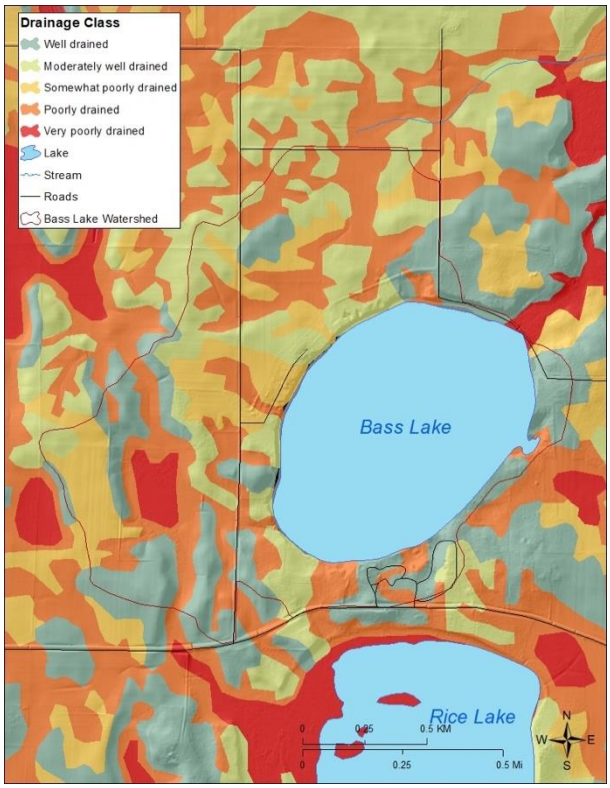

Figure 27. The drainage classes of the soils in the Bass Lake Subwatershed

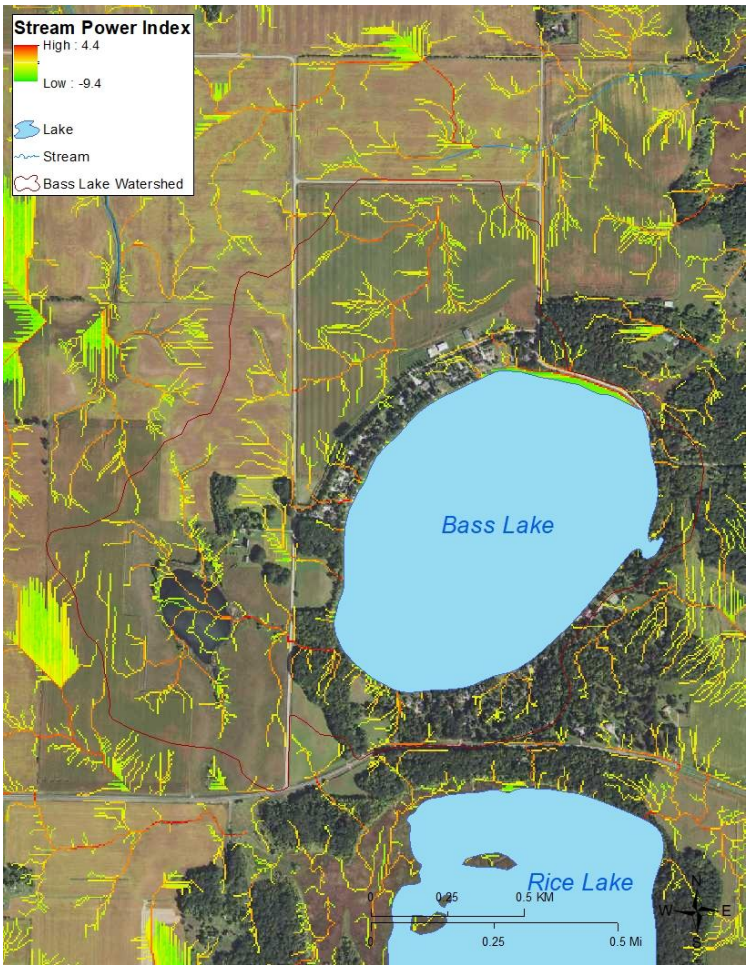

Figure 28. The soil erodibility weighted by slope in the Bass Lake Subwatershed. Bass Lake Watershed Stream Power Index.

WATER QUALITY

Water Quality Overview

Bass Lake has experienced water quality problems associated with frequent algal blooms for decades. The primary cause of Bass Lake's water quality problems is excessive nutrient loading, particularly phosphorus. Since phosphorus is the primary nutrient of concern and the major driver of water quality in Bass Lake, discussions and planning have centered on better understanding the sources, impacts, and management of phosphorus both within the lake and from sources across the watershed. Other pollutants of concern include sediment, nitrogen, and mercury.

Physical Factors and Land Use

Bass Lake contains a small watershed area relative to surface area (2:1 ratio). Land cover consists of wetlands, forestland, and cropland, but contains less cropland than typical Western Corn Belt Plain (WCBP) lakes. Therefore, external nutrient loading is likely to be less important in Bass Lake compared to other WCBP lakes. Regular water column mixing in Bass Lake likely leads to TP loading being dominated by internal loading and uniform water chemistry.

Water Quality Monitoring

1993 - Bass Lake was monitored in 1993 through the MPCAs Lake Assessment Program. Average chlorophyll a, TP, and secchi disk was 97 ug/L, 79 ug/L, and 0.94 meters, respectively. TN:TP ratios of 18:1 were measured in 1993, suggesting P limitation, although a potential role of N at times in stimulating algal growth should not be ruled out. Curly leaf pond weed likely contributed to a mid-summer pulse of TP in 1993. The 1993 report noted that herbicides simply shift the TP pulse earlier than natural senescence, but that harvesting curly leaf pond weed could reduce TP loads. The 1993 monitoring resulted in the installation of a CREP on west side of lake and upgraded septic systems.

2004 - Bass Lake was monitored again in 2004. Average chlorophyll a, TP, and secchi disk was 57 ug/L, 32 ug/L, and 0.7 meters, respectively. The highest and lowest chlorophyll measured were 42 ug/L in August, 24 ug/L in May, respectively. Citizen monitoring in Bass Lake has shown a trend of improved water quality in the lake.

2019-2020 – Sonde Water Quality Monitoring

Water quality was measured continuously at high frequency at a dock on the western side of Bass Lake using a sonde from May 2019 through October 2019 and May through November 2020. Additionally, hydrometerological parameters were measured using a weather station attached to the dock. Parameters included PAR (photosynthetically active radiation), wind direction/speed, air temperature, humidity, barometric pressure, rainfall, water temperature, pH, ORP (oxidation reduction potential), dissolved oxygen, specific conductivity, turbidity, and chlorophyll-a. Laboratory samples were collected periodically to calibrate and correct the sonde's chlorophyll probe for drift.

Chlorophyll-a read by the sonde ranged from approximately 13 to 71 ug/L in 2019 (fig. 29). In 2020, chlorophyll-a ranged from approximately 12 to 57 ug/L (fig. 30). The average chlorophyll measured by the sonde in 2019 was 18 ug/L, while the average was 15 ug/L in 2020. During 2019, chlorophyll-a was generally near 20 ug/L much of the year. However, a few major spikes in chlorophyll occurred: peak of

approximately 35 ug/L on 6/17/2019, 60 ug/L on 8/4/2019, and a peak of 71 ug/L on 9/24/2019. Chlorophyll values peaking between 30-40 ug/L were more common in mid-July to mid-August, with chlorophyll gradually increasing throughout the first half of August. Chlorophyll-a was generally lower in 2020, with fewer peaks, and the highest chlorophyll on 5/24/2020 of approximately 57 ug/L, and another peak of 30 ug/L on 8/16/2020. More algal biomass during the warmer months, especially July and August is unsurprising in Minnesota. The reason for the June spike in chlorophyll in 2019 is unclear; the major increase in chlorophyll-a in the late fall could reflect increased supply of nitrogen and phosphorus due to remineralization and accumulation of nutrients in the bottom water followed by mixing of nutrient rich waters to the surface in the fall. On significant difference between 2019 and 2020 was precipitation – 2019 was an unusually wet year, while 2020 was relatively dry. Higher precipitation amounts, or intensity could exacerbate blooms due to increased runoff of nutrients. Alternatively, increased precipitation can reduce nutrient concentrations by dilution, and dry periods can help allow for algae growth by stabilizing the water column.

One limitation of the sonde data is that it only provides measurements from a single point on the lake, and therefore could miss a bloom present elsewhere on the lake. Furthermore, data gaps in both year occur, which is common with sonde data, where maintenance problems related to biofouling present challenges. For example, a long gap in chlorophyll data during May, 2019 occurred, while late May showed a major bloom in 2020. At times, water sampling staff noticed relatively clear water near the water quality sonde, but intense cyanobacterial blooms along the shore of the Northeastern corner of the lake. Based on preliminary monitoring data and observation, intense cyanobacteria blooms appear to occur in Bass Lake well into September and October, and may occur mainly along the shore, often moving rapidly to different portions of the lake depending on the wind conditions. Therefore, even when the water quality sonde showed low chlorophyll concentrations, it does not rule out that a bloom was present elsewhere in the lake.

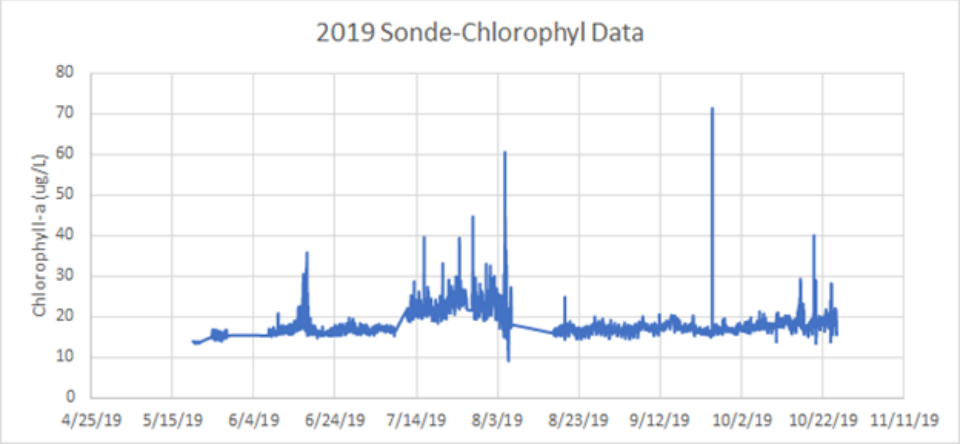

Figure 29. Chlorophyll-a from water quality sonde in Bass Lake, 2019.

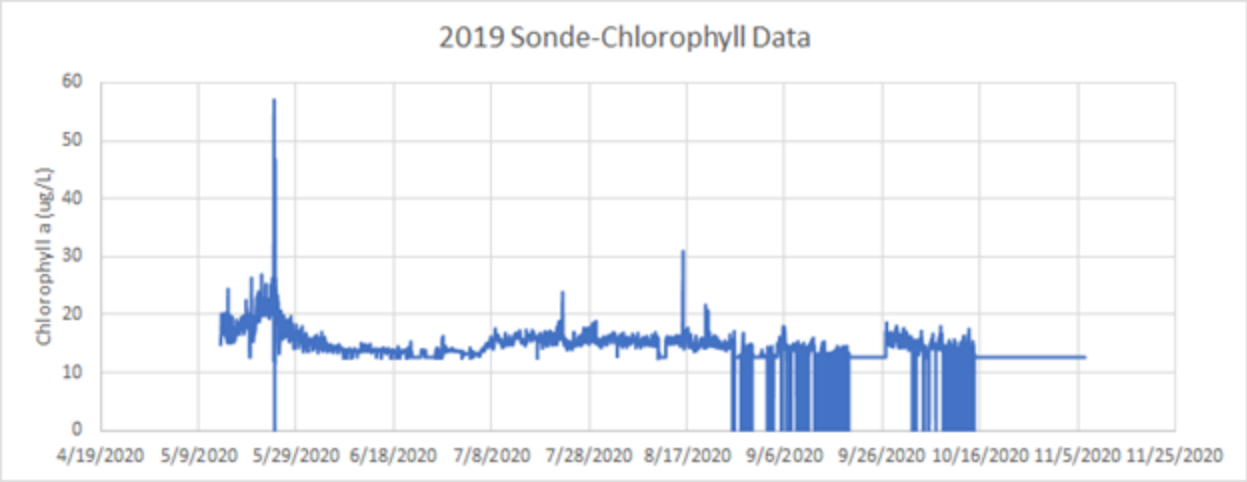

Figure 30. Chlorophyll-a in Bass Lake, 2020, from water quality sonde.
Data is raw and uncalibrated, and data processing is being completed in the spring of 2021.

Average TP was lower in 2020 than 2019, with concentrations of 28 and 59 ug/L, respectively. Average concentrations of TP, chlorophyll a, and secchi disk (table 8) were measured at multiple sampling sites in 2019 and 2020 to provide greater sampling coverage of the lake. The TP concentrations were in comparable ranges to average TP concentrations measured in 2004 and 1993. Average chlorophyll-a concentrations from grab samples were lower than previous measurement averages (near 35 ug/L in both 2019 and 2020), suggesting the potential for some water quality improvement, however, one limitation for comparing the averages between 2019/2020 and previous years is the increased number of sampling coverage in 2019/2020. Secchi tube readings averaged about .64 meters, which was lower than 2004 and 1993, which may suggest on average a slight reduction in water clarity.

