

Pine Mountain 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	Pine River	descriptive
Minor Watershed	11006	descriptive
Lakeshed	Pine Mountain Lake (1100600)	descriptive
Ecoregion	Northern Lakes and Forests	descriptive
Lake Area	1,612 acres	descriptive
Miles of Shoreline	9.44	descriptive
Miles of Stream	1.02	descriptive
Miles of Road	12.5	descriptive
Lake Max Depth	80 ft. (24.4 m)	descriptive
Lake Mean Depth	18 ft. (5.5 m)	-
Water Residence Time	4.3 years	+
Municipalities	Backus	-
Sewage Management	Individual waste treatment systems (septic systems and holding tanks – inspections scheduled for 2009) and city sewer	+
Public Drainage Ditches	1	x
Lake Management Plan	Healthy Lakes & Rivers Partnership program, 2001	+
Lake Vegetation Survey/Plan	Survey Completed 2007	+
Forestry Practices	Stand examination scheduled for 2010 for proposed clear-cut near southwest side of lake	-
Development Classification	General Development	-
Shoreline Development Index	1.7	+
Total Lakeshed to Lake Area Ratio (total lakeshed includes lake area)	4.1:1	x
Public Lake Accesses	1	x
Inlets	1 – Pine River	x
Outlets	1 – Pine River	x
Feedlots	None	+
Shoreland Conservation Potential (% shoreland identified for conservation)	45%	+
Agriculture Zoning	371 acres > 200 ft. from lake	x
Public Land : Private Land	1:1	x
Wetland Coverage	11%	+
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.

Pine Mountain Lake is found within the **Upper Mississippi River Basin**, which includes the **Pine River Major Watershed** as one of its sixteen major watersheds (Figure 1). The basin covers 20,000 square miles, while the Pine River Watershed covers 784 square miles (approximately 502,013 acres). Pine Mountain Lake falls within **minor watershed 11006**, one of the 69 minor watersheds that comprise the Pine River 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. Pine Mountain Lake falls within the **Pine Mountain Lake (1100600) lakeshed**, covering 6,624 acres (includes lake area) (Figure 3). Even though Pine Mountain Lake receives water from minor watershed 11026 via the Pine River, for the purpose of this assessment it is decided that only the immediate lakeshed be inventoried and assessed.

Pine Mountain 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.

A large percentage of the private land in Pine Mountain Lake's lakeshed is made up of forested uplands. This land can be the focus of development and protection efforts in the lakeshed.

	Private (35%)					30%	Public (35%)		
	Developed	Agriculture	Forested Uplands	Other	Wetlands	Open Water	County	State	Federal
Land Use (%)	3%	6.5%	16%	5.5%	4%	30%	0%	35%	0%
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

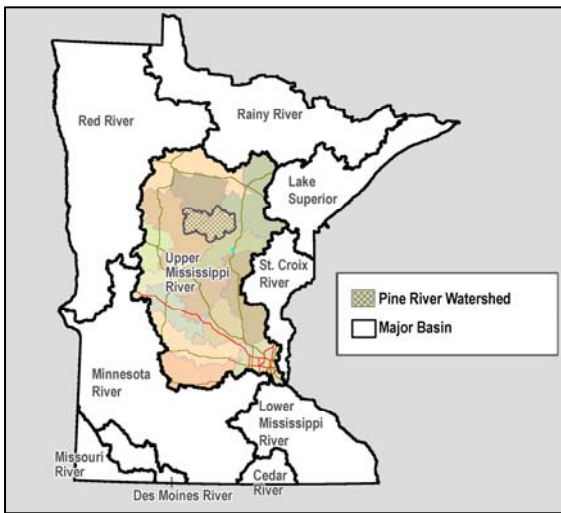


Figure 1. Upper Mississippi Basin and the Pine River Watershed.

