

**Baker Lake**  
Barry County  
Status and Trends Survey

**Kregg Smith, Fisheries Biologist**

**Environment**

Baker Lake is located in Yankee Springs Township, Barry County. Baker Lake is part of the Gun Lake chain of lakes that flow to the Kalamazoo River. There are two inlets to the lake; Baker Creek is a small stream flowing into the northwestern basin of Baker Lake and Townline Three drain is a Barry County drainage ditch flowing into the eastern basin of the lake. The outlet is a 500 ft long channel connecting to Round Lake. From the information in Humphrys and Green (1962), the area of Baker Lake is 58.8 acres, and the area of Round Lake (between Baker and Chief Noonday Lakes) is 6.7 acres (Figure 1). According to DNR- GIS mapping of the lake, the polygon for Baker Lake includes Round Lake for a total surface area of 68 acres. The perimeter of the lake is 3.14 miles and the fetch length is 0.78 miles. Public access is available off of Norris Road that is located along the east side of the lake. There is a no high speed boating regulation on the lake, defined as a speed at which a boat reaches a planing condition.

The Yankee Springs Recreation Area borders the lake along the south and the Barry State Game Area borders the lake along the north. When combined, these two adjoining Michigan Department of Natural Resources properties total more than 22,000 acres of public land. Baker Lake is undeveloped, except for one private landowner, and provides a scenic and natural shoreline. Forest (49%), agriculture (21%) and wetlands (19%) are the primary land cover in the watershed. Ice contact, outwash, alluvium, and fluvial materials are the dominant surficial geology all of which are coarse texture. The lake has a maximum depth of 26 ft with approximately 72% of the lake (by surface area) less than 10 ft deep. Organic soils are the predominant substrate in the littoral zone.

Limnological sampling was conducted at the deepest point in Baker Lake on August 15, 2012. The lake was thermally stratified with the epilimnion extending from the surface to a depth of 13 ft. The warmer upper layer of water was separated from the colder deeper layer by a thermocline at this depth. The metalimnion (zone of thermal change) extended from 13 ft to 20 ft. Cold waters of the hypolimnion extended from 20 ft to the bottom of the lake bed. Dissolved oxygen concentrations declined rapidly following a clinograde curve from the surface measurement of 8 ppm to less than 1 ppm by 17 ft. Total alkalinity was 140 mg/L, which is characteristic of a hardwater lake with substantial buffering capacity. Biological productivity of a lake is dependent on three water quality parameters including phosphorus, nitrogen, and chlorophyll a. Total phosphorus concentration during summer stratification was 26.7 µg/L. The total N to total P ratio was 32:1. In Michigan, concentrations of total phosphorus greater than 20 µg/L are considered indicative of eutrophic conditions (DNR, unpublished Status and Trends Data). Lakes with total nitrogen to total phosphorus ratio greater than 15 to 1 near the surface are generally considered phosphorus limited. Chlorophyll a concentration was 8.7 µg/L that indicates a high algal biomass in the lake. Based on these water quality parameters the lake is characterized as a warm eutrophic lake.

**History**

The first evaluation of the fishery of Baker Lake was conducted by the Institute of Fisheries Research at the University of Michigan in 1936 (Report No. 470). This evaluation was a creel census that recorded 3,476 legal sized fish taken by anglers in 734 angler days. The report indicated that bluegills were the predominant catch and represented 70 percent of all fish taken. Yellow perch, black crappie, bullhead, pumpkinseed sunfish, and largemouth bass were also represented in the angler catch. Warmouth bass and northern pike were an insignificant part of the catch, but still provided evidence of their occurrence in the lake at this time.

A fisheries survey for lakes in Yankee Springs Township of Barry County, including Baker Lake, was completed in 1941 by the Institute of Fisheries Research (Report No. 720). The Institute for Fisheries Research completed a lake inventory map of Baker Lake in 1962 that is still used as the base map for soundings, vegetation type, and lake bottom soil type along with an analysis of water chemistry. This information is reported in Humphrys and Green (1962).

