

**Management Plan for Fish
Hook Lake and River
2005**

Fish Hook Lake & River Association

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Introduction

Summary of Healthy Lakes & Rivers Partnership Program

In October 2003, the Fish Hook Lake and River Association [Fish Hook Association] participated in the Initiative Foundation's Healthy Lakes and Rivers Partnership program along with eight other lake Associations from Hubbard and Wadena Counties. Under the coordination of Darrin Moe (then-Hubbard County Local Water Planner) and Kari Tomperi (Wadena County Water Planner), representatives of Fish Hook Association attended two days of training on strategic planning, communication, and nonprofit group leadership.

Representatives of many state and local agencies, as well as nonprofit organizations also attended the training sessions in order to offer their assistance to each group in developing a strategic Lake Management Plan. Sharon Rezac-Andersen, Vicki Hartz, Ruth Brown, Ginger Carter, and Kent Shirley represented the Fish Hook Association.

On April 24, 2004, the Fish Hook Association held an inclusive community planning/visioning session, designed to identify key community concerns, assets, opportunities, and priorities. Larry Wannebo, Initiative Foundation facilitator for Healthy Lakes and Rivers Program, facilitated this planning session. Details of the public input received at this session are provided within this plan.

This document creates a record of historic and current conditions; this document identifies and prioritizes the goals of the Fish Hook community; ultimately, this document guides stakeholder action in the priority action areas. State agencies and local units of government have a vital role and responsibility in managing our surface waters and other natural resources, but above all else this Lake Management Plan is intended to be an assessment of what we as stakeholders can influence, what our desired outcomes are, and how we will participate in shaping our lake's destiny.

The Fish Hook Association will review this plan every year so that as new information becomes available; as we accomplish our goals; or as we discover alternative strategies, we will update this plan.

We have tried to express our goals, measures of success, and other themes as simply and clearly as possible, however in discussing lake management issues, it is impossible to avoid all scientific or technical terms. Therefore, we have included a glossary of common terms and list of common abbreviations in the Appendix.

We would like to thank the following for funding the Healthy Lakes & Rivers Partnership program for Hubbard and Wadena Counties: The McKnight Foundation, Laura Jane Musser Trust, Northwest Minnesota Foundation, Hewitt Family Charitable Fund, McDowall Company, Hubbard County Water Plan, Wadena County Water Plan, Hubbard County Coalition of Lake Associations, Minnesota Board of Water and Soil Resources, Lake Hubert Association-Crow Wing County, Linda Kaufmann, Don Hickman, and Sandra Kaplan.

Physical Characteristics and Location of Fish Hook Lake

Fish Hook (DNR ID# 29-0242¹) is located 2 miles north of Park Rapids, MN, in Henrietta-Todd Township, Hubbard County. Fish Hook is within the Crow Wing Watershed; the Northern Lakes & Forests Ecosystem [NLF]²; and the Upper Mississippi River Basin [UMB].³ The Hubbard County DNR Shoreland Development Classification⁴ of Fish Hook Lake is a Recreational Development Lake.⁵

The lake has a surface area of 1,632 acres of which 661 acres (41 percent) is in the littoral zone⁶. The maximum depth in the lake is 76 feet and the length of shoreline is 7.3 miles⁷.

Tributaries, which drain into Fish Hook Lake, include a river from Potato Lake to the north, and a stream from Portage Lake to the west. The outflow of Fish Hook Lake is the Fish Hook River that discharges into the Straight River below the City of Park Rapids.

The Ordinary High Water Level [OHWL] for Fish Hook Lake is 1426.3 ft. The recorded water level range is 2.12 feet, which includes a high of 1426.23 feet and a low of 1424.11 feet.⁸

On June 24, 2002, the DNR completed a Lake Survey on Fish Hook Lake. The survey data can be found in the Lake Information report for Fish Hook Lake.⁹ The DNR's Division of Ecological Services Lake Mapping Unit mapped Fish Hook Lake.¹⁰ Lake mapping identifies lake vegetation, lake soils, and lake depth.

¹ Minnesota DNR lake identification number from the DNR, 1968 publication "Bulletin 25: An Inventory of Minnesota Lakes." A six-digit code, the first two digits indicate the county; the next four digits indicate the lake number.

² The U.S. Environmental Protection Agency (EPA) mapped the ecoregions.

³ Minnesota has nine river basins. Basins and ecoregions are used to review and compare lake conditions.

⁴ Hubbard County DNR Shoreland Classifications at

http://files.dnr.state.mn.us/waters/watermgmt_section/shoreland/lake_classifications_Hubbard.pdf A classification system was developed so that the appropriate development standards could be applied.

⁵ **Recreational Development Lakes** usually have between 60 and 225 acres of water per mile of shoreline, between 3 and 25 dwellings per mile of shoreline, and are more than 15 feet deep.

⁶ **Littoral zone:** This is defined as that portion of the lake that is less than 15 feet in depth. The littoral zone is where the majority of the aquatic plants are found and is a primary area used by young fish. This part of the lake also provides the essential spawning habitat for most warm water fishes (e.g. bass, walleye, and panfish).

⁷ Minnesota DNR Lake Survey at

<http://www.dnr.state.mn.us/lakefind/showreport.html?downum=29024200>.

⁸ Water Level Data at <http://www.dnr.state.mn.us/lakefind/showlevel.html?id=29024200>. see Appendix B.

⁹ Found at <http://www.dnr.state.mn.us/lakefind/showreport.html?downum=29024200>.

¹⁰ Fish Hook Lake contour maps at: <http://thoreau.dnr.state.mn.us/lakefind/lakemaps/b0131011.pdf> and <http://thoreau.dnr.state.mn.us/lakefind/lakemaps/b0131010.pdf>.

History of Fish Hook Lake

The following "History of Fish Hook Lake", Appendix 2 of the 1991 LAP report, was originally compiled and written by Carolyn Spangler.

1871: A military road skirting the south side of Fish Hook Lake was used by the government for transporting soldiers and supplies from Leech Lake to the White Earth Reservation.

1881: Two years after the first settlers arrived, Frank D. Rice, owner of the town site named it Park Rapids. The park-like groves on the prairie and the rapids on the Fish Hook River (not dammed at that time) provided the impetus for the name.

1881: The Rice brothers built the first dam on Fish Hook River west of the footbridge. The dam powered their rolling stone and gristmill. The sawmill turned out rough lumber used for window, doorframes, floorboards, and roof boards. The dam broke in 1885 destroying the lumber mill.

1885: The dam at Park Rapids was the only developed water power in the county.

1885: A wooden bridge financed by private donations was built across the Fish Hook River (where Highway 34 presently crosses the river).

1886: A new dam was built where the present dam exists. A new flour and feed mill was built beside this dam.

1886: Peter Turnbull settled 40 acres on the northwest side of the lake. During this year, he received receipt from the government to live on the property before buying it in 1887. This property is now the Zinniel farm. A story is told that before the dam was built on the river, Zinniel claims that he drove his cattle across the lake near the present boat access. Harry Jones, a retired farmer living on Fish Hook Lake next to the Portage Creek, said this story is possible because there is a ridge across the lake in the area Zinniel claims to have crossed.

1889: The railroad came to Park Rapids.

1890-1910: The "Lottie Lee" excursion boat operated on the Fish Hook River.

1890: Logging began in the area when one of the biggest logging companies, the Red River Logging Company, drove pilings for a sawmill in Akeley. In these days, Fish Hook Lake was used primarily for logging. The Pine Tree Logging Company logged Norway and White Pine from acreage near Itasca Park where steam haulers traveling along ice roads carried the huge lumbering logs to ice covered lakes. In the spring, a boom was formed around the logs by chaining a circle of logs end-to-end to keep the logs in order. Barges pulled the boom down the rivers and lakes. Men, called "river pigs," as they were very skilled on their feet, would run on the logs with spiked shoes to break up

jammed logs. Logs from the Two Inlets area traveled through Island, Eagle, Potato, and Fish Hook lakes for a destination of Little Falls, Minnesota.

1891: Prior to 1891, the Northern Pacific Railroad owned the Eagles Nest Plat. In March 1891, it was sold to Frederick Wayerhauser, M.G. Norton, and Peter Musser under the corporation named the Immigration Land Company of Little Forks, MN. In 1904, the property was sold to J.C. Peabody and in 1914, he surveyed and platted the property and designated it as Eagles Nest. (The acreage is north of the Potato River and part of Peabody Bay).

1892-93: A single circular sawmill built by Ellersick & Sons on the east side of the river was later converted to a band mill by the new owners, Sawyer & Burnet in 1897. This mill operated until 1911.

1892: The Great Northern Brick Company, a company partially responsible for the economic growth of the area, bought 40 acres on the east end of the lake from Libby Kindred for \$400. The Brick Company delivered their bricks to Park Rapids by river barge. The barge was also used for pumping and hauling sand from the lake to a concrete block plant located on the river. A four-cylinder gasoline engine turned the barge, propelled by a paddle wheel.

1892: The Timber Act made possible the purchase of land and tree removal to lumber companies. Timberland sold for \$1.25 to \$2.50 per acre.

1896: Henry and Harriet Rose purchased a Homestead Patent of 145 acres on NE and NW of Portage Creek on the west side of Fish Hook Lake. One of two farms on the lake changed ownership several times until Harry Jones, the present owner, bought the farm (excluding Pine Park Acreage, part of the original property) from his parents for \$2,000 in 1945.

Circa 1900: The lumber people changed the mouth of Fish Hook River in order for the logs to flow more freely down the river. The mouth originally took a sharp turn and made the transport of logs down the river difficult.

1901-1918: The era of logging—at times logs covered the entire lake surface.

1902: Dr. Stone built the first hospital in Park Rapids on the site of the present Park Terrace. Known as Park Sanitarium, the wooden building burned on Christmas Day and was replaced by a brick structure in 1903 according to Pauline Schleicher, granddaughter of Dr. Stone. While the hospital was being built, Dr. Stone secured the Germania Hall on North Park Avenue as a temporary Hospital. The hospital later became the Rainbow Inn, a clubhouse or resort where per person weekly rates were \$5 or \$1 per night. The Rainbow Inn was named for the Rainbow Division in which Herbert Stone, a son of Dr. Stone, served during World War I. Sons of Dr. Stone, A.W. and Herbert, managed the Inn. The property was in the Stone family until 1962.

Dr. Stone also operated a health sanitarium on a 45-acre plot now owned by the Methodist Church Northern Pines Campground. The lake resort consisted of three buildings: a lodge, a girl's dormitory and one cabin. These were used to house guests and recuperating hospital patients. Cottages rented for \$1 a day, \$20 a month or \$50 a season. Dr. Stone sold his sanitarium for \$4,000 to a group of Methodist ministers and laymen who were looking for a campsite to serve people of the districts in a camping program. The church then sold lots to ministers, laymen, and churches to pay back money borrowed to pay for the property. Lots sold for \$100 to \$200. In later years, some of the lots were given back or sold back to the Assembly Grounds.

Margaret Nygaard, a Park Rapids resident since 1904, says that a road existed next to the lake on the south side across from Deane Park. Folk lore from logging days indicates that road may be a remnant of a road around the lake used to transport loggers and supplies to supply boats in peak logging years. The existing road, built as a Work Progress Administration project, is between the cabins and Deane Park.

1908: At the peak of logging activity, 4,000 or 5,000 men were employed in the woods.

1912: A steel bridge with plank flooring replaced the bridge across Fish Hook River (Highway 34). The clatter of the loose planks could be heard in the quiet of summer evenings, and it became known as a "rattling good bridge."

1914: A launch service was provided to carry supplies, fishermen, and passengers to local lakes. A page from the logbook of Captain Oscar Thomas says it took seven hours to travel from Fish Hook Lake to Island Lake for a day excursion. The journey cost \$5 for seven people.

1917: Bill Taber gave property on Fish Hook River to the city in memory of his son Deane, who died during World War I.

Circa 1918: River and lake logging ended and the big sawmill on the river was dismantled.

1920: After the cessation of big tree logging, the logging industry changed. Small logging companies started logging smaller trees such as Jackpine and Birch while moving around the area with their own mills. A process called deadheading where drowned logs were picked out of the water became popular. Deadheading did not last long as it was not profitable. In later years, the farmers or local loggers brought their logs by truck and used the sawmills on the river for cutting the logs into rough lumber. The logging industry still brightens the economy of Park Rapids and logs are now sold for studs and planks. Potlatch owns much of the logging land in the area.

1923: Fred Fulton bought the Fish Hook Resort, which became White City and is now Loon's Nest Resort. Fulton added the dance hall, restaurant, and eventually 15 cabins for tourists. The resort was a popular place in the Big Band days when an 8-piece band

entertained locals two nights a week. This is the only resort that exists today on Fish Hook Lake. Fulton sold the resort in 1947.

1928-30: A box factory across from the present Heartland Park on Fish Hook River provided jobs for local people.

Circa 1930: When Mrs. Higgs, who owned one of the first cabins on the lake wanted to sell her property on the east shore for \$3.75 a front foot people thought she was crazy to sell for so much.

1933: When a wider more heavily constructed bridge was constructed over the Fish Hook River (Highway 34), there was opposition to the large amount of fill used to shorten the span.

1937: Permits were required to fill public wetlands. Wetlands on Fish Hook Lake filled before 1976 were not considered public wetlands and were allowed to be filled.

1938: The dam on the Potato River was built on County Road 18 as a Work Progress Administration project.

1938-40: County Road 18 on the west end of the lake was moved into the lake to straighten out the original curvy and dangerous road. Horses pulled rail ore carts to the dirt pit to be filled with two tons of dirt, and then it rolled down to the lake with a brakeman riding in back to stop the car. Being a winter project, the pit was covered with straw on weekends to prevent freezing and dynamite was used to break up the pit, if needed. The Work Progress Administration did the construction. The road originally had water on either side, but homeowners on the road have filled in the area between their lawns and the road.

1940: Matt Michaels sold his farm (one of two farms on the lake) to Harry Jones' father. The foundation of the present Jones house is made from hand-hewn logs.

1940-45: During World War II, barges roamed the lake searching for sunken logs to be hoisted out for lumbering. It was usually the "but cut" – the best part of a log that sank while being driven down the lake during logging days. Logs were grabbed from the bottom of the lake with ice pick-like grappling hooks and then towed to shore to be milled into lumber.

1945 and after WWII: Tourism opened up in Hubbard with the advent of bulldozers to the area and the building of roads. Without bulldozers and heavy equipment, access to lakes was difficult.

1950s: A 50-foot bank was bulldozed to build homes on the north side of the lake.

Circa 1976: The Corps of Engineers formulated regulations that required permits to fill in wetlands with certain characteristics.

1976: Hogs from a local farm bathed in Portage Creek.

