Clear Lake
Van Buren County
Status and Trends Survey

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Environment

Clear Lake is a small lake located in Pine Grove Township, in the Northeastern corner of Van Buren County. Clear Lake has a total of 70 acres of surface water and a maximum depth of 55 ft. Michigan Department of Natural Resources maintains a public access site located on the east side of the lake, off 2nd Avenue, which consists of a gravel ramp, parking for up to 8 vehicles with boat trailers, and a single outhouse. This small, mostly undeveloped kettle lake has dark water and a diverse emergent aquatic plant community along the perimeter of the lake in depths less than eight feet. Transitional depth zones of the lake are limited as a result of steep drop offs from 5 to 20 feet. The preponderance of the surface area of the lake occurs in the open water zones with depths from 30 to 50 feet.

The environment of Clear Lake was assessed to evaluate the lake condition based on water chemistry parameters within the Status and Trends protocol. The standard sampling effort included a variety of samples and measurements collected at a mid-lake index site, which was the deepest point in the lake. Limnological surveys were conducted in summer (August) when the lake was at peak stratification. At the index site, water transparency and temperature and dissolved oxygen profiles were measured. Water samples were also collected to determine concentrations of alkalinity, nutrients, and chlorophyll a and to determine the size structure of zooplankton. The littoral zone and shoreline were also visually assessed to determine intensity of residential development and shoreline modifications as well as the quantity of fish habitat in the form of large woody structure. A temperature logger was placed in the littoral zone to characterize the thermal parameters during spawning periods for largemouth bass.

Water temperature profiles of the lake indicated that the water column was stratified during sampling with a thermocline established at 14.5 ft. Dissolved oxygen concentrations were higher than 3.0 ppm and acceptable to warm-water fish species down to the critical depth at 41 ft. Total alkalinity (156 mg/L CaCO3) was high indicating a good buffering capacity from acidification in Clear Lake. Secchi depth transparency was 11.5 ft indicating typical water transparency for this region of Michigan. Total nitrogen (0.899 mg/L) was high, but nitrogen naturally occurs in relatively high concentrations in aquatic environments and therefore rarely limits primary production in lakes. Total phosphorus, which is often a limiting nutrient in lakes, was also high in the lake at 0.19 mg/L. The high concentrations of phosphorus may explain the good growth of aquatic plants along the littoral zone of the lakes eastern perimeter. Residential development, measured as dwelling density (number of dwellings per kilometer of shoreline), provides an index of the potential influence of human activities on lake resources. Residential development was low around the lake with a total count of 17 dwellings and only 10% shoreline armoring. Chlorophyll a concentration was also high (3.3 ug/L) indicating a good lake for primary production by phytoplankton. Zooplankton tow samples were not measured to include with this report; however, the availability of phytoplankton appears to support a good size distribution and diversity of zooplankton.

History

Clear Lake was mapped in 1962 to describe the physical and chemical attributes of the lake. The Institute for Fisheries Research completed a lake inventory map of Clear Lake in 1964 that is still used as the base map for soundings, vegetation type, and lake bottom soil type along with an analysis of water chemistry. These initial efforts described the lake as having an organic lake bed with a surface area of 69 acres and a maximum depth of 55 ft.

The only historic fish community assessment conducted by the Fish Division was completed in 1977. This survey reported the presence of bluegill, pumpkinseed, black crappie, yellow perch, northern pike, largemouth bass, white sucker, warmouth, spotted gar, common shiner, bowfin, lake chubsucker, grass pickerel, bullhead, and green sunfish. The survey noted that growth of most fish was a little below state average, but their body weight and physical condition looked good relative to other local area fish populations.

No stocking of any type of fish has been conducted by the Division and relatively no fisheries management actions have been taken except for statewide regulations as this lake remained unchanged from historic assessments.

Current Status

Clear Lake was surveyed according to Fisheries Division's inland lake Status and Trends Program whereas the amount of sampling effort varies as a function of lake size and depth. 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 for three nights with a total effort of 15 net lifts and placed perpendicular to the shoreline with the pot in deeper water and the lead on or near shore. Standard experimental gillnets were set at random locations within the open water zone of the lake. Gill nets were set for three nights with a total effort of six lifts and were constructed of five monofilament panels of 1.5, 2, 2.5, 3, and 4 inch stretch 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. Additionally, there were three minnow seine hauls completed at random locations along the shoreline.

Analysis and Discussion

A total of 1,278 fish representing seventeen species were captured during the survey. The fish community (Table 1) had a large disparity between the number of individuals within each species resulting in low species evenness and diversity, but high species richness. The catch was dominated by five species that comprised 88% by number. Bluegill was the most dominant species caught with 662 individuals (52%). Largemouth bass was the most abundant predator species caught comprising 11% of the catch by number. Black crappie, pumpkinseed, and yellow bullhead each represented 8% of the

catch by number. Twelve other species were caught during the survey, but were only represented by few individuals with the exception of yellow perch (65) and warmouth (42).