The Michigan Department of Conservation conducted a fisheries survey and water analysis in 1965. The water analysis included temperature and oxygen profiles from the surface to a depth of 26 ft that was reported as the bottom. Alkalinity and pH were also recorded at various depths during the survey. There was a thermocline established at 10 ft with dissolved oxygen concentrations greater than 5.6 mg/L at a depth of 16 ft. The fisheries survey used experimental mesh gillnets for eight set nights of effort and captured yellow perch, black crappie, bluegill, northern pike and largemouth bass.

The Michigan Department of Natural Resources conducted an electrofishing survey of the lake in 1984. The survey captured all of the species previously reported and there were several additional species recorded including: bowfin, common carp, white sucker, golden shiner, grass pickerel, lake chubsucker, and spotted gar. There has been no history of stocking fish in Baker Lake to supplement this warmwater fishery.

### **Current Status**

Baker Lake was surveyed according to Fisheries Division's inland lake Status and Trends Program where the amount of sampling effort varies as a function of gear type and lake size. This was the first year of new sampling protocols that used only fyke nets (trap nets were eliminated from the protocol) that were set at randomly-selected locations in the littoral zone. Fyke nets were set perpendicular to the shoreline with the pot in deeper water and the lead on or near shore. Gillnets were set at random locations within the open water zone of the lake. Standard experimental gill nets consisted of five monofilament panels of 1.5, 2, 2.5, 3, and 4 inch mesh, each 25 ft in length for a total net length of 125 ft. Boom shocking was used to collect representative samples of near-shore fishes. Boom shocking took place at night during the same sampling period that the netting survey was conducted. A minimum of three 10-minute passes were made parallel to the shore in water depths less than 6 ft. The starting point of these passes was selected randomly and their coordinates were recorded. Small mesh dip-nets were used so that small-bodied species and young of larger-bodied species were captured.

### **Analysis and Discussion**

A total of 1,330 fish were captured during the survey that comprised 15 species. Bluegills were the predominant catch and represented 73.5 percent of all fish captured (Table 1). Four species of turtles were observed with painted turtle the most abundant. Baker Lake's fish community appears to be similar

to records obtained as early as 1936 with Centrarchid species the most abundant family represented in the catch. Northern pike were not captured during the survey.

Bluegills and largemouth bass displayed a poor size structure with the mean length at each age slightly lower than average. Bluegill fyke net catch rates were moderate at 52/fyke net lift and near the regional median value for lakes in southwest Michigan (Figure 2). Electrofishing catch rate for largemouth bass was near the southwest regional average at 1.23 fish per minute (Figure 3), but was higher than statewide median values. The composition of the bluegill catch was comprised of age classes from one to seven. There were ten age classes captured for largemouth bass. This information indicates there is fairly consistent recruitment of both species in the lake.

Black crappie (n = 30) were not an abundant panfish species in the sample. Most of the black crappies were of a similar size range 5.5 to 7 inches with only two age classes represented in the catch. Yellow perch (n = 16) composed less than 2% of the total fish caught during the survey. Yellow perch in the 7.0-8.9 inch range were common, but no fish > 9 inches were captured. The sample size was limited, but growth appeared to be at the state average for older fish. Pumpkinseed (n = 61) mean lengths-at-age were at statewide averages. Pumpkinseeds often hybridize with bluegills and vice versa with the hybrid sunfish (n = 74) composed 5.6% of the total fish captured during the survey.

Species that consist of only a few populations statewide or that have exhibited declines in distribution and abundance over the past fifty years are listed as species of greatest conservation need (SGCN) in the State of Michigan's Wildlife Action Plan (Eagle et al. 2005). These species and their habitats are unique within Michigan and are priorities for conservation efforts. Species of greatest conservation need captured in Baker Lake or reported in historic surveys include spotted gar, lake chubsucker, and grass pickerel.

### **Management Direction**

Species richness is a metric used to determine the characteristics of lake fish assemblages. A total of 15 fish species were captured during the survey. Species richness was lower in Baker Lake than the average of 18 species typically captured from status and trends lakes surveyed in the southwest region of Michigan. The overall catch of fish in the lake was low and did not allow for the evaluation of age and growth for most of the fish species collected. This may be a function of new procedures that eliminated the use of trap nets, rather than an indication of low fish species composition.