Table 8 Selected Water Quality Monitoring Data, 1993-2020

Parameter	Water Quality Standard	2020	2019	2004	1993
Total Phosphorus (ppb)	<90	28 ug/L (average of multiple sampling sites)	59 ug/L (average of multiple sampling sites)	32 ug/L	79 ug/L
Chlorophyll α (ppb)	<30	36.76 ug/L (average of multiple sampling sites)	35.2 ug/L (average of multiple sampling sites)	57 ug/L	97 ug/L
Secchi Disk Transparency (feet)	>2.3	0.63 meters (average of multiple sampling sites)	0.64 meters (average of multiple sampling sites)	0.7 meters	0.94 meters

*Minnesota Water Quality Standards (Minn. Rule 7050 2008)
**Le Sueur River Watershed Monitoring and Assessment Report, March 2012, pp. 28-29. The values represent the average of monitoring during the months of May through September in 2008 and 2009.

Harmful Algal Blooms (HABS) Monitoring

Researchers from Minnesota State University, Mankato (Von Korff, Lott, Hoppie) conducted HAB monitoring in 2019-2020 using grab sampling, drone surveys, and a deployed sonde. Cyanobacteria was present intermittently, especially late summer through the fall. Dense blooms along the shore intensifying until early October were common, with maximum chlorophyll concentrations of 1,000-8,000 ug/L measured in samples of surface algal scum. Cyanobacteria blooms were generally concentrated on the shore, and moved frequently around the lake due to wind. Blooms in 2019-2020 consisted of anabaena microcystis, and oscillatoria, with anabaena being the most common.

Figure 31. Dense cyanobacteria bloom along the northeastern shore on 9-14-2020. Bloom was mainly anabaena, but also contained microcystis and oscillatoria.

Toxin has not been measured, but given the high density of cyanobacteria at times along the shore, lake users are encouraged to avoid swimming in, and to prevent pets from swimming or drinking water in potential areas of dense blooms (dense green color). MNSU is developing methodology to map blooms on Bass Lake using multiple drones and cameras (NDVI, and 6-band multispectral Tetracam). Since the lake area is relatively small, and satellite imagery is infrequent, drones may be a useful tool for early detection and mapping algal blooms on the lake.

MNSU is also researching time series models to forecast blooms in Bass Lake using chlorophyll data from the deployed sonde. A trail camera deployed at the sonde station provided qualitative imagery of water quality along the shore, which was useful for early detection of bloom, however ability to detect blooms was limited by the frequent movement of blooms around the lake with the wind.

Water Quality Standards and Impaired Waters

Water Quality Standards

According to the MPCA's Watershed and Protection Strategy, the Intensive Watershed Monitoring Program and several previous TMDL studies streams and lakes in the Le Sueur River Watershed were monitored for pollutants and biological indicators of water body health. The monitoring results were compared against the established water quality standards (MPCA 2014) associated with the beneficial use(s) of the specific water bodies. Beneficial uses include: 1) aquatic recreation (the safety of the water

for swimming), 2) aquatic life (the ability of the water to support fish and bugs), and 3) aquatic consumption (the safety of eating the fish), and other uses. Water bodies were assessed as supporting or impaired (MPCA 2011) for their beneficial use depending on whether they did or did not (respectively) meet the water quality standards.

MPCA Assessment Status

MPCA is currently in the process of finalizing assessment for the Le Sueur River Watershed. According to 2018 303(d) Impaired Waters List, Bass Lake is non-supporting of aquatic recreational use and listed as impaired waters for nutrients. MPCA's Le Sueur River Watershed Monitoring and Assessment Report states: "Based on the trophic status data, Bass Lake was classified as hypereutrophic. Bass Lake water quality has also failed to meet aquatic recreational use standards for shallow lakes (Class 2b) in the Western Corn Belt Plains Ecoregion. Water clarity of Bass Lake is below the range expected for its ecoregion, with an average of just 0.2 meters (0.7 feet) (MPCA, 2012).

Additionally, based on the Total phosphorus and chlorophyll-a assessment standards, Bass Lake was determined to be non-supporting of aquatic recreational use and was listed as impaired on the 2012 303(d) Impaired Waters List" (MPCA, 2012). Table 9 illustrates impaired waters in Bass Lake Subwatershed current to 2018.

Assessment Status

Not enough monitoring data is available to provide an eutrophication assessment for Bass Lake. Based on the available data, the best guess of eutrophication status was hypereutrophic in 1993, and eutrophic in 2004. Water quality monitoring at routine sites by the MPCA in 2019-2020 combined with additional sampling locations by MNSU (Bryce Hoppie and Owen Lott) will be used to provide updated eutrophication assessments (results pending).

Based on the available data Bass Lake is considered to be nearly or barely impaired, with water quality borderline meeting standards, despite impairments for single data points at times. In general, Bass Lake contains good water quality given its land use, and an outlier for lakes in the region. The MPCA suggested that Bass Lake's prioritization and protection grade is an A, that it is significantly sensitive to Phosphorus inputs, vulnerable to future impairments, and therefore warrants consideration for future protection.

Rice Creek Watershed - Impaired Waters

According to the 2018 MPCA Assessment, Bass Lake is listed as impaired for mercury. Rice Lake is listed as impaired for mercury and nutrients. Downstream, Rice Creek is listed for bacteria (E. coli), turbidity, and biology impairments for fisheries and invertebrates (Table 9).

Table 9. Surface water impairments in the Rice Creek Watershed

Rice Creek Watershed Impairments	Description
Bass Lake – Hg-F	Mercury
Rice Lake – Hg-F	Mercury
Rice Lake – T	Turbidity
Rice Creek - FishesBio	Fishery bioassessments
Rice Creek - InvertBio	Aquatic macroinvertebrate bioassessments

Rice Creek - T	Turbidity
Rice Creek – E.Coli	Bacteria

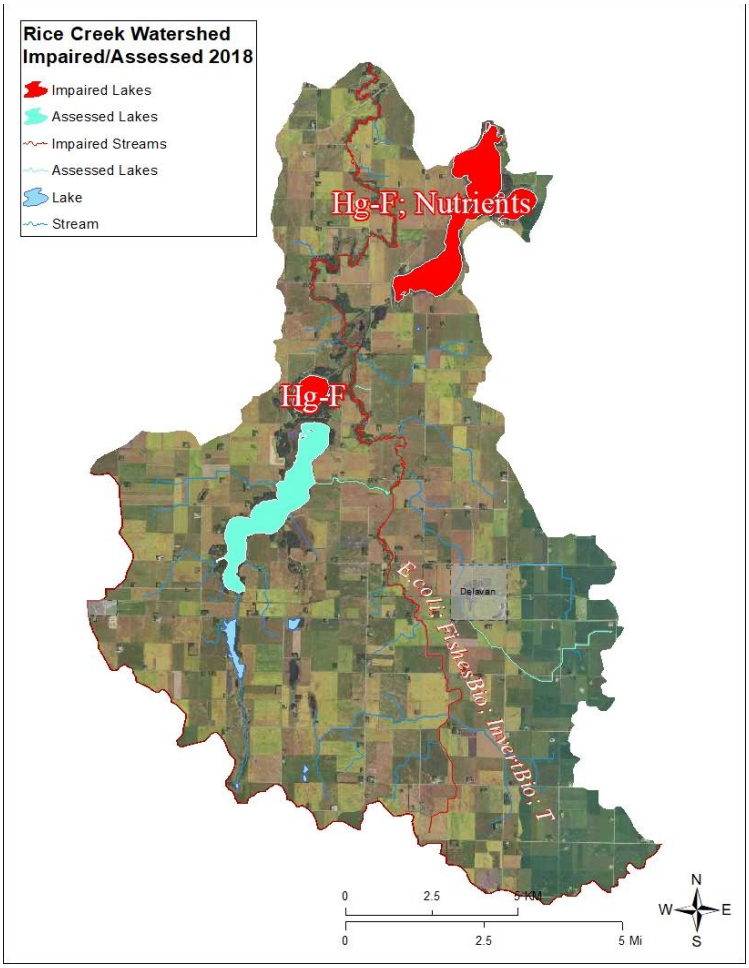

Figure 32. Rice Creek Watershed, Impaired (red) and assessed (blue) lakes and streams.

Draft Le Sueur River Watershed Assessment Update (2021)
While the final results are not yet available for the Watershed Assessment, according to the Draft Update, the preliminary results indicate:

- Bass, Madison, and Lura lakes were assessed for fish community and are Not Supporting for the Aquatic Life.
- Aquatic life assessments based on the fish community were completed on four lakes. Bass, Madison, and Lura were found to have impaired fish communities. Stressors that could be influencing those communities are degraded and/or developed shorelines and agricultural land use.
- Bass Lake is identified as vulnerable to exceeding the lake eutrophication standard, with total phosphorus below the standard, but Secchi depth and chlorophyll-*a* concentration inconclusively near the impairment thresholds.
- Bass, Madison, the upper basin of Elysian (upstream of the dam), Lura and St. Olaf are showing no discernable change in water clarity.

FISHERY MANAGEMENT

Bass lake has a long-recorded fisheries history by the Minnesota Pollution Control Agency (MPCA) and Department of Natural Resources (DNR). The MPCA has stocking records beginning in 1908 and removal records beginning in 1923. The DNR started doing fish abundance documentation and lake health assessments in 1941. In these surveys they number, size, and type of fish caught using seine nets and electrofishing was recorded. These assessments took place on average every 2 to 3 years. There was a gap from 1954 to 1978 were there are no records of a survey being taken. The DNR also recorded winter kill by low oxygen concentration in the winters of 1977-78 and 1978-79. In 1988 the DNR reclaimed the lake with rotenone, and the fish community was comprised of bluegills, black crappies, largemouth bass, yellow perch, northern pike, and channel catfish. After the 1988 reclamation standard DNR lake surveys have continued with the most recent occurring in May of 2018.

According to Tyler Fellows, MDNR Fisheries, the 2018 lake survey showed an exceptional fish community, the best a lake survey conducted by DNR Fisheries has shown. In fact, the walleye catch was 13 fish per net and fish averaged about 20 inches in length. Multiple fish were weighed that approached 10 pounds. The Northern Pike catch rate was over 5 per net and averaged 25 inches in length. In trap nets the Bluegill catch rate was over 20 fish per net and showed good size structure. Black crappies and yellow perch showed a good population although they had a smaller size structure. In reference to the carp and bullhead population issues, it appears both carp and bullheads are at a low population in Bass Lake, less than one per gill net and three per net respectively. Fellows said that because of what our lake survey has shown as far as the fish population I feel effort and money could be better used somewhere other than the carp and bullhead control suggested in the draft Management Plan document. I do see promise in the idea of a rock arch barrier downstream of the outlet to help with any upstream migration of carp into Bass Lake. A more detailed summary of Bass Lake Fishery is provided in Appendix D.

AQUATIC VEGETATION MANAGEMENT

Greening Lake

Many residents commented on concerns that they have over the lake turning green in the summer. Dr. Ryan Wersal suggested that an important next step is to determine what is causing the green. He added, "my guess is cyanobacteria not algae. Ultimately, it will come down to what you are targeting; had anyone identified the phytoplankton/s that are causing the green color? My guess is that it is not green algae (which would be chrlorophyll a), but a cyanobacteria (not an algae, not much chlorophyll a) causing the issue."

Algae sample surveys have confirmed the presence of cyanobacteria as suggested by Dr. Wersal, with a shift from diatoms to dominance by cyanobacteria in Bass Lake occurring during the late summer and fall; cyanobacteria were observed to persist late in the fall even through. Blooms of *anabaena* especially seemed common, but secondarily *microcystis and oscillatoria were present during blooms.*
Managing phosphorus primarily, and secondarily nitrogen may be useful for managing algal blooms in Bass Lake. Phosphorus is generally the limiting nutrient to algal growth in freshwater environments, and it is often assumed that cyanobacteria can fix nitrogen, so that reducing nitrogen loads to a lake may have limited impact on managing cyanobacteria. However, while *anabaena* can fix nitrogen, *microcystis,* does not. Managing nitrogen loads in hypereutrophic lakes has been suggested to be critical for managing cyanobacteria (Bogard et al. 2020). In addition, legacy P stored in sediments can make P readily available, increasing the chance that N+P co-limitation occurs compared to P limitation alone; (Paerl et al. 2020). The N:P ratio has historically been observed > 16:1 in Bass Lake, suggesting phosphorus limitation, however, the ratio has been near 16:1 suggesting the possibility of N+P co-limitation. In addition, no bioassay experiments, which are typically required to confirm nutrient limitation, have been performed, and historical data is considered insufficient to fully understand seasonal patterns of nutrient limitation in Bass Lake. Reducing nitrogen loads to Bass Lake may assist in managing algal or cyanobacteria growth if seasonal nitrogen limitation or co-limitation of N+P occurs.

Curly Leaf Pondweed

A permit from the DNR is necessary to mechanically remove curly-leaf pondweed and to treat the water with herbicides. Beginning in the 1990s, the Bass Lake Homeowners Association began treating the lake with copper sulfate as a way to control severe algae blooms. According to Lake Association records, treatments occurred on 7/26/02, 8/29/02, 8/20/03, 8/26/04 and 9/1/05 (MPCA 2004). If herbicide is used for management, it needs to be an endothall herbicide. Citizens reported using Aqualfol K at Bass Lake previously.

Dr. Ryan Wersal provided the following advice: "You cannot allow curlyleaf pondweed to complete its life cycle as it will produce turions that fall to the sediment and make more plants. Each plant can make a hundred or so turions each season so if you allow the plant to complete its life cycle you have exponential growth and spread of curlyleaf throughout the lake. The only way to defeat curlyleaf it from preventing turion formation and managing the turion bank. Unfortunately, many of our southern lakes have a large turion bank. Effective management programs for curlyleaf have been developed in MN, WI, MI, etc". Dr. Wersal advised that performing an assessment and developing Aquatic Species Management Plan would be important next steps to consider.

