
Lake Management Plan for Pelican Lake, Otter Tail County, Minnesota

Prepared by Blue Water Science

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OVERVIEW

Lake Management Goals

The goals of this project were:

- * to characterize existing lake conditions.
- * to develop a lake management plan that protects, maintains, and enhances Pelican Lakes' water quality.

Lake and Watershed Conditions

Geology and Soils

The Pelican Lakes are glacial lakes formed during the last retreat of the Red River Lobe starting about 13,000 years ago. The soils deposited by the glacier are primarily sands and loamy sands.

Watershed Characteristics

The lakes' watershed is approximately 162,000 acres (includes lake acres). However, much of the watershed area drains through large lakes first before the water reaches the Pelican Lakes. The upstream lakes act as "treatment" ponds and help improve water quality of the Pelican River and Spring Creek, two of the major tributaries to the Pelican Lakes. Land use is primarily agriculture comprising 23% of the overall watershed, with forest accounting for about 22% of the total watershed area.

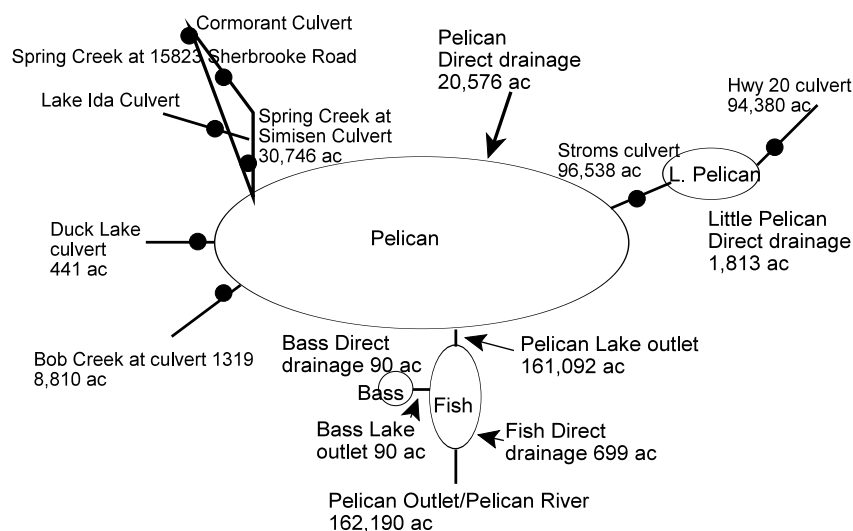


Figure 1. Watershed drainage areas to the Pelican Lakes. The black dots represent water quality sampling sites (a watershed is defined as the land area that drains to a lake or river).

Stream Quality

The water quality of the tributary streams is good. Phosphorus concentrations have been measured and generally range from 50 to 150 ppb. This is low and this helps maintain good water quality in the lakes. It is common for streams in this part of the state to have phosphorus concentrations of around 150 ppb and sometimes higher. If the Pelican Lake's tributary streams continue to maintain phosphorus concentrations at these low phosphorus levels, the lakes have a good chance to maintain good water clarity. However, other factors such as shoreland conditions are involved as well.

Lake Sizes and Depths

The Pelican Lakes consist of Pelican, Little Pelican, Bass, and Fish Lakes and are located in Otter Tail County, Minnesota. Pelican Lake is 3,986 acres in size, has an average depth of 22 feet and a maximum depth of 55 feet. Little Pelican Lake is 345 acres in size, has an average depth of 12 feet and a maximum depth of 25 feet. Bass Lake is 48 acres in size, has an average depth of 18 feet and a maximum depth of 33 feet. Fish Lake is 261 acres in size, has an average depth of 27 feet and a maximum depth of 69 feet.

Lake Dissolved Oxygen and Temperature

The Pelican Lakes thermally stratify during the summer. This means that wind action will mix the upper lake only during the summer. Oxygen concentrations will fall in the bottom water and become depleted in the bottom of the lake.

Lake Clarity

Growing season (May - September) lake water clarity in Pelican Lake, Bass Lake, and Fish Lake averages around 11 feet. Little Pelican Lake has lower clarity, with a summer average of 8.7 feet. Little Pelican has less clarity for several reasons and include: Little Pelican is shallower than Pelican, Bass, and Fish Lakes. The smaller volume makes it more sensitive to phosphorus inputs and resulting algae growth and it has a large watershed draining to it.