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 Clear Lake include spotted gar (9), lake chubsucker (2), and grass pickerel (1).

Black crappie age structure was distributed among six age classes. Growth of Black crappie was similar to other small and shallow lakes sampled by the Status and Trends survey protocols. Bluegill age structure consisted of eight age classes, but the distribution was comprised of mostly younger cohorts (age 1-4). Size structure of bluegills was dominated by smaller sized individuals; however, growth was similar to state average populations (Figure 2). Largemouth bass age structure was distributed across twelve age classes with a stable decline in age frequency from young to older cohorts. Growth of Largemouth bass was similar to state average populations (Figure 3). The presence of older cohorts indicates that exploitation may be low in this population. Northern pike were relatively low in number (9) to assess mean length at age and the few individuals captured ranged in size from 18 to 21 inches in length. Yellow perch age structure was distributed among seven age classes, but most of the fish caught were from only two cohorts (age 1 and 2). The presence of few yellow perch individuals within each cohort may be a result of high natural mortality or low recruitment.

In 2012, water temperatures were abnormally high in March followed by a decrease in nearshore temperatures in April (Figure 4). Water temperatures in the littoral zone then quickly increased above 67o F in May and peaked at a high mean temperature of 80o F in July.

The current fish community and morphological characteristics of Clear Lake can be generally characterized as having the following: 1) a panfish community considered to have low diversity, and dominated by bluegill, 2) a predator population having moderate density and dominated by largemouth bass and northern pike, remaining predators such as spotted gar in lower densities and produced naturally, 3) a low population of small bait fish including lake chubsuckers, golden shiners and central mudminnows, 4) a non-game fish community with low diversity and numbers, and 5) a lake with moderate productivity based on a low watershed to surface area.

The Clear Lake panfish community is low in diversity and fairly poor in quality. Species available to anglers include bluegill, black crappie, pumpkinseed sunfish, and an occasional yellow perch. Growth of panfish is average when compared to growth rates for each species statewide which may be a result of competition for thermal refuge and connectivity to other environments. Clear Lake is a natural kettle lake and its small watershed does not provide for much exchange of resources. Some individual panfish do attain quality harvest size though, particularly bluegill, pumpkinseed, and black crappie.

The predator base of Clear Lake is dominated by largemouth bass and northern pike. Largemouth bass are important predators which are needed to help keep many other species in balance by thinning slow growing panfish populations. Largemouth bass appear to be at acceptable levels despite exhibiting reasonable growth. Northern pike remain in low but acceptable numbers in Clear Lake, but survey

results suggest that they may not attain large sizes. Pike spawn on flooded aquatic vegetation and can even leave their egg masses on submersed aquatic vegetation. These types of habitat are prevalent along the eastern shore of Clear Lake where shoreline development might explain the low natural density of this species.

Management Direction

Clear Lake currently is providing acceptable fishing opportunities for bluegill, pumpkinseed, black crappie, largemouth bass, and northern pike. No stocking is recommended at this time. Management of Clear Lake fishes has primarily been with the use of statewide regulations and maintenance of most species through natural reproduction. Schneider (2000) observed that predators typically make up 20-50% of the biomass in lakes with desirable fish communities. Based on this standard, Clear Lake has a healthy predator-prey ratio that should keep the bass-bluegill populations balanced. Excessive nutrient inputs from Veley Drain should be monitored to prevent eutrophication of the lake and additional aquatic plant growth.

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.

Schneider, J. C. 2000. Interpreting fish population and community indices. Chapter 21 in Schneider, J. C. (editor). 2000. Manual of fisheries survey methods II: with periodic updates. Michigan Department of Natural Resources, Fisheries Special Report 25, Ann Arbor

