

# Boy 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	Leech Lake River	descriptive
Minor Watershed	8041	descriptive
Lakeshed	Boy Lake (804100)	descriptive
Ecoregion	Northern Lakes and Forests	descriptive
Lake Area	3,452 acres	descriptive
Miles of Shoreline	26.24	descriptive
Miles of Stream	5.31	descriptive
Miles of Road	27.9	descriptive
Lake Max Depth	45 ft (13.7 m)	descriptive
Lake Mean Depth	NA	NA
Water Residence Time	NA	NA
Municipalities	None	+
Sewage Management	Individual waste treatment systems (septic systems and holding tanks)	-
Public Drainage Ditches	None	+
Lake Management Plan	Healthy Lakes & Rivers Partnership program, 2006	+
Lake Vegetation Survey/Plan	Survey completed 2008	+
Forestry Practices	None	+
Development Classification	General Development	-
Shoreline Development Index	3.2	-
Total Lakeshed to Lake Area Ratio (total lakeshed includes lake area)	6:1	x
Public Lake Accesses	1	x
Inlets	4 – Boy River, Swift River, 2 Unnamed	x
Outlets	1 – Boy River	x
Shoreland Conservation Potential (% shoreland identified for conservation)	25%	+
Feedlots	None	+
Agriculture Zoning	1,107 acres > 200 ft. from lake	x
Public Land : Private Land	1.8:1	+
Wetland Coverage	33%	+
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.

Boy Lake is found within the **Upper Mississippi River Basin**, which includes the **Leech Lake River Watershed** as one of its sixteen major watersheds (Figure 1). The basin covers 20,000 square miles, while the Leech Lake River Watershed covers 1,335 square miles (approximately 854,349 acres). Boy Lake falls within **minor watershed 8041**, one of the 75 minor watersheds that comprise the Leech Lake 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. Boy Lake falls within the **Boy Lake (804100) lakeshed**, covering 20,987 acres (includes lake area) (Figure 3). Even though Boy Lake receives water from minor watershed 8046, for the purpose of this assessment it is decided that only the immediate lakeshed be inventoried and assessed.

## Boy 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.

The majority of Boy Lake's lakeshed is made up of public land. Nonetheless, the private forested uplands can be the focus of development and protection efforts in the lakeshed.

	Private (26%)					26%	Public (48%)		
	Developed	Agriculture	Forested Uplands	Other	Wetlands	Open Water	County	State	Federal
<b>Land Use (%)</b>	1.8%	3.7%	15%	0.5%	5%	26%	0%	16%	32%
<b>Runoff Coefficient</b> Lbs of phosphorus/acre/year	0.45 - 1.5	0.26 - 0.9	0.09		0.09		0.09	0.09	0.09
<b>Description</b>	Focused on Shoreland	Cropland	Focus of development and protection efforts	Open, pasture, grassland, shrubland	Protected				
<b>Potential Phase 3 Discussion Items</b>	Shoreline restoration	Restore wetlands; CRP	Forest stewardship planning, 3 <sup>rd</sup> party certification, SFIA, local woodland cooperatives		Protected by Wetland Conservation Act		County Tax Forfeit Lands	State Forest	National Forest

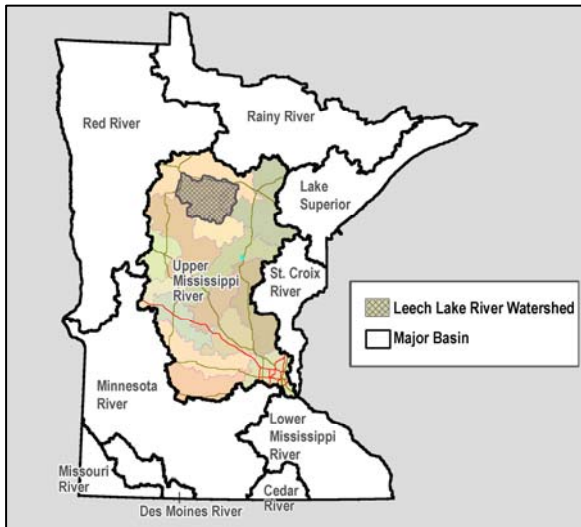


Figure 1. Upper Mississippi Basin and the Leech Lake River Watershed.

