

Pike Bay 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	7122	descriptive
Lakeshed	Pike Bay (712200)	descriptive
Ecoregion	Northern Lakes and Forests	descriptive
Lake Area	4,751 acres	descriptive
Miles of Shoreline	10.65	descriptive
Miles of Stream	4.87	descriptive
Miles of Road	32.3	descriptive
Lake Max Depth	95 ft. (29 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	None	+
Lake Management Plan	None	x
Lake Vegetation Survey/Plan	None	x
Forestry Practices	None	+
Development Classification	General Development	-
Shoreline Development Index	1.1	+
Total Lakeshed to Lake Area Ratio (total lakeshed includes lake area)	2.3:1	x
Public Lake Accesses	2	x
Inlets	1 – Fox Creek	x
Outlets	1 – Pike Bay Creek	x
Feedlots	None	+
Agriculture Zoning	112 acres > 200 ft. from lake	x
Public Land : Private Land	2.3:1	+
Wetland Coverage	8%	+
Lake Transparency Trend	NA	NA
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.

Pike Bay 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). Pike Bay falls within **minor watershed 7122**, 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. Pike Bay falls within the **Pike Bay (712200) lakeshed**, covering 10,986 acres (includes lake area) (Figure 3).

Pike Bay 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 Pike Bay's lakeshed is public, private forested uplands can be the focus of development and protection efforts in the lakeshed.

	Private (17%)					44%	Public (39%)		
	Developed	Agriculture	Forested Uplands	Other	Wetlands	Open Water	County	State	Federal
Land Use (%)	5.5%	3.5%	4.5%	1.5%	2%	44%	0%	4.5%	34.5%
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

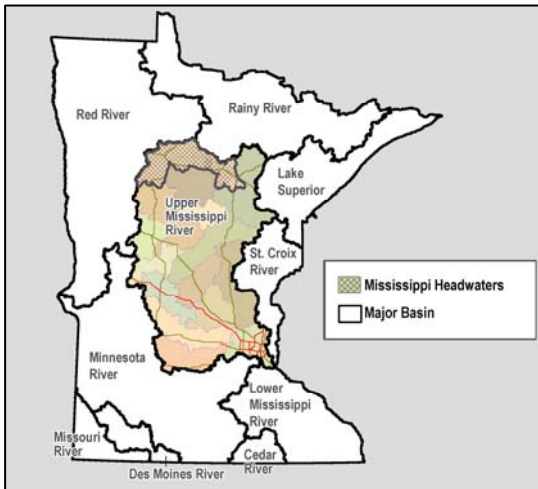


Figure 1. Upper Mississippi Basin and the Mississippi River - Headwaters Watershed.

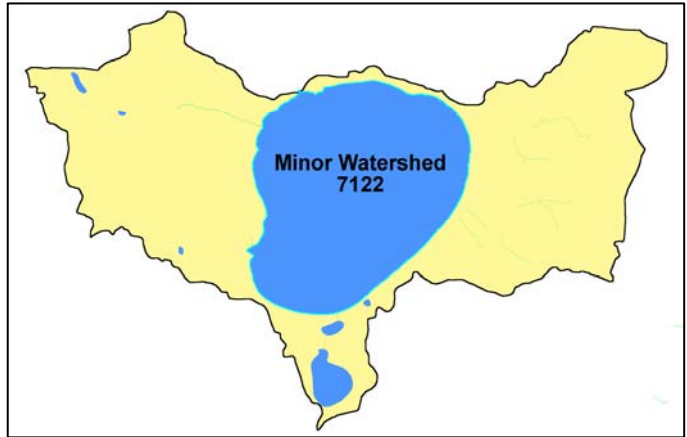


Figure 2. Minor Watershed 7122 contributes water to Pike Bay.

