

# Crooked Lakes Chain Lakes Management Plan

## Introduction

The Portage Crooked Lakes Improvement Association (PCLIA) drafted this Lakes Management plan in 2023 to identify goals and associated action steps to maintain and protect lake owners' property values and to document a framework for future PCLIA board members and lake association members to understand identified issues, previous and planned improvements, and maintenance efforts, and to serve as a guide on how to address any new lake issues.

This Lake Management Plan is intended to be a “living document;” as new or better information becomes available, as we accomplish our goals or discover that alternative strategies are needed, it is our intent to update this plan so that it continues to serve as a useful guide to future leaders.

The purpose of the PCLIA is to preserve and improve the condition and the quality of our lakes and surrounding area. We strive to create a spirit of cooperation and community with all property owners on the chain of lakes and to educate owners and members on issues affecting our lakes.

## Lakes Characteristics

### Ecoregion and Watershed

The Crooked Lakes Chain of Lakes includes Crooked Lake (Main Bay), Crooked Lake (Sugar Bay), Hanks Lake and Portage Lake. All lakes are located within Crow Wing County which is part of the *Northern Lakes and Forests Ecoregion* as well as part of the *Mississippi – Brainerd Watershed* and the *Ripple River Sub-watershed*.

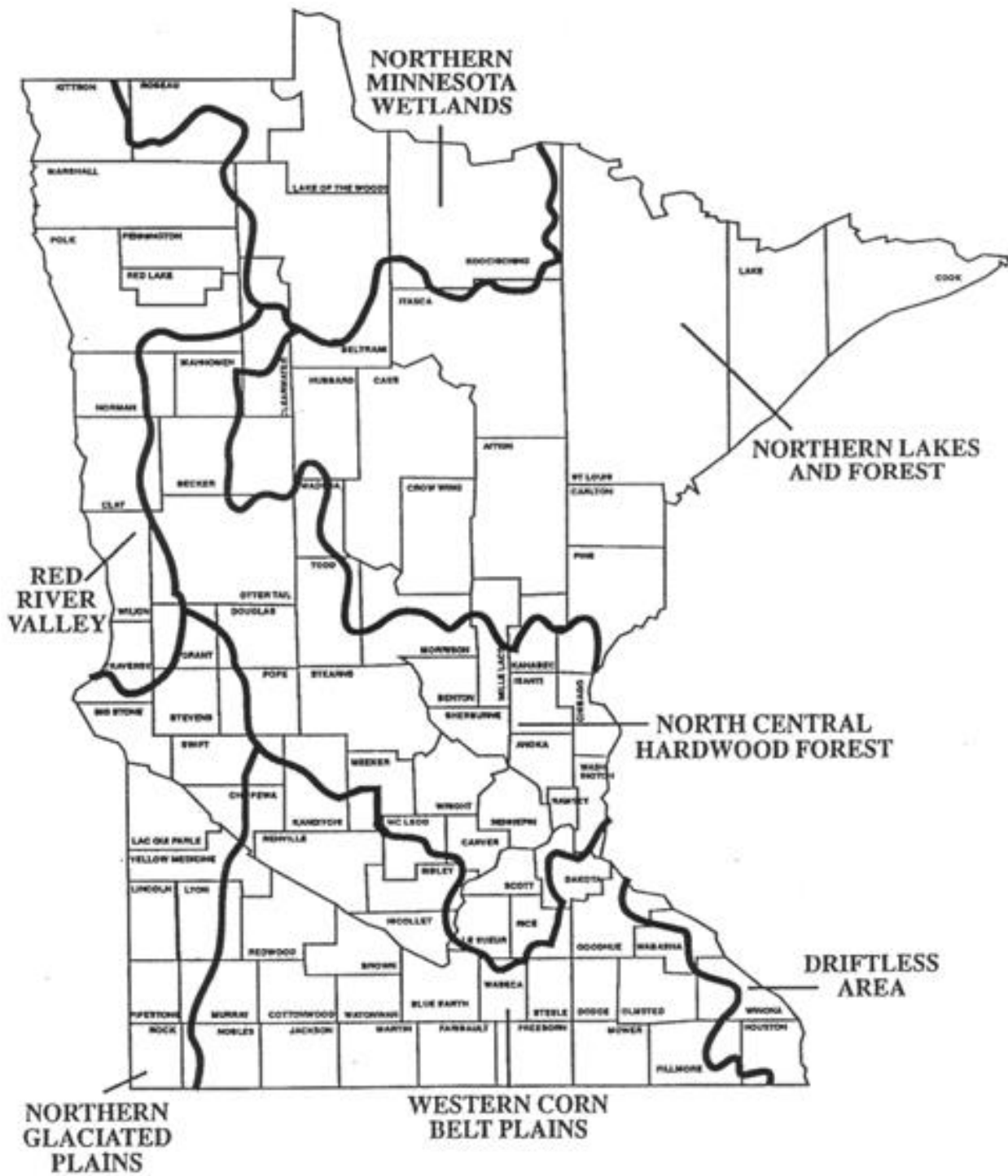
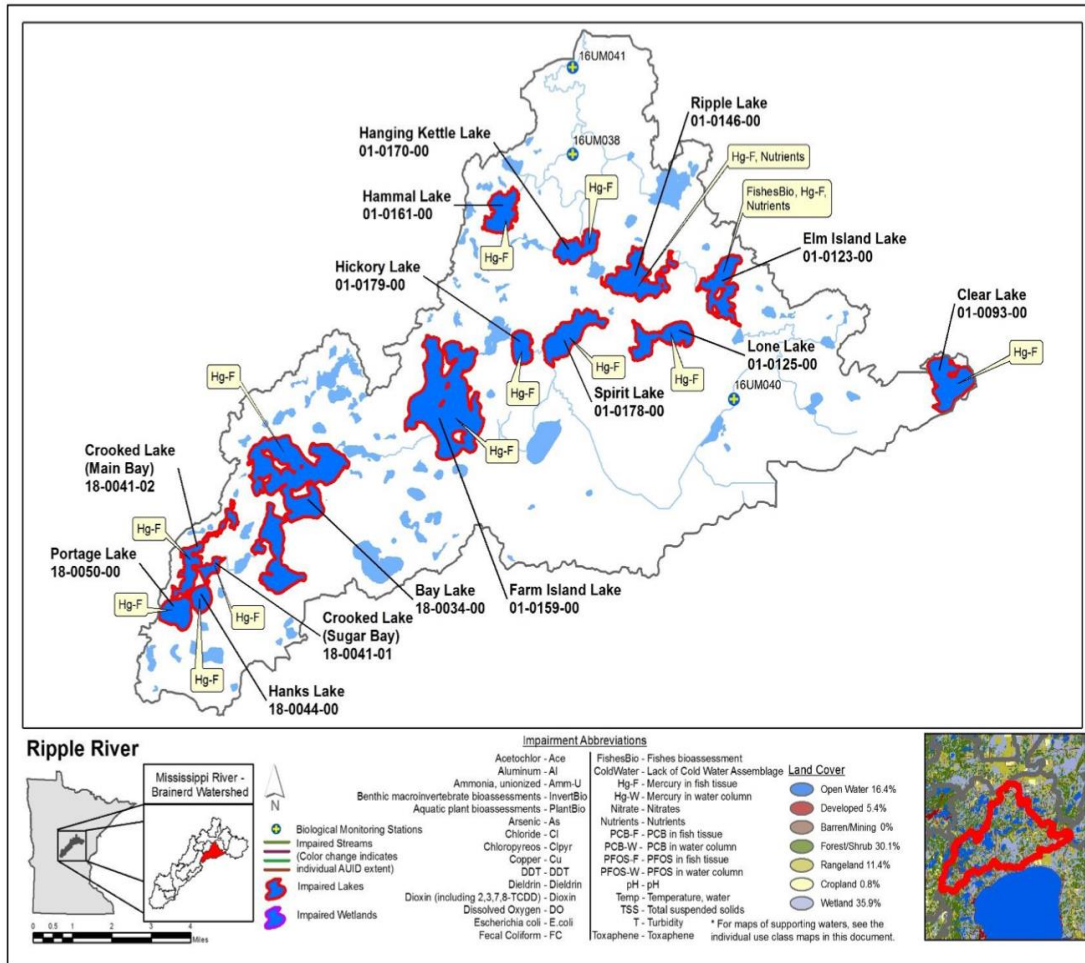