Chemical versus Mechanical Control

A common question that community members raised is how to best manage for curly leaf pondweed—chemical versus mechanical control. Dr. Wersal advised that which approach "will depend upon the goal of management. Harvesting is expensive and slow. You will harvest fewer acres per year than you can treat with a herbicide. What are they going to harvest? When are they going to harvest? How often can they afford to harvest (this tends to me more expensive)? There are ways to achieve selectivity with non-selective herbicides."

While herbicide can control curly-leaf pondweed, it may not be effective if the goal is to reduce algal growth, since killing the plants will still allow for decomposition of the plant and remineralization of nitrogen and phosphorus. Although harvesting of curly leaf pondweed has the potential to permanently remove some P from the lake system, in some cases removal of P with harvested material has been shown to be relatively negligible (Ryan Wersal personal communication 2020). The MPCA has suggested that removal and management of curly leaf pondweed may be important for managing the internal P load in Bass Lake, so should be considered as part of an overall nutrient management strategy for Bass Lake (Bass Lake Watershed Survey, 2020) Other physical approaches for curly-leaf pondweed management include shading, blanketing the lake bottom, and dredging.

Eurasian Water Milfoil

As of 2019 Bass Lake has been confirmed to be infested with Eurasian Water Milfoil (EWM) by MN DNR. Eurasian watermilfoil is a rooted, submerged aquatic plant that is native to Europe and Asia. In Minnesota it was first recorded in 1987 in Lake Minnetonka. Bass lake was recorded having Eurasian watermilfoil 2019 and placed on the DNR infested-waters list in 2019.

Eurasian watermilfoil is a threat to Minnesota waters because of how it impacts the ecosystem of the lake and the recreation taking place at the lake. It can create dense mats at the surface of the water inhibiting water recreation. It does not provide suitable shelter, food, and nesting habitat for native organisms, and it overtakes and outcompetes native aquatic plants. EWM does have some native lookalikes including coontail and northern watermilfoil. These plants are native and beneficial to aquatic environments.

EWM has feather like leaves, with four leaves arranges in whorl around the stem. The stem is typically light brown, and the tips of the plant are sometimes red or pink in color. The plant has a small pink flower spike up to four inches long covered tiny yellow flowers. EWM can produce up to a 100 seeds per plant a season, but the species is more successful by reproducing through fragmentation. Pieces of the plant can be broken off and develop roots to form a new plant. Fragmentation occurs easily and can occur via boat traffic and other recreation, as well as disturbance to the plants from fish.

There are control methods for EWM in lakes. One way of control is to mechanically cut or pull the plant by hand or by equipment, such as rakes or cutting blades. Herbicides can also be used for control. There are four herbicides that are used for Eurasian watermilfoil. Two of them are systemic herbicides, 2,4-D and triclopyr, and two of them are contact herbicides, endothall and diquat. All these methods of control do require a permit from the DNR.

DNR Invasive Species Specialist, Carli Wagner conducted surveys to assess the extent of EWM infestation in Bass Lake during summer 2020. She found the EWM infestation localized and was hopeful that they would be able to manage it by hand or mechanical equipment may keep in under control in the near term. Long term, the conservation partner group discussed the critical need to keep EWM in check to avoid a widespread infestation. DNR Fisheries biologist expressed concern is if there is a few small stands of EWM on the lake, and mechanical control is used it may spread more quickly throughout the lake (Tyler Fellows).

Healthy Native Plant Community

Ultimately, a diverse community of native plants would be a goal for the lake. Achieving this goal will first require water quality improvements through near shore best management practices, septic system upgrades, and reduced nutrient loading from agricultural tiles. A reduction in lake phosphorus levels should result in a reduction in chlorophyll and an increase in Secchi disk transparency.

COMMUNITY PERSPECTIVES

NEED PHOTOS FROM BASS LAKE COALITION MEETING

Bass Lake Coalition Meeting where citizens discussed Bass Lake Management Plan (Date)

A central part of the planning process was gathering input from diverse local stakeholders in the Bass Lake subwatershed. In order to gain community perspectives, identify issues of concerns and watershed goals, project partners gathered input by: 1) attending Bass Lake Coalition meetings; 2) conducting interviews with diverse watershed residents (Appendix B); and 3) obtaining feedback and advice from local, state and federal conservation professionals (Appendix C).

Bass Lake Coalition

The Bass Lake Coalition was started in February 2018 by Bass Lake Property owners Mark Hanson and Tim Kelly. The broad mission of the group is to improve the water quality of Bass Lake. Throughout 2018-2020 they started networking with watershed residents, hosting meetings and learning from conservation professionals about how to "Make Bass Lake Better." Their approach is to "educate in a positive way, to local lake shore/cabin owners, farmers and local community the benefits of clean water and improving Bass Lake and its watershed area." They registered as a nonprofit 501c3 and began gathering residents and hosting meetings.

Bass Lake Coalition Goals (4/2020):

- Understand where the sources of nutrients are coming from and work together to make it better.
- Work with Bass Lake watershed landowners to educate and enroll land to filter water before it enters Bass Lake
- Changing lake weed control methods. Stop with chemicals and consider other alternatives
- Invest in weed cutting equipment to harvest lake weeds during the summer season. This prevents the dead weeds from chemical weed killing during the decomposing stage and reduced phosphates and slows the algae growth cycles.
- Analyze carp and fish populations of Bass Lake – carp solutions

- Fix outlet culvert. Add rough fish/minnow barrier.

Bass Lake Coalition & Community Meetings

Project partners attended numerous Bass Lake Coalition meetings in 2020 to learn about residents questions, concerns, and goals to help to inform and gain input for the Bass Lake Management Plan.

Bass Lake Coalition Meeting
On (insert date), Minnesota State University, Mankato Professor Dr. Ryan Wersal gave a presentation about goals and typical steps of a Lake Management Plan and components of an aquatic species management plan. The group discussed what they could do next to solidify the coalition and move forward with lake implementation priorities.

Bass Lake Coalition Meeting
A Bass Lake Coalition was held on February, 19, 2020. Michele Stindtman, Faribault County SWCD provided an update of activities around Bass Lake and Professor Dr. Bryce Hoppie from Minnesota State university, Mankato provided an overview of water quality monitoring research that he and student Owen Lott have been conducting over the past 2 years. The Bass Lake Coalition discussed approaches for organizing efforts and formalizing the group.

Planned Meetings
Faribault County SWCD and WRC and planned to host a series of public meetings during 2020 but the covid pandemic limited the ability to meet. Instead, the planning team decided on a different approach to gain community input by performing interviews and hosting a meeting with regional technical advisors.

Community Interviews
WRC worked with Faribault SWCD to select a representative cross section of watershed residents to interview in order to learn about local residents goals and strategies for Bass Lake watershed improvement. WRC staff conducted interviews with landowners during summer 2020. These one-on-one interview findings are summarized and framed into major themes. More detail can be found in Appendix B.

Goals Update Meeting
The planning committee met with Bass Lake Steering Committee members (September 14, 2020) to go over the goals and implementation strategy. Steering committee members planned to get input from other watershed residents and report back about next steps.

Regional Technical Advisors Meeting
WRC convened 11 conservation partners on October 5, 2020 to discuss and learn from technical experts. This technical advisory group met to review plan goals and implementation plan and to provide input and advice. The group identified short term priorities are based on technical partner input from local staff (SWCD), state researchers (MDNR, MPCA), and Minnesota State University, Mankato researchers. Meeting summary information and more detail can be found in Appendix C.

Plan Update Meeting
The planning team met with Bass Lake Coalition Steering Committee members (May 25, 2021) to review the Bass Lake Management Plan and discuss next steps.

Landowner Interview Results – Common Themes & Goals

Community perspectives were gathered from in-depth interviews of six landowners in the Bass Lake watershed who represent a cross section of watershed residents. Water Resources Center, Minnesota State University, Mankato staff conducted interviews with landowners during summer 2020. As interview comments were grouped, seven broad categories emerged that can serve as overarching goals. The themes are summarized below. For more detail, see Appendix B.

Preserve Recreation

Residents greatly value the lake's recreational opportunities and talked at length about the benefits and improved quality of life living on or near the lake. They talked fondly of using the lake for boating, water skiing, swimming, fishing, and wildlife viewing. Most residents discussed the interest in preserve recreational value of lake for future generations, saying things like: "Let's keep the lake as good as it is, or better for future generations." Some talked about a goal of maintaining high enough water quality for swimming while others emphasized wanting to keep it a reasonable place for grandkids to learn how to water ski. Many provided personal testimonials about taking kids or grandkids out boating, water skiing or jet skiing and "having a hoot of a time." Others reminisced "fishing off the dock with little kids, it brings great joy." Many noted the regional importance of the lake, drawing people from town and the broader region to recreate, fish and boat. Residents stressed the importance of considering stakeholders from outside the watershed: "Many people around the state have a history with the lake, visit seasonally or swam in lake when they were children" and "I have heard many stories about people who live in Winnebago and use the lake a lot." Some noted that "it would be a nice goal ….To keep it as you have enjoyed it."

Manage Fishery

Many residents discussed the need to manage the fishery to ensure quality fishing opportunities and to control roughfish, particularly carp. They expressed concern about overfishing and wanted DNR to help with fishery management to prevent overfishing of particular species that they had seen in the past. Many residents expressed concern about rough fish management. They said "Carp is a big issue" and "Carp stirs up sediment" and "We have an abundance of carp and need an eradication plan." Many had a goal for DNR to develop a carp and rough fish management plan. Many expressed concern about an existing rough fish barrier that "is not working, is leaking" or "The fish trap doesn't work." Some talked about the impact that carp and bullhead – "The carp and bullhead infestation prohibits beneficial aquatic plants." Some residents got an estimate from Carp Solutions for carp count/inventory/capture ($8,000) and eradication ($30,000).

Protect Water Quality & Manage Aquatic Vegetation & Invasive Species

Many residents expressed concerns about the lake turning green in late summer. They talked a lot about algae blooms and reducing nutrient levels. They wanted to protect water quality of lake for recreational purposes and to find effective and cost-efficient ways to "manage weeds." Many expressed concern

about invasive species, both understanding current conditions and managing for new invasives such as milfoil. Some noted “I am really concerned about milfoil and milfoil management.”

Manage Land to Reduce Inputs

Many residents talked about the need to manage land across the watershed to reduce nutrient and sediment pollution into the lake. They talked about both agricultural and lakeshore landowners playing a role managing land to protect the lake. They acknowledged that “landowners have to take a big responsibility. It is their lake, they need fertilizer management.” Regarding the shoreline, they suggested “the shoreline should be better managed, not lawns and mowing down to the shore” or “on hills let is grow to native flowers and plants.” They acknowledged that “When it rains, it is all coming down and all going to Bass Lake (fertilizer, weed control, mosquito control).” Some noted that there are “some good management principles getting done” but more could be done. Some expressed concern about the “different management styles of lakeshore owners” particularly between the “North side of lake, use fertilizers and have lawns” and “Basswood, where no fertilizers are allowed.”

On agricultural lands in the watershed, residents talked about the importance of farm management and best management practices to reduce pollution to the lake. Some expressed concern about increased tiling on agricultural lands noting “I’ve never seen so much tile going in.” Many talked about the need for retention to hold the water back – “Over a longer time frame, we need to get more retention.” Some interviewees had delineated potential water storage areas. Many talked about the large CREP wetland while others expressed concern about maintenance – “Nobody is paying attention to the [CREP] retention pond. Is that system still working?” Some suggested that “we need to purchase land or work with farmers on management.” A few residents expressed concern about future land development – “I worry about if some of the now undeveloped lots get developed, how will that change the lake?”

Work Together, Engage & Educate the Whole Community

An overarching recurrent theme in the interviews was an interest in a fostering an active, engaged community that protects and cares for Bass Lake. The approach they talked about was to involve everyone saying “Everyone can play a role.” The Bass Lake Coalition has already met residents “in new locations across the lakeshed, there are super people, the draw is the lake.” Interviewees talked about the need to “clarify what we [citizens, landowners] can do.” They noted that it is a fun journey and acknowledged that it will take time and incremental change. Some citizen leaders talked about their goal:“ In my lifetime, I want to keep the motor running and find common interest of people.”

Many talked about the critically important role of working together. “Top of the priority list, if people could all get together and be on the same united front, there is money and funding available.” All residents talked about challenges to overcome. **“**There are multiple lake associations. The 3 associations, each have their own neighborhood bickering.” Some have deep tensions with “50-60 year old family feuds.” Others noted a barrier is “a lack of participation by many landowners, adding that the population around the lake is aging and many people don’t get involved.” Some talked about social tensions like “There is some finger pointing. Farmers are accused of polluting the lake.” Others talked about historical tensions between “Lakeshore owners vs. Trailer trash.” In the words of one resident, “My hope is that people can get along, let kids and grandkids play together.”

Residents acknowledged the complex lake management structure with “so many state and local agencies involved.” “ You have many people, DNR, fisheries, lake owners and visitors.” Some

underscored that we “need agencies working together and with us” and that we need to clarify roles and responsibilities. Some noted concern about leadership saying “We need to have somebody drive it and push it.”

Better Understand Lake & Watershed Dynamics

Watershed residents had many questions that they wanted to better understand about complex watershed dynamics. Gaining a better understanding of water quality through monitoring was a priority. “We need to understand inputs from watershed, carp, shoreland, tile.” Many were very interested in learning more about existing monitoring efforts asking “What are they learning?” Questions included: “We need to understand Internal vs External loading for water quality?” “What are the Phosphorus and Nitrate levels in the lake and what are their impacts? Put it in laymen’s terms.” They wanted to learn more about the role phosphorus and nitrogen play triggering algae blooms. The extent of invasive species was another central topic of discussion. Residents wanted to learn more about weed management and weed control. A central point of discussion was whether to continue to use chemical control or move to mechanical control.