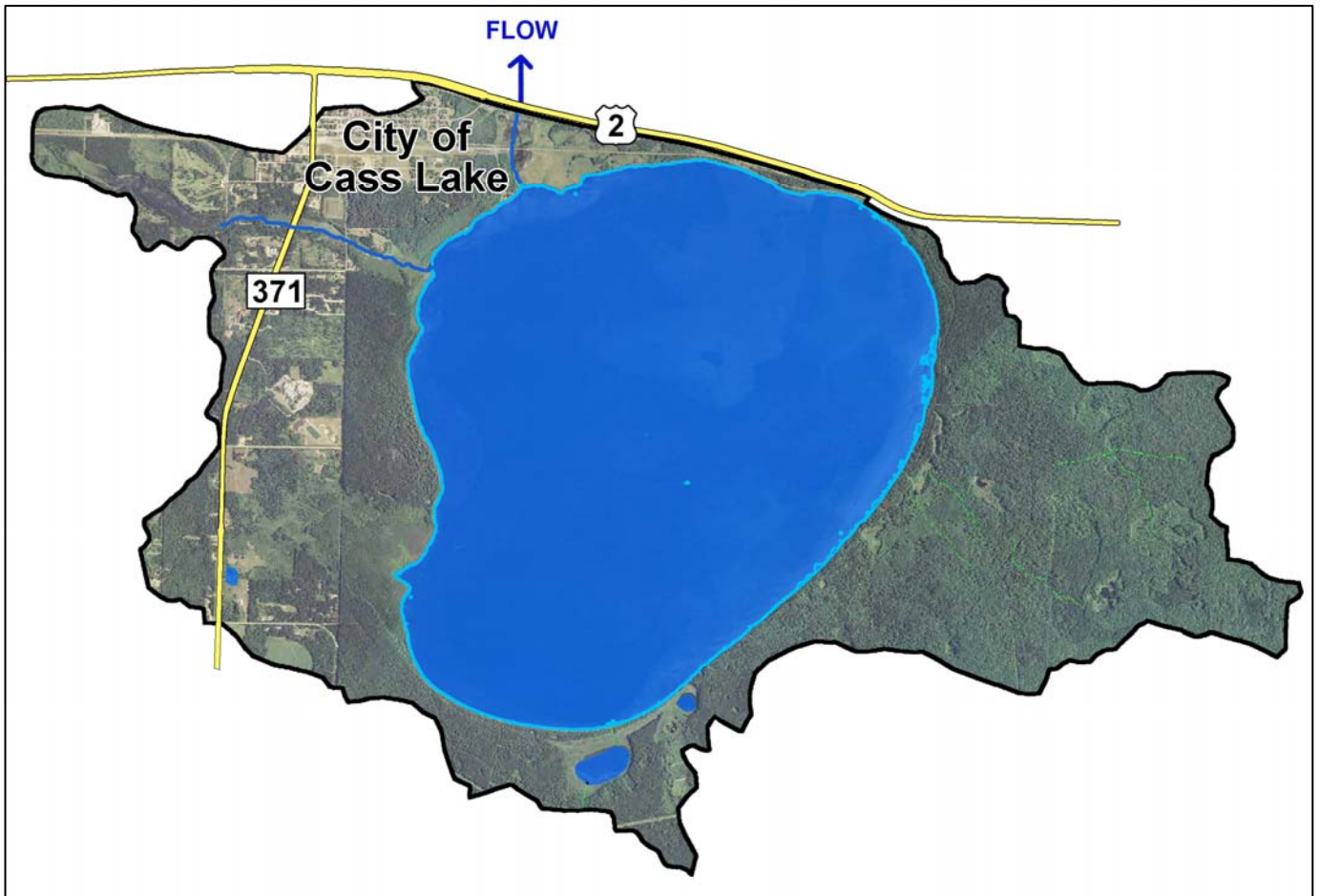


Figure 3. The Pike Bay (712200) Lakeshed (Aerial Imagery 2008 1M).

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.