Figure 21. Currently listed impaired waters by parameter and land use characteristics in the Ripple River Aggregated 12-HUC



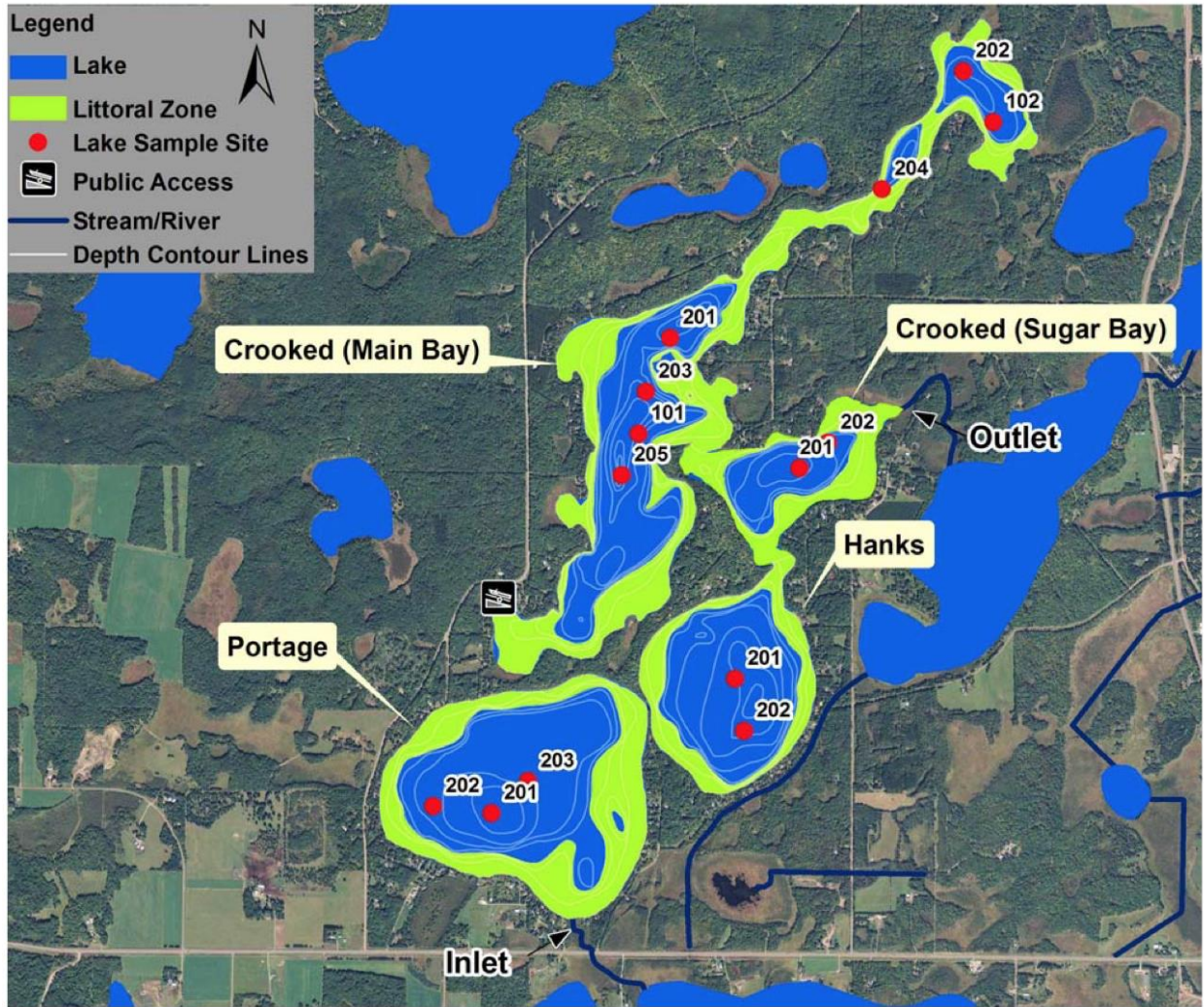


Figure 1. Map of Portage, Crooked and Hanks Lakes with 2010 aerial imagery and illustrations of lake depth contour lines, streams/ivers, sample site locations, inlets and outlets, and public access points. The green shaded areas in the lake illustrate the littoral zone, where the sunlight can usually reach the lake bottom allowing aquatic plants to grow.