Find Funding

Many interviewees talked about the need to find funding for research to better understand lake dynamics and pay for in-lake and watershed improvement projects. They were curious about how other lake associations got their funding. Some said, “We need grant writers” while others talked about the many players involved and figuring out who can pay for what.

Technical Advisory Group Meeting Summary

A Technical Advisory Group met to review plan goals and implementation plan and to provide input and advice. The group identified short term priorities based on technical partner input from local staff (SWCD), state agency researchers (MDNR, MPCA), and university researchers at a meeting on October 5, 2020.

Due to the large number of goals and implementation strategies, project partners recommend an adaptive management approach with a short term implementation plan developed every three (3) years. This approach can identify near term priorities and help local partners and managers to phase in and prioritize the many longer term goals. For more information, see Appendix C.

ADAPTIVE MANAGEMENT APPROACH

Project partners advise using an adaptive management approach to guide progress in the Bass Lake watershed. Adaptive lake management planning is an iterative and flexible method for improving a resource over time by learning from management outcomes during the process.

The concept is that the broader, longer term goals and objectives are focused into three-year priority steps to help guide actions. “Taking an adaptive management approach acknowledges that a lake is a dynamic living ecosystem that may not respond immediately or fully to management actions as predicted. An adaptive management approach accounts for the uncertainty with implementing management actions and builds in a framework for addressing it.” (Source: Como Lake).

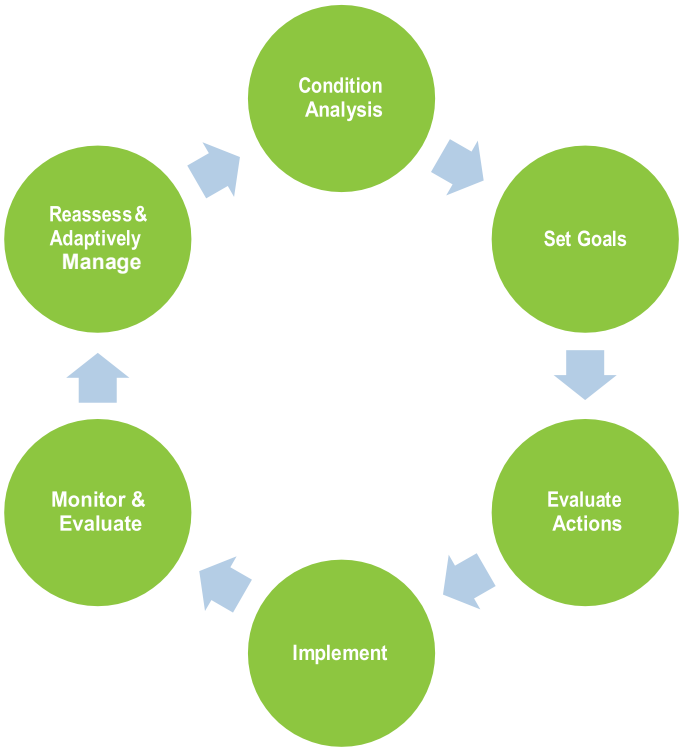

Figure 33. Adaptive Lake Management Planning Cycle (Source: Como Lake)

Figure 33 illustrates the six key steps of the adaptive management plan framework, which is a cyclical and iterative process to be implemented over the defined life of the plan. The steps of the framework include (in order) a condition analysis, goal setting, the evaluation of actions, implementation, monitoring and evaluation, reassessing, and then adaptively managing by starting the cycle over again every three years. (Source: Como Lake).

LAKE MANAGEMENT GOALS

As part of the planning process, input was gathered from existing documents, local stakeholders, and local and state conservation partners to identify the issues of concern relating to Bass Lake. The list below is a summary of goals. See Appendix A for a more detailed list of Bass Lake goals.

Goals from Existing Plans and Documents

Goal 1: Lake Management
Bass Lake will be managed as an ecologically healthy, shallow lake

Water quality
- Perform water quality monitoring
- Reduce phosphorus levels
- Reduce sediment levels

In-lake Management
- Aquatic Invasive Species Management
- Promote Native Aquatic Plants
- Fisheries Management

Goal 2: Shoreland Management
Maintain healthy shoreline areas that can contribute to the ecological health of Bass Lake

- Naturalize the lakeshore and promote the growth of beneficial aquatic plants
- Lake buffers, setbacks, and native/healthy lakescaping
- Shoreland Development
- Manage Septic Systems

Goal 3: Watershed Management & BMPS
Manage land and implement Best Management Practices (BMPs) that contribute to the ecological health of Bass Lake

- Reduce soil erosion
- Nutrient management
- Storm/drainage water management
- Address field tiles and open tile inlets
- Wetland restoration
- Fertilizer, manure management

Goal 4: Planning, Management & Data
Utilize the best science, partnerships, and resources to ensure successful implementation

- Lake Planning
- Encourage lakeshore rules
- Acquire data to better understand resources, threats, trends and status (Septics, feedlots etc)

Goal 5: Community Action - Engagement, Education & Recreation
Achieve strong sustained community engagement and stewardship to improve and protect Bass Lake

Provide outreach and education to lake shore residents and lake users
Provide outreach and education to farmers

RECOMMENDED MANAGEMENT ACTIONS

Shallow lakes in southern Minnesota typically have numerous water quality challenges and Bass Lake is no different. It will take significant effort and time to improve Bass Lake water quality and continue to safeguard its recreational importance to the region. The watershed improvement approach should include combination of watershed and in-lake management actions spearheaded and sustained by engaged community partners.

Lake management actions will seek to control internal phosphorus loading while watershed management actions will include structural and non-structural BMPs that effectively reduce phosphorus loads. Community-based management actions will work to help build awareness and stewardship ethic across the lakeshed. A significant amount of effort, partnership development, and resources will be required to obtain the water quality goals.

Goal 1: Lake Management Actions

In-lake phosphorus management
Phosphorus is a major driver of water quality. There is a need to clarify phosphorus reductions needed from both in-lake and watershed sources to reduce algae blooms. Once there is a better understanding of in-lake versus watershed sources of phosphorus, implementation strategies can more clearly be targeted.

Aquatic vegetation management
Many residents have expressed concern about the lake turning green in late summer and are motivated to improve water quality and find effective and cost-efficient ways to “manage weeds” and promote healthy aquatic vegetation.

- Develop and implement lake vegetation management plan
- Conduct annual aquatic vegetation surveys
- Promote the growth of beneficial aquatic plants

Aquatic invasive species management
The aquatic vegetation community in Bass Lake is dominated by curlyleaf pondweed (CLP). CLP (*Potamogeton crispus*) is an invasive aquatic plant that is challenging to eradicate once it has become established. Chemical control has been the dominant technique but mechanical harvesting is currently under consideration. Once CLP is under control, management efforts can focus on establishment of a diverse, native aquatic plant community.

- Inventory existing invasive species and create an invasive species management plan.
- Invasive Species Research and Identification
- Continue to control curly-leaf pondweed. Get advice and clarity about herbicide versus mechanical treatment as part of the invasive species management plan.
- Determine best methods of harvesting/removal of aquatic vegetation
- Continue Milfoil Management - Manage localized infestation of milfoil through hand pulling and keep milfoil numbers low and in check
- AIS Signage at Public Landing

- AIS Information on Website, Newsletters, In-person
- Harmful Algae Bloom research and management

Lake level management

- Work with the DNR to manage the gate
- Investigate the benefits of lake draw down
- Investigate the benefits of dredging

Fisheries & wildlife management

Collaborate with MNDNR to develop a fisheries management plan for the lake that can help to sustain a diverse, ecologically balanced fishery as well as support recreational fishing for the community. Promote MDNR continuing to conduct regular fish surveys to track and maintain a healthy, balanced fishery. Carp management - Part of the internal loading issue includes roughfish management. A central question that emerged from resident interviews is the number of carp and the role they play in stirring up sediment making Phosphorus available.

- Work with MDNR to develop a Fisheries Management Plan
- Explore need for carp and bullhead management
- Contract for a carp count, inventory, and capture and potential eradication
- Implement and maintain effective carp barrier (e.g. Install rock arch barrier downstream in stream channel to reduce upstream migration)
- Replace and maintain culvert
  Work with agency partners to develop a wildlife management plan

Goal 2: Shoreland Management Actions

Shoreline management

Work with shoreland owners to explore opportunities for improved shoreland management and opportunities to reduce Phosphorus, TSS and Nitrogen loading from lakeshore properties. Promote shoreland stabilization projects that will help to reduce Phosphorus loading into the lake from shoreland properties.

- Engage local partners in shoreland restoration
- Conduct shoreland assessment (Use tools like “Score your Shore”)

- Promote adequate buffers on lakeshore property to capture surface runoff and filter pollutants
- Promote vegetation to grow along shoreline, particularly native buffers along edges of the lake
- Ensure adequate setbacks of structures

- Identify erosional areas (current and susceptible)
- Reduce lakeshore Phosphorus and sediment loading with riprap along lake
- Identify direct inputs resulting from home and yard runoff
- identify direct inputs from shoreland sluffing

- Encourage Lake Associations to develop consistent Lakeshore Management Rules
- Develop rules on downspouts, lakeshore vegetation, lawn fertilizers, and other homeowner inputs

- Identify and update non-compliant Subsurface Sewage Treatment Systems (SSTS)
- Enforce SSTS Maintenance and Compliance through Association Rules and Regulations
- Identify and Establish "Green Space" throughout the lakeshore and non-ag areas
- Identify critical areas for rain garden and other infiltration practices

Goal 3: Watershed Management Actions

Many residents talked about the need to manage land across the watershed to reduce nutrient and sediment pollution into the lake. They talked about both agricultural and lakeshore landowners playing a role managing land to protect the lake. "A lake is a reflection of its watershed as drainage area, land use, topography and geology impact the phosphorus budget of a lake. Where external loading is sufficient to cause water quality issues over the residence time of the lake, a significant proportion of the watershed phosphorus load will likely need to be reduced to achieve long-term water quality improvement. Unless external loading has been adequately addressed, in-lake treatment will have short-term benefits at best." (Phosphorus Load Control, 2020)

Agricultural best management practices (BMPS)

Work with agricultural land owners and renters to explore opportunities to reduce Phosphorus loading from agricultural lands

- Reduce field runoff and tiles that are running into the lake
- Convert open (surface) tile intakes to conservation inlets
- Reduce soil erosion
- Promote cover crops and conservation tillage
- Promote wetland restorations
- Promote waterways, sediment control basins
- Identify tile drainage areas for nitrate reduction management opportunities
- Encourage Ag Land Owners to practice nutrient management practices on their fields
- Promote and encourage conservation program opportunities and cost share

Goal 4: Planning and Partnership Actions

Partnerships

Building partnerships is a central strategy for watershed and lake improvement. Partnerships and cooperative efforts are integral to successful planning and implementation. There are many partners that play a role in addressing the issues facing Bass Lake. Strong partnerships will help increase capacity and sustain the momentum needed for long-term improvement and help to secure funding.

A recurring theme in landowner interviews and meetings was an interest in a fostering an active, engaged community that protects and cares for Bass Lake. The approach they advocated for was involving everyone saying "Everyone can play a role."

- Conduct annual meeting with agency partners
- Discuss with partners potential opportunities for outside funding/financing sources to implement (grants, cost-sharing, in-kind contributions etc)
- Work together to find diverse funding sources (e.g AIS funding, 319 grant, Pheasants Forever etc.)

Conservation Targeting and Implementation Plan
Conduct an Implementation Plan to identify Total Phosphorus (TP) load sources and reduction targets. The study would include research on strategies for potential upland and shoreland practices that can be implemented to achieve pollutant loading reduction goals. The plan could focus on what can be done, where it should be done, and how much it will cost. The plan would identify potential best management practices and consider cost-effectiveness. It would use conservation targeting tools (e.g. ACPF or HSPF SAM) to identify conservation sites. It will help define structural and upland BMPs and land management that could help to meet TP reduction goals.

- Identify Phosphorus sources to reduce Phosphorus loading
- Use GIS conservation targeting tools (e.g. ACPF, HSPF-SAM) to identify suitable locations for BMP targeting
- Find the most appropriate and cost-effective projects to reduce phosphorus loading to the lake

- Review current shoreland zoning ordinances and clarify gaps
- Work with County Planning and Zoning to address gaps in shoreland ordinances

- Protect shoreland areas from future development
- Identify "Protection" Areas
- Work with current landowners to "Protect" these areas (eg. Perpetual Easements)

- Work with the SWCD on current funding opportunities
- Include Bass Lake Plan in other Local and State Planning Efforts
- Include Bass Lake Plan in the LeSueur 1 Watershed 1 Plan Planning and Document
- Include Bass Lake Plan in the Rice Creek 319 workplan

Goal 5: Community Actions – Engagement, Education & Recreation

While there are many actions that can be taken both in-lake and across the watershed, community based actions are equally important to drive water quality improvements. An overarching recurrent theme in the interviews was an interest in a fostering an active, engaged community that protects and cares for Bass Lake. The approach they talked about was to involve everyone saying “Everyone can play a role.”

Recreation – Bass Lake is a beloved recreational area by the community, particularly for boating, fishing, and wildlife viewing. To help support continued recreational activities on the lake:

- Host annual community fishing event
- Create on-the-water educational opportunities for people recreating on Bass Lake, particularly ones that focus on lake friendly shoreland management techniques

Education & Outreach – Many community members underscored the need to focus on public education to teach people around the lake about how they affect the lake so they can help. Clarify how land practices on shorelands and agricultural lands are having adverse effects on the lake. Conservation partners also mentioned the need to work with residents to manage expectations for shallow lake water quality (it will never look like Bemidji area lakes).