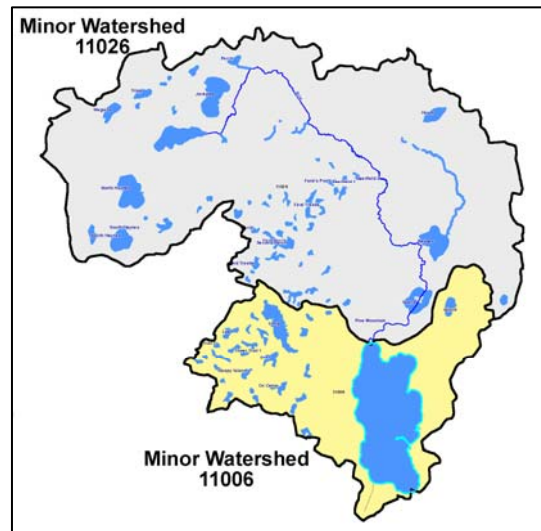


Figure 2. Minor Watersheds 11006 & 11026 contribute water to Pine Mountain Lake.

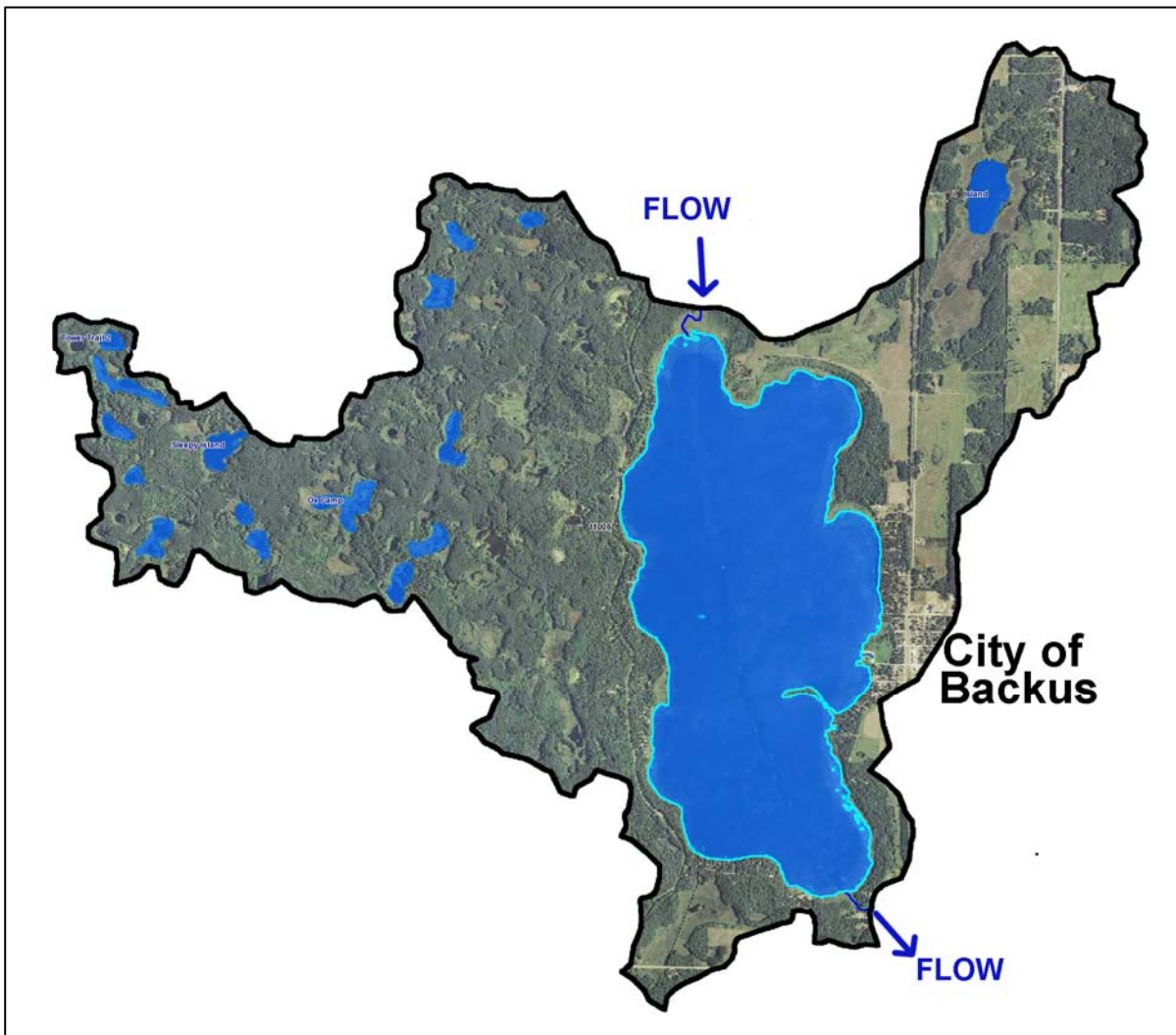


Figure 3. The Pine Mountain Lake (1100600) Lakeshed (Aerial Imagery 2008 1M).

Conservation Easement Potential

In an ever-growing society, today's landscapes are being urbanized more and more to sustain the ever-growing population and behavior of recreational usage. In Minnesota, the land of ten thousand lakes, it is only natural to develop properties within the boundaries and beauty of our lakes and streams. Conservation efforts to limit or slow down the development process can only assist in the preservation of the lakeshed and inevitably the water quality of water bodies found within. Figure 4 identifies parcels within the lakeshed that are large enough to warrant the investigation of parcel conservation practices and purchase.