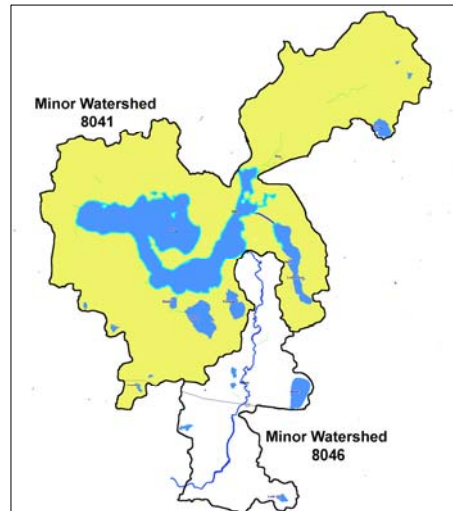


Figure 2. Minor Watersheds 8041 & 8046 contribute water to Boy Lake.

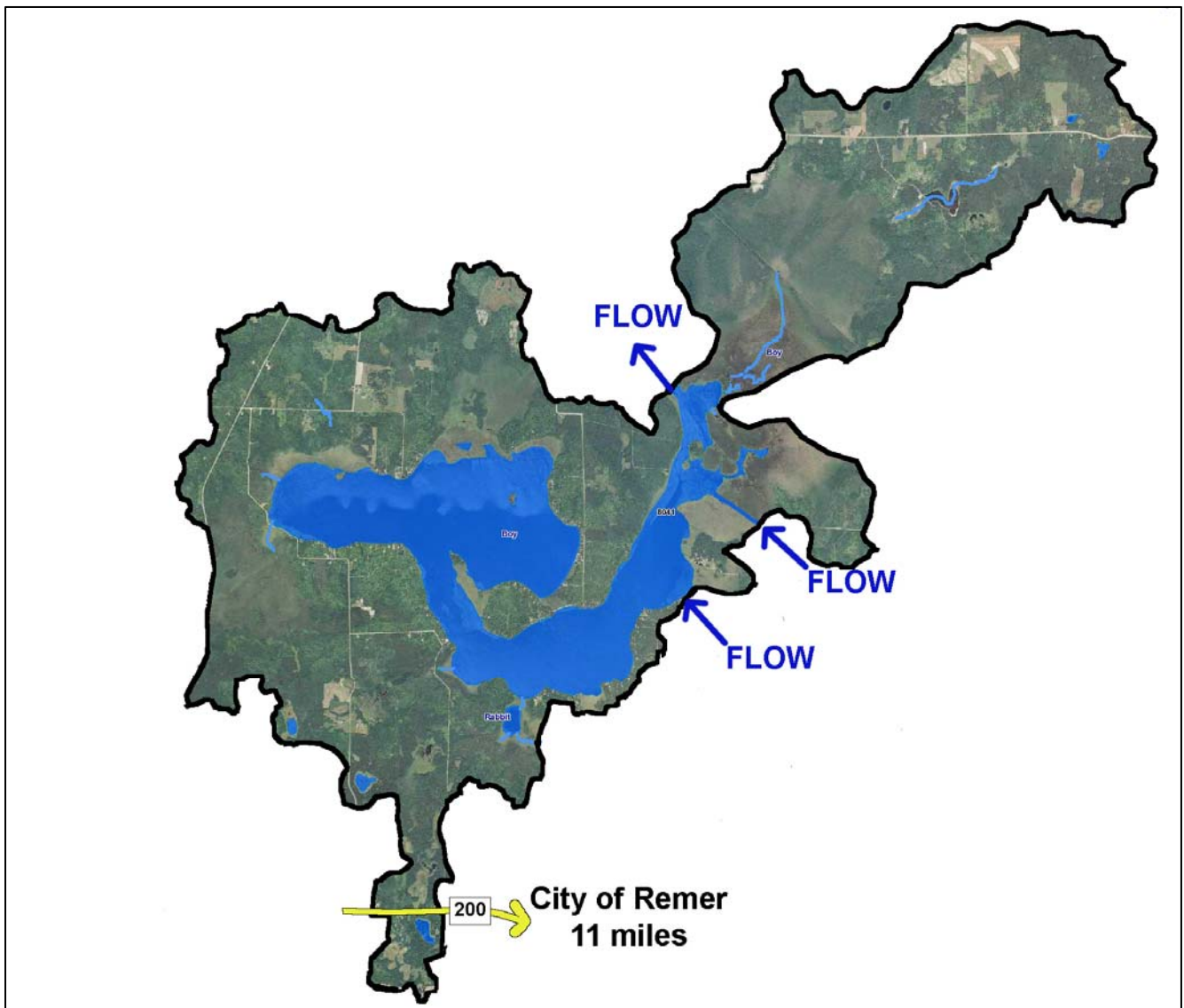


Figure 3. The Boy Lake (804100) Lakeshed (Aerial Imagery 2008 1M).