SWCD

- Create a Newsletter to educate watershed residents
- Conduct annual educational workshops or events on watershed and lake protection
- Develop educational resources about Bass Lake for school groups and community groups
- SWCD to continue to attend Coalition meetings

Bass Lake Coalition & Lake Associations

- Website updates and meetings
- Elect Board and develop committees and assignments
- Lake Associations educate new homeowners
- Lake Associations implement SSTS pumping requirements and maintenance
- Residents reach out to the SWCD/County for SSTS information
- Identify Priority Projects

Researchers

- Monitoring updates or webinars

Engage Youth

- Utilize Prairie Ecology Bus in local schools
- Continue youth fishing contests
- Fishing Pier

Goal 6: Research – Better understand lake & watershed dynamics

Lake water quality monitoring

Continue to perform water quality monitoring within lake. Establish a program of regularly sampling the lake at the former MPCA site to continue the long-term assessment of water quality. There is also a need to monitor to better understand the relationship between internal phosphorus loading and watershed loading. Internal loading is the process in which phosphorus is released from sediment during anoxic conditions and mixed back into the water column by wind or wave action. Many community discussions centered around the need a better understanding of the lake's internal loading. There are numerous internal loading management options that range from chemical, physical, and biological approaches (see Table 1. Internal loading management options (Phosphorus Load Control, 2020).

- Support continued partnerships to assist with necessary monitoring
- Establish a program of regularly sampling the lake at the former MPCA site to continue the long-term assessment of water quality
- Have researchers present findings at community meetings

Water quality sampling to determine watershed versus in-lake phosphorus loading

There is a need to monitor to better understand the relationship between internal phosphorus loading and watershed loading.

- Install monitoring probes at the major sites of input (1-2 locations) and outflow (1 location) to determine the mass balance of loading and nutrient flux in the lake

Lake coring

Conduct a lake sediment core study will help to determine TP levels in lake sediments.

- Geophysically map, core, and analyze a small number of lake bottom sites for nutrient storage
- (Already in progress, winter 2021, Dr. Hoppie)

Invasive species and HAB monitoring

- Continue to measure size, shape, and timing of algae blooms in the lake
- Continue to monitor for Harmful Algae Bloom (HABs) (Hoppie, Lott, Von Korff research)

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Greater Blue Earth River Basin Alliance: www.gberba.org

Le Sueur River Watershed Network
Le Sueur River Watershed Network Steering Committee - website: www.lesueurriver.org

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DNR Lake Finder, Bass Lake

https://www.dnr.state.mn.us/lakefind/lake.html?id=22007400

APPENDICIES

APPENDIX A: EXISTING WATERSHED GOALS

Goal	Source
IN-LAKE MANAGEMENT	
WATER QUALITY GOALS	
Reduce Phosphorus Levels	
A reduction in lake phosphorus levels should result in a reduction in chlorophyll and an increase in Secchi disk transparency. Lakes with moderate transparency through the growing seasons tend to support more diverse macrophyte communities. Selective harvesting or mechanical harvesting rather than the use of nonspecific herbicides may also promote a more diverse macrophyte community.	MPCA, 1993 Bass Lake Report
Le Sueur WRAPS Goals High Phosphorus Concentrations in Lake Watersheds (WRAPS) • Goal: 60% reduction in average seasonal TP Concentration (On average for all lakes) • Years to Goal: 40-60 years • 10 Year Target: 10-15% reduction (depending on lakewatershed ratio: 20% for lakes with large ratio and 15% for lakes with small ratio)	MPCA, 2015 Le Sueur WRAPS, Lake Watersheds
Reduce Soil Erosion	
Soil erosion must be kept at an absolute minimum in all parts of the watershed, including the lakeshore. Tillage of crop land should be limited to the extent possible, and the possibility of cover cropping might be investigated. The Homeowners Association could consider providing some financial support for changes to tillage practices or cover cropping.	MPCA, 2004 Bass Lake Report Update
Water Quality Monitoring	
Participation in the Citizens Lake Monitoring Program should continue since it is an effective way to assess long-term and year-to-year variations in algal productivity (lake trophic status). Monitoring should be conducted over the site of maximum depth near MPCA site 101.	MPCA, 1993 Bass Lake Report
Promote Native Aquatic Plants	

Efforts should continue to naturalize the lakeshore and promote the growth of beneficial aquatic plants. Staff of the Faribault SWCD and Minnesota Department of Natural Resources are available to provide assistance.	MPCA, 2004 Bass Lake Report Update
Ultimately, a diverse community of native plants would be a goal for the lake. Achieving this goal will first require water quality improvements through near shore best management practices, septic system upgrades, and reduced nutrient loading from agricultural tiles.	MPCA, 1993 Bass Lake Report
Aquatic Invasive Species Management	
Bass Lake supports a dense growth of curly leaf pondweed (*p crispus*), an exotic plant which grows in dense beds during the spring and early summer and dies in early July. Attempts to control the plan with herbicide application are effective but only serve to hasten the natural mid-summer plant die-off. Large increases in TP and Chlorophyll in the late summer may be related to nutrient release from the simultaneous die off of large bed curly leaf pondweed due to the chemical treatment or natural senescence. Allowing the plants to complete their natural life cycle may delay the severe late season algae blooms. If plant control is considered important mechanical harvesting and removal may be preferred to herbicide treatment because it would reduce the amount of decaying plant material in the lake. Selective harvesting or mechanical harvesting rather than the use of nonspecific herbicides may also promote a more diverse macrophyte community.	MPCA, 1993 Bass Lake Report
WATERSHED MANAGEMENT & BMPS	
Drainage Management, Open Tile Inlets & Field Tiles	
Improved storm/drainage water management	MPCA, 2015 Le Sueur WRAPS Lakes Focus Group
The Faribault County Soil and Water Conservation District (SWCD) reports that there are six **open tile intakes** in the watershed. If at all possible, these inlets should be removed. At a minimum, these inlets should be surrounded with a non-cropped vegetative buffer.	MPCA, 2004 Bass Lake Report Update

A significant amount of the water enters Bass Lake from **agricultural field tiles**. Tile water can be high in nutrient concentrations especially in tiles with surface intakes.	MPCA, 1993 Bass Lake Report
Wetland Restoration	
Wetland restoration	MPCA, 2015 Le Sueur WRAPS Lakes Focus Group
Funding from various government agencies and private conservation groups is often available to landowners who are interested in restoring wetlands on their property. Wetland restoration in the Bass Lake watershed may improve incoming water quality.	MPCA, 1993 Bass Lake Report
Fertilizer, Manure Management	
Phosphorus (from fertilizer or manure) should only be used in the watershed if soil testing clearly shows it is necessary. This applies to both agricultural land and developed lakeshore.	MPCA, 2004 Bass Lake Report Update
Nutrient management	MPCA, 2015 Le Sueur WRAPS Lakes Focus Group
Reduce Soil Erosion	
Soil erosion must be kept at an absolute minimum in all parts of the watershed, including the lakeshore. Tillage of crop land should be limited to the extent possible, and the possibility of cover cropping might be investigated. The Homeowners Association could consider providing some financial support for changes to tillage practices or cover cropping.	MPCA, 2004 Bass Lake Report Update
SHORELINE MANAGEMENT	
Planning	
Encourage lake associations to develop rules on lakeshore vegetation, lawn fertilizer, etc. Work with all Bass Lake Associations.	Faribault County Local Water Management Plan & Implementation Plan 2018-2027
Lake buffers, setbacks, and native/healthy lakescaping	MPCA, 2015 Le Sueur WRAPS Lakes Focus Group
The shoreline of Bass Lake is partially developed. Any development along undeveloped portions of	MPCA, 1993 Bass Lake Report

the shoreline should be completed so that the impacts to lake water quality are minimized. Setback provisions and natural buffer strips should be strictly adhered to. Soil loss can be reduced by utilizing best management practices during construction or road building. Protection of the existing vegetation along the shore will preserve the aesthetic value of the lake, inhibit nutrient runoff from developed areas around the lake and provide habitat for songbirds and other small animals. Maintenance of large green lawns can require significant amount of fertilizer. Runoff of lawn fertilizers directly to the lake will degrade the water quality of Bass Lake. Education of the lakeshore owners will help minimizing the impact of the developed area on lake water quality. The Bass Lake Associations should provide educational materials to homeowners with respect to lawn maintenance and shoreline protection. The MPCA, MDNR, and county offices (Such as Agricultural Extension and Soil and Water Conservation District) may be able to provide assistance in this area. The books A Citizen's Guide to Lake Protection (1985) and Landscaping for Wildlife (1987) may be good sources of information for Bass Lake residents.	
Septic Systems	
Even newer fully-functioning **septic systems** have potential to leach phosphorus to Bass Lake. Phosphorus-containing household products and wastes should not be used, or should be kept out of septic systems. Septic systems should be carefully managed for optimum performance through proper maintenance and frequent inspections. Proper maintenance includes avoidance of harsh chemicals and regular pumping.	MPCA, 2004 Bass Lake Report Update
Septic systems are potentially a significant source of nutrients to Bass Lake because of the small size of the watershed and the number of homes around the lake. The response from the septic system surveys suggests that education on system codes and maintenance is needed. A schedule for getting nonconforming systems installed should be adopted.	MPCA, 1993 Bass Lake Report

PLANNING, MANAGEMENT & DATA	
Planning	
Develop individualized lake watershed plans for lakes with an active lake association or conservation club. Develop 2 plans, Bass Lake and Minnesota Lake.	Faribault County Local Water Management Plan & Implementation Plan 2018-2027
Encourage lake associations to develop rules on lakeshore vegetation, lawn fertilizer, etc. Work with all Bass Lake Associations.	Faribault County Local Water Management Plan & Implementation Plan 2018-2027
Public education/outreach	
Provide outreach and education to lake shore residents with an active lake association or conservation club. Provide outreach to 2 lakes, Bass Lake and Minnesota Lake. Score your Shore.	Faribault County Local Water Management Plan & Implementation Plan 2018-2027
Public education/outreach	MPCA, 2015 Le Sueur WRAPS Lakes Focus Group
Education of the lakeshore owners will help minimizing the impact of the developed area on lake water quality. The Bass Lake Associations should provide educational materials to homeowners with respect to lawn maintenance and shoreline protection.	MPCA, 1993 Bass Lake Report
Acquire & Manage Data	
Objective 4. Acquire data necessary to gain a better understanding of the resources, threats, trends, and status for planning and implementation.	Faribault County Local Water Management Plan & Implementation Plan 2018-2027
Secure long term water quality monitoring at the subwatershed level. Prioritize subwatersheds based on data obtained through coordination amongst monitoring agencies.	
Maintain inventory of septic systems and maintenance records. GIS Layer updated	
Maintain inventory of feedlots and spreading acres. GIS Layer updated	

APPENDIX B: COMMUNITY INTERVIEWS

Project Overview
The overarching goal of the interviews was to provide a social-science approach to understanding resident opinions about Bass Lake watershed to inform the development of the Bass Lake Watershed Management Plan. Data were gathered from in-depth interviews of six landowners in the Bass Lake watershed. WRC staff conducted interviews with landowners during summer 2020.

Participant Profile
Faribault SWCD staff provided an interview participant list that included a cross section of watershed residents including landowners from Jay's North Shore, Basswood Park, Bob's Beach, and agricultural land. Participants also included leaders from Bass Lake Coalition. Six participants were interviewed.

Study Design and Methods
The project used a qualitative approach to study design, data collection and data analysis.
Data were gathered through in-depth, semi-structured interviews with farmers and landowners in the Bass Lake watershed. Participants were contacted via phone or email and interviews were conducted via phone and lasted from 45 minutes to 1.5 hours. The interviewer emphasized that participation in the project was voluntary, confidential and identities of individual participants would not be tied to interview data in any publications.

Interview Questions
An interview guide was developed in collaboration with Faribault SWCD and focused on participants' personal history of lake, perspectives about current lake conditions, challenges and goals. The questions included:

CURRENT USES
How do you and your family currently use lake?
What are the activities that you like most?

VALUE
What do you value about it and want to preserve about the lake?
If you have kids, how would you envision your kids/grandkids using the lake?

CHALLENGES & PROBLEMS
Do you have any concerns about the changes that you have observed in the lake over the years?
What do you think about the current status of the lake? What do you see as the major challenges?
Do some of the challenges prevent you from using the lake the way you'd like to?

GOALS
What do you think the top 2-3 goals that the group should work on?

MANAGEMENT
How do you think management is going with the lake?

QUESTIONS
What questions do you have about the lake that you think need answering?

COMMON THEMES & GOALS

As interview comments were grouped, seven broad categories emerged that can serve as overarching goals. The themes are summarized below.

Preserve Recreation

Residents greatly value the lake's recreational opportunities and talked at length about the benefits and improved quality of life living on or near the lake. They talked fondly of using the lake for boating, water skiing, swimming, fishing, and wildlife viewing. Most residents discussed the desire to preserve recreational value of lake for future generations, saying things like: "Let's keep the lake as good as it is, or better for future generations." Some talked about a goal of maintaining high enough water quality for swimming while others emphasized wanting to keep it a reasonable place for grandkids to learn how to water ski. Many provided personal testimonials about taking kids or grandkids out boating, water skiing or jet skiing and "having a hoot of a time." Others reminisced "fishing off the dock with little kids, it brings great joy." Many noted the regional importance of the lake, drawing people from town and the broader region to recreate, fish and boat. Residents stressed the importance of considering stakeholders from outside the watershed: "Many people around the state have a history with the lake, visit seasonally or swam in the lake when they were children." Others noted "I have heard many stories about people who live in Winnebago and use the lake a lot." Many said that "it would be a nice goal ….To keep it as you have enjoyed it."