1982: A new dam was built in the summer of 1982. The dam broke in October 12, 1982 after heavy rains and the upper river receded 10 feet (unofficial footage). It was rumored that one million dollars worth of damage was done. The dam was repaired by October 16, 1982.

1985: Fish Hook Lake Association formed.

1991: A mobile home park was built on property south of the lake and across from the Heartland Golf Course. Originally a wetland, this property was filled in the early 1970's.

1991: Fishing in Portage Creek is almost impossible with the rampant weed growth, unlike the 1940's when boats easily trolled the clear creek.

1991: The Wetlands Conservation Act enacted state laws designed to protect wetlands not covered under previous regulations.

1991: The Fish Hook Association conducted a survey of on-site sewage treatment systems, and noted that 43 systems were installed since 1980, including 39 conventional systems with septic tanks and drainfields, and 4 with septic tanks and seepage pits. This survey also identified 74 systems installed prior to 1980, of which only 16 had conventional tanks and drainfields. The remaining pre-1980 systems were cesspools, seepage tanks, or seepage tanks with drainfields. Eleven wastewater systems were identified as "unknown," and three homeowners refused to participate. Additional background on this survey is included in the MPCA's 1992 LAP study, Appendix I.

1992: Flourmill stones were discovered in the river near the city park when the new dam was being built. They had been left in the bottom of the river with the destruction of the mill and probably covered naturally over the years. The millstones are at the Hubbard County Historical Society.

The housing development property North of White City Resort, filled in during the 1980's, was once a wetland and cow pasture.

While the plan was to build an amphitheater by Heartland Park, an abundance of sawdust on the bank north of the footbridge deemed the project unsafe and impossible. This is near where a planer and sawmill existed in the early 1900's and an estimated 100,000 feet of lumber traveled through the mills each day. The planer mill continued operation until 1935.

History of the Fish Hook Lake and River Association

The Fish Hook Association formed in 1985.¹¹ Any owner or occupier of lands within 1000 feet of Fish Hook Lake or Fish Hook River in Hubbard County, Minnesota, is eligible for membership. In 2004, there were 126 members.

FISH HOOK ASSOCIATION MISSION STATEMENT:

The Fish Hook Lake and River Association shall be an advocate of the environment of our lake/river system. We shall be a partner with other lake associations and agencies which have an impact on water quality. We shall act as an educator in community understanding of the issues and goals of our association. The objectives of our efforts are better water quality and property values for everyone. As a group, we have a stronger voice than as separate individuals.

This mission statement is included in every issue of our newsletter.

In the summer of 1991, a "Lake Assessment Program" [LAP] study of Fish Hook Lake was conducted through an innovative program that combined the Fish Hook Association with the following public agencies: the Minnesota Pollution Control Agency [MPCA], the Hubbard County Environmental Services Office, the Hubbard County Soil and Water Conservation District [SWCD], the Headwaters Regional Development Commission [HRDC].

For about seven years, the Fish Hook Association sponsored a two-mile section of Highway 71 for roadside cleanup.

Fish Hook Association has been a member of the Hubbard County Coalition of Lake Associations [COLA] since its inception. Hubbard County COLA was organized in 1988 to facilitate cooperation among member lake associations.

Things the Fish Hook Association does:

1. Publishes a newsletter to members 3 times a year
2. Holds an annual meeting in June or July with a catered outdoor picnic and educational program
3. Sponsors a fourth of July flotilla
4. Sponsors a golf tournament with Potato Lake Association in August with a supper
5. Sponsors a women's luncheon
6. Monitors the lake for curlyleaf pondweed each spring; contributes money to Portage Lake curlyleaf pondweed eradication
7. Does a water monitoring program during the summer that includes secchi disc reading as well as water testing
8. Belongs to Hubbard County Coalition of Lake Associations (COLA)

¹¹ See Appendix A Fish Hook Lake and River Association Bylaws

9. Published a new directory in 2004 of property owners on the Fish Hook Lake and River
10. Has a loon watch program with a covered loon nesting platform to protect the chicks from predators
11. Works with the local DNR office and county zoning office to keep informed on local development affecting Fish Hook
12. Has an active board of directors who meet regularly and work to keep members educated and informed
13. Delivers membership bags with assorted educational information door-to-door in June to all properties on the lake and river
14. Belongs to the Minnesota Lakes Association [MLA] which is a group active with the state legislature and with educating lake owners
15. Sponsors a scholarship to a high school senior from Park Rapids who majors in science or environmental studies in college (By involving the younger generation, we involve the future beneficiaries of our lake plan.)
16. Sponsors a Fish Hook "happy hour" cruise on pontoons which includes pizza and music in the city park
17. Donated money to Park Rapids Shoreland Restoration Project for improvements at Red Bridge Park

II. Review of Historical and Existing Conditions for Eight Focus Areas

- 1. Water Quality**
- 2. Fisheries Management Plans**
- 3. Aquatic Vegetation**
- 4. Wildlife**
- 5. Exotic Species**
- 6. Land Use and Zoning**
- 7. Managing Water Surface Use Conflicts**
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1. Water Quality

The Fish Hook Association identified preserving the quality of the lake water as the number one goal of the Association. As the DNR states “Water is one of Minnesota's most valuable resources. Lakes, rivers, and wetlands are important assets.”¹² The Fish Hook Association has a long history of attention to the water quality of Fish Hook Lake.

Since 1989, volunteers from the Fish Hook Association have participated in the Minnesota Pollution Control Agency's (MPCA) Citizen Lake Monitoring Program (CLMP), recording secchi disc transparency—a measure of water clarity. During this time, the annual average reading has ranged from an average low of 7.7 feet in 1996, to an average high of 13.5 feet in 1992.¹³

Additional data for chlorophyll *a* and total phosphorus suggest that Fish Hook is at the lower range of mesotrophic conditions, with a mean total phosphorus concentration of 25 µg/L, mean chlorophyll *a* of 3.5 µg/L, and a mean Secchi transparency of 10.83 feet.¹⁴

The trophic state index [TSI] is used to rate the biological productivity of a lake, the above numbers from the secchi depth, the chlorophyll, and total phosphorus measurements are used to calculate the Carlson's Trophic Index (TSI) value; a score between 0-100 that allows comparison to measures of water quality from other lakes or at other times. Fish Hook has a TSI score of 43.¹⁵ The trophic status is mesotrophic¹⁶ or average for the lakes in the NLF region. The score is better than 48 percent of all other lakes within the Northern Lakes and Forests ecoregion.¹⁷

In the summer of 1991, a “Lake Assessment Program” [LAP] study of Fish Hook Lake was conducted through an innovative program that combined the Fish Hook Association with the following public agencies: the Minnesota Pollution Control Agency [MPCA], the Hubbard County Environmental Services Office, the Hubbard County Soil and Water Conservation District [SWCD], the Headwaters Regional Development Commission [HRDC]. According to the study, “LAP's are designed to assist lake associations collect and analyze baseline water quality in order to assess the current condition (e.g., trophic status) of their lake.”¹⁸ Additional discussion and interpretation of historic water chemistry data is included in the LAP report, found in Appendix F.

Phosphorus [P] needs to be regularly tested in the lake as even small amounts of phosphorus make a difference—P is the crucial pollutant connected with accelerated

¹² A Guide for Buying and Managing Shoreland at <http://www.dnr.state.mn.us/shorelandmgmt/guide/watersheds.html>

¹³ See Appendix C Secchi Disc Readings

¹⁴ See Appendix D Lake Water Quality Summary Information

¹⁵ See Appendix D Lake Water Quality Summary Information

¹⁶ Mesotrophic—Lake midway in nutrient levels between the eutrophic (very productive) and oligotrophic (nutrient poor) lakes; a lake with moderate productivity of nutrients such as algae.

¹⁷ MPCA Lake Water Quality Database

¹⁸ Fish Hook Lake Assessment Program 1991 [LAP] at <http://www.pca.state.mn.us/publications/reports/lar-29-0242.pdf>

aging (eutrophication) of Minnesota lakes. According to the DNR, "one pound of phosphorus can lead to the growth of 500 pounds of algae."¹⁹ This changes the lake and impairs recreational uses. Total phosphorus (TP) is a key factor in determining the degree of eutrophication in a lake.

Fish Hook Lake has a mean total phosphorus concentration of 25 µg/L; this is on the high end for lakes in the NLF ecoregion.²⁰ The MPCA lists the water quality of Fish Hook Lake as "fully support (marginal)" for swimming and other recreational contact. This classification means that swimmable use is still supported, but the lake is near the phosphorus limit for its ecoregion, consequently small increases in lake P will result in increased algal blooms and perceptible decreases in transparency.

For that reason, the new state fertilizer rules that are effective in 2005, banning the use of phosphorus lawn fertilizer in the state of Minnesota will be supportive of preserving lake water quality.

Lake quality is an important resource not only for swimming and for fishing, but additionally, lake quality is an important resource for property values. Last summer, Charles Parson and Dr. Pat Welle, of Bemidji State University [BSU], co-authored a study titled "Lakeshore Property Values and Water Quality." This economic analysis of the fiscal benefits of protecting lake water quality showed a direct relationship between water quality and lakeshore property values, based on property sales in the Mississippi headwaters region. In other words, the better the water clarity in a lake, the higher the value of the land around that lake. The study compared clarity in three-foot increments per frontage foot [FF] of lakeshore. As the article from the Park Rapids Enterprise noted:

Here is how it works: The "mean" for water quality on Fish Hook Lake is about 11 feet. The BSU study says if the water gets clear enough so people can see down another three feet, property values would rise \$61 for each foot of frontage. On a typical 200-foot lake lot, that would mean an increase of more than \$12,000. If, however, the water clarity on Fish Hook were to decrease by three feet, property values would decrease by \$82 per foot of frontage. That represents a decrease in value of more than \$16,000 on a 200-foot lot.²¹

In 1990, Hank Todd, former director of the Minnesota State Tourism Department, used lake surface area as a basis for estimating the economic impact of lakes on the local economy. For example, he estimated that lakes generate 16.5 jobs per thousand lake acres and consumer purchases at \$509 per acre.²² Even if the numbers are estimates, the evidence clearly shows that clear water is important for all stakeholders.

¹⁹ Retailers Set for New Fertilizer Rules Park Rapids Enterprise, June 9, 2004 by Heather Leinen

²⁰ See Appendix K NLF data: range of mean total phosphorus 14-27.

²¹ Park Rapids Enterprise--Research confirms what most suspected Clean lakes pay off Maureen Gibbon, Reporter 06/25/2003

²² <http://www.shorelandmanagement.org/depth/swim.pdf>

2. Fisheries

The Minnesota Department of Natural Resources [DNR] conducted a fisheries assessment for Fish Hook Lake in June 2002, and observed, "Fish Hook is a popular lake and receives a fair amount of fishing and recreational activity year around."²³ According to the DNR Lake Information Report of June 24, 2002²⁴:

The 2002 survey showed walleye numbers (3.3 walleye/gillnet) to be down and below the current management goal of 5.0 walleye/gillnet. Walleye abundance in past surveys has been higher, generally near or above the management goal. Anglers can expect to find good numbers of 16-20 inch walleye as well as larger fish up to 30 inches. Fish Hook is known as one of the better lakes in this area for the opportunity of catching a trophy walleye (30 inch plus). While natural reproduction is occurring, the good walleye population found in Fish Hook is the result of an aggressive and successful stocking program by the DNR. Fish Hook is stocked with walleye fingerlings in odd numbered years.

Northern pike numbers were up, with the gillnet catch rate of 19.6 pike/net the highest recorded for all surveys. Past surveys have shown northern pike abundance to fluctuate from moderate to high numbers. While small, "hammer handle" northern pike dominated the catch, larger pike are present with fish measured up to 34.6 inches.

Fish Hook has excellent populations of largemouth bass and panfish. Largemouth bass in the 14-16 inch size range are common as well as bass up to 20 inches. Anglers will find good numbers of bluegill in the 7-8 inch range. The black crappie population in Fish Hook is known more for quality than quantity. Typically, low numbers of crappie are present, with fish in the 10-12 inch size range.

The Environmental Protection Agency records a fish consumption advisory due to mercury in Fish Hook Lake.²⁵

For Hubbard County, the DNR Area Fisheries Manager is Doug Kingsley, 301 South Grove Avenue, Park Rapids, MN 56470, Phone: (218) 732-4153, Email: doug.kingsley@dnr.state.mn.us.

²³ Lake Information Report at <http://www.dnr.state.mn.us/lakefind/showreport.html?downum=29024200>

²⁴ Lake Information Report at <http://www.dnr.state.mn.us/lakefind/showreport.html?downum=29024200>

²⁵ See Appendix R

3. Aquatic Vegetation

Aquatic plants are a crucial part of the natural ecosystem in the lake. Fish Hook Lake contour maps identify aquatic vegetation areas.²⁶ The DNR uses the maps for fisheries management, wildlife management, research, environmental review, and general public use.²⁷

However, exotic/invasive aquatic plants are not part of Fish Hook's natural ecosystem. The problem plants that are the highest threat to Fish Hook Lake are Eurasian watermilfoil and curlyleaf pondweed.

Curly pondweed is a non-native, invasive aquatic plant. Actually one of the first noted invasive plants in Minnesota, it develops thick surface mats that hinder water activities and is an unfit habitat for boats, swimmers, fish, and native plants.

In Hubbard County, Portage Lake has mats of curly pondweed. Portage Lake drains into Fish Hook Lake through a stream. In 2004, Portage Lake treated 20.5 acres of open water for curly leaf pondweed. The cost for the treatment totaled \$6,370 with property owners contributing shares for the treatment²⁸. This was the second year of spraying and treatment must continue to maintain control. The DNR approved the application of the open water treatment. For treatment of the pondweed near shore, the individual property owner had to obtain a DNR permit.

In Wadena County, Blueberry Lake, Upper and Lower Twin Lake all have mats of curly pondweed.

Eurasian watermilfoil is a non-native, invasive aquatic plant. In July 2004, a swimmer discovered Eurasian watermilfoil in Leech Lake, Walker, Cass County, Minnesota, near the public access on state highway 200. Leech Lake also has curly leaf pondweed.

As it is unlawful in Minnesota to launch watercraft with prohibited aquatic plants or exotic species attached, Fish Hook Association has signage at both public accesses for educational purposes.

Jed Anderson is the DNR's Aquatic plant management specialist for Hubbard County at 23070 North Lakeshore Drive, Glenwood, MN 56334, Phone: (320) 634-4573, Email: jed.anderson@dnr.state.mn.us.

²⁶ Fish Hook Lake contour maps are located at <http://thoreau.dnr.state.mn.us/lakefind/lakemaps/b0131011.pdf> and <http://thoreau.dnr.state.mn.us/lakefind/lakemaps/b0131010.pdf>.

²⁷ http://www.dnr.state.mn.us/ecological_services/lakemapping/index.html

²⁸ Fish Hook Lake Association contributed one share each year.

