

Cass Lake Lakeshed Assessment

The lakeshed vitals table identifies where to focus organizational and management efforts for each lake. Criteria were developed using limnological concepts to determine the effect to lake water quality.

Lakeshed Vitals		Rating
Major Basin	Upper Mississippi River	descriptive
Major Watershed	Mississippi River - Headwaters	descriptive
Minor Watershed	7090	descriptive
Lakeshed	Cass Lake (709000)	descriptive
Ecoregion	Northern Lakes and Forests	descriptive
Lake Area	15,958 acres	descriptive
Miles of Shoreline	45.38	descriptive
Miles of Stream	3.79	descriptive
Miles of Road	39.4	descriptive
Lake Max Depth	120 ft (35.1 m)	descriptive
Lake Mean Depth	NA	NA
Water Residence Time	NA	NA
Municipalities	Cass Lake	-
Sewage Management	Individual waste treatment systems (septic systems and holding tanks) and city sewer	-
Public Drainage Ditches	1	x
Lake Management Plan	None	x
Lake Vegetation Survey/Plan	None	x
Forestry Practices	None	+
Development Classification	General Development	-
Shoreline Development Index	2.6	-
Total Lakeshed to Lake Area Ratio (total lakeshed includes lake area)	1.7:1	+
Public Lake Accesses	4	x
Inlets	1 – Mississippi River	x
Outlets	1 – Mississippi River	x
Feedlots	None	+
Agriculture Zoning	None	+
Public Land : Private Land	2.7:1	+
Wetland Coverage	7%	+
Lake Transparency Trend	No trend	+
Exotic Species	None	+

Rating Key:

- + beneficial to the lake
- possibly detrimental to the lake
- x warrants attention

Lakeshed



Understanding a lakeshed requires the understanding of basic hydrology. A watershed is the area of land that drains into a surface water body such as a stream, river, or lake and contributes to the recharge of groundwater. There are three categories of watersheds: 1) basins, 2) major watersheds, and 3) minor watersheds.

Cass Lake is found within the **Upper Mississippi River Basin**, which includes the **Mississippi River - Headwaters Major Watershed** as one of its sixteen major watersheds (Figure 1). The basin covers 20,000 square miles, while the Mississippi River - Headwaters Watershed covers 1,960 square miles (approximately 1,254,651 acres). Cass Lake falls within **minor watershed 7090**, one of the 121 minor watersheds that comprise the Mississippi River - Headwaters Major Watershed (Figure 2).

Within this watershed hierarchy, lakesheds also exist. A lakeshed is defined simply as the land area that drains to a lake. While some lakes may have only one or two minor watersheds draining into them, others may be connected to a large number of minor watersheds, reflecting a larger drainage area via stream or river networks. Cass Lake falls within the **Cass Lake (709000) lakeshed**, covering 27,647 acres (includes lake area) (Figure 3). Even though Cass Lake receives water from minor watershed 7089 via the Mississippi River, for the purpose of this assessment it is decided that only the immediate lakeshed be inventoried and assessed.

Cass Lake Lakeshed Water Quality Protection Strategy

Each lakeshed has a different makeup of public and private lands. Looking in more detail at the makeup of these lands can give insight on where to focus protection efforts. The protected lands (easements, wetlands, public land) are the future water quality infrastructure for the lake. Developed land and agriculture have the highest phosphorus runoff coefficients, so this land should be minimized for water quality protection.

Although the majority of the land in Cass Lake's lakeshed is public, private forested uplands can be the focus of development and protection efforts in the lakeshed.

	Private (11%)					60%	Public (29%)		
	Developed	Agriculture	Forested Uplands	Other	Wetlands	Open Water	County	State	Federal
Land Use (%)	2%	1%	5%	1%	2%	60%	0.1%	2%	26.9%
Runoff Coefficient Lbs of phosphorus/acre/year	0.45 - 1.5	0.26 - 0.9	0.09		0.09		0.09	0.09	0.09
Description	Focused on Shoreland	Cropland	Focus of development and protection efforts	Open, pasture, grassland, shrubland	Protected				
Potential Phase 3 Discussion Items	Shoreline restoration	Restore wetlands; CRP	Forest stewardship planning, 3 rd party certification, SFIA, local woodland cooperatives		Protected by Wetland Conservation Act		County Tax Forfeit Lands	State Forest	National Forest