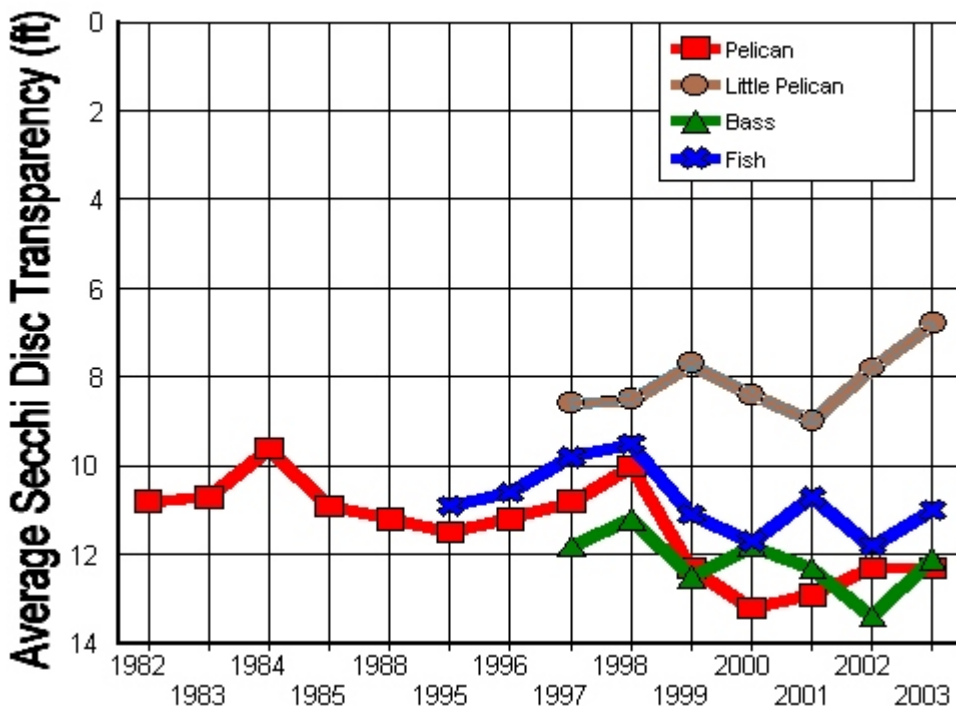


Figure 2. Summary of growing season water clarity measurements using a Secchi disc. Measurements were taken by lake residents and compiled by the MPCA and represent a seasonal average from June through September. Pelican, Bass, and Fish Lakes have good water clarity. Little Pelican has fair water clarity.

Lake Nutrients

Phosphorus concentrations in the Pelican Lakes are low when compared to other lakes in the North Central Hardwood Forest ecoregion. A growing season phosphorus average for Little Pelican is 20 ppb and for Pelican, Bass and Fish is 13, 14, and 11 ppb respectively. A predicted phosphorus concentration using ecoregion stream values is higher.

Lake Algae

The Pelican Lakes have algae species that are common to lakes in this part of the state.

Lake Aquatic Plants

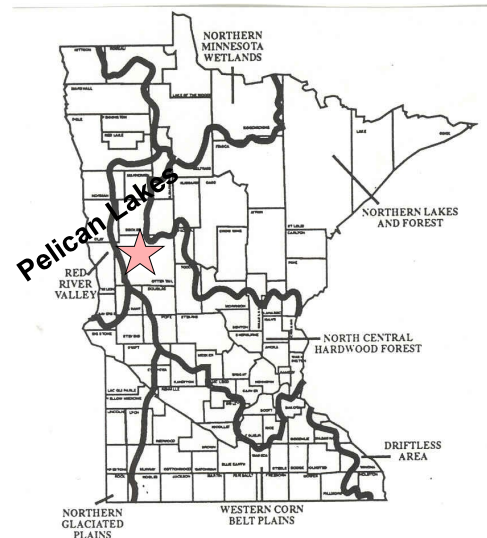
Submerged aquatic vegetation coverage in the lakes is generally low. Little Pelican has areas of substantial aquatic plant coverage, but generally the growth is not a navigational hindrance. Aquatic plant diversity is fair with 17 submerged or floatingleaf plant species identified in Pelican and Little Pelican Lakes. Bass and Fish Lakes has a lower diversity with 4 submerged or floatingleaf plant species. No Eurasian watermilfoil has been found in the Pelican Lakes, but the exotic plant, Curlyleaf pondweed, has been spotted in Little Pelican and in Pelican. Nuisance growth encompasses about 10-15 acres in early summer. The plant then dies back naturally.