4. Wildlife

The brochure *Developing a Lake Management Plan*²⁹ notes that:

Minnesota's lakes are home to many species of wildlife. From our famous loons and bald eagles to muskrats, otters, and frogs, wildlife is an important part of our relationship with lakes. In fact, Minnesota's abundant wildlife can be attributed largely to our wealth of surface water. From small marshes to large lakes, these waters are essential to the survival of wildlife.

Fish Hook Lake Association participates in the Minnesota Loon Monitoring Program (MLMP). Through volunteers in this program, the DNR annually gathers information about common loon numbers on more than 600 lakes in Minnesota. This year we saw three nesting pairs on the lake and river with five live chicks.³⁰

Protection of loons during reproduction and rearing is important. In 2004, we launched an ANI [Artificial Nesting Island]—a floating manmade loon nesting platform. We anchored the ANI near a previous nesting site. Natural loon nests are made of weeds and grass located along the lake shoreline. Therefore, we lined the ANI with weeds to encourage the loons to use it. Usually, it takes one to two years before the loons use the artificial nest.

The primary agency charged with the management of Minnesota's wildlife is the Department of Natural Resources, Division of Fish and Wildlife, Wildlife Section. For Fish Hook Lake area, the DNR Area Wildlife Manager is Rob Naplin 603 1st St W, Park Rapids, MN, 56470, phone 2187328452; Katie Haws is the DNR's Non-Game Wildlife Specialist, Division of Ecological Services, 2115 Birchmont Beach Road NE, Bemidji MN 56601, and Phone: 218-755-2976.

²⁹ *Developing a Lake Management Plan* Prepared by the Interagency Lakes Coordinating Committee
Contributing agencies: Minnesota Board of Water and Soil Resources; Minnesota Department of Natural Resources; Minnesota Pollution Control Agency; Minnesota Department of Agriculture. With participation by Minnesota Lakes Association; Metropolitan Council; Hennepin Parks August 1996. found at <http://www.shorelandmanagement.org/depth/plan.pdf>

³⁰ See Appendix J Hubbard County Minnesota Volunteer Loon Survey Records for 2003

5. Exotic Species

The harmful exotic species that is of most concern to Fish Hook Lake is the zebra mussel. A lake in North-Central Crow Wing County, Lake Ossawinnamakee, near Brainerd, Minnesota, has zebra mussels. It appears from the number of mussels found that they have been present for years. The larvae were floating in the lake and adult mussels were found on boatlifts, docks, and rocks. The zebra mussel is small—about 1/4-inch in size—and can lay 10,000 eggs. They can attach to any surface, such as plants, boats, and motors. Therefore, it is important for boaters to remove all plants from their boats and trailers.³¹ It is unlawful in Minnesota to launch watercraft with prohibited aquatic plants or exotic species attached.

Zebra mussel identification cards are available from the DNR Information Center at 1-888-MINNDNR (646-6367) and the Minnesota Sea Grant Program at (218) 726-8712.

³¹ Zebra mussel information found at <http://www.mnlakes.org/HubbardCOLA/>

6. Land Use and Zoning

While there are a variety of factors that affect lake quality, we can control some factors through prudent zoning. According to Garry Johanson, prior zoning administrator for Hubbard County, "Northern Minnesota will see an increase in population of 250,000 by 2030." Hubbard County will grow by 56 percent according to the Minnesota Center of Demographics.³²

Hubbard County uses the DNR lake classifications in their zoning regulations. The DNR classifications are: General Development (GD), Recreational Development (RD), or Natural Environmental (NE) lakes. Hubbard County used these classifications to establish minimum lot area and setbacks to preserve the nature reflected by the lake classification.

Fish Hook is a Recreational Development Lake. The Hubbard County Shoreland Ordinance explains that

The Recreational Development (RD) management district is established to manage proposed development reasonably consistent with existing development and use; to provide for the beneficial use of public waters by the general public, as well as the riparian owners; to provide for a multiplicity of lake uses; and to protect areas unsuitable for residential and commercial uses from development.³³

Hubbard County's web site offers contact information regarding planning and zoning matters.³⁴ Links to the Environmental Services Department and Planning and Zoning Department provide details on shoreland standards, answers to frequently asked questions, and educational resources.

The Hubbard County Shoreland Management Ordinance policy underscores the concern for the shorelands:

The uncontrolled use of shorelands of Hubbard County, Minnesota affects the public health, safety and general welfare not only by contributing to pollution of public waters, but also by impairing the local tax base. It is, therefore, in the best interest of the public health, safety and welfare to provide for the wise subdivision, use and development of shorelands of public waters. The Minnesota State Legislature has delegated responsibility to local governments of the state to regulate the subdivision, use, and development of the shorelands of public waters in order to preserve and enhance the quality of surface waters, conserve the economic

³² The Minnesota Center for Demographics projects Becker County's population to grow 24 percent by 2030 --below the expected statewide growth of 27 percent. Other counties known for their lakes will see explosive growth, as projected by state demographers. Otter Tail County's population will grow by 37 percent. Hubbard County, which includes Park Rapids, will grow by 56 percent. Douglas County, which includes Alexandria, will see 41 percent growth.

³³ Hubbard County Shoreland Ordinance Section 302 Management Goals and Objectives at <http://www.co.hubbard.mn.us/Ordinances/ORDINANCE%20SEVENTEEN.htm>

³⁴ Hubbard County website at : <http://www.co.hubbard.mn.us>

and natural environmental values of shorelands, and to provide for the wise use of waters and related land resources. This responsibility is hereby recognized by Hubbard County, and will be accomplished through the enforcement of this Ordinance, which shall be known and cited as the Hubbard County Shoreland Management Ordinance.³⁵

The city of Park Rapids governs the Fish Hook River and parts of Mud Lake. Therefore, municipal shoreline ordinances would also apply to this section. In the city, there is concern about adequate stormwater retention and treatment.

Minnesota is seeing trends of conversion of resorts into Planned Unit Developments [PUD]. In Hubbard County, near Fish Hook Lake, there has been a growth in housing plats, including conversion of agricultural land into residential developments. Fish Hook Lake has seen some conversion of seasonal cabins or undeveloped areas into year round homes.

In 2004, there are 364 property owners identified on the lake and river.

³⁵ Hubbard County Shoreland Ordinance Section 102 Policy at <http://www.co.hubbard.mn.us/Ordinances/ORDINANCE%20SEVENTEEN.htm>

7. Managing Water Surface Use Conflicts

Lake management is to provide benefits that attract homeowners and users. However, wherever there are people, there are conflicts among uses. We hope through this process to promote resolution of conflicts by working collaboratively to arrive at solutions.

At the DNR, the Bureau of Information and Education is responsible for managing surface water use conflicts—The Boat and Water Safety Section administers the Water Surface Use Management (WSUM) program. The goal of their program is to enhance the recreational use and enjoyment of the water surface in Minnesota while protecting the natural resources.

The MDNR Boat and Water Safety³⁶ maintains that a water ordinance must:

- Accommodate all compatible recreational uses; where feasible,
- Minimize adverse impacts on natural resources
- Minimize conflicts between users in a way that provides for maximum use, safety, and enjoyment, and
- Conform to the standards set in law and rule.

Encouraging community education is a good approach to managing conflicts. Annual distribution of state standards for watercraft operation, setbacks from shorelands, loon nests, swimming areas, and other topics helps create public awareness of proper activities.

Fish Hook Association distributes “welcome packets” with state and local information to assist in educating our community.

For information on water surface use management, contact:
Minnesota DNR Boat and Water Safety Section
500 Lafayette Road
St. Paul, MN 55155-4046
E-mail: info@dnr.state.mn.us
(651) 296-3336 or toll-free: 1-888-MINNDNR (646-6367)

³⁶ At <http://www.dnr.state.mn.us/regulations/boatwater/surfaceusezoning.html>

8 Public water access

The Minnesota Department of Natural Resources, Trails and Waterways Unit is responsible for public water access including the acquisition, development, and management of access sites. The DNR can manage the access itself or contract with county or local government. The goal of the DNR public water access program is free public access to all of Minnesota's lake and river resources consistent with demand and capabilities to provide recreation opportunities. Any lake that receives fisheries stocking must have a public access.

According to the 2002 Minnesota Department of Natural Resources Fisheries Survey, there are two public accesses on Fish Hook, as shown below:

Public Access Information³⁷

Ownership	Type	Description
County	Concrete	County-owned access located on the southwest shore.
County	Concrete	County-owned access located in Heartland Park on the Fish Hook River south of the lake.

The Heartland Park public access has restroom facilities. At the Fish Hook public access, the Fish Hook Association has performed volunteer inspections for exotic species and provided signage to alert access users to exotic plant identification and problems.

³⁷ Lake Information Report at <http://www.dnr.state.mn.us/lakefind/showreport.html?downum=29024200>

III. Summary of Visioning/Planning Session

On April 24, 2004, the Fish Hook Association held an inclusive community planning/visioning session, designed to identify key community concerns, assets, opportunities, and priorities.

We advertised in the local paper and sent announcements to key community partners and all Fish Hook Association members.

Larry Wannebo, Initiative Foundation facilitator for Healthy Lakes and Rivers Program, facilitated this planning session.

We agreed that our foremost goal is to increase participation of the entire membership of our association. We understand that we are the stakeholders in the future of Fish Hook Lake and River. To further membership participation, we will form teams to work on our focus areas. We will also identify neighborhood teams to monitor their area of the lake.

We agreed that we would present a summary of this session at our annual association meeting. Prior to the annual meeting, in June 2004, we met and further discussed our goals and plans.

Prioritized Goals and Action Plan

We chose to work on these issues:

1. Association membership;
2. Water quality;
3. Invasive species: Aquatic vegetation/exotic species; and
4. Land use and zoning.

Education is an ongoing process and necessary for all our goals. We will share this document with the Fish Hook Association membership as an educational tool. We hope that the sharing of this document will promote our number one goal—larger membership participation.

Specifically, for each goal we have attempted to answer in the table below:

- the criteria for measuring success
- our schedule for implementation
- who is responsible
- the budget for this action/goal

Goals	Action	Success Criteria	Implementation	Who is responsible	Budget
Increase Association membership	Education of membership benefits: list of FHILA actions	Increased number of members	June 2004 meeting; in Fall 2004 newsletter	Membership committee	vary
	Lake Management Plan	To Initiative Foundation by June 2005	Began June 2004; shared with 2004 annual meeting	FHILA Board	plan earns grant money
Water Quality: to monitor and increase clarity	Continue Secchi disc monitoring	Secchi Disc readings to MPCA	Ongoing and continuous	Mike McCann	time
	compare for trends	Trends go up rather than down	Ongoing and continuous	FHILA Board	Time
	Compare to other NLF lakes	Better than 50% of other NLF lakes	Ongoing and continuous	FHILA Board	Time
	Education		Sponsor at least one educational activity per summer	FHILA Board	Vary

	Education: New state law Jan 2005	No lawn phosphorus	6/2004 annual meeting (done); 6/2005 annual meeting	FHLA Board	time
	Participate in Loon Watch	Continued loon presence on lake	Done for summer 2004	Designated loon watcher	time
Invasive Species	Education: Signage at public access	No foreign species	Ongoing and continuous	FHLA Board	Done
	Education: what to look for and who to report to	No foreign species	In Welcome Packet and yearly at annual meeting	Membership committee	Packet costs
	Neighborhood watch	Monitor neighborhood areas for invasives, esp. curlyleaf pondweed	Began 2004 with monitor of lake for curlyleaf pondweed by volunteers; Implementation of neighborhood watch planned for 6/2005	Neighborhood Committees	None
	Assist Portage Lake with one share spraying cost	No curly pondweed in Fish Hook	Spring 2005 (did in 2003 & 2004)	FHLA Board	\$85 (\$218 in 2003 & 2004)
Land Use and Zoning	Education— use the newsletter for continued education on issues		Ongoing and continuous— plan at least one article per newsletter	Government committee	mailing cost
	Maintain membership in COLA	participation	participate in meetings; read COLA news	COLA representative	time
	monitor Shoreland ordinances	Aware of any proposed changes; comment if necessary	Attend meetings regarding proposed changes	Government committee	vary
	Monitor local zoning issues	Local officials at Board and/or	2004: Hubbard Cty planner to Board meeting	FHLA President	Thank you

		annual meetings	and spoke at annual meeting		
			2005: invite Park Rapids new Planning Administrator Mike Strodman to Board meeting	FHLA President	Thank you
	Attend local meetings Governor Clean Water Initiative	Attendance at local meetings Governor Clean Water Initiative	Monitor results of Initiative	FHLA Board	Two FHLA Board members attended

In conclusion, we will share this plan with the Initiative Foundation and the Healthy Lakes & Rivers Partnership program for Hubbard County. The plan will be reviewed and revised at our September 2005 Board meeting.

We hope that we have achieved our objectives in this document and above all else created in this Lake Management Plan an assessment of what we as stakeholders can influence, what our desired outcomes are, and how we will participate in shaping our lake's destiny.

Appendix A
Fish Hook Lake and River Association Bylaws

**BY-LAWS
OF THE FISH HOOK LAKE AND RIVER ASSOCIATION, INC.**

**ARTICLE I.
MANAGEMENT**

1. Management. The management of the business and affairs of the Corporation shall be in the hands of a Board of Directors, who shall be chosen by a majority vote of all members present at the annual meeting of said Corporation.

2. Election. At such annual meeting the Corporation shall elect up to 11 directors. The term for directors shall be three years. Board members must be composed of both Lake and River members. The COLA representative and the Membership chairman can be elected members of the Board or they can be positions appointed by the Board of Directors. The immediate past president may serve on the Board of Directors in an advisory capacity with no voting privileges and is in addition to the 11 elected directors.

3. Vacancies. The Board of Directors shall have the power to fill any vacancies occurring in said Board for any cause other than expiration of term of office. Persons appointed to fill such vacancies shall only serve until the next annual meeting.

Should any member of the Board of Directors miss three consecutive meetings of the Board, the office may be declared vacant on vote of the majority of all members of the Board of Directors.

4. Officers. At the first meeting of the Board of Directors after the annual meeting, the Board of Directors shall elect officers for the coming year. The officers of the Corporation shall be: President, Vice-President, Secretary, and Treasurer and shall be chosen from the Board of Directors. The Secretary and Treasurer may be combined into a single office. A simple majority in number of the Board of Directors shall constitute a quorum.

5. President. The President, and in his/her absence, the Vice-President, shall preside at all meetings of the Corporation and at all meetings of the Board of Directors. The President shall have the power to appoint such committees as may be necessary, with the approval of the Board of Directors. These committees shall act under the direction of the Board of Directors.

6. Secretary. The Secretary shall keep a record of all meetings of the Corporation and of the Board of Directors and perform such duties as are usually performed by secretaries of such corporations.