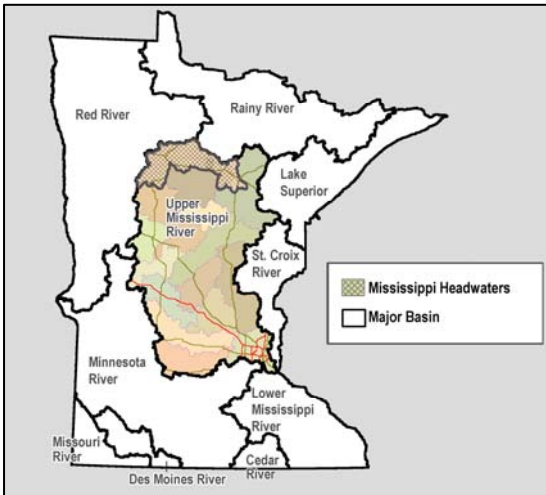


Figure 1. Upper Mississippi Basin and the Mississippi River - Headwaters Watershed.

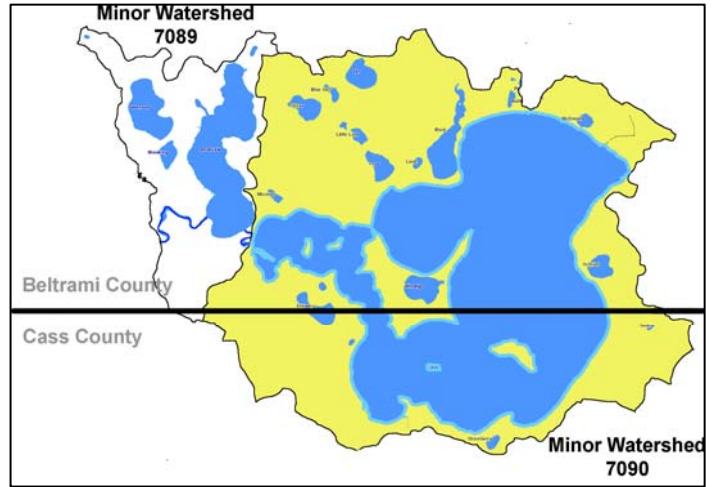


Figure 2. Minor Watersheds 7090 & 7089 contribute water to Cass Lake.