Understanding What Impacts the Pelican Lakes

- Lake water quality results are within range compared to other lakes in the ecoregion.
- The water quality of the tributary streams is generally good and does not appear that stream inputs of nutrients are great enough to generate algae blooms at this time.
- The lake basins in the watershed act as sedimentation basins and help promote good water quality as streams make their way to the Pelican Lakes.
- The result is relatively good water quality in the Pelican Lakes when compared to Ecoregion values.
- To sustain good water quality will take ongoing protection efforts from the watershed and the shoreland areas.

Summer average water quality characteristics for lakes in the North Central Hardwood Forest ecoregion and for the Pelican Lakes (2003 summer average).

Parameter	North Central Hardwood Forest	Pelican	Little Pelican	Bass	Fish
Total phosphorus (ug/l) (measures nutrient content and the lower the better)	23 - 50	13	20	14	11
Chlorophyll (ug/l) (measures amount of algae in the lake)	5 - 22	3	5	2	2
Chlorophyll - max (ug/l)	7 - 37	6	10	4	3
Secchi disc (ft) (measures water clarity)	4.9 - 10.5	10.9	8.7	10.3	10.8



Recommended Lake Management Projects (Draft List: 2004)

- 1. Watershed projects:** Maintain programs that promote the increased use of conservation tillage, grass waterways, buffer strips along stream channels, and nutrient management techniques for the agricultural areas (work with Otter Tail and Becker Counties).
- 2. Stream projects:** Continue to monitor watershed streams and analyze samples for total phosphorus and total suspended solids (TSS). If a seasonal average exceeds 150 ppb of phosphorus (as a flow-weighted mean), watershed work within the contributing area to the stream should be a high priority.
- 3. On-site system maintenance:** Onsite wastewater treatment systems are operating satisfactorily around the Pelican Lakes and there is little evidence of failing onsite systems based on the County record review. However there are soil limitations in the shoreland area and there is a relatively high percentage (30%) of holding tanks around the lakes. At some point in the future, offsite treatment should be considered for various shoreland areas. Cluster system options are less expensive than centralized sewer options.
- 4. Shoreland projects:** Pelican Lake has stretches of natural shoreline conditions but vegetative buffers and natural conditions are lacking along some of the developed parcels. The challenge is to protect the existing natural conditions and to enhance shorelands that lack native vegetative buffers. A volunteer lakescaping program should be implemented.
- 5. Aquatic plant projects:** Aquatic plants are important in Pelican Lake for fish habitat and for helping sustain good water quality. Curlyleaf pondweed is an exotic plant and grows to nuisance conditions in a few areas in Pelican and Little Pelican. Future curlyleaf management should be considered if curlyleaf starts to expand from its current base.
- 6. In-lake nutrient reduction:** Good residential management practices conducted in the shoreland area will reduce excessive amounts of nutrients running off into Pelican Lake. Ongoing information inserted into newsletters on fertilizer use and buffer strip maintenance will minimize excessive nutrient inputs into Pelican Lake.
- 7. Fish management options:** The Pelican Lakes have a balanced fish community based on MnDNR records. Sensitive walleye and panfish spawning habitat should be recognized and published.
- 8. Ongoing education program:** Results from lake questionnaires can indicate the priorities lake residents and help guide lake management programs. A mailed questionnaire to survey lake residents could be helpful. Otherwise, the Lake Improvement District's newsletter should be an ongoing instrument to provide lake protection information. Abundant material is available that can inserted into newsletters.
- 9. Lake monitoring program:** Ongoing lake testing should include: Secchi disk, total phosphorus, and chlorophyll a for all four lakes. Testing once per month from May through September is adequate to characterize lake conditions.