7. Treasurer. The Treasurer shall keep safely all the funds of the Corporation and remit funds as provided by the constitution and by-laws of the Corporation. At each annual meeting he/she shall render a complete statement of the finances of the Corporation for the past year, and such other statements from time to time as shall be required by the Board of Directors.

8. Removal. Any officer of the Corporation may be removed from office for malfeasance of duties by two-thirds vote of the Board of Directors.

9. Quorum. A Quorum shall consist of ten percent of the total number of members.

10. Meetings of Directors. Regular meetings of the Board of Directors shall be held at least 4 times a year at such time and place as shall be designated by the President. Directors shall be notified prior to the date of the meeting. Special meetings may be held at the call of the President or at the request of any director submitted to the Secretary who will notify the President.

ARTICLE II. MEMBERSHIP

1. Classes. The membership of the Corporation shall be made up of a single class.

2. Membership. Any owner or occupier of lands within 1000 feet of Fish Hook Lake or Fish Hook River in Hubbard County, Minnesota, is eligible for membership. Any interested person may become an associate member by paying the annual dues. However, they shall not have voting privileges.

3. Voting. Each member who has paid his/her annual dues shall have one vote. A husband and wife are viewed as a single member and shall have only one vote. However, if each spouse has paid his/her annual dues, then each of them shall have one vote.

4. Members meeting. The annual meeting of the Corporation for the selection of a Board of Directors and other business shall be held during the summer months at the discretion of the Board of Directors. Meetings of the Corporation may be called at any time by order of any officer or by three members of the Board of Directors or by ten members upon notification to the Secretary, who shall notify all members by mail or telephone at least three days prior to the date for such special meeting.

ARTICLE III. DUES AND FEES

1. Dues. The annual dues shall be set by the Board of Directors and are due and payable by July 1st. The Membership chairperson shall mail bills to the members on or about May 1st of each year.
2. Reductions. No reductions in dues shall be made to persons paying dues after July 1st.
3. Refunds. Members resigning shall receive no refunds.
4. Membership List. The Membership chairperson shall maintain a list indicating each member's (and spouse's) name, address, phone number, e-mail and dues status. The list shall be confidential with the exception of COLA.
5. Assessment of members. The Board of Directors may assess the membership during the course of the year to support special projects or extraordinary expenses. Statements or bills for assessments shall be sent at the direction of the Board of Directors, all such bills payable within 30 days.

ARTICLE IV. SPECIAL COMMITTEES

1. Appointment. The President and the Board of Directors shall appoint such special committees as they deem fit.
2. Duties. Special committees shall perform such duties as shall be designated by the Board of Directors.
3. Expenses. All expenses incurred in the special committees shall be audited, checked and approved for payment by the Chairperson of the committee under whom such expenses is incurred before being paid by the Treasurer.

ARTICLE V. FINANCES

1. Limit of Indebtedness. The Board of Directors shall not incur any indebtedness on the part of the Corporation in excess of money in the hands of the Treasurer, and the debts, dues, and obligations in process of collection from the membership, less amount of unexpected appropriations unless such indebtedness be authorized by the Corporation at the annual meeting or at a special meeting called for that purpose.

2. Allocations. The Board of Directors shall not allocate more than \$1000 from the Corporation's treasury to be spent without the approval of the membership at a membership meeting or by a vote of the membership by mail.

3. Scholarship. A scholarship fund shall be set up to award a scholarship to a high school senior who plans to pursue a career in Biology, Environmental Studies, or any DNR related field of study.

4. Special Funds. An Environmental Fund shall be set aside for a major crisis or pollution clean-up. This fund will come from 25% of the dues collected each year.

5. Money Requests. Any requests for money from the Corporation's funds must be submitted in writing to the President at least 14 days before the next Board meeting. There shall be a form to fill out to make the request.

6. Annual Report. The Board of Directors shall at the annual meeting report on the condition of the Corporation including membership, a complete account of the financial transactions of the past year, and offer suggestions for the welfare and improvement of the Corporation. Any written reports shall be kept on file in the archives of the Corporation and shall be subject to the inspection of any member.

ARTICLE VI. SEAL

1. Seal. The Corporation shall act without seal.

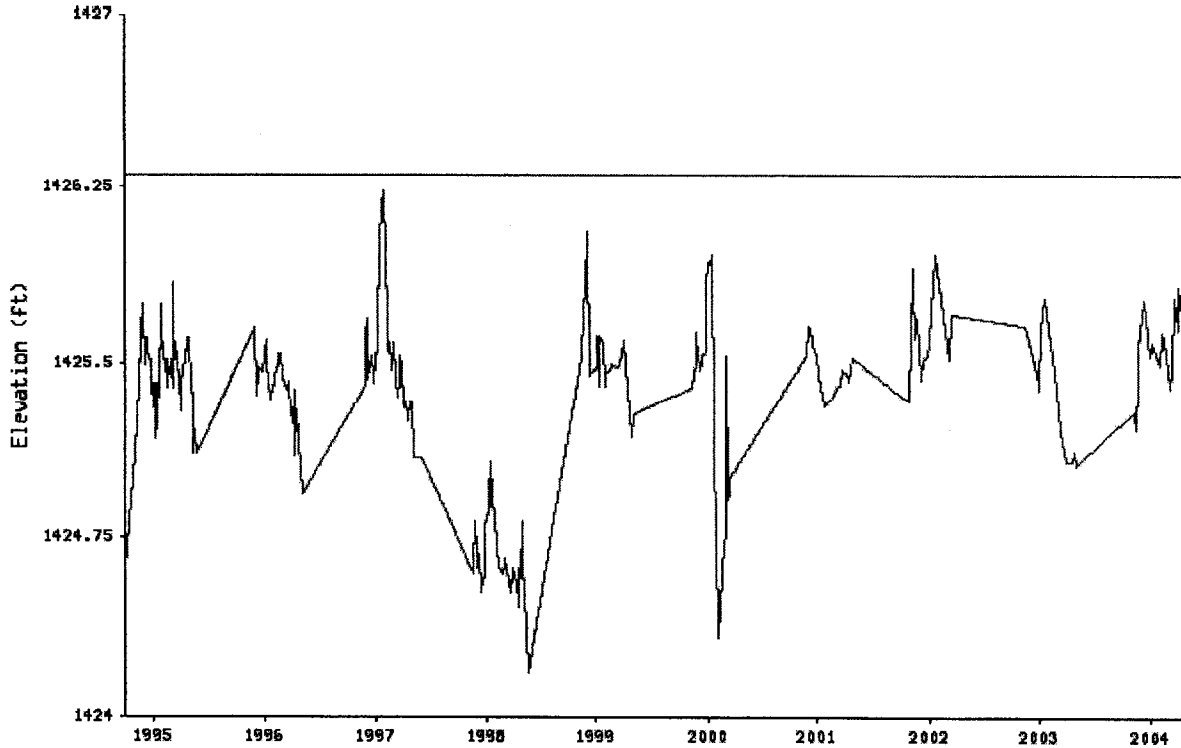
ARTICLE VII. AMENDMENTS

1. Amendments. The By-Laws may be modified, altered, or amended by two-thirds vote of the members present at the annual meeting of the Corporation, or at a special meeting called for that purpose, provided that due notice of any proposed modification, alteration, or amendment shall be given to all members, giving the substance of such modification, alteration, or amendment.

Adopted by the Board of Directors in May 2001 pending ratification by the membership at the annual meeting on July 13, 2001.

Appendix B
Water Level Data

Fish Hook - 29024200



Water Level Data--Last 10 years of data³⁸

Period of record: 06/16/1977 to 10/07/2004

of readings: 599

Highest recorded: 1426.23 ft (07/14/1997)

Lowest recorded: 1424.11 ft (06/24/1988)

Recorded range: 2.12 ft

Average water level: 1425.46 ft

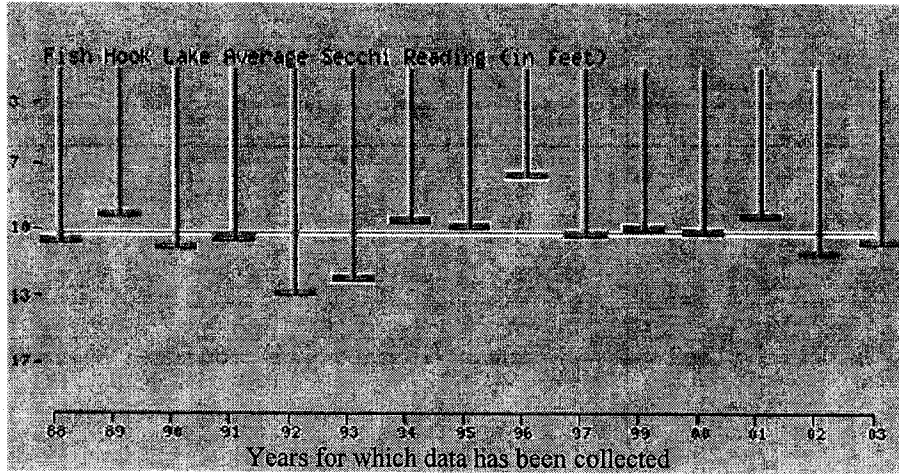
Last reading: 1425.63 ft (10/07/2004)

Ordinary High Water Level (OHWL) elevation: 1426.3 ft

³⁸Water Level Data at <http://www.dnr.state.mn.us/lakefind/showlevel.html?id=29024200>

Appendix C Secchi Disc Readings

This following graph represents Secchi disc readings, expressed in units of feet, collected by volunteers in the Citizen Lake-Monitoring Program.

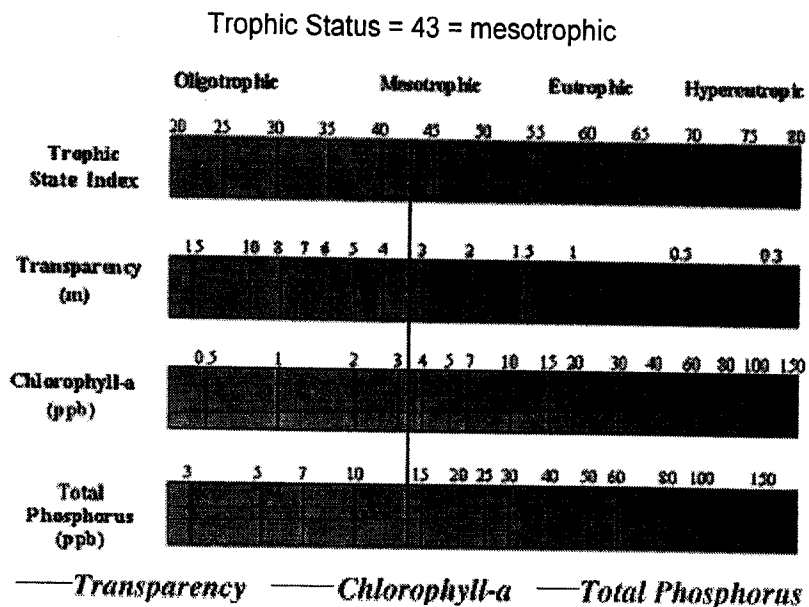


Citizen Lake Monitoring Graph³⁹

³⁹Graph found at <http://www.pca.state.mn.us/water/clmp/clmpSearchResult.cfm?lakeID=29-0242>

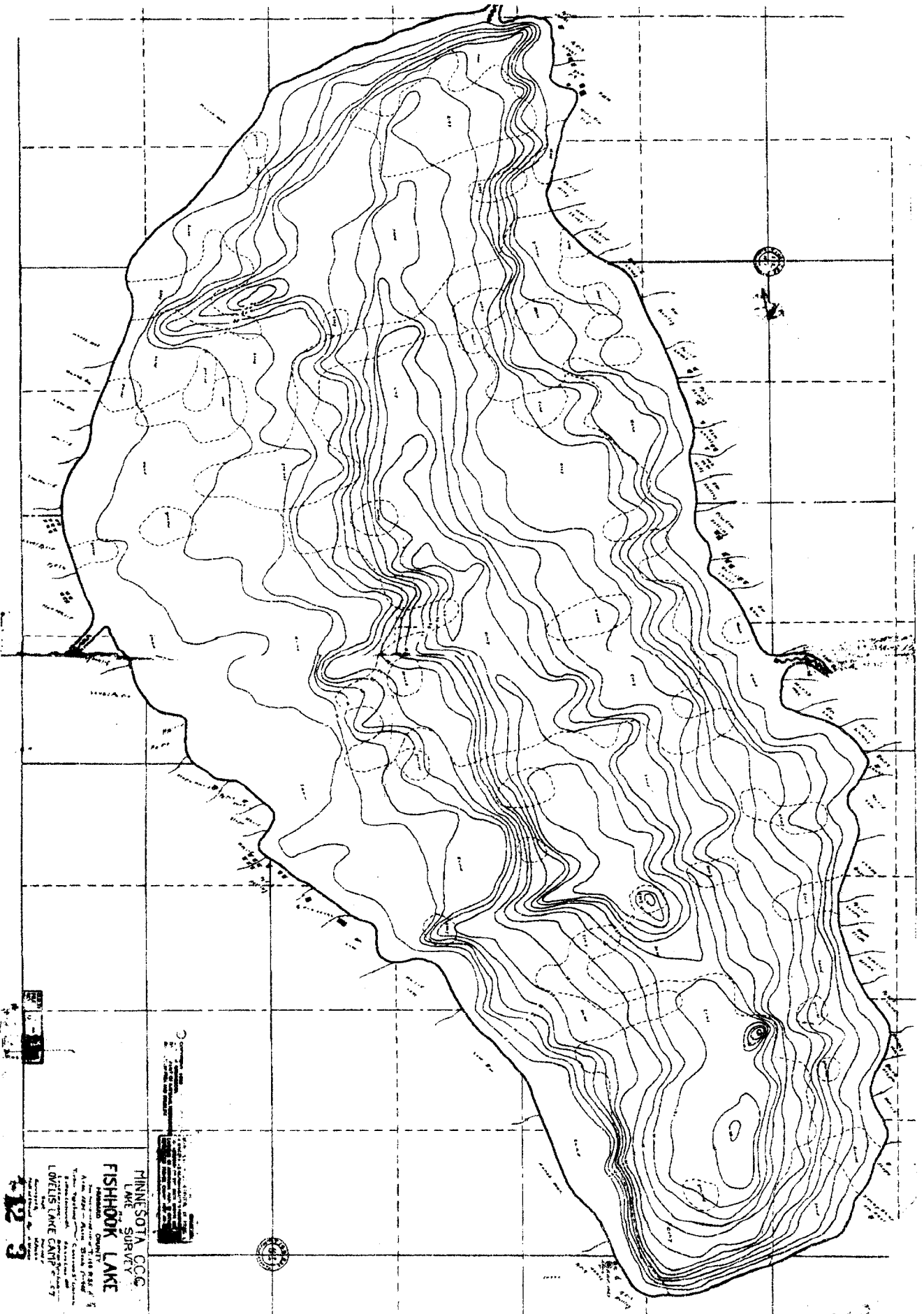
Appendix D

Lake Water Quality Summary Information⁴⁰



⁴⁰Trophic graph from <http://www.pca.state.mn.us/water/clmp/lkwqReadFull.cfm?lakeid=29-0242>

