

## **The Fish Community and Fishery of Burt Lake, Cheboygan County, Michigan in 2001-02 with Emphasis on Walleyes and Northern Pike**

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### **Introduction**

Michigan Department of Natural Resources (MDNR), Fisheries Division surveyed fish populations and angler catch and effort at Burt Lake, Cheboygan County, Michigan from April 2001 through March 2002. 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 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* and northern pike *Esox lucius* as special-interest species in this survey of Burt Lake. 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 two types of exploitation rate estimators for walleyes and northern pike in this survey of Burt Lake.

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 to directly evaluate differences between lakes or changes within a lake over time. Burt Lake is only the fourth lake to be 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.

## Study Area

The size of Burt Lake is about 17,000 acres, with sources disagreeing only slightly on size. Humphrys and Green (1962) estimated 17,120 acres for Burt Lake by taking measurements from United States Geological Survey (USGS) topographical maps using hand-held drafting tools. Michigan Digital Water Atlas<sup>1</sup> (2003) reported 17,394 acres for Burt Lake by using computerized digitizing equipment and USGS topographical maps. They overlaid the boundaries of the lake polygon from the MDWA GIS layer with aerial photos of the lake using ArcView<sup>®</sup>, and the two matched well. In our Large Lakes Program, we want to compare various measures of productivity among lakes, such as number of fish per acre or harvest per acre, so a measure of lake size is important. Therefore in our analyses, we will use the more modern estimate of 17,394 acres as the size of Burt Lake.

Burt Lake is fed by Crooked and Maple rivers on the west shore (Figure 1) and the Sturgeon River on the south shore. Other tributaries that enter the lake include the Little Carp River, Hasler Creek, and various small unnamed streams. The Little Carp, Maple, and Sturgeon rivers are designated Michigan trout streams. Burt Lake is part of the Inland Waterway, a historically important boating route across Northern Michigan between lakes Michigan and Huron. From Lake Michigan, the route goes through Little Traverse Bay and Round Lake, then enters the Lake Huron drainage after a short portage to Pickerel Lake. It continues through Crooked Lake, the Crooked River, Burt Lake, the Indian River, Mullet Lake, and finally through the Cheboygan River to Lake Huron.

The shoreline is largely developed with private and commercial residences, but some public riparian land exists in the form of a state forest and state park (Figure 1). The maximum depth of Burt Lake is about 73 ft. The bathymetry is variable, with both shallow flats and deep holes. Most of the lake, however, is less than 40 ft deep. Percent area and percent volume by depth are presented in Figures 2 and 3. Substrate in shallow areas consists of sand, marl, rock, and gravel, while substrate in deeper water is sand and organic matter. Aquatic vegetation is typically sparse and located in the shallower, northern end of the lake and near the confluence of the Maple and Indian rivers.

The most complete water chemistry analyses on Burt Lake were done in 1955. There were two stations that were sampled over 7 days through July and August. Summer dissolved oxygen concentrations (ppm) averaged 7.3 at the surface, and decreased with increasing depth. Generally, dissolved oxygen was below 6.0 ppm only at depths greater than 30 ft. Dissolved oxygen concentrations ranged from 0.2–1.0 at depths greater than 50 ft. Surface water temperature averaged 75.9°F during these summer months, and it gradually declined to an average of 64.6°F at the bottom. Borgeson (MDNR, unpublished data) reported an alkalinity of around 150 mg/l CaCO<sub>3</sub> for Burt Lake.

The fish community of Burt Lake includes species typical of northern Michigan. We listed common and scientific names of all fish species captured during this study in the Appendix. Henceforth, we will refer to fishes only by common name in the text. Families of fish include, but are not limited to, *Amiidae*, *Cyprinidae*, *Catostomidae*, *Centrarchidae*, *Esocidae*, *Ictaluridae*, *Lepisosteidae*, *Percidae*, and *Salmonidae*. Previous surveys of the walleye population have generally

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<sup>1</sup> A statewide program conducted by MDNR, Fisheries Division, Lansing to develop computerized maps and reference data for aquatic systems in Michigan. (<http://ifrgis.snre.umich.edu/dwa/introduction.html>)