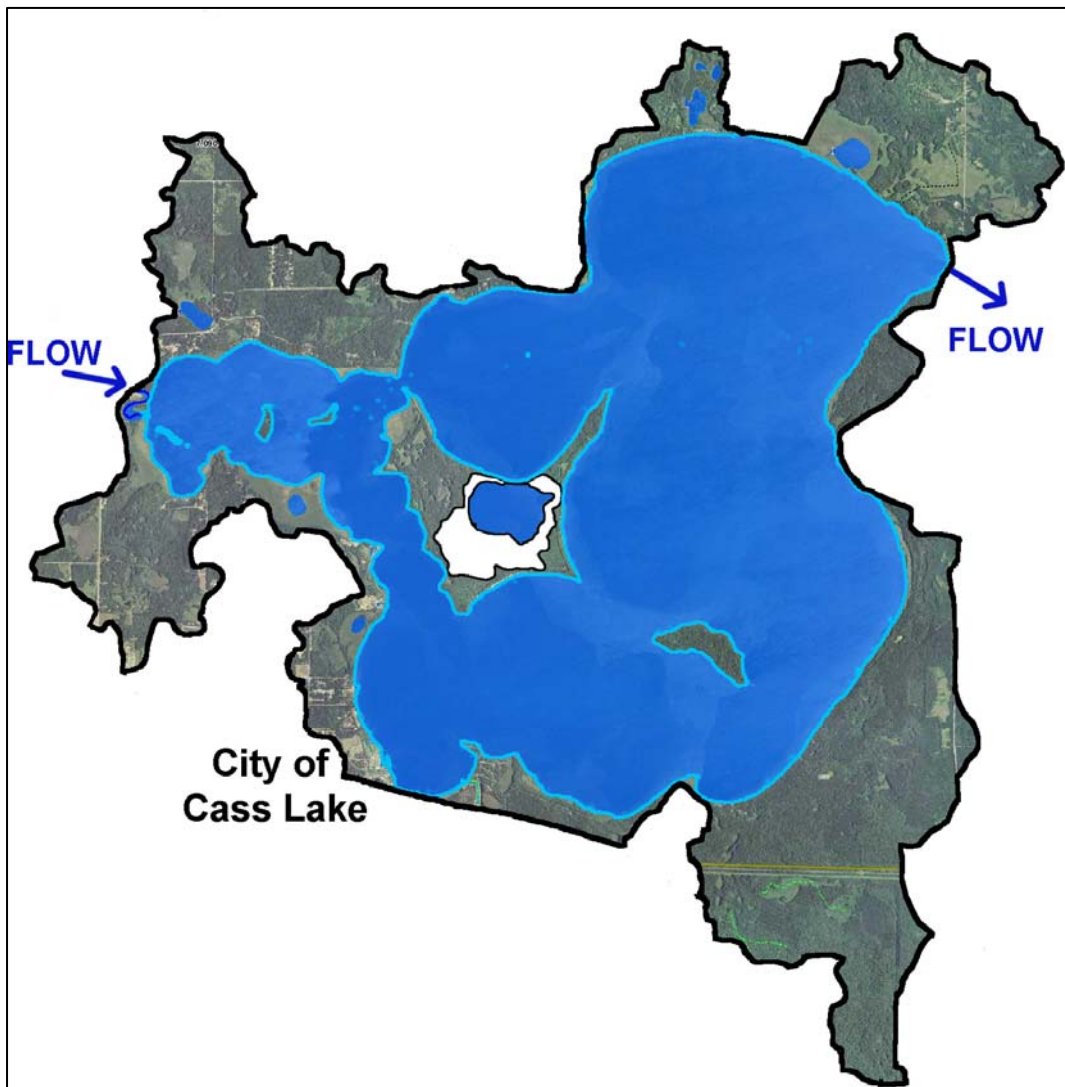


Figure 3. The Cass Lake (709000) Lakeshed (Aerial Imagery 2008 1M).

Land Cover / Land Use

The activities that occur on the land within the lakeshed can greatly impact a lake. Land use planning helps ensure the use of land resources in an organized fashion so that the needs of the present and future generations can be best addressed. The basic purpose of land use planning is to ensure that each area of land will be used in a manner that provides maximum social benefits without degradation of the land resource.

Changes in land use, and ultimately land cover, impact the hydrology of a lakeshed. Land cover is also directly related to the land's ability to absorb and store water rather than cause it to flow overland

(gathering nutrients and sediment as it moves) towards the lowest point, typically the lake. Impervious intensity describes the land's inability to absorb water, the higher the % impervious intensity the more area that water cannot penetrate into the soils. Monitoring the changes in land use can assist in future planning procedures to address the needs of future generations.

Phosphorus export, which is the main cause of lake eutrophication, depends on the type of land cover occurring in the lakeshed. Figure 5 depicts Cass Lake's lakeshed land cover.

The University of Minnesota has online records of land cover statistics from years 1990 and 2000 (<http://land.umn.edu>). Table 1 describes Cass Lake's lakeshed land cover statistics and percent change from 1990 to 2000. Due to the many factors that influence demographics, one cannot determine with certainty the projected statistics over the next 10, 20, 30+ years, but one can see the transition within the lakeshed from agriculture and grass/shrub/wetland acreages to forest, water, and urban acreages. The largest change in percentage is the decrease in agriculture (43.5%); however, in acreage, the forest cover has increased the most (472 acres). In addition, the impervious intensity has increased, which has implications for storm water runoff into the lake. The increase in impervious intensity is consistent with the increase in urban acreage.