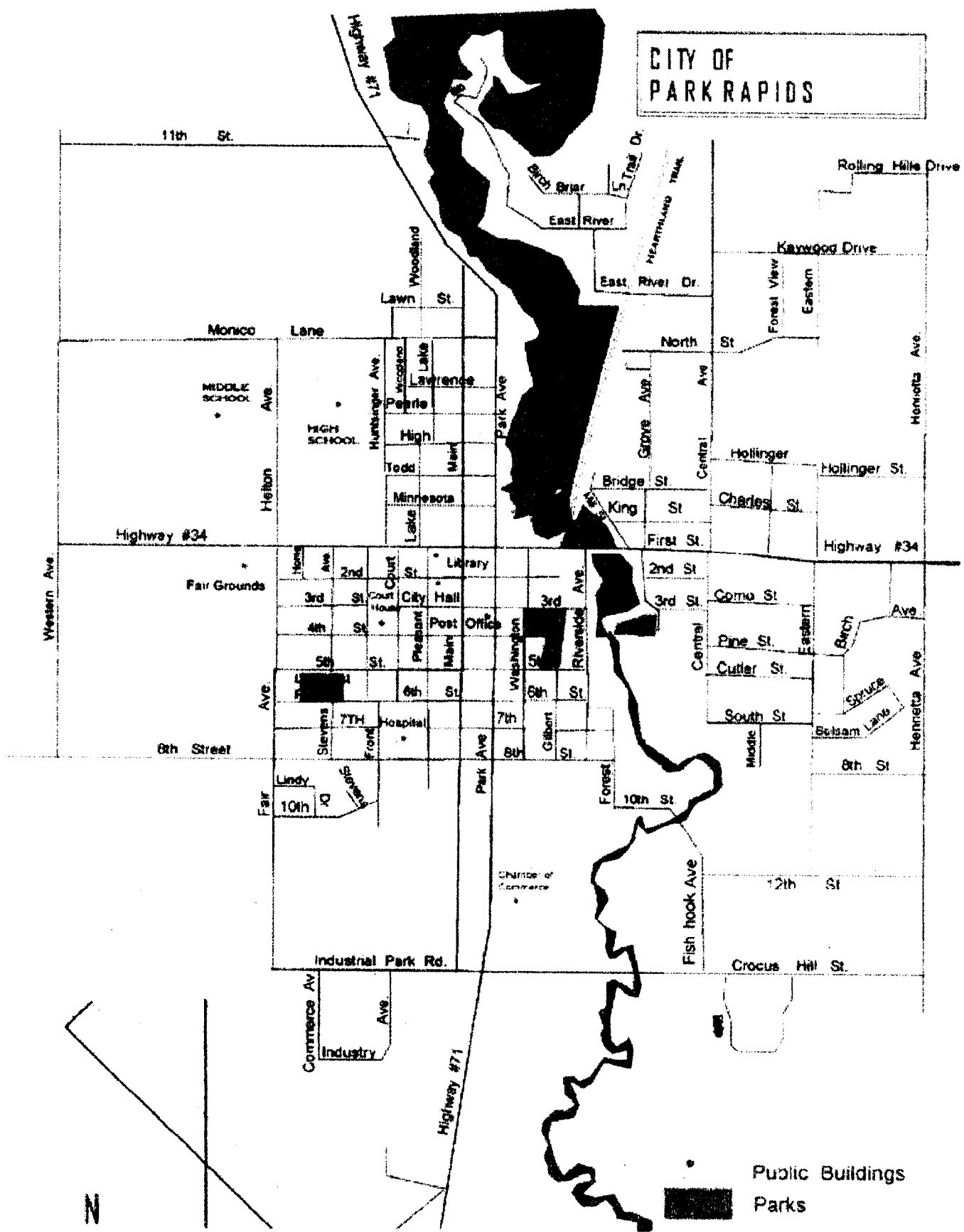
Appendix E
Area Map



MINNESOTA C.C.C.
 LAKE SURVEY
FISHHOOK LAKE
 LAUREL LAKE CAMP
 1927

3
 2
 1

CITY OF PARK RAPIDS



Appendix F
1991 Lake Assessment Program [LAP] Study of Fish Hook Lake⁴¹

⁴¹ Fish Hook Lake Assessment Program 1991 [LAP] at <http://www.pca.state.mn.us/publications/reports/lar-29-0242.pdf>

Lake Assessment Program 1991

Fishhook Lake

(I.D. #29-242)

RECEIVED

OCT 09 1992

M.P.C.A.
Water Quality Div.

Hubbard County, Minnesota

**Hubbard County Environmental Services
Beltrami County Soil and Water Conservation District
Fishhook Lake Association
Minnesota Pollution Control Agency
Headwaters Regional Development Commission**

June, 1992

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Conversion Factors

This report's discussions assume that the reader is familiar with basic water quality terminology as used in the "Citizens' Guide to Lake Protection". Commonly used abbreviations in this report include:

ug/l = micrograms per liter = parts per billion [These are the "normal" units for phosphorus and chlorophyll (algae) and are the smallest units of measure in this report.]

mg/l = milligrams per liter = parts per million [These are the next largest units of measure and are typically used for alkalinity, nitrogen, total solids and chloride concentrations.]

m = meters = 3.3 feet

km = kilometer = 3,280 feet, which is about 0.6 miles

ha = hectare = 2.5 acres

1 square mile = 2.6 RM

1 square mile = 640 acres

1 acre-foot = 1 foot of water over one acre

Executive Summary, Conclusions, and Recommendations

Fish Hook Lake is located approximately one-half mile north of Park Rapids, Minnesota in Hubbard County. Its surface area is 1,634 acres, maximum depth is approximately 76 feet and average depth is about 26 feet.

It has a large watershed area of 129,252 acres and is connected upstream via the Potato River to Potato Lake which is connected in turn to large lakes such as Eagle and Island. Portage Lake, a shallow lake basin drains into Fish Hook along the western shore. The Fish Hook River drains to the south through the City of Park Rapids where it connects with the Straight River.

Total phosphorus concentrations measured during the open water season of 1991 averaged 18.4 ug/l (micrograms per liter) +/- 7.13 ug/l. Chlorophyll-a concentrations averaged 3.77 +/- 1.47 ug/l. Secchi disk transparency averaged 10.3 +/- 2.2 feet over the monitoring period. Average TSI using Carlson's Trophic State Index was 44.5 which indicates a mesotrophic condition.

In general, considering the large size of the watershed, water quality in Fish Hook Lake is somewhat better than computer models such as MINLEAP and the Reckhow-Simpson model would indicate. This may in part be due to the fact that upstream lakes and wetlands act as nutrient sinks, trapping phosphorus before it can be transported to Fish Hook. It is important, therefore, to protect the existing water quality in the face of continuing development.

Watershed and lakeshore protection should begin with educational efforts aimed at both lakeshore residents and landowners within the watershed. Enforcement of current shoreland regulations and careful land use planning should help to protect the water quality in Fish Hook Lake.

Conclusions:

The water quality in Fish Hook Lake, based on 1991 sampling, is consistent with what would be expected for lakes in the Northern Lakes and Forests Ecoregion. The lake generally has better water quality than would be expected based on computer models such as MINLEAP and Reckhow-Simpson. This may in part be due to the fact that the models overestimate the amount of phosphorus loaded directly into the lake from the large watershed. Upstream lakes and wetlands may act as sinks and intercept this phosphorus load before it reaches Fish Hook. Extremely wet years, with more water moving through the upstream lakes and wetlands, may transport nutrients into Fish Hook and cause a decrease in water quality. These fluctuations in water quality on a year-to-year basis are to be expected and only continued monitoring will determine the limits of those fluctuations. If water quality changes exceed those limits, then corrective measures will have to be initiated before water quality is severely degraded. Continued participation in the CLMP program will provide a cost-effective monitoring system. Basic water chemistry could be sampled every 3-5 years in order to assure the accuracy of Secchi Disk transparency readings.

Recommendations:

The following recommendations are based on conclusions developed as a result of this study:

1. The Fish Hook Lake Association should continue to gather information on the water quality in Fish Hook Lake by continuing Secchi disk transparency monitoring and lake level monitoring as

they have done in the past. Volunteer monitoring efforts such as CLMP and lake level monitoring are cost-effective and can provide information on trends in water quality. This information can be used to initiate corrective measures before the lake water quality has been too severely degraded.

- B
2. The Fish Hook Lake Association should continue to work with its members and other lake management groups including local and state agencies and the Hubbard County Coalition of Lake Associations to provide information and education materials to lakeshore members and other landowners within the watershed for the lake. This may be an opportunity to work closely with other lake associations on lakes upstream from Fish Hook. As the computer models suggest, these lakes may act as "sinks" for some of the phosphorus loading that would normally reach Fish Hook. Protecting these upstream lakes will help assure the water quality in Fish Hook Lake.

Educational materials are available from the MPCA, MNDNR, and County offices such as Soil and Water Conservation District, Environmental Services and County Extension. These agencies may provide assistance in this educational effort.

- B
3. The Fish Hook Lake Association conducted a septic survey in conjunction with this lake assessment. Efforts should be made to continue the effort to bring non-complying systems into compliance with state and county codes. The lake association may wish to request assistance from the Hubbard County Environmental Services Office to accomplish this goal. To place the potential impact from septic systems on the lake in perspective, if there were a large percentage of poor systems, then leaking septic tanks could contribute as much as 5-20 percent of the current estimated phosphorus income to the lake.
 4. Development within the watershed should proceed in such a manner as to minimize water quality degradation in the lake. Major shifts in current land use patterns must be studied carefully for their impact on Fish Hook Lake and the lakes upstream. Wetlands can serve as "filters" for surface and groundwater quality and should not be drained. These natural filters can be overloaded, however, and use of these ecosystems as "sinks" and "filters" should be limited to their natural capacity. The Hubbard County Planning Commission and Hubbard County Board of Commissioners will have a significant impact in this area, as they make decisions regarding land use controls.
 5. Protection of groundwater quality from toxic materials and other pollutants such as excess fertilizer and chemical usage is not only important from the standpoint of drinking water quality but is also important because there is undoubtedly some groundwater flow into and out of Fish Hook Lake. Pollutants could be transmitted to the lake waters which could affect fish and other aquatic life. Use of the lake could be affected and this would have a detrimental effect on the economy in the Park Rapids area.
 6. The Fish Hook Lake Association can help state agencies such as the Department of Natural Resources by educating its members about exotic species such as Eurasian Water Milfoil, Purple Loosestrife and Zebra Mussels. Volunteering to conduct inspections at boat landings will help to raise awareness about exotic species. In many cases the only time that infestations of exotic species can be eradicated is during the initial invasion stage. Regular checks for exotics such as Eurasian Water Milfoil may allow for its detection in time for control actions to be effective. The lake association members may want to conduct regular examinations for the presence of exotic species.
- R

7. Future water monitoring efforts should include:

- a. CLMP participation
- b. Water level monitoring
- c. Aquatic plant surveys
- d. Basic water chemistry every 3-5 years — unless routine Secchi disk monitoring as mentioned above indicates a dramatic change.
- e. Monitor inflows into the lake to more accurately determine the actual nutrient loading.
- f. Continue refinement of computer models based on additional data.

Appendix G
Hubbard County Secchi Transparency
Minnesota Pollution Control Agency Water Quality #2.29 November 2003⁴²

Detecting trends in water quality over time is a primary goal for many lake programs. For Minnesota Pollution Control Agency (MPCA) analysis . . . Secchi transparency is one of the best parameters for determining a lake's overall health (trophic status) and assessing trends in Minnesota lakes. Transparency is a preferred parameter for many reasons: low cost, easily incorporated in existing lake monitoring programs, and it allows for the collection of a large number of samples in a given sampling period on many different lakes. Transparency of a lake may vary from year to year in response to changes in amounts of algae, watershed runoff, precipitation, and many other factors.

HUBBARD COUNTY LAKES

There were 30 lakes in Hubbard County that met the minimum data requirements for trend analysis. Of these, eight exhibited significant improvements in transparency, 20 exhibited no change in transparency, and there were two lakes with a significant decline in transparency over time. The Hubbard County lakes had data sets spanning eight to 25 years. Lakes within each category will be listed alphabetically by

Lake Name/Nearest City/# Years Monitored/Last Year of Available Data.

Lakes with Improving Trends in Transparency:

Belle Taine/Dorset/10/2002; Big Bass/Akeley/11/2002; Boulder/Dorset/8/1997; Kabekona/Laporte/17/2002; Little Sand/Dorset/16/2002; Palmer/Park Rapids/13/2002; Potato/Park Rapids/13/2002; Spider (East)/Nevis/19/2002;

Lakes with No Trends in Transparency:

Big Sand/Park Rapids/16/2002; Big Stony/Hubbard/14/2002; Crooked (East)/Nevis/8/2001; Eagle/Park Rapids/8/2002; Eighth Crow Wing/Nevis/9/2002; Fifth Crow Wing/Nevis/14/2002; First Crow Wing/Badoura/10/2002; Fish Hook/Park Rapids/13/2002; Garfield/Laporte/16/2002; Gilmore/Nevis/13/2002; Lord/Park Rapids/12/1999; Mantrap (East)/Dorset/13/2002; Mantrap (Middle)/Dorset/15/2002; Mantrap (West)/Dorset/12/2002; Midge/Bemidji/20/1995; Portage/Park Rapids/17/2002; Sixth Crow Wing/Nevis/12/2002; Spearhead/Bemidji/15/2002; Third Crow Wing/Nevis/25/2002; Upper Bottle/Park Rapids/15/2002;

Lakes with Negative Trends in Transparency:

Long/Park Rapids/19/2002; Mantrap (Home)/Dorset/12/2002

⁴² <http://www.pca.state.mn.us/publications/clmp-hubbard.pdf>



**Minnesota
Pollution
Control
Agency**

Environmental
Outcomes Division
Environmental
Standards &
Analysis Section

Hubbard Co. Secchi Transparency

Water Quality #2.29 November, 2003

SECCHI TRANSPARENCY



Secchi transparency measurements provide a basis for assessing current water quality, estimating trophic status (overall health and productivity) and documenting water quality trends over time. It is a measure of water clarity and varies greatly among Minnesota's lakes. In most Minnesota lakes, Secchi transparency provides an indirect measure of the amount of algae in the water; however, suspended sediments (soils), or color due to dissolved organic materials, can limit transparency as well. These dissolved organic materials create the "tea" or "coffee" color of lakes and rivers such as Big Sandy Lake in Aitkin County or the St. Croix River. Calcium carbonates in the water, creating the extreme turquoise color in lakes such as Bluewater Lake in Itasca County, can also limit transparency.