Manage Fishery

Many residents discussed the need to manage the fishery to ensure quality fishing opportunities and to control roughfish, particularly carp. They expressed concern about overfishing and wanted DNR to help with fishery management to prevent overfishing of particular species that they had seen in the past. Many residents expressed concern about rough fish management. They said "Carp is a big issue" and "Carp stirs up sediment" and "We have an abundance of carp and need an eradication plan." Many had a goal for DNR to develop a carp and rough fish management plan. Many expressed concern about an existing rough fish barrier that "is not working, is leaking" or "The fish trap doesn't work." Some talked about the impact of carp and bullhead. "The carp and bullhead infestation prohibits beneficial aquatic plants." Some residents got an estimate from Carp Solutions for carp count/inventory/capture ($8,000) and eradication ($30,000).

Protect Water Quality & Manage Aquatic Vegetation & Invasive Species

Many residents expressed concerns about the lake turning green in late summer. They talked a lot about algae blooms and reducing nutrient levels. They wanted to protect water quality of lake for recreational purposes and to find effective and cost-efficient ways to "manage weeds." Many expressed concern about invasive species, both understanding current conditions and managing for new invasives such as milfoil. Some noted "I am really concerned about milfoil and milfoil management."

Manage Land to Reduce Inputs

Many residents talked about the need to manage land across the watershed to reduce nutrient and sediment pollution into the lake. They talked about both agricultural and lakeshore landowners playing a role managing land to protect the lake. They acknowledged that "landowners have to take a big responsibility. It is their lake, they need fertilizer management." Regarding the shoreline, they suggested "the shoreline should be better managed, not lawns and mowing down to the shore" or "on hills let is grow to native flowers and plants." They acknowledged that "When it rains, it is all coming down and all going to Bass Lake (fertilizer, weed control, mosquito control)." Some noted that there are "some good

management principles getting done" but more could be done. Some expressed concern about the "different management styles of lakeshore owners" particularly between the "North side of lake, use fertilizers and have lawns" and "Basswood, where no fertilizers are allowed."

On agricultural lands in the watershed, residents talked about the importance of farm management and best management practices to reduce pollution to the lake. Some expressed concern about increased tiling on agricultural lands noting "I've never seen so much tile going in." Many talked about the need for retention to hold the water back – "Over a longer time frame, we need to get more retention." Some interviewees had delineated potential water storage areas. Many talked about the large CREP wetland while others expressed concern about maintenance – "Nobody is paying attention to the [CREP] retention pond. Is that system still working?" Some suggested that "we need to purchase land or work with farmers on management." A few residents expressed concern about future land development – "I worry about if some of the now undeveloped lots get developed, how will that change the lake?"

Work Together, Engage & Educate the Whole Community

An overarching recurrent theme in the interviews was an interest in a fostering an active, engaged community that protects and cares for Bass Lake. The approach they talked about was to involve everyone saying "Everyone can play a role." The Bass Lake Coalition has already met residents "in new locations across the lakeshed, there are super people, the draw is the lake." Interviewees talked about the need to "clarify what we [citizens, landowners] can do." They noted that it is a fun journey and acknowledged that it will take time and incremental change. Some citizen leaders talked about their goal:" In my lifetime, I want to keep the motor running and find common interest of people."

Many talked about the critically important role of working together. "Top of the priority list, if people could all get together and be on the same united front, there is money and funding available." All residents talked about challenges to overcome. **"**There are multiple lake associations. The three associations, each have their own neighborhood bickering." Some have deep tensions with "50-60 year old family feuds." Others noted a barrier is "a lack of participation by many landowners, adding that the population around the lake is aging and many people don't get involved." Some talked about social tensions like "There is some finger pointing. Farmers are accused of polluting the lake." Others talked about historical tensions between "Lakeshore owners vs. Trailer trash." In the words of one resident, "My hope is that people can get along, let kids and grandkids play together."

Residents acknowledged the complex lake management structure with "so many state and local agencies involved." " You have many people, DNR, fisheries, lake owners and visitors." Some underscored that we "need agencies working together and with us" and that we need to clarify roles and responsibilities. Some noted concern about leadership saying "We need to have somebody drive it and push it."

Better Understand Lake & Watershed Dynamics

Watershed residents had many questions that they wanted to better understand about complex watershed dynamics. Gaining a better understanding of water quality through monitoring was a priority. "We need to understand inputs from watershed, carp, shoreland, and tile." Many were very interested in learning more about existing monitoring efforts asking "What are they learning?" Questions included: "We need to understand Internal vs External loading for water quality" "What are the Phosphorus and Nitrate levels in the lake and what are their impacts? Put it in laymen's terms." They wanted to learn more about the role phosphorus and nitrogen play triggering algae blooms. The extent of invasive species was another central topic of discussion. Residents wanted to learn more about weed

management and weed control. A central point of discussion was whether to continue to use chemical control or move to mechanical control.

Find Funding

Many interviewees talked about the need to find funding for research to better understand lake dynamics and pay for in-lake and watershed improvement projects. They were curious about how other lake associations got their funding. Some said, “We need grant writers” while others talked about the many players involved and figuring out who can pay for what.

CURRENT USES

How do you and your family currently use lake? What are the activities that you like most?

Fishing (3)
Fishing with grandkids (2)
Fishing – many who fish don't live on the lake
Fun place for recreation and fishing

Waterskiing (2)
Tubing
Ski boats
Surfing

Boating
Pontoon boats (3)

Lake viewing
Wildlife viewing

Swimming (3)
Swim, we go out into middle of lake when greener along the shores

Duck hunting, appreciate restoration of (Rice Lake)

This is a hidden gem, serene place, total bonus

Consider other stakeholders
People around the state have a history with the lake, visit seasonally or swam in lake when they were children
Heard stories about people who live in Winnebago and use the lake a lot

VALUE, WANT TO PRESERVE

What do you value about it and want to preserve about the lake?
If you have kids, how would you envision your kids/grandkids using the lake?

Preserve recreation
Keep the lake as good as it is, or better for future recreation

Water quality
We have some blue green algae, certain times July and Aug and I won't let kids get in the water

Swimming
I want to maintain high enough water quality for swimming

Water skiing
Want to keep it a reasonable place for grandkids to learn how to ski. That would be nice….To keep it as you have enjoyed it.

Healthy aquatic plants
We need to get the right plants back. Handle it with herbicides

Weed management
We need well managed weed control

Fish management
Fisheries management, not overfishing
See DNR lake management plan on carp management and rough fish management

Land development
The lake is surrounded, there is not much more development
What happens if future development worsens water quality and quality of life

Usage
Concern about the number of people using the lake stays the same

CHALLENGES & PROBLEMS

Do you have any concerns about the changes that you have observed in the lake over the years?

What do you think about the current status of the lake? What do you see as the major challenges?

Do some of the challenges prevent you from using the lake the way you'd like to?

Working Together
Top of the priority list, if people could all get together and be on the same united front. There is money and funding available.
There are multiple lake associations: 3 reasons that they don't function
Now the 3 associations, each have their own neighborhood bickering
There are 50-60 year old family feuds, some with deep tensions
There is a lack of participation by many landowners
My hope is that people can get along, let kids and grandkids play together

Social tensions
There is some finger pointing. Farmers are accused of polluting the lake
Lakeshore owners vs. "Trailer trash"
It is not just their [shoreland owners] lake. It is everyone's lake
There are some tensions with the groups. Seems like there is quibbles and quabbles with the Coalition.
There are 50-60 year old family feuds along the lake.
My hope is that everything can be more relaxed, not conning, and that their intentions are good.
Farmer-Lakeshore Owner Tensions. Tiptoeing around the issue with farmers, tough position to be in. We can all work it out. There are too many powers in farming and chemical business

Lack of participation
The population around the lake is aging
Many people don't get involved

Coalition
Coalition should clarify and emphasize its goal or mission statement – Clean water

Leadership
Need to have somebody drive it and push it

Funding & Grants
How are the lake associations in their funding? Covid botched everything. There is a great number of players. We need grant writers.

Coordination
Need agencies working together and with us

Septic systems
I have concern with the Basswood area – the concentration of cabins and septic systems

Weed management
Managing the weeds is a huge problem
Algae would be only thing that would keep me off the lake

Lake Management - Draw Down
Needs a draw down really bad to expose mud flat, and get emergent vegetation growing

Culvert
My number one concern is the culvert

Land Development
I worry about if some of the now undeveloped lots get developed, how will that change the lake?

Fishing
I have seen over fishing be cyclic as a population is fished hard
Bass fishing is excellent all the time, mostly catch and release, want to keep it that way

Carp and Bullhead Management
Carp invasive species into the lake. Carp roots sediments up
Bull heads poop, clouds water
We just don't know all of fish habits. Carp find a way to get into water. Always go to see how many minnows outlet to east side, told DNR and township officials you have water going outside culvert under road. Bullheads spawn from swamp into Bass Lake.

Lakeshore Management
We need more beneficial aquatic species along the shore

Retention, address tiles
Over a longer time frame, we need to get more retention, tile addressed

Tiling on agricultural Lands
Never seen so much tile going on
Get into some real serious arguments, discussions with farmers

GOALS

What do you think should be the top 2-3 goals that the group should work on?

Purpose
We're doing this for generations ahead

Involve Everyone
Everyone can play a role
Met in new locations across the lakeshed, there are super people, the draw is the lake
Clarify what we [citizens, landowners] can do
Incremental change, a fun journey
My lifetime, keep the motor running, find common interest of people

Education
Keeping people educated around the lake

Timeline
We need persistence and patience and money to make things happen

Preserve Recreation
Took Fishing boat out, kids were out there jet skiing having a hoot of a time.
Fishing off the dock, little kids, brings great joy

Stop Greening Lake
Lake is turning green in late summer

Management, Land use

Water quality monitoring
Need to understand water quality dynamics
Need to understand inputs (from tile, carp)

Rough Fish Barrier
The existing barrier is not working, is leaking. The fish trap doesn't work

Carp Management
Carp is a big issue. Carp stirs up sediment
We have an abundance of carp and need an eradication plan
The carp and bullhead infestation prohibits aquatic plants

Channel lagoon Basswood Park, can capture the carp. Did get an estimate from Carp Solutions – $8,000 to do a carp count/inventory/capture, $30,000 estimate for eradication
Shallowing in by rock sides, DNR issue, impairment 85 carp per acre

Fishery Management and Fish Kill*
Need to do a fish kill, rotenone, to restart the plan
Restocking, education about fishing and not letting minnows get out
*Note: Please see DNR fisheries summary about high quality fishery (Appendix D)

Lake Level Management
Water Level Gate – late in year so lake level stays high
Lake draw down, water control, fish barrier

Retention
Tile, need to create retention

Shoreline Management
Shoreline should be better managed so not lawns and mowing down to the shore
Still some good management principles getting done
When it rains, it is all coming down and all going to Bass Lake (fertilizer, weed control, mosquito control)
Landowners have to take a big responsibility. It is their lake, need fertilizer management
On hills let is grow to native flowers and plants

Aquatic Vegetation Management
Need to manage aquatic vegetation

Invasive Species
Invasive species are hard to control, new ones coming out

MANAGEMENT

How do you think management is going with the lake?

Coordination
There is complex management with many players
You have many people, DNR, fisheries, lake owners and visitors
Can't say bad management, there is no management from state and federal officials

Leadership
Need to have somebody drive it and push it
Rather be the driver, helping
Keep the hammer on us, we [Bass Lake Coalition members] will get busy

Working Together
Need all Bass Lake organizations to work together and be unified
Common interest of people
Approach with Coalition, we tried not to point fingers

I want to work on this in my lifetime, keep the motor running
Engage residents and make it a fun journey

Clarify roles
What role can people play? Everyone can play a role
Clarify what we can do next. Push any homework our way, we will do it.
We need incremental change

Get Innovative
Think of creative ways to get innovative
Look at other examples like how Lake Volney took farmers on a drive around the lake. Farmers wanted to help. They got creative.

BMP Maintenance
Nobody is paying attention to the [CREP] retention pond. Is that system still working?

Lakeshore Management
Different management styles, lakeshore owners
North side of lake, use fertilizers and have lawns
Basswood, no fertilizers and are more aware of things that they could be doing

Farm Management
Need to purchase land or work with farmers on management

Invasive Species Management
I am really concerned about milfoil. Milfoil Management

Culvert - Fish Trap
The fish trap doesn't work. The existing culvert is leaking water
DNR is dragging their feet about the culvert
Getting culvert addressed and weed management is just as important as retention

Funding
Look at Ducks Unlimited, USFWS, there are millions of dollars out there

QUESTIONS

What questions do you have about the lake that you think need answering?

Expectations
Long term what can we expect for ecosystem health with Bass Lake?

Water Quality Monitoring
Testing, Water quality monitoring - what is recording water quality monitoring at dock now? What are they learning?
We need to understand Internal vs External loading for water quality

What are the Phosphorus and Nitrate levels in the lake and what are their impacts? Put it in laymen's terms.
We hear that phosphorus plays a big role triggering algae blooms but clarify what is the role of Nitrogen?

Water Quality - Tile Monitoring
There are 5 different tiles entering the lake, We need to monitoring those to see what is coming into the lake. If we are not getting anything from them, then where is it coming from?

Sediment in lake
How much Phosphorus is attached to sediment in the lake bottom?
Could be 3 different scenarios for testing to find this out

Algae Blooms
Are algae blooms triggered from elevated phosphorus levels from lake bed, carp, watershed?