## 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.

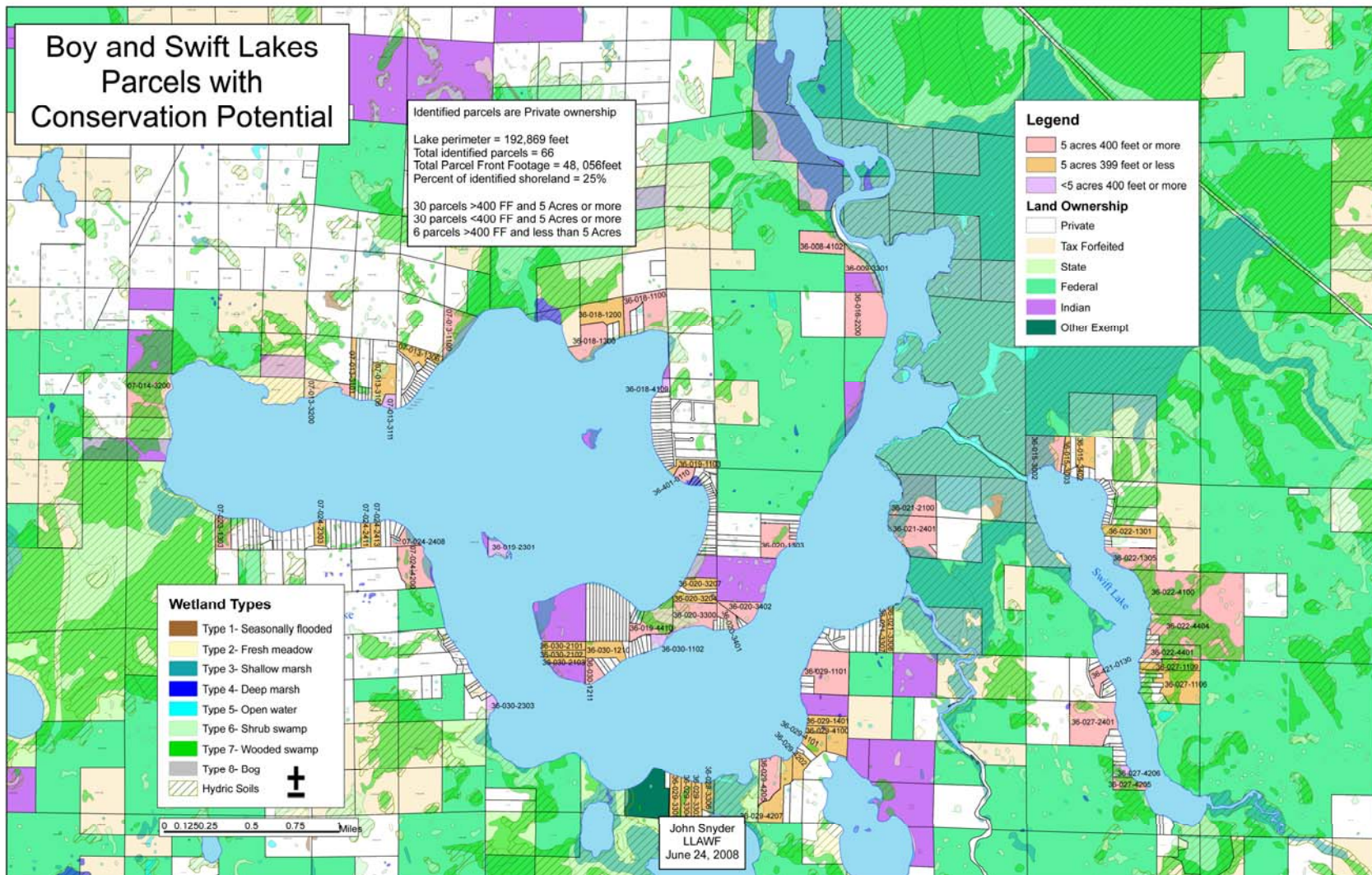


Figure 4. Lake parcels with conservation potential (developed by John Snyder, LLAWF).

## 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.

Phosphorus export, which is the main cause of lake eutrophication, depends on the type of land cover occurring in the lakeshed. Figure 5 depicts Boy 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 Boy 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, forest, and water acreages to grass/shrub/wetland and urban acreages. The largest change in percentage is the decrease in agriculture cover (29.1%); however, in acreage, grass/shrub/wetland cover has increased the most (882 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.