WATER QUALITY TRENDS

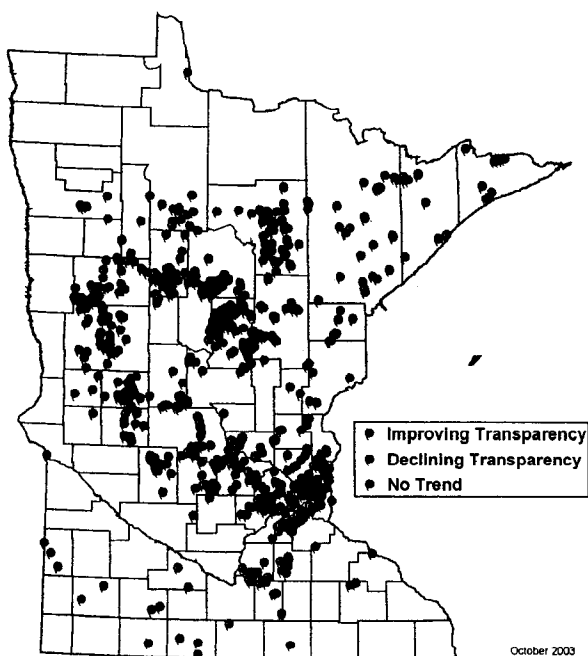
Detecting trends in water quality over time is a primary goal for many lake programs. For Minnesota Pollution Control Agency (MPCA) analysis, detecting trends requires taking a minimum of 4 readings each summer for 8 to 10 years. Secchi transparency is one of the best parameters for determining a lake's overall health (trophic status) and assessing trends in Minnesota lakes. Transparency is a preferred parameter for many reasons: low cost, easily incorporated in existing lake monitoring programs, and it allows for the collection of a large number of samples in a given sampling period on many different lakes. Transparency of a lake may vary from year to year in response to changes in amounts of algae, watershed runoff, precipitation and many other factors. It is important to consider

all of these aspects when determining if any significant long-term changes have occurred, or if changes are random in nature.

All available Secchi transparency data from STORET (U.S. EPA's national water quality database) were used for the 2002 assessments. The majority of the data collected is from volunteer lake monitors in the MPCA's Citizen Lake-Monitoring Program (CLMP). This program began in 1973, and involves the voluntary participation of citizens who live and recreate on Minnesota lakes. These volunteers provide the state and many others with valuable information on the water quality of Minnesota's lakes. In fact, for many lakes, CLMP data is the only water quality information available. This program continues to be a cost-effective mechanism for obtaining good, basic water quality data on many Minnesota lakes.

For our trend analysis, we ran Kendall statistical tests using WQ Stat Plus™ software on lakes with 4 or more transparency readings per summer (June – September) and 8 or more years of data. We used a probability (p) level of $p \leq 0.1$. At this p-level, there is a 10 percent chance of identifying a trend when it does not exist. There were 714 lakes in Minnesota that met the minimum requirements for trend analysis. Of the 714 assessed lakes, 177 of them exhibited a statistically significant improvement in transparency over time. In contrast, only 49 lakes exhibited a statistically significant decline in transparency. The majority (68 %) of

Transparency Trends in Minnesota



wq2-29

Minnesota Pollution Control Agency, 520 Lafayette Road North, St. Paul, Minnesota 55155-4194
(651) 296-6300, toll-free (800) 657-3864, TTY (651) 282-5332 or (800) 657-3864

This material can be made available in alternative formats for people with disabilities.



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Standards &
Analysis Section

Hubbard Co. Secchi Transparency

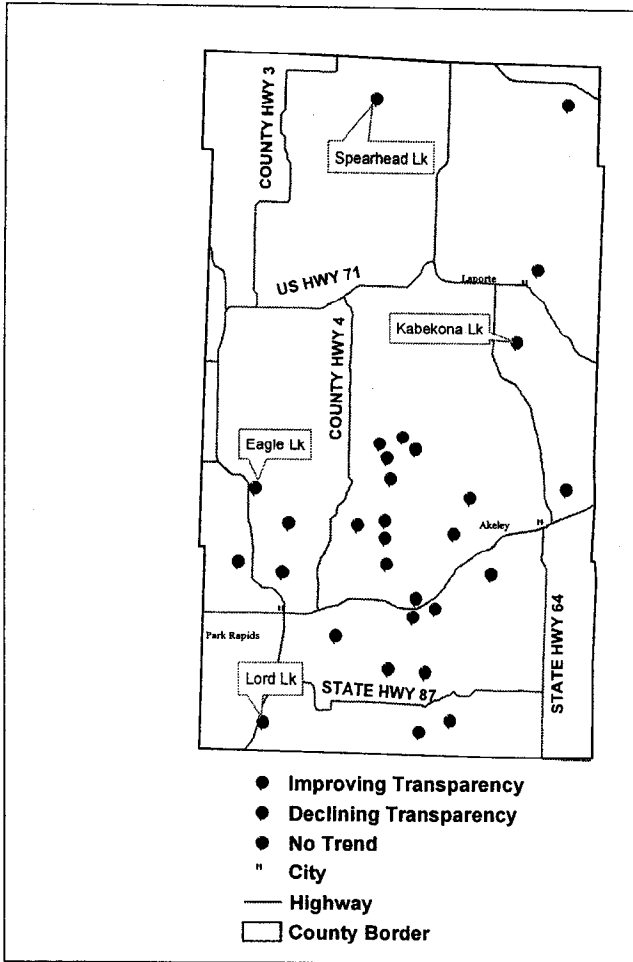
Water Quality #2.29 November, 2003

the assessed lakes (488 lakes) exhibited no change in transparency over time.



HUBBARD COUNTY LAKES

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Lakes with No Trends in Transparency:

Big Sand/Park Rapids/16/2002; Big Stony/Hubbard/14/2002; Crooked (East)/Nevis/8/2001; Eagle/Park Rapids/8/2002; Eighth Crow Wing/Nevis/9/2002; Fifth Crow Wing/Nevis/14/2002; First Crow Wing/Badoura/10/2002; Fish Hook/Park Rapids/13/2002; Garfield/Laporte/16/2002; Gilmore/Nevis/13/2002; Lord/Park Rapids/12/1999; Mantrap (East)/Dorset/13/2002; Mantrap (Middle)/Dorset/15/2002; Mantrap (West)/Dorset/12/2002; Midge/Bemidji/20/1995; Portage/Park Rapids/17/2002; Sixth Crow Wing/Nevis/12/2002; Spearhead/Bemidji/15/2002; Third Crow Wing/Nevis/25/2002; Upper Bottle/Park Rapids/15/2002;

Lakes with Negative Trends in Transparency:

Long/Park Rapids/19/2002; Mantrap (Home)/Dorset/12/2002;

Want more information? You can find out more detailed information about these and other Minnesota lakes at our web site using the search feature on our database: <http://www.data.pca.state.mn.us/pca/clmp.html> or call Jennifer Klang or Pam Skon, MPCA at (651)296-6300 or toll-free at (800)657-3864.

Appendix H
Hubbard County Population

Census 2000: Minnesota population change by county 1980-2000

County	1980	1990	2000	% Change 1980-2000	% Change 1990-2000
Hubbard	14,098	14,939	18,376	30.3	23.0

Population projections for Hubbard county 2000-2030⁴³

Year	2000	2005	2010	2015	2020	2025	2030
Population	18,376	20,160	21,950	23,810	25,550	27,160	28,590

⁴³ Minnesota State Demographic Center October 23, 2002

Appendix I
Hubbard County Shoreland Management Ordinance⁴⁴

Setback provisions:

Section 502.2. Recreational Development Lakes (Amended January 1, 1999)

- Structure setback from ordinary high water level 100 Ft.
- Structure, sewage treatment system, driveway setback from side lot line 10 Ft.
- Structure setback from Federal, State or County Highway Right of Way 50 Ft.
- Structure setback from Right of Way of other public roads 20 Ft.
- Structure and ISTS setback from top of bluff 30 Ft.
- Sewage soil treatment system setback from ordinary high water level* 150 Ft.

Impervious surface coverage shall not exceed 25 percent of the lot area.

The Hubbard County's zoning standards for the respective lake classifications are:

Standards:	General Development	Recreational Development - Unsewered	Recreational Development - Sewered	Natural Environment
Structure setback from OHW	75 ft	100 ft	100 ft	150 ft
Sewage soil treatment system setback from OHWL	150 ft	150 ft	150 ft	150 ft
Maximum Impervious Coverage	25 percent	25 percent	25 percent	25 percent
Structure and ISTS setback from top of bluff	30 ft	30 ft	30 ft	30 ft
Minimum Lot Size: Single, Riparian Lots/Non-riparian lots	20,000 sq ft/ 40,000 sq ft	40,000 sq ft/ 80,000 sq ft	30,000 sq ft/ same	80,000 sq ft/ 120,000
Minimum Lot Size: Duplex	40,000 sq ft/ 80,000 sq ft	80,000 sq ft/ 120,000 sq ft	60,000 sq ft/ same	120,000 sq ft/ 160,000
Minimum Lot Size: Triplex	60,000 sq ft/ 120,000 sq ft	120,000 sq ft/ 160,000 sq ft	90,000 sq ft/ same	160,000 sq ft/ 240,000 sq ft
Lot Width – Single	100 ft/100 ft	150 ft/150 ft	100 ft/100ft	200 ft/200 ft
Lot Width-Duplex	180 ft/265 ft	225 ft/265 ft	150 ft/150 ft	300 ft/400 ft
Side Yard Setback	10 ft	10 ft	10 ft	10 ft

⁴⁴ <http://www.co.hubbard.mn.us/Ordinances/ORDINANCE%20SEVENTEEN.htm>

Got Shoreland?

Give us a call

Hubbard County residents have the great fortune of living among the beauty of the woods and waters that make up the headwaters of the Mississippi River. We must use these precious resources wisely in order to protect our natural systems and maintain the high quality of life we have come to enjoy.

If you own property within 1000 feet of a lake or 500 feet of a river or stream, or are thinking of purchasing land near water, keep this brochure handy. It contains numbers and other resources for answering questions about using, developing and/or restoring land near waterways.

Hubbard County Environmental Services Department / 218-732-3890
www.co.hubbard.mn.us/Environmental.htm

- Shoreline alterations
- Building, remodeling
- Cutting trees and shrubs
- Rock riprap, driveways, garages, decks, etc.
- Storage sheds, boathouses
- Sanitary, septic requirements
- Shoreland setbacks and protection
- Wetlands
- 911 address
- Variances
- Drinking water test
- Commercial use
- Stormwater drainage, runoff control (also Minn. Pollution Control / 218-846-0749)

DNR contacts (www.dnr.state.mn.us)

- Aquatic plant removal / 218-732-4153
- Docks, quiet hours, etc. / 218-755-3973
- Burning permits / 218-732-3309

Other contacts

- Abandoned wells / SWCD / 218-732-0121
- Noxious weeds / County agriculture inspector's office / 218-732-2303
- Road issues / Highway Dept. / 218-732-3302
- Trash and garbage / Solid Waste office / 218-732-9568
- Wells / Dept. of Health / 218-755-3820
- Shoreland buffer, restoration / "Restore the Shore" CD / 218-327-4616 also SWCD / 218-732-0121
- Shoreland volunteer program
- Yard-care, fertilizers, environment / Minn. Extension Service / 218-732-3391

Keep in mind that in many cases, a permit or other authorization is required before beginning any work in or near a lake, river, or stream.

This brochure is provided courtesy of the Hubbard County Water Planning Task Force and is available at our web site: www.co.hubbard.mn.us/Environmental.htm

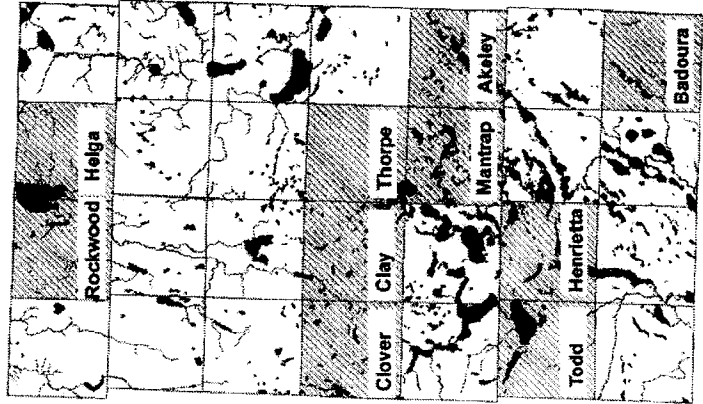
A who-to-contact guide for zoning issues and other land use topics in Hubbard County

Are you in a zone?

Many townships now require permits

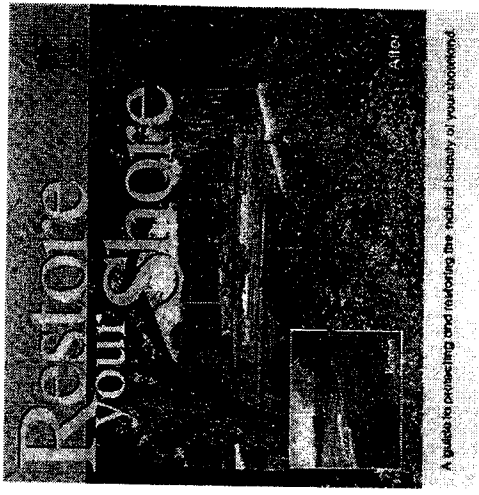
Many townships in Hubbard County (shaded areas) now have zoning laws that require permits for certain land uses and alterations; for example, if you want to add a driveway or garage, or use your property for commercial purposes. The back of this brochure lists other actions that require contacting the zoning department. Even if you're not in a township with zoning ordinances, the resources in this brochure can help you maintain and enhance the value of your property, both to you as a landowner and to the plant and animal ecosystems that exist in and near our waterways. Have questions? Contact the **Hubbard County Environmental Services**-218-732-3890, or on the web:

www.co.hubbard.mn.us/Environmental.htm.



New storm water permit needed for work affecting one acre or more

Beginning in March, 2003, construction projects (whether public or private) that disturb one or more acres of land require a General Storm Water Permit, for example, road construction/improvement, and construction of houses, office/commercial buildings, landfills, airports, and feedlots. Public ditch activities also require a permit. Agriculture and forestry are exempt. For more information about construction stormwater permits and requirements, call the Minnesota Pollution Control Agency Customer Assistance Center at 800-646-6247, or see the MPCA web site: www.pca.state.mn.us/water/stormwater/index.html.