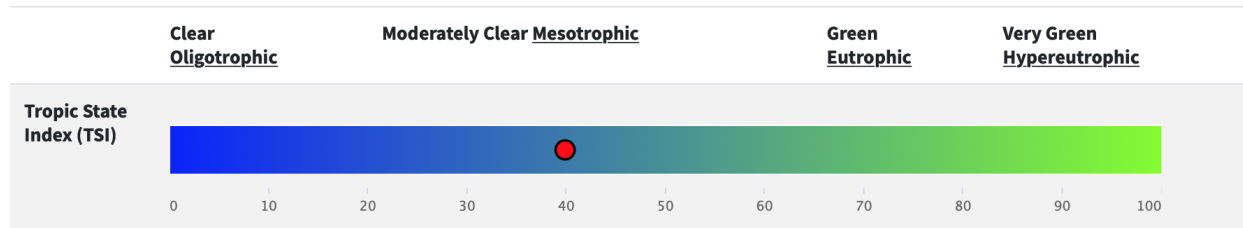
### Characteristics of the Lakes

	Crooked Lake	Sugar Bay	Hanks Lake	Portage Lake
<b>MN DNR ID</b>	18-0041-02	18-0041-01	18-0044-00	18-0050-00
<b>Surface Area (acres)</b>	457	92	164	287
<b>Littoral Area (acres)</b>	234	Included with Crooked Lake	49	110
<b>Max Depth (ft)</b>	72	32	45	37

<b>Water Quality Parameters (data from RMB Database 10.2022)</b>				
<b>Years monitored</b>	2008-2022	2008-2022	2008-2022	2008-2022
<b>Mean Tot. Phosphorus</b>	12.1	12.8	12.5	14.5
<b>Mean Chlorophyll-a</b>	3.3	3.9	3.8	4.7
<b>Mean Secchi Depth</b>	15.2	14.2	13.1	12
<b>Mean Trophic State Index</b>	39.5	40.4	40.8	42.4
<b>Trophic State</b>	Oligotrophic-Mesotrophic	Mesotrophic	Mesotrophic	Mesotrophic
<b>Trends</b>				
<b>Total Phosphorus</b>	No significant trend	No significant trend	No significant trend	Declining (99% Confidence)
<b>Chlorophyll-a</b>	Improving (90% confidence)	No significant trend	No significant trend	Declining (95% Confidence)
<b>Secchi Depth</b>	Declining (95% confidence)	No significant trend	Declining (95% confidence)	Declining (99.9% Confidence)
<b>Trophic State Index</b>	No significant trend	No significant trend	Declining (90% confidence)	Declining (99% Confidence)
<b>Comparisons</b>				
<b>Total Phosphorus</b>	Better than expected	Better than expected	Better than expected	Within range
<b>Chlorophyll-a</b>	Within range	Within range	Within range	Within range
<b>Secchi Depth</b>	Better than expected	Within range	Within range	Within range