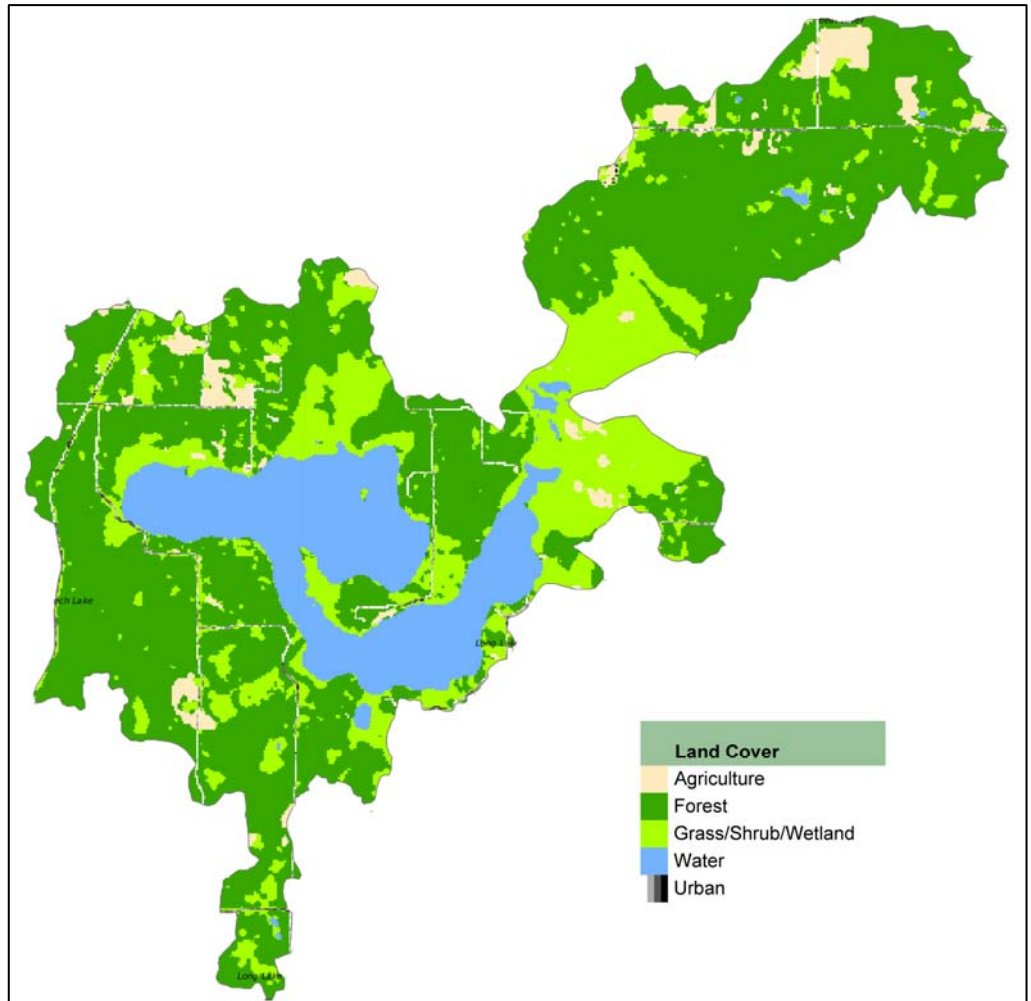


Figure 5. The Boy Lake (804100) lakeshed land cover (<http://land.umn.edu>).

Table 1. Boy 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	1,079	5.14	765	3.65	29.1 % Decrease
Forest	12,699	60.51	12,351	58.85	2.7 % Decrease
Grass/Shrub/Wetland	3,433	16.36	4,315	20.56	25.7 % Increase
Water	3,405	16.22	3,185	15.18	6.5 % Decrease
Urban	373	1.78	374	1.78	0.3 % Increase
<b>Impervious Intensity %</b>					
0	20,848	99.33	20,761	98.91	0.4 % Decrease
1-10	61	0.29	80	0.38	31.2 % Increase
11-25	60	0.29	95	0.45	58.3 % Increase
26-40	13	0.06	38	0.18	192.3 % Increase
41-60	5	0.02	13	0.06	160 % Increase
61-80	2	0.01	3	0.01	50 % Increase
81-100	1	0	1	0	No Change
<b>Total Area</b>	20,987		20,987		
<b>Total Impervious Area</b> (Percent Impervious Area Excludes Water Area)	21	0.12	42	0.24	100 % Increase

## Demographics

Boy 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, Rogers Township has a higher extrapolated growth projection, whereas Boy Lake Township has a lower extrapolated growth projection.