Restore your shore with DNR CD

The borders of lakes, rivers and streams are critical areas for controlling erosion and runoff, and for providing habitat that sustains our bird, animal, and fish populations. Many resources exist to help individuals and communities maintain or improve their shoreland property. The Minnesota DNR web site includes a section devoted to choosing, managing and restoring shoreland property: www.dnr.state.mn.us/shorelandgmt/guide/index.html. You can order from this site an **interactive CD** called "Restore Your Shore" that's rich in photos, illustrations, text and audio clips that describe ways to protect and restore shorelands. The DNR toll-free number is 888-646-6367.

Dig safely

Before starting any project that involves digging, call the **Minnesota Gopher State One Call hotline: 800-252-1166**. One Call notifies the utility companies in your area to come out and mark where gas, power and other utilities are buried on your property.

Appendix J
Hubbard County Minnesota Volunteer Loon Survey Records for 2003

2003 Loon Watcher Survey Summary

county	# of lakes surveyed	# adults	# chicks	avg.# adults/lake	avg. # chicks/lake	adult loons per 100 acres	watchers
Aitkin	19	63	23	3.3	1.2	0.3	18
Anoka	10	19	7	1.9	0.7	1.3	8
Becker	9	61	20	6.7	2.2	1.1	7
Beltrami	5	30	3	6	0.6	0.8	5
Carlton	1	2	1	na	na	na	1
Cass	38	201	76	5.3	2	0.7	33
Chisago	3	9	1	3	0.3	1	3
Clearwater	1	2	0	na	na	na	3
Cook	1	2	0	na	na	na	1
Crow Wing	73	244	71	3.3	1	0.6	61
Dakota	1	2	1	na	na	na	1
Douglas	3	38	0	12.6	uk	0.4	3
Grant	1	uk	uk	uk	uk	uk	1
Hennepin	3	2	0	0.6	na	na	5
Hubbard	30	182	59	6.1	2	1.2	26
Itasca	17	157	31	9	1.8	1.3	16
Kandiyohi	1	2	1	na	na	na	1
Lake	3	12	2	4	0.6	0.8	3
Mille Lacs	1	2	0	na	na	na	1
Morrison	3	16	3	5.3	1	0.6	5
Ottertail	22	101	25	4.5	1.1	0.4	15
Pine	1	2	0	na	na	na	1
Ramsey	2	2	2	na	na	na	2
Scott	1	2	2	na	na	na	1
Sherburne	2	4	2	na	na	na	3
St. Louis	23	110	24	4.7	1	0.3	19
Stearns	12	28	9	2.3	0.8	0.5	10
Todd	10	47	17	4.7	1.7	0.8	10
Wadena	2	6	0	3	na	na	1
Washington	7	21	8	3	1.1	0.5	7
Wright	16	49	17	3.1	1.1	0.8	14
Total #	319	1,418	405				283

* Not applicable= na
 * Unknown= uk

Minnesota Volunteer Loon Survey Records for 2003

16-Mar-04

Hubbard County



COUNTY	LAKE	DOW	YEAR	T	R	ACRES	EOB	NESTING	PAIRS	ADULTS	CHICKS	NAME	ADDRESS	CITY
Hubbard	11th Crow Wing	29-036	2003	141	32	790P	Yes	1	2	0	0	ZOUBEK, STEVE	9325 NASON CT NE	ELK RIVER MN 55330
	8th Crow Wing	29-072	2003	140	32	515E	Yes	3	6	4	4	NOVAK, JUDY	21073 FOOTHILL TR	AKELEY MN 56433
	Bad Axe	29-208	2003	142	34	322E	Yes	1	6	1	1	MARTIN, JOHN	29199 JOLIET DR	PARK RAPIDS MN 5647
	Belle Taine	29-146	2003	140	33	1252E	Yes	6	24	6	6	LUNDSTROM, JACKIE & D	809 RIVERSIDE AV N	SARTELL MN 56377
	Benedict	29-048	2003	142	32	488E	Yes	2	4	3	3	KNOLL, GARY & JOYCE	PO BOX 102	BENEDICT MN 56436
	Big Mantrap	29-151	2003	141	33	1770E	Yes	16	35	10	10	LASKE, LYLE	28292 JUNCO DR	NEVIS MN 56467
	Blue	29-184	2003	141	34	364E	No	UK	2	0	0	JACOBSON, BOBBI	24684 HEARTH DR	PARK RAPIDS MN 56470
	Buck	29-206	2003	142	34	28E	Yes	1	2	1	1	MARTIN, JOHN	29199 JOLIET DR	PARK RAPIDS MN 5647
	Crooked	29-101	2003	141	33	1020E	Yes	3	6	2	2	DITTBRENNER, AL & GIN	12182 DRAKE ST NW	COON RAPIDS MN 5544
	Daisy	29-328	2003	140	33	40E	Yes	1	2	1	1	MARG, DONALD F	23791 GREENBRIER DR	NEVIS MN 56467
	Eagle	29-256	2003	141	35	440E	Yes	2	4	1	1	HUEBNER, GERE	24742 US HWY 71	PARK RAPIDS MN 56470
	Emma	29-186	2003	141	34	85E	Yes	1	2	1	1	WERDER, JERRY & MICH	20234 HUNTER RD	PARK RAPIDS MN 5647
	Fish Hook	29-242	2003	140	34	1432E	Yes	2	23	4	4	CARTER, VIRGINIA	PO BOX 5654	FARGO ND 58105
	Hinds	29-249	2003	139	35	310E	Yes	1	2	1	1	FRIDAY, WES	37122 129TH AV	MENAHGA MN 56464
	Indian	29-074	2003	141	32	54E	No	UK	2	0	0	DANIELS, TREFFLE	8900 W 31ST ST	ST LOUIS PARK MN 554
	Kabekona	29-075	2003	142	32	2607E	No	0	2	0	0	SMEBY, ROLF C	33854 LANTERN TR	LAPORTE MN 56465
	Kettle	29-001	2003	139	32	43E	Yes	1	2	2	2	MCLEVIS, RONALD	15573 STATE 64	AKELEY MN 56433
	Little Sand	29-150	2003	141	33	437E	Yes	3	6	3	3	PETERS, RICHARD	PO BOX 225	NEVIS MN 56467
	Lord	29-248	2003	139	35	79E	Yes	1	2	2	2	FREEMAN, MYRON L & L	12219 145TH AV	MENAHGA MN 56464
	Lower Bottle	29-180	2003	141	34	712E	Yes	4	15	4	4	DEWOLF, AL	25708 HART TR	PARK RAPIDS MN 56470
	Mud	29-004	2003	139	32	42E	Yes	1	2	1	1	VISHER, CHUCK	13434 BOONSTRA DR	NEVIS MN 56467
	Mud	29-119	2003	142	33	146E	UK	UK	2	UK	UK	LASKE, LYLE	28292 JUNCO DR	NEVIS MN 56467
	Mud (Fish Hook Bay)	29-251	2003	140	35	64E	Yes	1	2	1	1	SYVERSON, BONNIE & D	19424 E FISH HOOK TR	PARK RAPIDS MN 56470
	Mud (Spring)	29-065	2003	145	32	68E	Yes	1	2	0	0	LARSON, TERRY	51463 WOLF RIDGE DR	CASS LAKE MN 56633
	Spider	29-117	2003	141	33	593E	Yes	3	8	2	2	MARG, DONALD F	23791 GREENBRIER DR	NEVIS MN 56467
	Stocking	29-172	2003	141	34	111E	No	UK	4	0	0	STROMING, KARL B	20095 CR 24	PARK RAPIDS MN 56470
	Tripp	29-005	2003	139	32	151E	No	0	1	0	0	VISHER, CHUCK	13434 BOONSTRA DR	NEVIS MN 56467
	Unnamed (Thorpe)	29-120	2003	142	33	19E	Yes	1	2	2	2	FISHER, LORLIE	29659 CO RD 91	NEVIS MN 56467
	Upper Bottle	29-148	2003	141	33	505E	Yes	4	8	6	6	VANDERHOOF, DONNA	420 OAK ST	NORTHFIELD MN 55057
	Williams	29-015	2003	140	32	91E	Yes	1	2	1	1	DUCCLOS, KATHY & LINDA	32692 695TH AV	KIMBALL MN 55353

Appendix K
NLF Data

Table 4. Ecoregion reference lake data summary. Based on the interquartile range (25th – 75th percentile) for reference lakes in each ecoregion.

Parameter	Northern Lakes and Forests
Total Phosphorus (µg/L)	14 to 27
Chlorophyll mean (ug/l)	4 to 10
Chlorophyll maximum (ug/l)	< 15
Secchi Disk (feet) (meters)	8 to 15 (2.4 - 4.6)
Total Kjeldahl Nitrogen (mg/l)	0.4 to 0.75
Nitrite + Nitrate-N (mg/l)	<0.01
Alkalinity (mg/l)	40 to 140
Color (Pt-Co Units)	10 to 35
pH (SU)	7.2 to 8.3
Chloride (mg/l)	0.6 to 1.2
Total Suspended Solids (mg/l)	< 1 to 2
Total Suspended Inorganic Solids (mg/l)	< 1 to 2
Turbidity (NTU)	< 2
Conductivity (umhos/cm)	50 to 250
TN:TP ratio	25:1 to 35:1

Appendix L
Independent Lake Data Summary from RMB Environmental Laboratories, Inc



Environmental Laboratories, Inc.

- Services
- About Us
- Customer Service
- Resources
- Information
- Home
- Lakes Da

Individual Lake Data Summary

[Printer Friendly](#) [Return to](#)

RMB Environmental Laboratories, Inc.

22796 County Highway 6 - Detroit Lakes, MN 56501-7002

218-846-1465 Phone and Fax - rmbel@lakesnet.net

Robert Borash, Lab Director

Lake: Fishhook

Lake MN ID#: 29-242

Site ID#: 202

Continuous Monitoring Program Data

Date	Time	Sampler	Lab Code	TP ug/L	ChlA ug/L	Secchi Ft.	TSI Phos.	TSI ChlAL	TSI Secchi Ft.
<u>5/16/1999</u>	1400	McCann		< 5	7	9	< 27	50	46
<u>6/20/1999</u>	1500	McCann		12	6	10	43	48	44
<u>7/18/1999</u>	1100	McCann		< 5	4	8.5	< 27	44	46
<u>8/18/1999</u>	1530	McCann		10	4	9	37	44	46
<u>9/19/1999</u>	1100	McCann		< 5	6	11	< 27	48	43

Date	Time	Sampler	Lab Code	TP ug/L	ChlA ug/L	Secchi Ft.	TSI Phos.	TSI ChlAL	TSI Secchi Ft.
<u>5/14/2000</u>	17:00	McCann		15	4	13.5	43	44	40
<u>6/18/2000</u>	08:30	McCann		10	3	14	37	41	39
<u>7/16/2000</u>	13:00	McCann		22	3	9	49	41	45
<u>9/17/2000</u>	18:00	McCann		20	9	11	47	52	43

Date	Time	Sampler	Lab Code	TP ug/L	ChlA ug/L	Secchi Ft.	TSI Phos.	TSI ChlAL	TSI Secchi Ft.
<u>6/17/2001</u>	12:00	McCann		15	4	13	43	44	40
<u>7/15/2001</u>	12:00	McCann		15	4	9.5	43	44	45
<u>8/19/2001</u>	NA	McCann		15	4	NA	43	44	NA
<u>9/16/2001</u>	15:00	McCann		25	8	12	51	51	41

Date	Time	Sampler	Lab Code	TP ug/L	ChlA ug/L	Secchi Ft.	TSI Phos.	TSI ChlAL	TSI Secchi Ft.
<u>5/20/2002</u>	09:00	McCann		17	5	10	45	46	44
<u>6/16/2002</u>	14:10	McCann		20	3	23	47	41	32
<u>7/15/2002</u>	08:00	McCann		12	1	11	40	31	43
<u>8/18/2002</u>	10:00	McCann		17	2	11	45	37	43
<u>9/15/2002</u>	14:00	McCann		15	5	12	43	46	41

Date	Time	Sampler	Lab Code	TP ug/L	ChlA ug/L	Secchi Ft.	TSI Phos.	TSI ChlAL	TSI Secchi Ft.
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5/18/2003	18:00	McCann		28	6	14	52	48	NA
6/15/2003	13:00	McCann		12	2	16	40	37	37
7/20/2003	12:00	McCann		13	6	8	41	48	47
8/17/2003	18:00	McCann		14	4	9	42	44	45
9/14/2003	12:00	McCann		19	8	11	47	51	43

Date	Time	Sampler	Lab Code	TP ug/L	ChlA ug/L	Secchi Ft.	TSI Phos.	TSI ChlAL	TSI Secchi Ft.
5/16/2004	1200	McCann	33519	20	7	10	47	50	44
7/19/2004	0830	McCann	35291	15	5	9	43	46	45
8/16/2004	0730	McCann	36161	36	4		56	44	Infinity
9/19/2004	1800	McCann	37170	14	5	13	42	46	40



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Monthly Individual Lake Report

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Lake: Fishhook

Lake MN ID#: 29-242

Site ID#: 202

County: Hubbard

Lab Code #: 37170

Date/Time Sampled: 9/19/2004 - 1800

Date/Time Received: 9/20/2004 - 1525

Sampler: McCann

Sample Results

Total Phosphorus: 14 ug/l

Chlorophyll A: 5 ug/l

Secchi Disk: 13 Feet

Trophic State Index (TSI) *Calculated*

TSI Phosphorus: 42

TSI Chlorophyll A: 46

TSI Secchi: 40

TSI Month Average: 43

Trophic State: Mesotrophic

Weather Conditions

Sky Condition: partly-cloudy

Wind Direction: SE

Wind Velocity: 10-20 mph.

Water Temperature: NA °F

Air Temperature: 70 °F

Recent Precipitation: NA in. on NA

Recreational Suitability

Color of Water: Tea Stained

Wave Height (Inches): 6 in.

Physical Condition: Some Algae Present

Recreation Suitability: Minor Aesthetic Problems

Lake Uses Observed: Fishing

Erosion Problems: N/A

Appendix M Glossary

Aerobic: Aquatic life or chemical processes that require the presence of oxygen.

Algal bloom: An unusual or excessive abundance of algae.

Alkalinity: Capacity of a lake to neutralize acid.

Anoxic: The absence of oxygen in a water column or lake; can occur near the bottom of eutrophic lakes in the summer or under the ice in the winter.

Benthic: The bottom zone of a lake, or bottom-dwelling life forms.

Best Management Practices: A practice determined by a state agency or other authority as the most effective, practicable means of preventing or reducing pollution.

Bioaccumulation: Build-up of toxic substances in fish (or other living organism) flesh.

Biological Oxygen Demand: The amount of oxygen required by aerobic microorganisms to decompose the organic matter in sample of water. Used as a measure of the degree of water pollution.