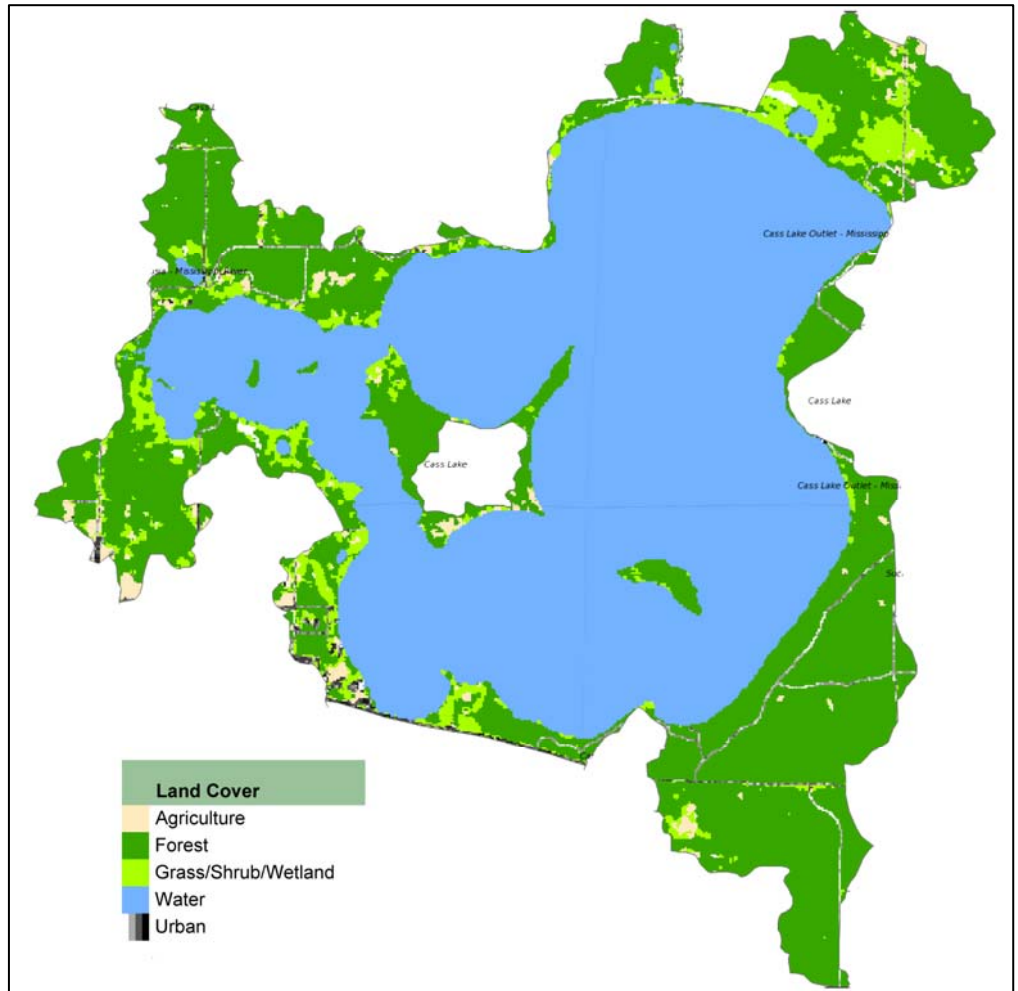


Figure 5. The Cass Lake (709000) lakeshed land cover (<http://land.umn.edu>).

Table 1. Cass Lake's lakeshed land cover statistics and % change from 1990 to 2000 (<http://land.umn.edu>).

Land Cover	1990		2000		% Change 1990 to 2000
	Acres	Percent	Acres	Percent	
Agriculture	644	2.33	364	1.32	43.5 % Decrease
Forest	8,772	31.73	9,244	33.44	5.4 % Increase
Grass/Shrub/Wetland	1,663	6.02	1,411	5.1	15.2 % Decrease
Water	16,036	58	16,072	58.13	0.2 % Increase
Urban	525	1.9	548	1.98	4.4 % Increase
Impervious Intensity %					
0	27,238	98.55	27,166	98.29	0.3 % Decrease
1-10	135	0.49	123	0.45	8.9 % Decrease
11-25	115	0.42	169	0.61	47.0 % Increase
26-40	61	0.22	82	0.3	34.4 % Increase
41-60	55	0.2	70	0.25	27.3 % Increase
61-80	26	0.09	22	0.08	15.4 % Decrease
81-100	9	0.03	7	0.03	22.2 % Decrease
Total Area	27,647		27,647		
Total Impervious Area (Percent Impervious Area Excludes Water Area)	100	0.86	119	1.03	19% Increase

Demographics

Cass Lake is classified as a general development lake. General development lakes usually have more than 225 acres of water per mile of shoreline and 25 dwellings per mile of shoreline, and are more than 15 feet deep.

The Minnesota Department of Administration Geographic and Demographic Analysis Division extrapolated future population in 5-year increments out to 2035. These projections are shown in Figure 6 below. Compared to Cass County as a whole, Pike Bay Township has a lower extrapolated growth over the next 30 years, whereas the city of Cass Lake has a negative extrapolated growth.