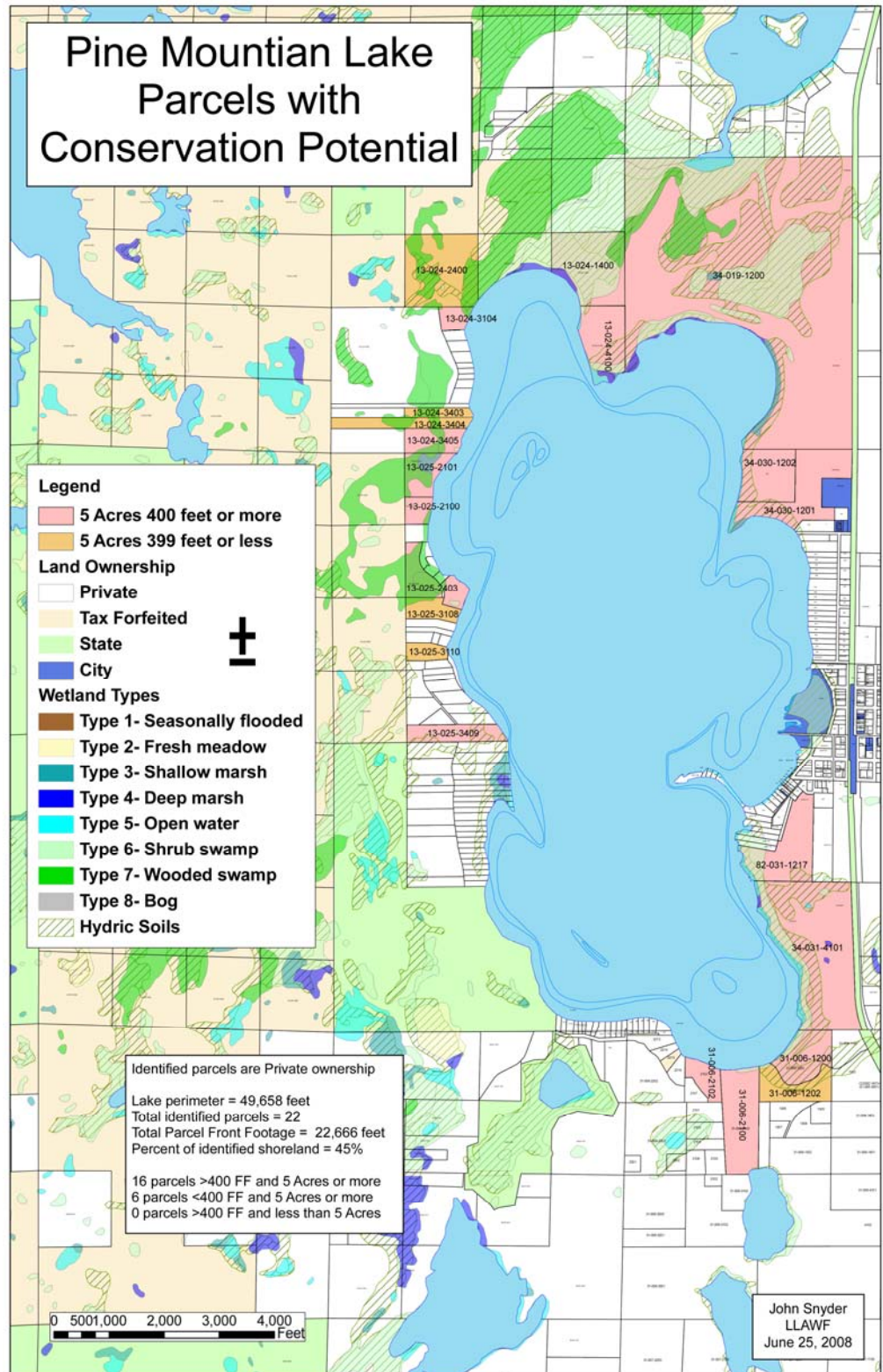


Figure 4. Lake parcels with conservation potential (developed by John Snyder, LLAWF).

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 lands 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 lands inability to absorb water, the higher the % impervious intensity the more area that water cannot penetrate in to the soils. Monitoring the changes in land use can assist in future planning procedures to address the needs of future generations.