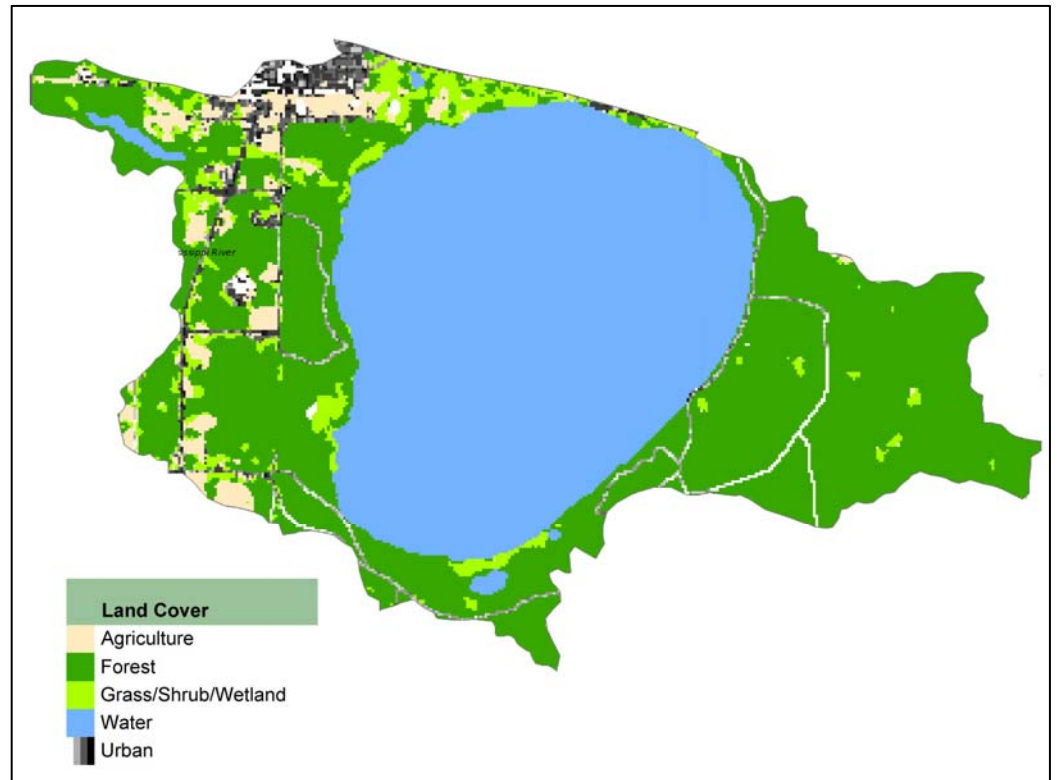


Figure 5. The Pike Bay (712200) lakeshed land cover (<http://land.umn.edu>).

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 Pike Bay'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 Pike Bay'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 and urban acreages. The largest change in percentage is the decrease in agriculture cover (30.6%); however, in acreage, forest cover has increased the most (259 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.

Table 1. Pike Bay'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	565	5.14	392	3.57	30.6 % Decrease
Forest	4,410	40.14	4,669	42.5	5.9 % Increase
Grass/Shrub/Wetland	647	5.89	510	4.64	21.2 % Decrease
Water	4,814	43.82	4,810	43.78	0.1 % Decrease
Urban	549	5	604	5.5	10.0 % Increase
Impervious Intensity %					
0	10,528	95.84	10,435	94.99	0.9 % Decrease
1-10	88	0.8	93	0.85	5.7 % Increase
11-25	96	0.87	110	1	14.6 % Increase
26-40	78	0.71	118	1.07	51.3 % Increase
41-60	104	0.95	130	1.18	25 % Increase
61-80	58	0.53	47	0.43	19 % Decrease
81-100	33	0.3	52	0.45	57.6 % Increase
Total Area	10,986		10,986		
Total Impervious Area (Percent Impervious Area Excludes Water Area)	169	2.74	209	3.38	23.7 % Increase