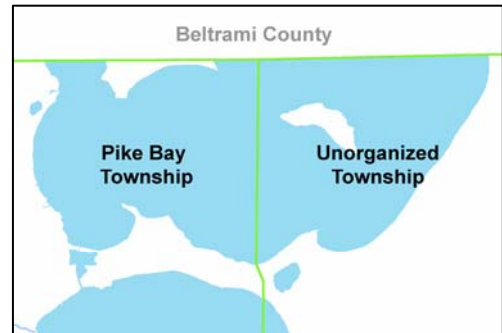
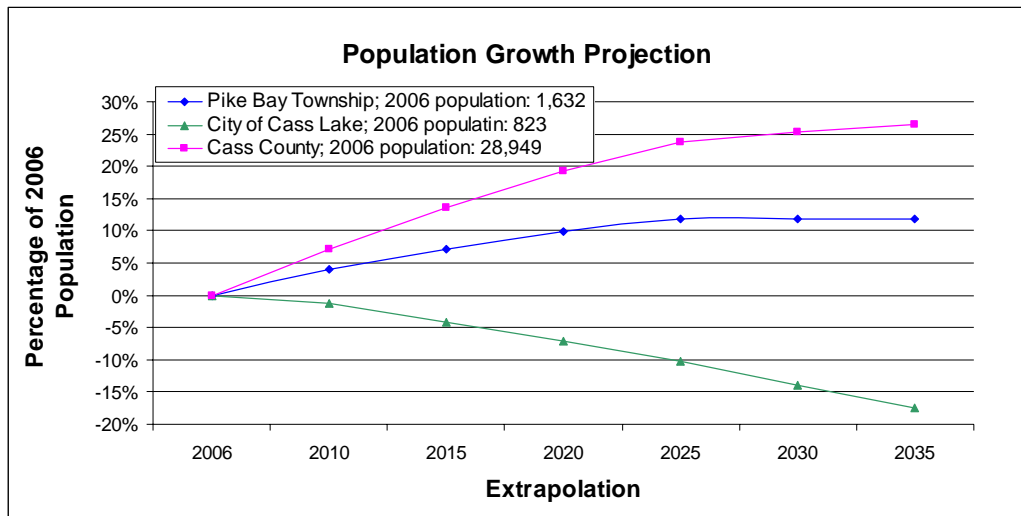


Figure 6. Population growth projection for the city of Cass Lake, townships (Cass County only) around Cass Lake, and Cass County. Figure excludes one unorganized township that lacks individual population data (source: <http://www.demographic.state.mn.us/resource.html?id=19332>).



Status of the Fishery (DNR, as of 07/01/2007)

Special Problems and Conditions Affecting Fish or Fishing

Cass Lake water levels are affected by the operation of two dams on the Mississippi River. Otter Tail Power Company operates a dam upstream, just below Stump Lake. At the Cass Lake outlet is Knutson Dam, owned and operated by the U.S. Forest Service. A Superfund cleanup site exists on Pike Bay near the south side of Cass Lake. The U. S. Environmental Protection Agency has placed a consumption advisory on lake whitefish from Cass Lake and Pike Bay due to elevated body burdens of dioxins in this species. The Leech Lake Band of Chippewa Indians operates a commercial fishery for lake whitefish and cisco on the Cass Lake chain. The only special fishing regulation currently in effect is a ban on winter spearing for Cass Lake proper (excluding the remainder of the chain of lakes).

Present Fish Population Status

The walleye population of Cass Lake is healthy and is comprised of good numbers of fish distributed among numerous year classes. The 2007 gill net catch rate of 10.5 fish/net is slightly below the long-term median catch rate (13.3 fish/net). Historic data indicate that overall walleye biomass was slightly higher during the 1990 s than in recent years. The recruitment of several recent strong year classes, most notably the 2002 year class, appears to be carrying the population. Approximately 63% of the sample consisted of fish less than age-5, and most of those were from the 2005 and 2006 year classes.

Analyses of the fall 2007 gill net sample indicate that walleye from 9 year classes were sampled, the oldest a female from the 1991 year class (age-16). Only 3% of the walleye sample consisted of fish from the strong 1999 year class, and only 5% were from the strong 2001 year class. Fish from the strong 2002 year class were more abundant, and made up 23% of the gill net catch. Thirty-two percent of all walleye sampled were 16 inches or larger.

Mean catch rates for yellow perch were below long-term medians for both number and weight per gill net lift. Approximately 24% of the sample consisted of perch 8 inches or larger, and 3% were 10 inches or larger. Average size of yellow perch declined from 2006, likely due to an abundance of age-2 fish newly recruited to the gill nets. There is some evidence that quality of this population has decreased over the past 30 years, as indicated by an overall gradual decline in average fish size.

The 2007 northern pike catch rate of 2.9 fish per net was about the same as the long-term median of 2.8 fish/net, and the catch rate in terms of weight (10.2 lbs/net) was slightly above the long-term median (9.5 lbs/net). Approximately 67% of the sample was comprised of northern pike less than 26.0 inches, while 26% were 28.0 inches or larger.

Catch rates for all other fish species were similar to long-term averages, highly variable, or so low that no useful trends could be discerned.

See the link below for specific information on gillnet surveys, stocking information, and fish consumption guidelines. <http://www.dnr.state.mn.us/lakefind/showreport.html?downum=04003000>