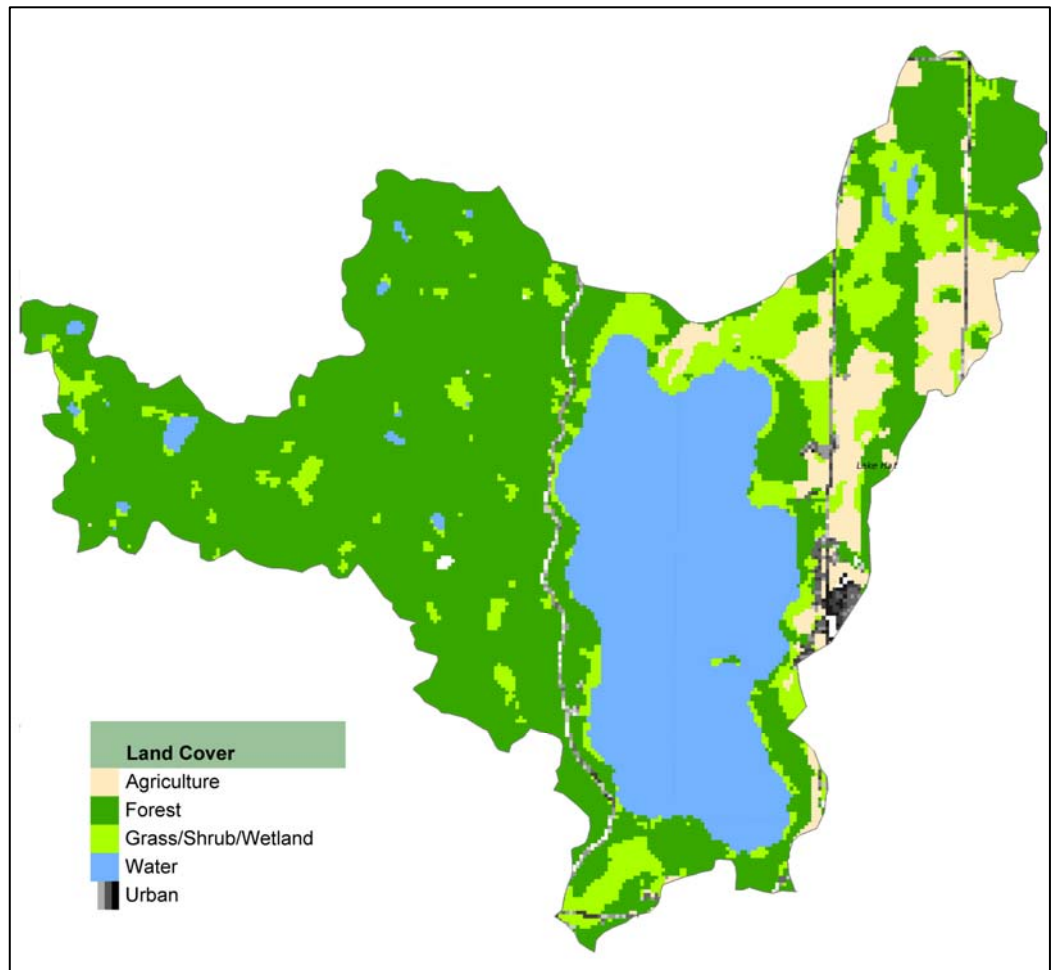


Figure 5. The Pine Mountain Lake (1100600) lakeshed land cover (<http://land.umn.edu>).

Phosphorus export, which is the main cause of lake eutrophication, depends on the type of land cover occurring in the lakeshed. Figure 5 depicts Pine Mountain 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 Pine Mountain 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, grass/shrub/wetland, and water acreages to forest and urban acreages. The largest change in percentage is the decrease in grass/shrub/wetland cover (27.3%); however, in acreage, agriculture cover has increased the most (564 acres). In addition, the increase in urban acreage has implications for storm water runoff into the lake.

Table 1. Pine Mountain 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	538	8.12	437	6.6	18.8 % Decrease
Forest	3,084	46.56	3,648	55.07	18.3 % Increase
Grass/Shrub/Wetland	1,070	16.15	778	11.75	27.3 % Decrease
Water	1,761	26.59	1,572	23.73	10.7 % Decrease
Urban	169	2.55	186	2.81	10.1 % Increase
Impervious Intensity %					
0	6,466	97.66	6,454	97.48	0.2 % Decrease
1-10	19	0.29	25	0.38	31.6 % Increase
11-25	35	0.53	49	0.74	40 % Increase
26-40	30	0.45	52	0.79	73.3 % Increase
41-60	42	0.63	26	0.39	38.1 % Decrease
61-80	19	0.29	9	0.14	52.6 % Decrease
81-100	10	0.15	6	0.09	40 % Decrease
Total Area	6,624		6,624		
Total Impervious Area (Percent Impervious Area Excludes Water Area)	61	1.25	51	1.01	16.4 % Decrease

Demographics

Pine Mountain 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, Deerfield, Powers, and Pine River Townships have higher extrapolated growth projections, whereas the city of Backus has an identical extrapolated growth projection.