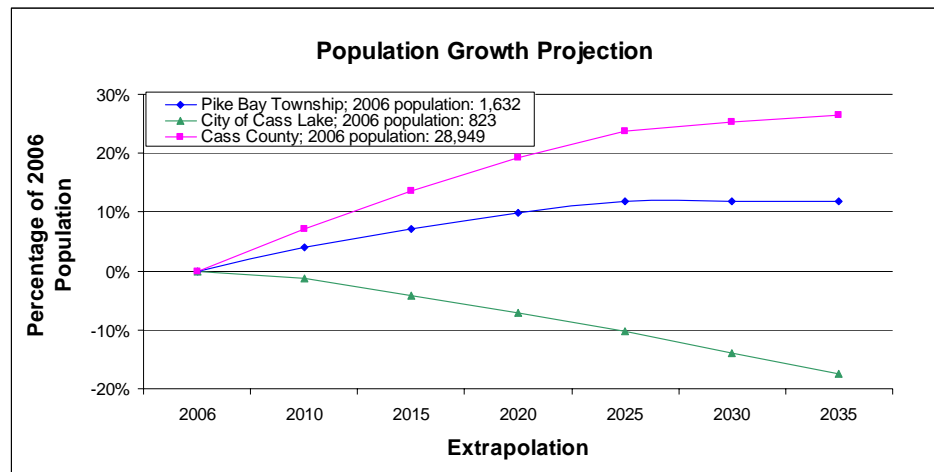
Demographics

Pike Bay 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 projection, while the city of Cass Lake has a negative extrapolated growth projection.



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



Status of the Fishery (DNR, as of 07/26/2004)

Pike Bay is a 4760-acre lake with a maximum depth of 95 feet located adjacent to the community of Cass Lake in northern Cass County. There are two public accesses maintained by the United States Forest Service. On the south end of the lake is the South Pike Bay Campground which has a concrete access. On the east side of the lake at the Ojibway Beach Campground, there is a steel ramp. Pike Bay is also frequently accessed by boat from Cass Lake via the channel connecting both lakes.

The Minnesota Department of Natural Resources has classified Minnesota's lakes into 43 different lake classes based on physical and chemical characteristics. Pike Bay is in lake class 22. Other Bemidji area lakes in the same lake class include Bemidji, Cass and Plantaganette Lakes. Typically lakes in this class are very large, very deep, clear and are harwater lakes.

Pike Bay is within both the Chippewa National Forest and the Leech Lake Indian Reservation. Leech Lake tribal code allows band members to harvest fish through subsistence netting or by other means of harvest. The DNR manages the lake for walleye, northern pike, muskellunge and yellow perch.

Walleye fingerling have been stocked on alternating years. Fish are stocked cooperatively between the MN DNR and Leech Lake Division of Resource Management and have exceeded 1,000 pounds of fingerlings each stocking since 1989. The 2004 walleye abundance rating declined from the 1999 findings but is still comparable to other class 22 lakes. The 2004 average length of walleye sampled was 16.6 inches and was up from 1999 (14.4 inches). Anglers can expect to catch numbers of walleye that are 13-15 and 19-21 inches long.

The 2004 northern pike abundance rating was the highest of any survey conducted on Pike Bay and was comparable to the upper limit for class 22 lakes. Both mean length and weight were down slightly from 1999. Age data indicates that there is consistent natural reproduction with pike from ages 1-5 sampled. Anglers can expect to catch numbers of pike in the 20-25 inch range.

Standard population assessments are a poor indicator of muskellunge abundance, but Pike Bay is known to be an excellent muskellunge fishery. It is a popular destination for muskie anglers and is known to produce very large fish. No special sampling has been conducted specifically for this species.

Yellow perch abundance in 2004 was the lowest recorded since 1971 but is still more than twice what you would normally find in a class 22 lake. Yellow perch are valuable both as food for predator fish such as northern pike and walleye and as a recreational fish for anglers. The mean weight in 2004 (0.22 pound) was the highest recorded since 1971 (0.23). In 2004 almost 15% of yellow perch were nine inches or greater in length compared to only 2% in 1999.

White sucker are present and provide an abundant forage fish for the larger predators like muskellunge and northern pike. Cisco (tullibee) were also sampled in low numbers but is also an important forage species.

Sampling gear that would be used to sample panfish such as bluegill and black crappie were not employed in 2004 because of historically low catch rates for these species. However, anglers often report high catch rates of rock bass. Bluegill and largemouth bass are also caught by anglers on occasion.

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=11041500>