Mean size and proportion of large bluegills, black crappie, and yellow perch in fyke and gill net samples decreased between 1941 and 2012. There was a small, but significant reduction in the size of bluegills and number of yellow perch in the population indicating that there appears to be a shift in population structure that is less desirable quality fish for anglers. Predatory fish numbers were low in the lake and the abundant bluegill numbers reflect a density dependent growth, with growth rates inversely related to population density. Poor size structure may have resulted because of fairly consistent recruitment and high densities of earlier maturing and slower growing bluegill. Age distribution analysis indicated many bluegills survive to age five, but fewer fish exceeding age six were captured. The apparent decrease between these successive age classes may suggest high natural mortality of adult bluegill, or may indicate high harvest rates, as bluegill generally grow to an angler desired size in their fifth growing season. Black

crappie angling opportunities may be limited by inconsistent reproduction and recruitment, resulting in the variable population numbers and similar sizes that we encountered during this survey.

For the state as a whole, the typical range of largemouth bass catch rates for electrofishing gear was roughly 0.4 to 1.6 fish per minute. Catch rates during this survey indicated a moderate population size compared to lakes in the state. Using the mean length at age data for all status and trends lakes in Michigan, largemouth bass reach the current minimum size of 14 inches at approximately age six. Sampled largemouth bass from Baker Lake achieved the legal size in their seventh growing season. Largemouth bass populations with these population characteristics often are associated with bluegills of lower quality.

### **References**

Eagle, A.C., E.M. Hay-Chmielewski, K.T. Cleveland, A.L. Derosier, M.E. Herbert, and R.A. Rustem, eds. 2005. Michigan's Wildlife Action Plan. Michigan Department of Natural Resources. Lansing, Michigan. 1592 pp.

Humphrys, C. R., and R. F. Green. 1962. Michigan lake inventory bulletins 1-83. Michigan State University, Department of Resource Development, East Lansing