### Recreational suitability measures

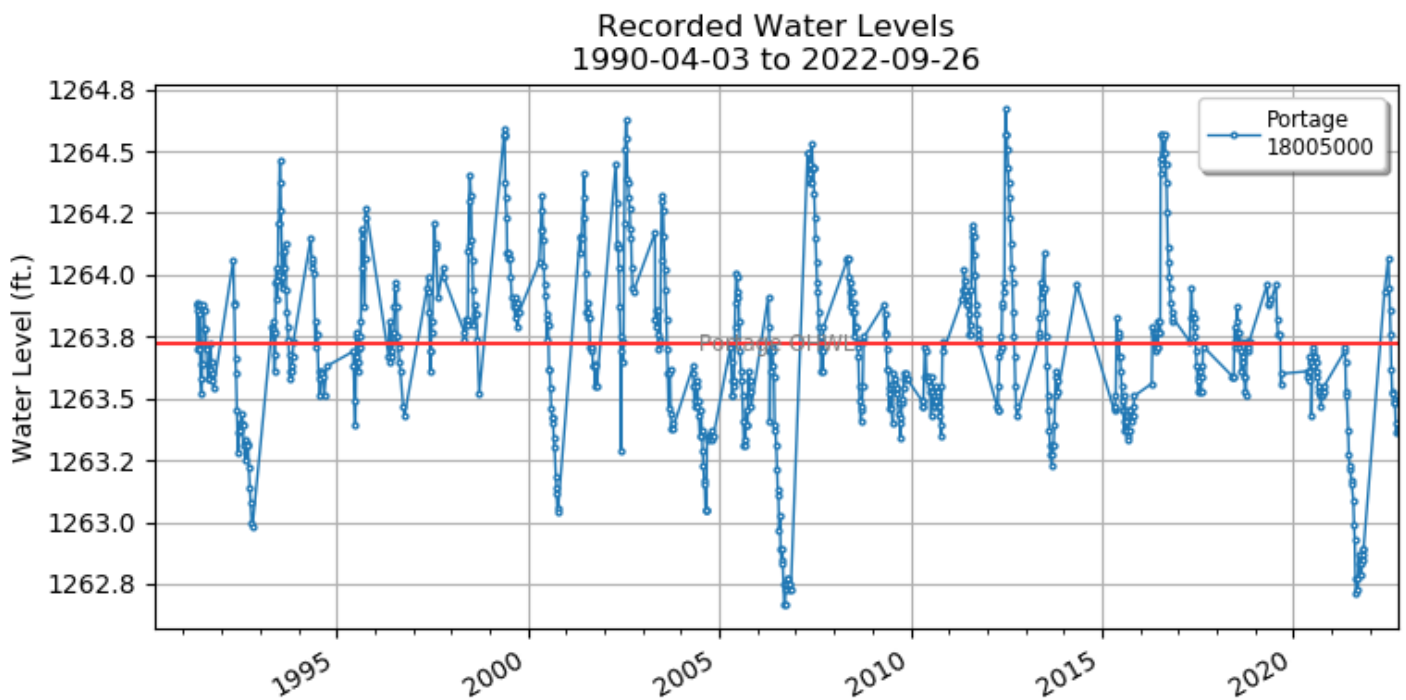
The **Trophic State Index (TSI)** is a number that summarizes a lake's overall nutrient richness. Nutrient richness ranges from clear lakes, low in nutrients (oligotrophic), to green lakes, with very high nutrient levels (hypereutrophic). The chart below shows the overall TSI rating for this lake (top bar), followed by TSI ratings for the individual parameters that contribute to nutrient richness. The TSI calculations are based on data collected between June and September 2008 to 2017.



For detailed information on Water quality components and how they interact, see [RMB Understanding Lake Data](#)

### Water levels

Lake water level fluctuation is monitored annually by the MN DNR. Portage water levels reflect the level of all lakes.



## **Goal #1- Minimize Impact of Aquatic Invasive Species (AIS)**

### **Objectives:**

- Understand and communicate current state of aquatic invasive species.
- Determine best approach for our lake to coexist with aquatic invasive species while minimizing impact to property owner's and visitor's access to and enjoyment of the lake.

### **Action Steps:**

- Continue regular and systematic monitoring, testing and reporting to property owners on AIS
- Seek input and use resources of the Minnesota Aquatic Invasive Species Research Center (MAISRC) to help us in the prevention, detection and control of AIS in our lakes.
- Coordinate with Crow Wing County's stated 2020 AIS Plan and any new Water plans.
- Continue to maintain signage and public access inspectors when available
- Continue with regular chemical treatment methods (that do not appreciatively harm native vegetation) and continue to explore new technologies and approaches to minimizing lake impact.
- Zebra mussels – continue to monitor annually for veligers and adults.
- Where appropriate, contract with experienced and reputable consultants to help with aquatic invasive species management plans.
- Budget for any contracted services and seek grants from available sources to mitigate cost to property owners.