Weed management: Chemical versus mechanical controls
What is a better approach: harvesting or chemical?
Management strategies for lake long term, more effort to try something else.
Suggest mechanical harvest, not just spraying
Ecoharverster, roller skims to 10 feet, pulling weeds out by the roots, could reduce chemical use, causes $80k. Currently, they spend $10k on spraying each year. People are fond of, used to spraying, may be hard to convince them
Letting decaying vegetation stay and rot, better to get decaying vegetation out, could be adding more Phosphorus to the lake.

Water Control Structure
What is the status of the water control structure?

Fisheries and Carp Management
Mechanical removal [of carp] is a bandaid, we still have a problem, still have some of those fish. They multiply every spring.
What are the best methods to control carp in the watershed?

Draw down
What about a draw down? Draw down and chemical treatment (rotenone) takes everything out and could be a win-win for lakeshore owners

Floating islands
What about Floating islands, can they help?

APPENDIX C: CONSERVATION PARTNER PRIORITY ACTIONS

A Technical Advisory group met to review plan goals and implementation plan and to provide input and advice. The following short term priorities are based on technical partner input from local staff (SWCD), state researchers (MDNR, MPCA), and Minnesota State University, Mankato researchers at a meeting on October 5, 2020.

Due to the large number of goals and implementation strategies, project partners recommend an adaptive management approach with a short term implementation plan developed every three (3) years. This approach can identify near term priorities and help local partners and managers to phase in and prioritize the many longer term goals.

SUGGESTED SHORT TERM IMPLEMENTATION PLAN (2021-2024)

CATEGORY	**ACTION**	**COST** (Estimated)	**LEAD**
LAKE			
Lake Water Quality Monitoring	Continue to perform water quality monitoring within lake. Establish a program of regularly sampling the lake at the former MPCA site to continue the long-term assessment of water quality AND to the relationships that exist among the sources/outflow of the lake and the quality of the water in the lake. (BH)	Cost per year:	MSU, MPCA
Water Quality Monitoring for Mass Balance	Install monitoring probes at the major sites of input (2?) and outflow (1) to determine the mass balance of loading and nutrient flux in the lake. (BH)		MSU Bryce Hoppie, MPCA
Lake Coring	Geophysically map, core, and analyze a small number of lake bottom sites for nutrient storage. Planned for this winter. (BH)	$200 for chemicals and milage	MSU Dr. Hoppie
Fisheries - Carp and bullhead management	Explore need for carp and bullhead management (JL)		MDNR
Fisheries - Carp control barrier	Install rock arch barrier downstream in stream channel to reduce upstream migration (TF)		MDNR
Invasive Species Inventory and Management Plan	Inventory existing invasive species and create an invasive species management plan (RW)		MSU Dr. Wersal MDNR
Milfoil Management	Manage localized infestation of milfoil through hand pulling and keep milfoil numbers low and in check (CW)		MDNR

HAB	Harmful Algae Bloom Monitoring		MSU, DNR
WATERSHED			
Identify watershed Phosphorus (P) sources to reduce loading	Use GIS Conservation targeting tools for BMP targeting (e.g. ACPF, HSPF-SAM)		SWCD
Lakeshore – Vegetative Buffers	Promote buffers on lakeshore property (TF) Promote vegetation to grow along shoreline Reduce lakeshore P with native buffers along edges of the lake (JL)		SWCD Landowners
Lakeshore – Riprap	Reduce lakeshore P with riprap along lake (JL)		
Agricultural BMPs	Reduce P Ag Lands - promote cover crops, convert open tile intakes to another form of blind intake (JL)		Landowners
	Ag - reduce field runoff and tiles that are running into the lake		SWCD Landowners
	Ag - reduce soil erosion (TF)		
COMMUNITY			
Funding	Find funding (BH) County AIS funds (Sheriff)		BLC, SWCD
Education	Public education to teach the people around the lake about how they affect the lake so they can help. Clarify how land practices are having adverse effects on the lake. (TF)		SWCD
	Work with residents to manage expectations for managing shallow lakes (DG)		MDNR

Participants
Tyler Fellows (TF), Minnesota Department of Natural Resources, MDNR
Dan Girolamo (DG), MDNR
Jon Lore (JL), MDNR
Carli Wagner (CW), MDNR
Brooke Hacker, MDNR
Mel Markert, MPCA
Dr. Bryce Hoppie (BF), Minnesota State University, Mankato (MSU)
Dr. Ryan Wersal (RW), MSU
Owen Lott, MSU
Ben Von Korff, MSU- WRC
Kimberly Musser, MSU- WRC

Potential Use of County AIS Funding (Discussed at meeting)
Milfoil management
Invasive Species Inventory and Management Plan
Carp removal – Could be used as a pilot project
DNR fish barrier, address the culvert issue
Water quality monitoring

Sediment Study (lake coring)
Harmful algae bloom (HAB) study

APPENDIX D: BASS LAKE FISHERIES

Fish Surveys

Bass lake has a long-recorded fisheries history by the Minnesota Pollution Control Agency (MPCA) and Department of Natural Resources (DNR). The MPCA has stocking records beginning in 1908 and removal records beginning in 1923. The DNR started doing fish abundance documentation and lake health assessments in 1941. In these surveys they number, size, and type of fish caught using seine nets and electrofishing was recorded. These assessments took place on average every 2 to 3 years. There was a gap from 1954 to 1978 were there are no records of a survey being taken. The DNR also recorded winter kill by low oxygen concentration in the winters of 1977-78 and 1978-79. In 1988 the DNR reclaimed the lake with rotenone, and the fish community was comprised of bluegills, black crappies, largemouth bass, yellow perch, northern pike, and channel catfish. After the 1988 reclamation standard DNR lake surveys have continued with the most recent occurring in May of 2018.

According to Tyler Fellows, MDNR Fisheries, the 2018 lake survey showed an exceptional fish community, one of the best a lake survey conducted by DNR Fisheries has shown. In fact the walleye catch was 13 fish per net and fish averaged about 20 inches in length. Multiple fish were weighed that approached 10 pounds. The Northern Pike catch rate was over 5 per net and averaged 25 inches in length. In trap nets the Bluegill catch rate was over 20 fish per net and showed good size structure. Black crappies and yellow perch showed a good population although they had a smaller size structure. In reference to the Carp and bullhead population issues, it appears both carp and bullheads are at a low population in Bass Lake, less than one per gill net and three per net respectively.

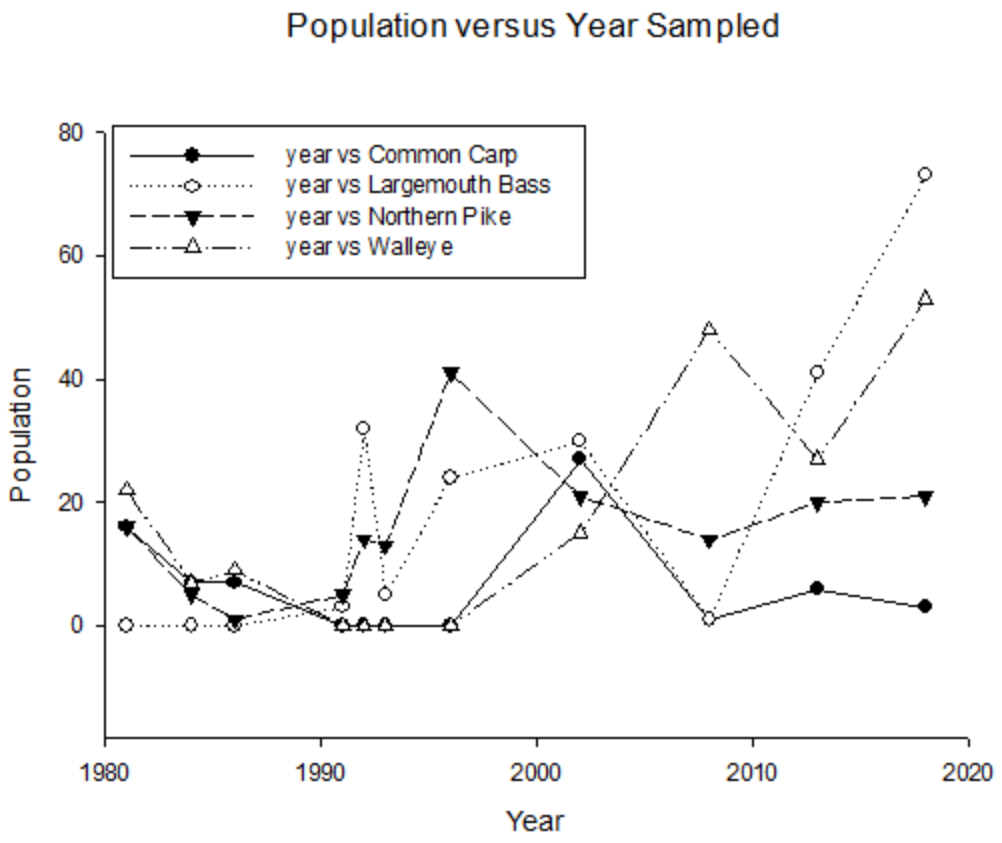
Because of what our Lake survey has shown as far as the fish population, DNR Fishers staff said “I feel effort and money could be better used somewhere other than the carp and bullhead control shown in the Implementation Plan document. I do see promise in the idea of a rock arch barrier downstream of the outlet to help with any upstream migration of carp into Bass Lake (Tyler Felllows).

DNR Fish Surveys

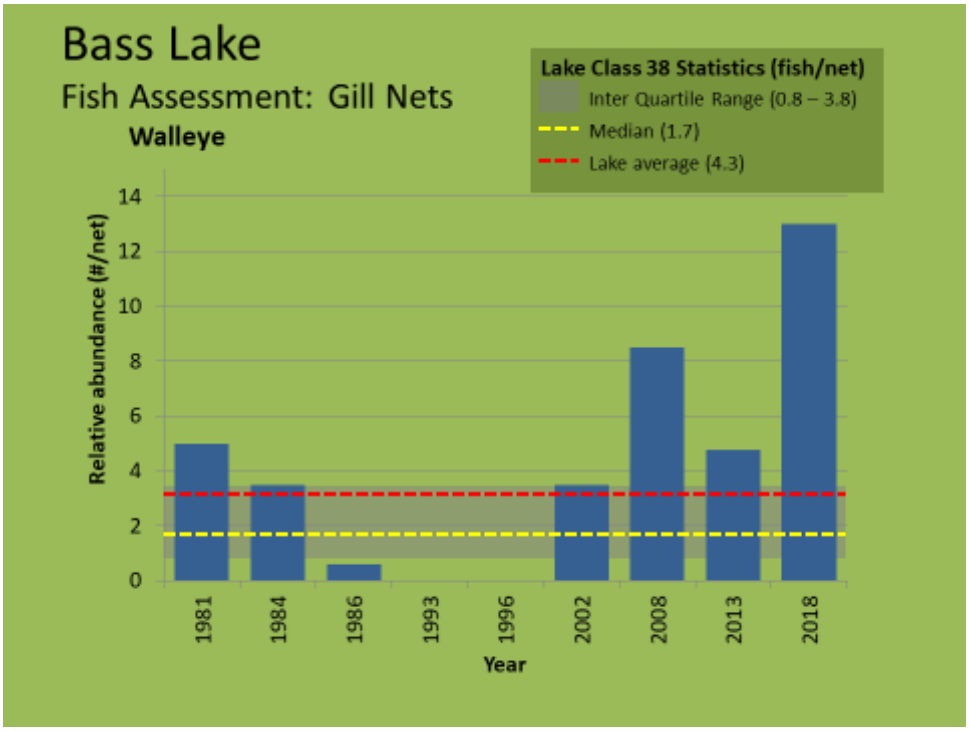
Date Year	Survey
1908	MPCA Stocking records begin
1923	Removal records begin
1941	Fish abundance documentation with seine haul, followed by assessment of some sort in 1947, 1954, 1978, 1981, 1984, 1986, 1989, 1990, 1991, 1992, 1993
1941	Fish Survey – Carp, bigmouth buffalo, and quillback. Assumed that immigration of carp, buffalo and other species from the Maple River had a significant effect on the composition of the Bass Lake fish community in earlier years.
1947	Fish Survey– Bluegills and crappies abundant
1944-45	Winter dissolved-oxygen concentrations monitoring started, possibly annually since
1947	Documentation of abundance of aquatic vegetation occurred. Also in 1947, 1954, 1986, 1991

1941-1993	Bass lake fairly stable habitat for fish during fifty year period (1941-1993) although winter mortality caused a low oxygen concentrations has been documented twice (1977-1978) and 1978-1979).
1954	Survey– Bluegills and crappies abundant Documentation of abundance of aquatic vegetation
1977-78	Winter kill, Low Oxygen Concentrations
1978-79	Winter kill, Low Oxygen Concentrations
1981	Standard DNR Lake Survey 1981-05-19
1984	Standard DNR Lake Survey 1984-06-05
1986	Standard DNR Lake Survey 1986-06-09 Documentation of abundance of aquatic vegetation
1988	Reclaimed with rotenone and the fish community, was comprised entirely of bluegills, black crappies, largemouth bass, yellow perch, northern pike and channel catfish. Black bullheads and carp have not been documented in post-reclamation samples.
1991	Standard DNR Lake Survey 1991-06-05 Documentation of abundance of aquatic vegetation
1992	Standard DNR Lake Survey 1992-08-24
1993	Standard DNR Lake Survey 1993-08-04
1996	Standard DNR Lake Survey 1996-08-10
2002	Standard DNR Lake Survey 2008-06-04
2004	The following information was provided by staff of the Minnesota Department of Natural Resources Waterville Fisheries office. The “reclamation” referred to is a process whereby the lake is chemically treated to remove undesirable fish species that have come to dominate the fish community. Unfortunately, the treatment also kills gamefish, other desirable fish species, and amphibians such as frogs and toads. *DNR Fisheries has monitored the Bass Lake fish community regularly over the last 25 years and have been encouraged with the recent developments in watershed improvements, wetland restoration and septic system upgrades.* *All improvements have potential for providing some very positive changes in the Bass Lake fish community.* *Recently we have attempted to reestablish a natural northern pike spawning run on Bass Lake using the newly created CREP wetland basin on the western lake shore. We have stocked northern pike fry in this wetland basin over the last two years with some very encouraging results. This strategy may provide additional benefits for other gamefish species in the future. At this point and time the fish community in Bass Lake looks very good. (MPCA, 2004)*
2008	Standard DNR Lake Survey 2008-05-27
2013	Standard DNR Lake Survey 2013-06-03
2018	Standard DNR Lake Survey 2018-05-30

The changes in fish populations based off of DNR surveys from 1981 to 2018 can be seen in the following graph. A few species of concern in theses tables and graphs are the common carp and black bullheads because the is an invasive and the other is not desired.