Buffer Zone: Undisturbed vegetation that can serve as to slow down and/or retain surface water runoff, and assimilate nutrients.

Chlorophyll a: The green pigment in plants that is essential to photosynthesis.

Clean Water Partnership (CWP) Program: A program created by the legislature in 1990 to protect and improve ground water and surface water in Minnesota by providing financial and technical assistance to local units of government interested in controlling nonpoint source pollution.

Conservation Easement: A perpetual conservation easement is a legally binding condition placed on a deed to restrict the types of development that can occur on the subject property.

Cultural eutrophication: Accelerated "aging" of a lake because of human activities.

Epilimnion: Deeper lakes form three distinct layers of water during summertime weather. The epilimnion is the upper layer and is characterized by warmer and lighter water.

Eutrophication: The aging process by which lakes are fertilized with nutrients.

Eutrophic Lake: A nutrient-rich lake – usually shallow, “green” and with limited oxygen in the bottom layer of water.

Exotic Species (invasive species): Any non-native species that can cause displacement of or otherwise threaten native communities.

Fall Turnover: In the autumn as surface water loses temperature they are “turned under” (sink to lower depths) by winds and changes in water density until the lake has a relatively uniform distribution of temperature.

Feedlot: A lot or building or a group of lots or buildings used for the confined feeding, breeding or holding of animals. This definition includes areas specifically designed for confinement in which manure may accumulate or any area where the concentration of animals is such that a vegetative cover cannot be maintained. Lots used to feed and raise poultry are considered feedlots. Pastures are not animal feedlots.

Frontage foot: a common way to measure lakeshore property, measuring the number of feet fronting the lake.

Groundwater: water found beneath the soil surface (literally between the soil particles); groundwater is often a primary source of recharge to lakes.

Hardwater: Describes a lake with relatively high levels of dissolved minerals such as calcium and magnesium.

Hypolimnion: The bottom layer of lake water during the summer months. The water in the hypolimnion is denser and much colder than the water in the upper two layers.

Impervious Surface: Pavement, asphalt, roofing materials or other surfaces through which water cannot drain. The presence of impervious surfaces can increased the rates and speed of runoff from an area, and prevent groundwater recharge.

Internal Loading: Nutrients or pollutants entering a body of water from its sediments.

Lake Management: The process of study, assessment of problems, and decisions affecting the maintenance of lakes as thriving ecosystems.

Littoral zone: The shallow areas (less than 15 feet in depth) around a lake’s shoreline, usually dominated by aquatic plants. These plants produce oxygen and provide food, shelter and reproduction areas for fish & animal life.

Local Unit of Government: A unit of government at the township, city, or county level.

Mesotrophic Lake: A lake that is midway in nutrient concentrations (between a eutrophic and oligotrophic lake). Characterized by periodic problems with algae blooms or problem aquatic vegetation.

Native Species: An animal or plant species that is naturally present and reproducing.

Nonpoint source: Polluted runoff – nutrients or pollution sources not discharged from a single point. Common examples include runoff from feedlots, fertilized lawns, and agricultural fields.

Nutrient: A substance that provides food or nourishment, such as usable proteins, vitamins, minerals, or carbohydrates. Fertilizers, particularly phosphorus and nitrogen, are the most common nutrients that contribute to lake eutrophication and nonpoint source pollution.

Oligotrophic Lake: A relatively nutrient-poor lake, characterized by outstanding water clarity and high levels of oxygen in the deeper waters.

Nutrient: A substance that provides food or nourishment, such as usable proteins, vitamins, minerals, or carbohydrates. Fertilizers, particularly phosphorus and nitrogen, are the most common nutrients that contribute to lake eutrophication and nonpoint source pollution.

pH: The scale by which the relative acidity or basic nature of waters are assessed,

Photosynthesis: The process by which green plants produce oxygen from sunlight, water, and carbon dioxide.

Phytoplankton: Algae – the base of the lake’s food chain, it also produces oxygen.

Point Sources: Specific sources of nutrient or pollution discharge to a water body, i.e., a stormwater discharge pipe.

Riparian: The natural ecosystem or community associated with river or lake shoreline.

Secchi Disc: A device measuring the depth of light penetration in water. It is a circular metal plate, six to eight inches in diameter, attached to a calibrated rope. It is lowered into the water until it disappears and then raised until it reappears with the depth recorded (the least expensive and easiest lake water monitoring device).

Sedimentation: The addition of soils to lakes, which can accelerate the “aging” process by destroying fisheries habitat, introducing soil-bound nutrients, and filling in the lake.

Spring turnover: After ice melts in the spring, warming surface water sinks to mix with deeper, colder water. At this time of year all water is the same temperature.

Thermocline: During summertime deeper lakes stratify by temperature to form three discrete layers; the middle layer of lake water is known as the thermocline.

Trophic Status: The level of growth or productivity of a lake as measured by phosphorus, content, algae abundance, and depth of light penetration.

Watershed: The surrounding land area that drains into a lake, river, or river system.

Zooplankton: Microscopic animals.

Appendix N
Common Biological or Chemical Abbreviations

BOD	Biological Oxygen Demand
°C	degree(s) Celsius
cfs	cubic feet per second (a common measure of rate of flow)
cfu	colony forming units (a common measure of bacterial concentrations)
chl <i>a</i>	Chlorophyll <i>a</i>
cm	centimeter
COD	Chemical Oxygen Demand
Cond	conductivity
DO	dissolved oxygen
FC	fecal coliform (bacteria)
ft	feet
IR	infrared
L	liter
m	meter
mg	milligram
ml	milliliter
NH ₃ -N	nitrogen as ammonia
NO ₂ -NO ₃	nitrate-nitrogen
NTU	Nephelometric Turbidity Units, standard measure of turbidity
OP	Ortho-phosphorus
ppb	parts per billion
ppm	parts per million
SD	Standard Deviation (statistical variance)
TDS	total dissolved solids
TN	total nitrogen
TP	total phosphorus
TSI	trophic status index
TSI ©	trophic status index (based on chlorophyll <i>a</i>)
TSI (P)	trophic status index (based on total phosphorus)
TSI (S)	trophic status index (based on secchi disc transparency)
TSS	total suspended solids
µg/l	micrograms per liter
µmhos/cm	micromhos per centimeter, the standard measure of conductivity
UV	Ultraviolet

Appendix O
Guide to Common Acronyms

State and Federal Agencies

BWSR	Board of Soil & Water
COE	U.S. Army Corps of Engineers
CRP	Conservation Reserve Program
DNR	Department of Natural Resources
EPA	U.S. Environmental Protection Agency
EQB	MN Environmental Quality Board
LCMR	Legislative Commission on Minnesota Resources
MDH	Minnesota Department of Health
MLMP	Minnesota Loon Monitoring Program
MPCA	Minnesota Pollution Control Agency
OEA	MN Office of Environmental Assistance
RIM	Reinvest in Minnesota -- Minnesota Conservation Program
SCS	Soil Conservation Service
SWCD	Soil & Water Conservation District
USDA	United States Department of Agriculture
USGS	United States Geological Survey
USFWS	United States Fish & Wildlife Service
WSUM	Water Surface Use Management

Other groups

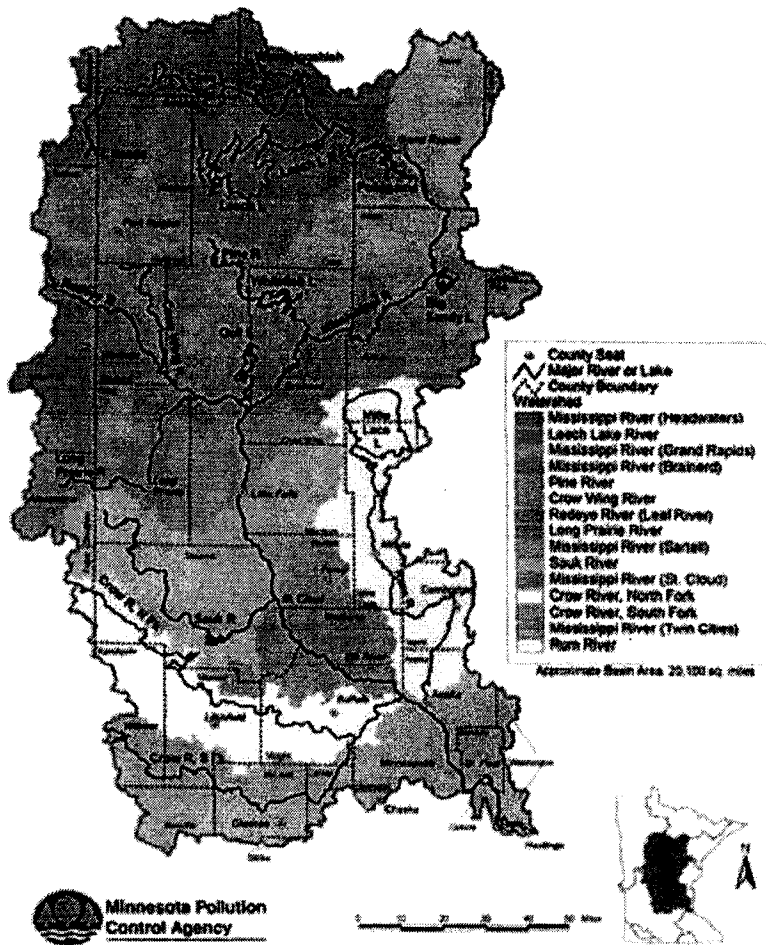
AMC	Association of Minnesota Counties
COLA	Coalition of Lake Associations
FHLA	Fish Hook Lake Association
IF	Initiative Foundation
LMC	League of Minnesota Cities
MAT	Minnesota Association of Townships
MLA	Minnesota Lakes Association
MLA	Minnesota Lakes Association
MnSCU	Minnesota State Colleges and Universities
RCM	Rivers Council of Minnesota

Appendix P
Codes and Regulations Abbreviations

110B	The Minnesota law that regulates non-metro county water plans
BOA	Board of Adjustment
Chapter 70/80	Individual Sewage Treatment Standards
CIC Plat	Common Interest Community Plat
Class V	Class 5 "Injection" well; any well which receives discharge
CUP	Conditional Use Permit
CWA	Clean Water Act
EAW	Environmental Assessment Worksheet
EIS	Environmental Impact Statement
GD	General Development (lake)
ISTS	Individual Sewage Treatment System
LMP	Lake Management Plan
OHWL	Ordinary High Water Level
PUD	Planned Unit Development
RD	Rural Development (lake)
SF	Square feet
SIZ	Shoreland Impact Zone

Appendix Q River Basin and Watershed

MPCA Basin and Watersheds⁴⁵



Upper Mississippi River Basin
Crow Wing River Watershed

⁴⁵ At <http://www.pca.state.mn.us/water/basins/uppermiss/index.html>

River Basin

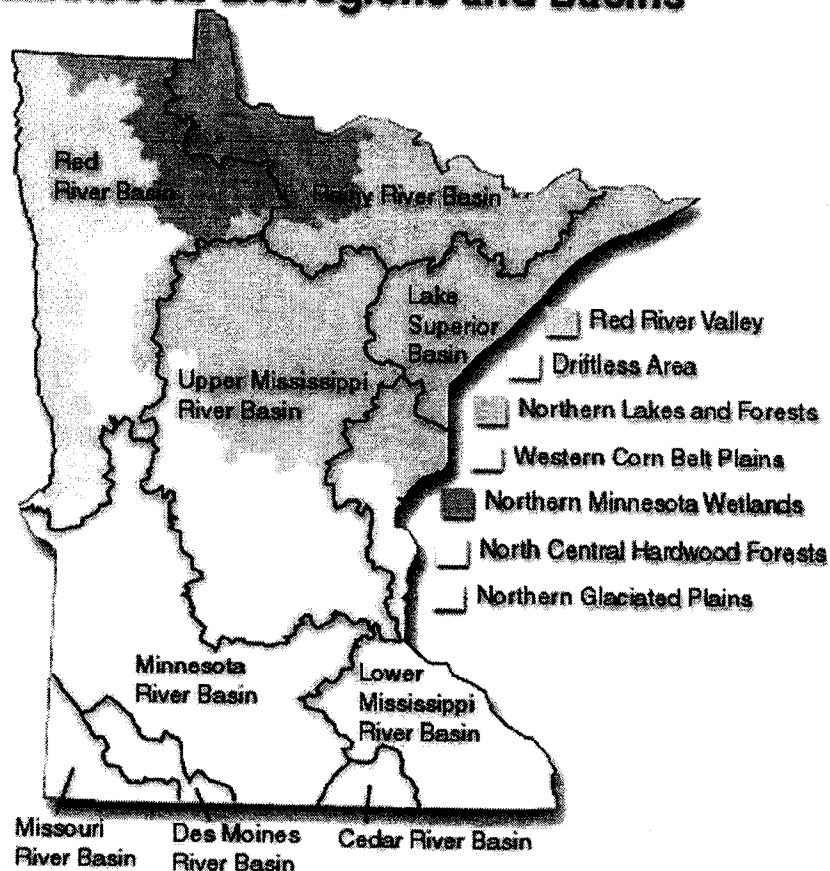
The major river basin that the lake is located in.

- UMB = Upper Mississippi
- LMB = Lower Mississippi
- MNB = Minnesota River
- RRB = Red River
- RAB = Rainy River
- LSB = Lake Superior
- CDB = Cedar and Des Moines
- MOB = Missouri
- SCB = St. Croix

Minnesota is characterized by nine major drainage basins (see figure 3 below).

Figure 3. Minnesota's Ecoregions and Major Drainage Basins

Minnesota Ecoregions and Basins



The MPCA is using the major river basins as a basis for focusing permitting, monitoring, and other water quality activities. Basin information documents (BID's) and plans will be developed for each basin over the next several years. BID's are currently completed for the Minnesota, Lake Superior and Red River Basins and underway for several other basins. The ecoregion framework will be used in

Appendix R
EPA Fish Hook Lake Impairment Warning



U.S. Environmental Protection Agency

Total Maximum Daily Loads

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Listed Water Information

CYCLE : 2002

Click [here](#) to see metadata for this report.

Cycle: 2002 **State:** MN **List ID:** MN29-0242-00
Waterbody Name: FISH HOOK
State Basin Name: UPPER MISSISSIPPI RIVER
Listed Water Map Link: No Spatial Data

State List IDs:

Cycle	State List ID
2002	29-0242-00

State Impairments:

State Impairment	Parent Impairment	Priority	Rank	Targeted Flag	Anticipated TMDL Submittal
FCA (MERCURY)	FISH CONSUMPTION ADVIS.				

Potential Sources of Impairment:

There were no potential sources reported to EPA by the state.

Total Maximum Daily Load (TMDL) Information:

There were no TMDLs reported to EPA by the state.

Watershed Information:

Watershed Name	Watershed States
CROW WING	MINNESOTA

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