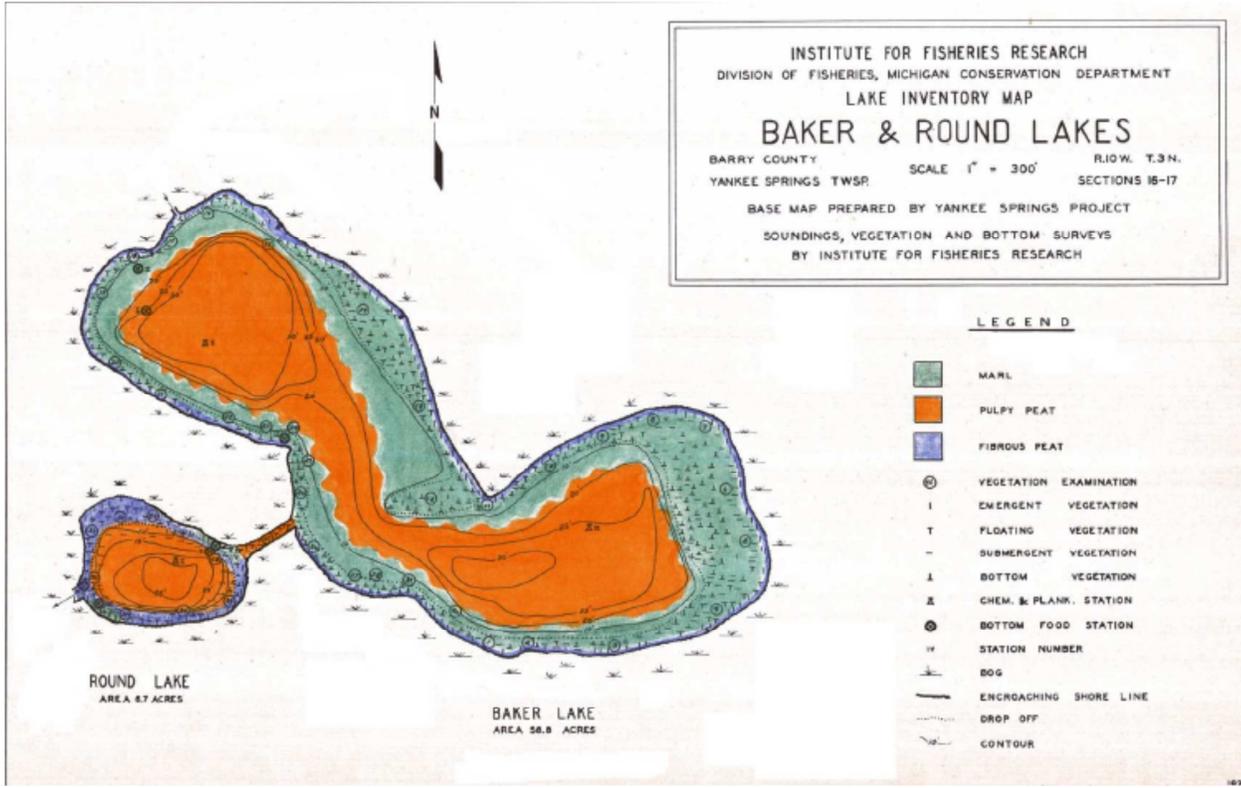


Figure 1. Lake Inventory Map (Humphrys and Green, 1962) of Baker Lake, Barry County.

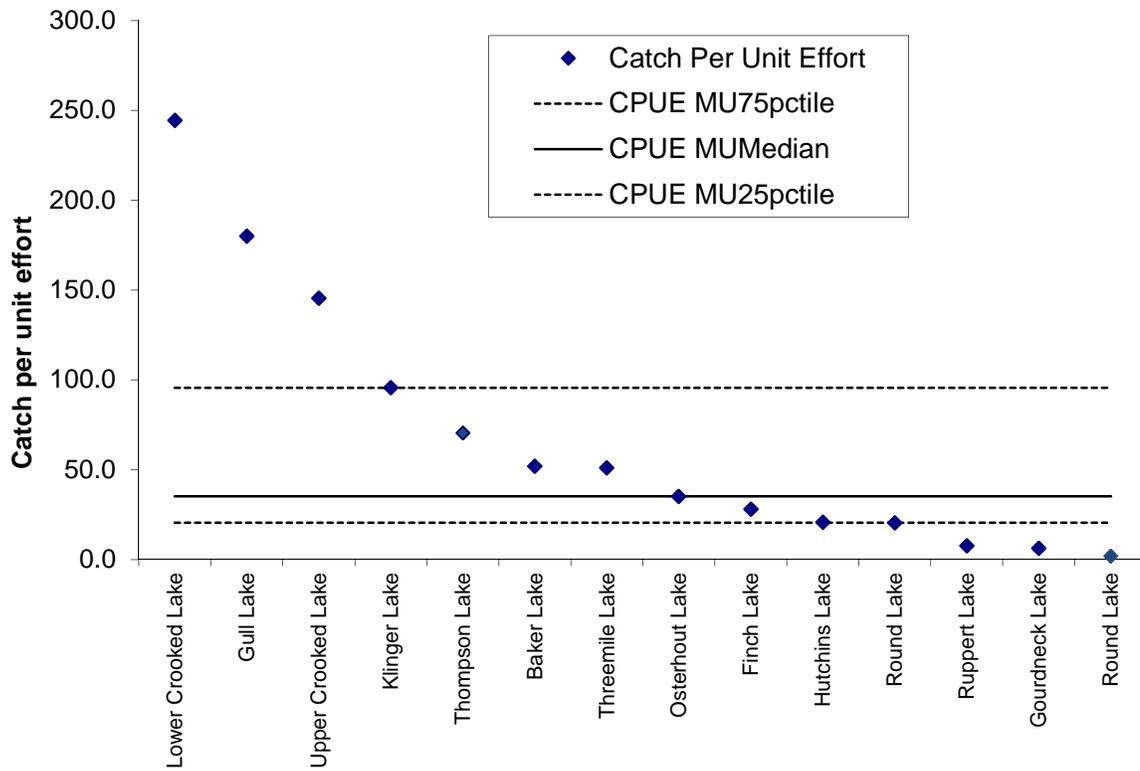


Figure 2. Fykenet catch per unit effort for bluegill in Baker Lake and other regional lakes surveyed by the Status and Trends protocol.