## **Goal #2: Protect and Improve the Lake Water Quality and Shoreline**

### **Objectives:**

- Monitor water quality values to provide property owners and visitors with a quality experience for recreating and fishing (on-going).
- Monitor water quality values within the average range of the Northern Lakes and Forests Ecoregion as outlined by the Minnesota Pollution Control Agency. Those values and ranges are:
  - **Total phosphorus (nutrient level):** <30 or 40 ug/L (state); RMB Environment Labs says Crooked Lake Chain levels have historically been between 12.1-14.5 ug/L

- **Chlorophyll-a concentrations (algae level):** <10 ug/L; RMB Environmental Labs says Crooked Lakes Chain levels are 3.3 – 4.7 ug/L
- **Secchi depth (transparency):** 8-15 feet but will vary during open-water season; RMB Environmental Labs says Crooked Chain Lakes were between Secchi depth of 12 for Portage and 15.2 for Crooked Main Bay in 2022 but has been declining for all but Sugar Bay.
- Establish and communicate to property owners’ best practices for promoting healthy shorelines and for protecting our watershed.
- Provide transparent communication to property owners on any issues and possible solutions using Association website, emails, annual meeting or other appropriate methods.
- Identify and document any watershed issues or characteristics that currently are impairing or could potentially impair the water quality through nutrient or sediment loading issues into our lakes and create action plan to help mitigate any adverse effects.
- Continue systematic monitoring, testing and reporting to property owners on water quality and trends.

**Action Steps:**

- Contract with experienced and reputable water quality testing labs or State Agencies on an as planned and budgeted basis to monitor, sample and assess the lake water quality.
- Using data from previous and future water quality reports, identify if any metrics are not in desired range after allowing for reasonable year-to-year variabilities caused by climate or other natural sources. Attempt to identify root causes and develop corrective action plans.
- Keep outbound creek flowing by monitoring and removing any impediments.
- Budget for any contracted services and seek grants from available sources to mitigate cost to property owners.

**Goal #3- Protect Native Aquatic Vegetation**

**Objectives:**

- Understand current state of native aquatic vegetation and how to preserve and foster re-growth of lost vegetation to properly support the water quality and variety of fish species and wildlife.
- Determine root causes for any loss of aquatic vegetation.



- Determine mitigation strategies for reducing or minimizing loss of aquatic vegetation.

**Action Steps:**

- Communicate to property owners the impact human influence can have on native vegetation and the watershed (sewage runoff, agricultural runoff, etc.) and provide information on action steps they can take to reduce that impact.
- Minimize use of chemicals or alternative technologies that would harm native vegetation if, and when, treating invasive weeds that compete and overtake native vegetation.
- Budget for any contracted services and seek grants from available sources to mitigate cost to property owners.

**Goal #4 - Protect and Improve Fish and Wildlife Habitat**

**Objectives:**

- Fish stocking per DNR guidelines

**Action Steps:**

- Seek DNR fisheries input on recommended species and quantity to stock.

**Goal #5. Safe boating and navigation**

**Objectives:**

- Promotion of and education on safe boating practices and water activities (personal watercraft)
- Maintenance of Buoys to guide boaters

**Action Steps:**

- Continue newsletter articles in the spring and summer about safe boating and personal watercraft practices.
- Continue buoy maintenance.

## PRIORITY ACTION STEPS

Priority area	Action step	Timing	Owner
Water Quality/Shoreline Protection	Continue to monitor water quality and engage with RMB labs and the DNR	Summer Months	Healthy Lakes Committee
Water Quality/Shoreline Protection	Include educational pieces about shoreline erosion prevention in newsletters	Spring, summer and fall newsletters	Various authors, Editor of The Shoreline
Minimize impact of Aquatic Invasive Species	Control and monitor Milfoil and other invasive species and assess impact and effectiveness of current and new treatments available	Ongoing	Healthy Lakes Committee
Fishery	Stock per DNR guidelines and recommendations	Per DNR guidelines	Fish Stocking Committee
Boating and watercraft Safety	Educational piece on boating and watercraft safety	spring and summer newsletters	Various authors, Editor of The Shoreline
All	Communicate to property owners our Lake Management Plan and encourage them to assess on a regular basis the impact their property is having on the health and quality of the lake	Summer newsletter and Annual Meeting	Healthy Lakes Committee, Shoreline Editor, President