

The Fish Community and Fishery of Lake Leelanau, Leelanau County, Michigan with Emphasis on Walleyes, Northern Pike and Smallmouth Bass

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Introduction

The Michigan Department of Natural Resources (MDNR), Fisheries Division surveyed fish populations and angler catch and effort on Lake Leelanau, Leelanau County, Michigan from April 2002 through March 2003. This work was part of a statewide program designed to improve assessment and monitoring of fish communities and fisheries in Michigan's largest inland lakes. Known as the Large Lakes Program, it is currently scheduled to survey about four lakes per year over the next ten years (Clark et al. 2004).

The Large Lakes Program has three primary objectives. First, we want to produce consistent indices of abundance and estimates of annual harvest and fishing effort for important fishes. Initially, important fishes are defined as species susceptible to trap or fyke nets and/or those readily harvested by anglers. Our hope is to produce statistics for important fishes to help detect major changes in their populations over time. Second, we want to produce abundance estimates and sufficient growth and mortality statistics to be able to evaluate effects of fishing on special-interest species which support valuable fisheries. This usually involves targeting special-interest species with nets or other gears to collect, sample, and mark sufficient numbers. We selected walleyes *Sander vitreus*, northern pike *Esox lucius*, and smallmouth bass *Micropterus dolomieu* as special-interest species in this survey of Lake Leelanau. Finally, we want to evaluate the suitability of various statistical estimators for use in large lakes. For example, we applied and compared three types of abundance and three types of exploitation rate estimators.

The Large Lakes Program will maintain consistent sampling methods over lakes and time. This will allow us to build a body of fish population and harvest statistics for direct evaluation of differences between lakes or changes within a lake over time. Lake Leelanau was the seventh lake sampled under the protocols of the program; thus, we were sometimes limited in our ability to make valid comparisons. Of course, as our program progresses we will eventually have a large body of netting data collected under the same conditions in the future.

We will refer to fishes by common name in the text. We listed common and scientific names of fish species in Appendix A.

Study Area

The Lake Leelanau watershed encompasses 140 square miles (Northwest Michigan Council of Governments 1996). According to the Michigan Digital Water Atlas (Breck 2004), Lake Leelanau is 8,607 surface acres with a maximum depth of 120 ft. Lake Leelanau has several major feeder tributaries, including the Cedar River, Cedar Run, and Houdek Creeks. The Carp River drains Lake Leelanau into Lake Michigan in the town of Leland, Michigan (Figure 1). The Leland Dam raises the natural water level seven feet and prevents migration of Lake Michigan aquatic species into Lake Leelanau. The elevation of Lake Leelanau is maintained at 589.21 feet from April 15–November 15, and lowered 12 inches from November 15–April 15. These elevations were established by a Leelanau County Circuit Court Order in 1978. Lake Leelanau has two basins (north and south) connected by a navigable channel called the “Narrows.” These two basins are often considered separate lakes, North Lake Leelanau and South Lake Leelanau (Figure 1). In this report, we will refer to North Lake Leelanau and South Lake Leelanau as the north and south basins. Water chemistry is similar in the two basins (Laarman 1976), but there are some physical differences. The north basin is smaller at 2,914 acres and deeper with a maximum depth of 120 ft (Breck 2004). About 58% of its surface has depths greater than 20 feet (Figure 2) and 90% of its volume is in depths greater than 20 ft (Figure 3). The south basin is larger at 5,693 acres and shallower with a maximum depth of 62 feet. About 53% of its surface has depths greater than 20 feet (Figure 4) and 82% of its water volume is in depths greater than 20 ft (Figure 5).

Michigan Department of Environmental Quality (MDEQ) characterizes Lake Leelanau as oligotrophic based on low nutrient concentrations and water clarity. A thermocline typically develops at 30–40 ft. deep (Laarman 1976).

The topography of the Lake Leelanau watershed is gently sloping with soils that range from mucky to well-drained (Northwest Michigan Council of Governments 1996). Surrounding land use of the south basin was estimated at 60% undeveloped, 25% agriculture, and 15% urban in 1993. Shoreline composition was estimated at 80% upland and 20% wetland. Shoal soils were composed of 80% sand, 10% gravel, and 10% muck. The upland areas consisted of hemlock, red pine, maple, aspen, and orchard trees. Five-hundred and sixty-three houses, seven resorts, and two boat liveryes were also tabulated along the shoreline of the south basin in 1996 (Northwest Michigan Council of Governments 1996).

Lake Leelanau has several public access sites with boat launches, including sites at the Narrows, two on the east shore on County Road 641, and three on the west shore on county roads 643, 204, and 22. There are also several public campgrounds and two marinas near or on Lake Leelanau.

The current fish community of Lake Leelanau is typical of oligotrophic lakes in the region. Coolwater fishes present include longnose gar, northern pike, minnows, suckers, sunfishes, yellow perch, and walleyes. However, it does not appear that walleyes were very abundant prior to the 1980s based on survey, harvest, and stocking records presented by Laarman (1976). It is likely that walleyes were native to the lake because it was connected to Lake Michigan prior to construction of Leland dam. Management efforts prior to the 1970s centered around coldwater species, primarily lake trout, rainbow trout, and brown trout (Laarman 1976). Coldwater fishes present include lake whitefish, lake herring, brown trout, rainbow trout, and lake trout. The lake was stocked with walleyes, bluegill, rainbow trout, lake trout, brown trout, splake, and lake whitefish between 1948 and 2005 (Table 1). In addition, smallmouth bass, largemouth bass, yellow perch, and warmouth were stocked prior to 1948 (Laarman (1976). Lake trout are the only species presently stocked in Lake Leelanau on a regular basis. Stocking of brown trout and walleyes was discontinued in 2000 and 2001 (Table 1). Brown