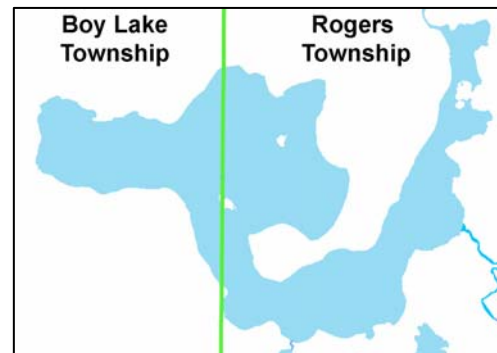
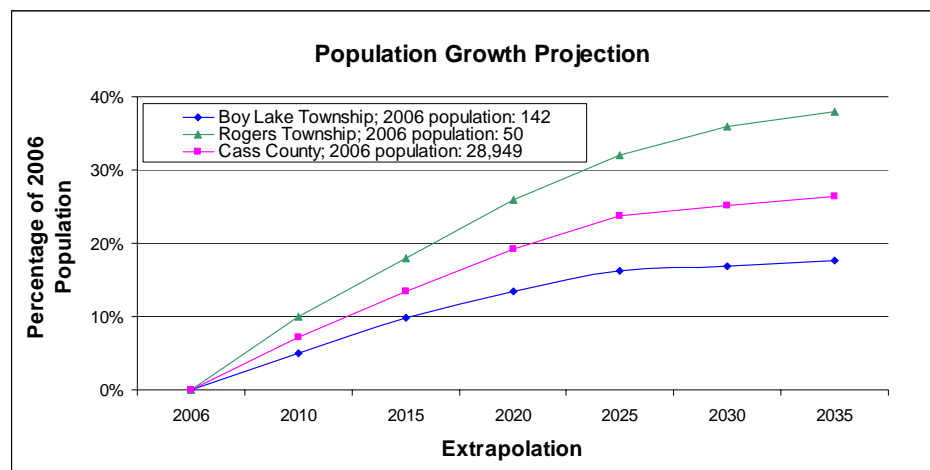


Figure 6. Population growth projection for the townships around Boy Lake and Cass County (source: <http://www.demography.state.mn.us/resource.html?id=19332>).



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

Big Boy Lake is a 3,186-acre lake located near Boy River, Minnesota that has 20.9 miles of shoreline and a maximum depth of 45 feet. There is a state-owned public access on the southwest shore. The Minnesota Department of Natural Resources (MNDNR) has classified Minnesota lakes into 43 different classes based on physical, chemical, and other characteristics. Big Boy Lake is in Lake Class 25; lakes in the class are generally deep, clear and irregularly shaped lakes. This lake is primarily managed for walleye, northern pike, and muskellunge and secondarily for bluegill, black crappie, largemouth bass, yellow perch, and tullibee (cisco).

Walleye are abundant in Big Boy Lake and the 2005 catch rate was the historical high for Big Boy Lake. The mean length was 16 inches and fish up to 27 inches were sampled. The walleye population is the result of natural reproduction; no walleye stocking has occurred since the late 1980's. In addition, northern pike are abundant and the 2005 catch rate was the historical high for Big Boy Lake. The mean length for northern pike was 19 inches and fish up to 36 inches were sampled. Other fish species that are available to anglers to catch are black bullhead, black crappie, bluegill, bowfin (dogfish), brown bullhead, burbot, largemouth bass, pumpkinseed sunfish, redhorse (greater and shorthead) rock bass, tullibee (cisco), white sucker, yellow bullhead, and yellow perch.

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 Big Boy Lake and provide anglers the opportunity to catch more and larger fish in the future.

Shoreline areas on the land and into the shallow water provide essential habitat for fish and wildlife that live in or near Minnesota's lakes. Overdeveloped shorelines can't support the fish, wildlife, and clean water that are associated with natural undeveloped lakes. The combined effects of all lakeshore owners "fixing up" their property can destroy a lake's valuable natural shorelines.

Shoreline habitat consists of aquatic plants, woody plants and natural lake bottom soils. Plants in the water and at the water's edge provide habitat, prevent erosion and absorb excess nutrients. Shrubs, trees, and woody debris such as fallen trees or limbs provide good habitat both above and below the water and should be left in place. Natural lake bottom materials like silt or gravel are more ecologically productive than pure sand trucked in for a swimming beach. A tidy lawn and a sandy beach make great spots for sunbathing and swimming but do little to provide habitat for fish and wildlife. By leaving a buffer strip of natural vegetation along the shoreline, property owners can reduce erosion, help maintain water quality, and provide habitat and travel corridors for wildlife.

Only if more lakeshore owners manage their shoreline in a natural condition can fish and wildlife populations on Minnesota lakes remain healthy and abundant. More specific information on protecting or restoring shorelines and watersheds is available through the local MNDNR Fisheries office.

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=11014300>