Graph of Changes in Fish populations in Bass Lake 1980-2020. Source DNR Fish Survey.



Graph of Walleye Caught by Gill Net 1981-2018. Source DNR, 2020.

2018 Fish Survey

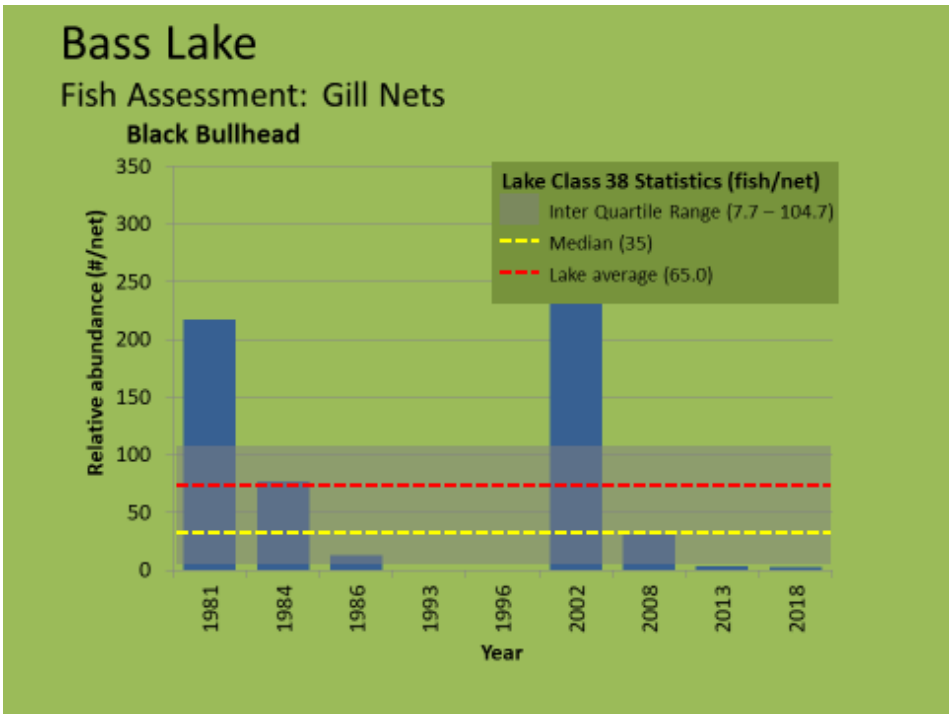
DNR's 2018 lake survey showed an exceptional fish community, the best a lake survey conducted by DNR Fisheries has shown. In fact the walleye catch was 13 fish per net and fish averaged about 20 inches in length. Multiple fish were weighed that approached 10 pounds. The Northern Pike catch rate was over 5 per net and averaged 25 inches in length. In trap nets the Bluegill catch rate was over 20 fish per net and showed good size structure. Black crappies and yellow perch showed a good population although they had a smaller size structure. (Tyler Fellows, DNR).

Roughfish Management - Carp and Bullhead

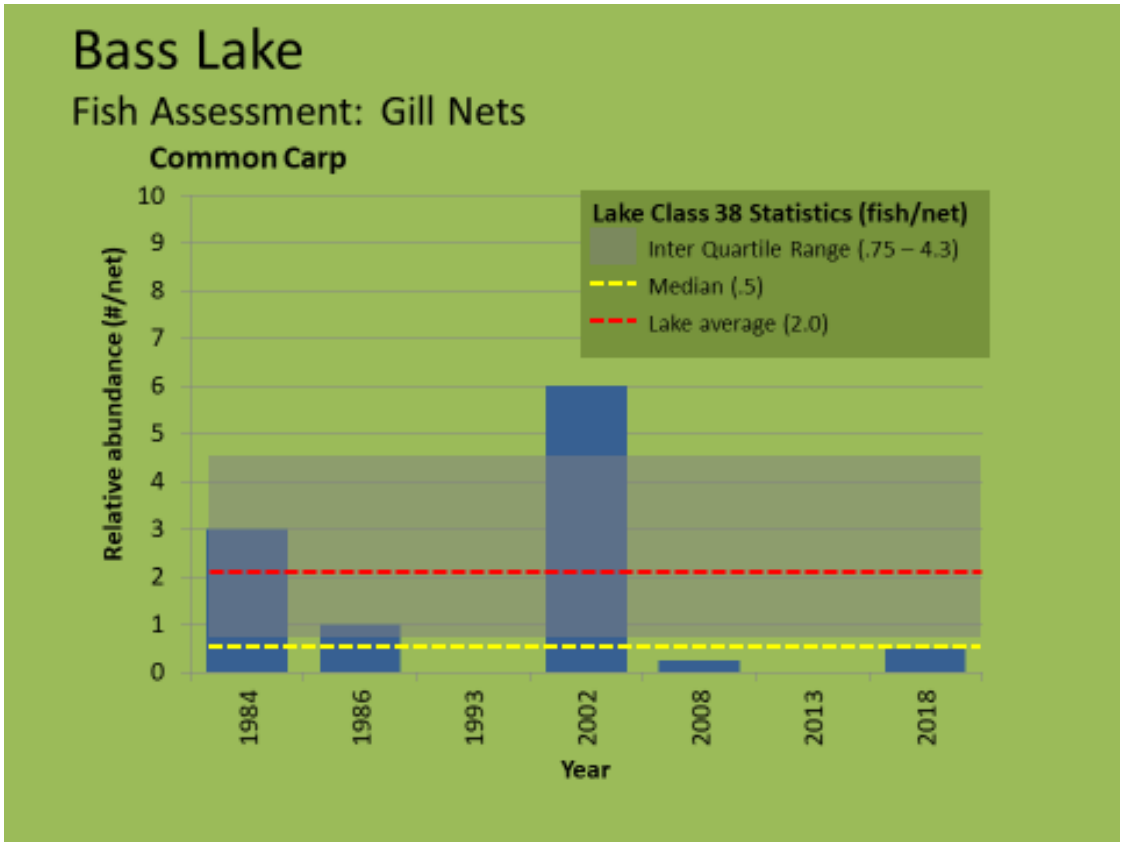
The 2018 fisheries survey indicated that common carp and yellow bullheads were also present but occurred in low numbers. Both carp and bullheads are at a low population in Bass Lake, less than one per gill net and three per net respectively (Tyler Fellows, DNR).

Based on length distributions, the carp that were sampled were older carp. Black bullhead were also sampled, but at rates lower than similar lakes in the area. Based on these numbers I would say that the rough fish population is within check. If the lake owners see spawning carp in the shallows, it may be good to document them and selectively harvest them out. My guess is they are most likely to try to spawn in the canal on the south side of the lake. It may be in their best interest to either capture them in the canal or block the canal so carp cannot reach their spawning grounds. Bullhead populations can be held in check by walleyes and other predators. I've seen higher densities of larger walleyes >20" (Bass Lake Gill net average size 20.3") do a great job of keeping bullhead populations in check. That usually results in lower densities of small bullheads" (Jon Lore , DNR).

Because of what our Lake survey has shown as far as the fish population I feel effort and money could be better used somewhere other than the carp and bullhead control shown in the Implementation Plan. I do see promise in the idea of a rock arch barrier downstream of the outlet to help with any upstream migration of carp into Bass Lake (Tyler Fellows, DNR).



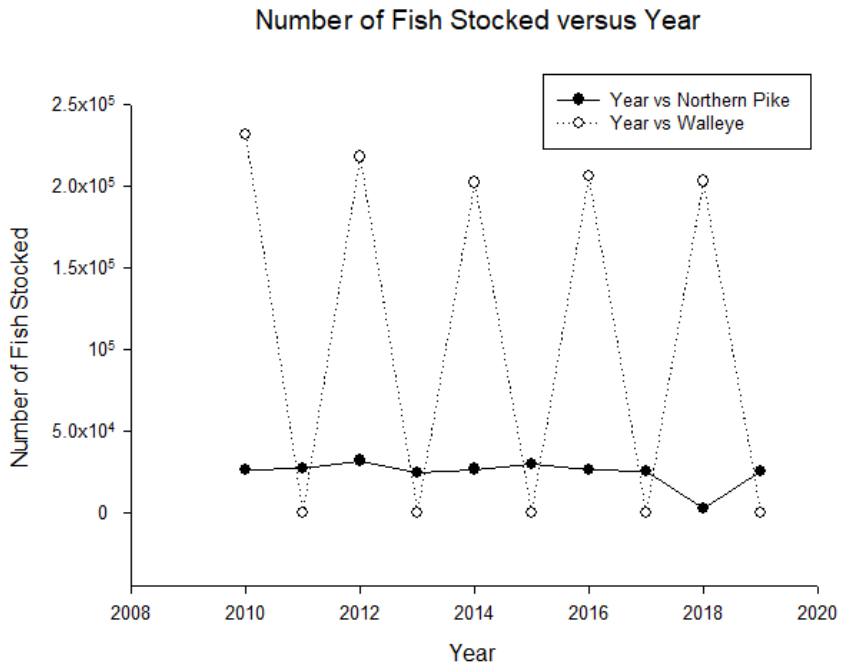
Graph of Black Bullhead caught by Gill Net 1984-2018. Source DNR, 2020.



Graph of Common Carp caught by Gill Net 1984-2018. Source DNR, 2020.

Fish Stocking

To support recreational fishing, the DNR has been stocking walleye and northern pike for many years. The following graph and chart illustrate the number of Northern Pike and Walleye stocked in Bass Lake over the past ten years. Every year for the past ten years Northern Pike has been restocked and every other year Walleye has been restocked. For more information: https://www.dnr.state.mn.us/lakefind/showstocking.html?downum=22007400&context=desktop



Number and type of newly hatched (fry) fish stocked in the last 10 years for Northern Pike and Walleye.

Year	Species	Number
2010	Northern Pike	26,458
	Walleye	231,799
2011	Northern Pike	26,676
2012		
	Northern Pike	31,729
2013	Walleye	218,000
2014	Northern Pike	24,664
	Northern Pike	26,490
	Walleye	202,160
2015	Northern Pike	29,394
2016	Northern Pike	26,215
	Walleye	205,850
2017	Northern Pike	25,000
2018	Northern Pike	25,000
	Walleye	203,000
2019	Northern Pike	25,000

For More information
DNR fisheries surveys
https://www.dnr.state.mn.us/lakefind/showreport.html?downum=22007400

MPCA biological monitoring
https://www.pca.state.mn.us/water/biological-monitoring-water-minnesota
MPCA Bass Lake Water Quality Monitoring
https://webapp.pca.state.mn.us/surface-water/station/22-0074-00-100

APPENDIX E: FREQUENTLY ASKED QUESTIONS

The questions below were raised by community members at meetings and in interviews. Future educational meetings can help to answer some of these key questions.

Expectations

- Long term what can we expect for ecosystem health with Bass Lake?

Water Quality Monitoring

- Testing, water quality monitoring - what is recording water quality monitoring at dock now? What are they learning?
- We need to understand Internal vs External loading for water quality
- What are the Phosphorus and Nitrate levels in the lake and what are their impacts? Put in laymen's terms.
- We hear that phosphorus plays a big role triggering algae blooms but what is the role of Nitrogen?

Water Quality - Tile Monitoring

- There are 5 different tiles entering the lake. We need to monitor those to see what is coming to us. If we are not getting anything from them, then where is (the pollution) coming from?

Sediment in lake

- How much Phosphorus is attached to sediment in the lake bottom? What are the different scenarios for testing to find this out?

Algae Blooms

- Are algae blooms triggered from elevated phosphorus levels from lake bed, carp, watershed?

Weed management: Chemical versus mechanical controls

- What is a better approach: harvesting or chemical?
- Management strategies for lake long term, more effort to try something else.
- How would we benefit from mechanical harvest, not just spraying? An Ecoharverster, roller skims to 10 feet, pulling weeds out by the roots, could reduce chemical use, costs $80k. Currently, we spend $10k on spraying each year.
- With spraying, if we are letting decaying vegetation stay and rot, could that be adding more Phosphorus to the lake?

Water Control Structure

- What is the status of the water control structure?

Fisheries and Carp Management

- What are the best methods to control carp in the watershed?
- Mechanical removal [of carp] is a bandaid, we still have a problem, still have some of those fish. They multiply every spring.

Draw down*

- What about a draw down? Draw down and chemical treatment (rotenone) takes everything out and could be a win-win for lakeshore owners

*Note concern expressed by DNR fisheries staff about draw down idea impacting the existing healthy fishery (Appendix D)

Floating islands

- What about Floating islands, can they help?

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