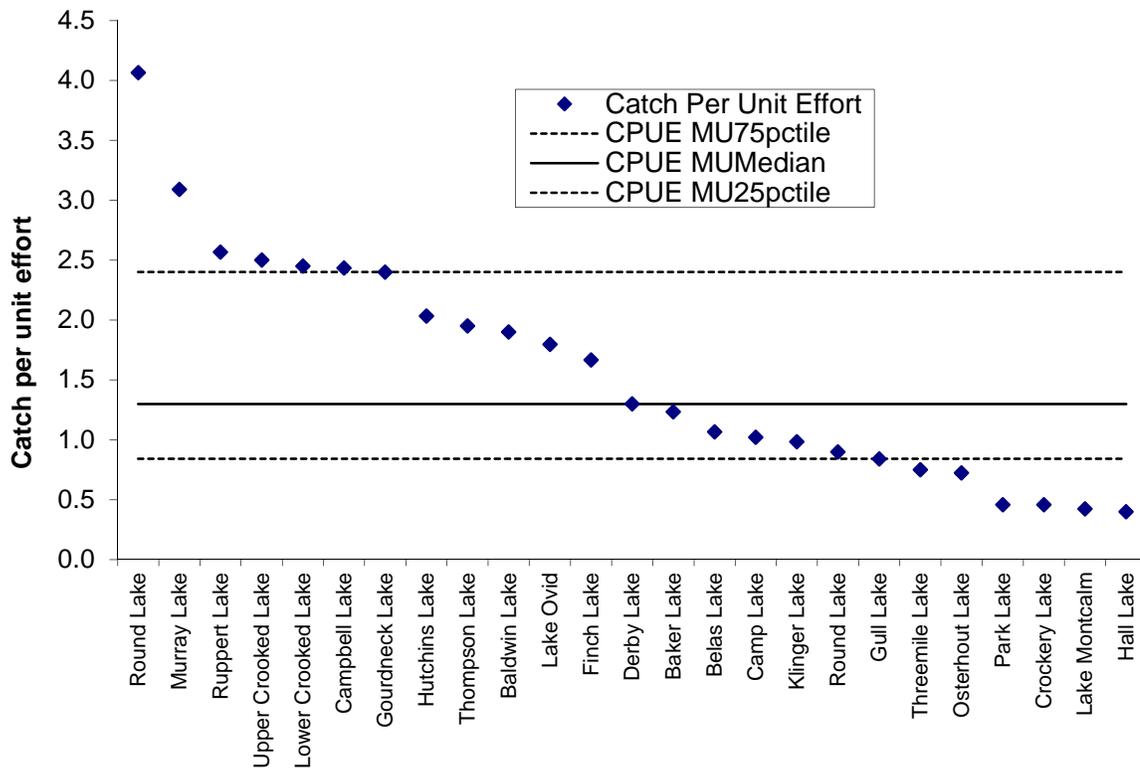


Figure 3. Electrofishing catch rate of largemouth bass in Baker Lake and other regional lakes surveyed by the Status and Trends design.

Table 1. Species composition during the 2012 Status and Trends Survey in Baker Lake, Barry County.

Species	Number	Percent by Number
Black Crappie	30	2.3
Bluegill	977	73.5
Bowfin	19	1.4
Brown bullhead	3	0.2
Brook silverside	1	0.1
Blackstripe topminnow	5	0.4
Golden shiner	7	0.5
Grass pickerel	2	0.2
Hybrid sunfish	74	5.6
Lake chubsucker	6	0.5
Largemouth bass	69	5.2
Pumpkinseed	61	4.6
Spotted Gar	40	3.0
Warmouth	4	0.3
Yellow Perch	16	1.2
Yellow bullhead	16	1.2
<b>Total fish</b>	<b>1330</b>	
Snapping turtle	6	9.7
Common musk turtle	10	16.1
Common map turtle	10	16.1
Painted turtle	36	58.1
<b>Total turtles</b>	<b>62</b>	