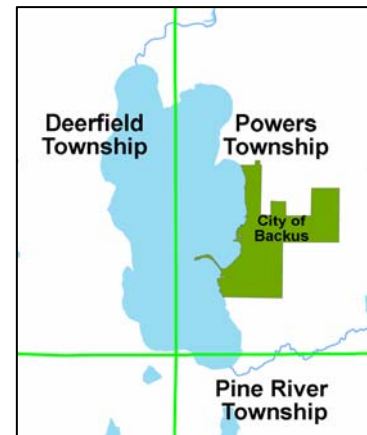
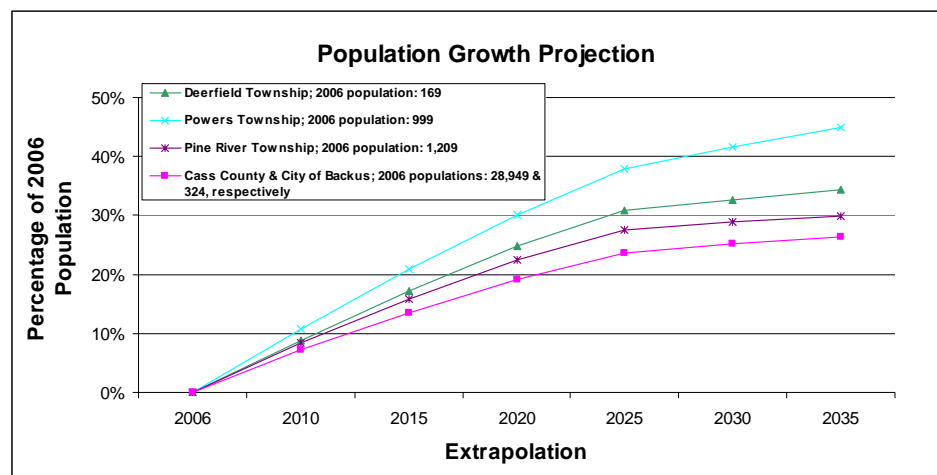


Figure 6. Population growth projection for the townships around Pine Mountain Lake, the city of Backus, and Cass County. (source: <http://www.demography.state.mn.us/resource.html?id=19332>)



Status of the Fishery (DNR, as of 08/15/2005)

Pine Mountain Lake (DOW # 110411) is a 1,567-acre lake located on the west side of Backus, MN. There is a public access located in a city park on the lake's east shore. The Minnesota Department of Natural Resources (MNDNR) has classified Minnesota's lakes into 43 different classes based on physical, chemical and other characteristics. Pine Mountain Lake is in Lake Class 22; lakes in this class are generally clear, very large, very deep, have a low percentage of shallow water area, and have very irregularly shaped shoreline with many bays or points. Pine Mountain Lake is managed primarily for northern pike and walleye, and secondarily for cisco (tullibee), bluegill, largemouth bass, black crappie, and yellow perch.

Both the number and average size of northern pike in Pine Mountain Lake are good; sampled fish ranged from 9 to 31 inches and had an average length of 23 inches. Walleye abundance in the 2005 sampling in Pine Mountain Lake was similar to the average of ecologically similar lakes. Fish from 8 to 27 inches were sampled in MNDNR test nets. Stocking has been successful in helping to maintain a good walleye population in this lake. Historical survey data suggest that there could be significant natural reproduction occurring in Pine Mountain Lake. The frequency and timing of stocking that has occurred in Pine Mountain Lake has not afforded the opportunity to gauge the consistency of natural reproduction. However, consideration will be given to scheduling one to three years of no stocking between stocked years to get a better measure of the role of natural reproduction in this lake. Bluegill abundance was similar to other lakes of this type, and some 6- to 8-inch bluegill are available. Yellow perch are abundant in Pine Mountain Lake. Most yellow perch sampled in MNDNR test nets were small, with a limited number in the 8- and 9-inch categories. Other species present include bluegill, black crappie, bowfin (dogfish), brown bullhead, cisco (tullibee), hybrid sunfish, largemouth bass, pumpkinseed sunfish, rock bass, white sucker, and yellow bullhead.

Anglers can help maintain or improve the quality of fishing by practicing selective harvest. Selective harvest allows for the harvest of smaller fish for table fare, but encourages release of medium- to large-sized fish. Releasing these fish can help maintain balance in the fish community in Pine Mountain Lake and provide anglers the opportunity to catch more and larger fish in the future.

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=11041100>