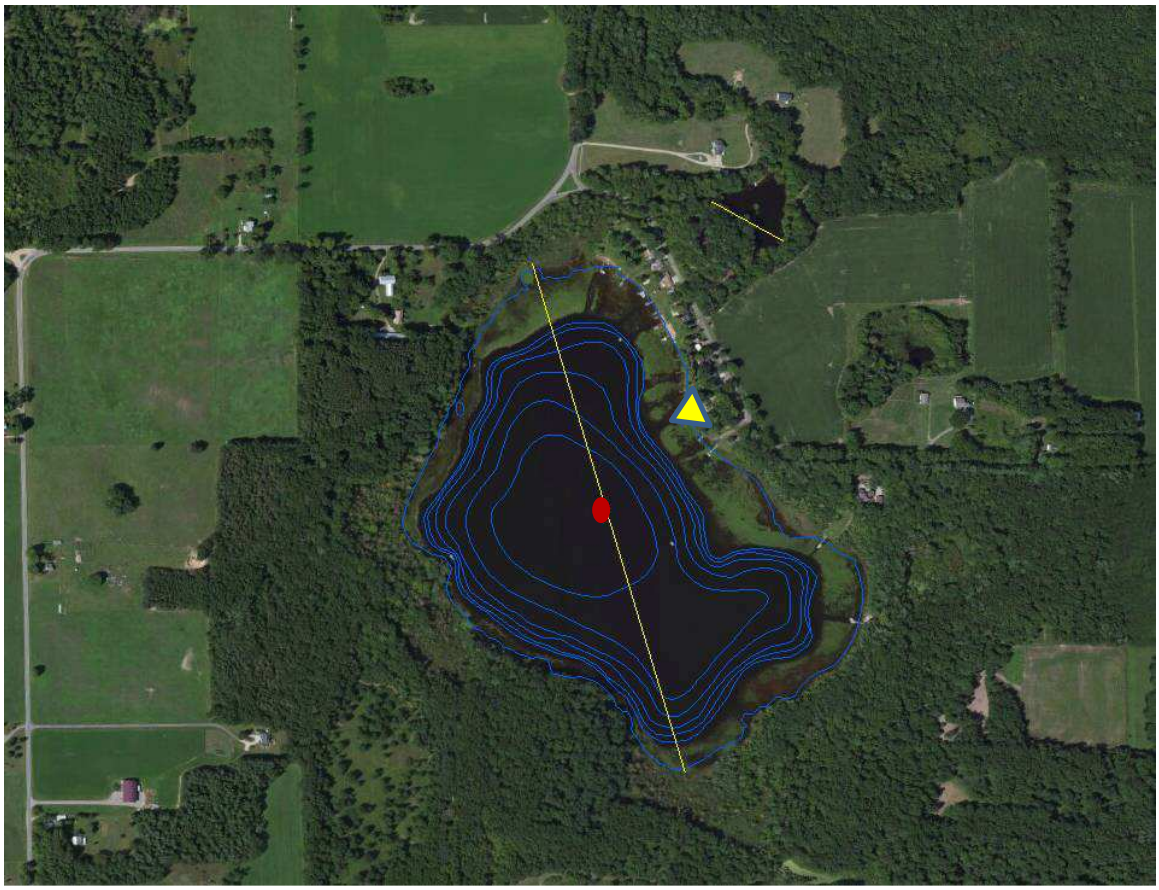

Figure 1. Bathymetric map of Clear Lake, Van Buren County, MI. Yellow line is the fetch, red point is the deepest depth of the lake, yellow triangle marks the MDNR boating access site located off 2nd Avenue.

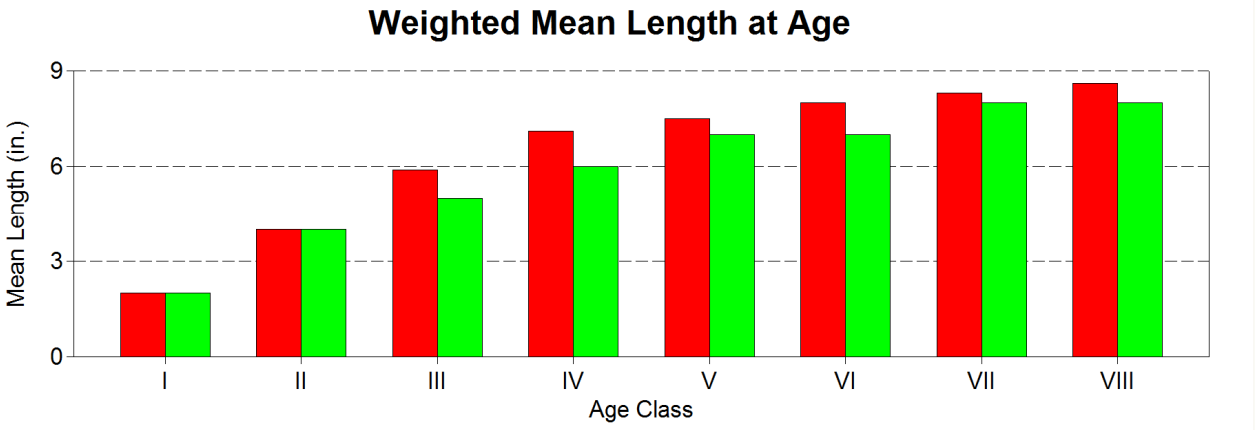

Figure 2. Growth of bluegill in Clear Lake, as determined from scale and spine samples collected during May 7-9, 2012. Red bars are the mean length at age for Clear Lake, while the green bars are state average lengths from Schneider et al. (2000).

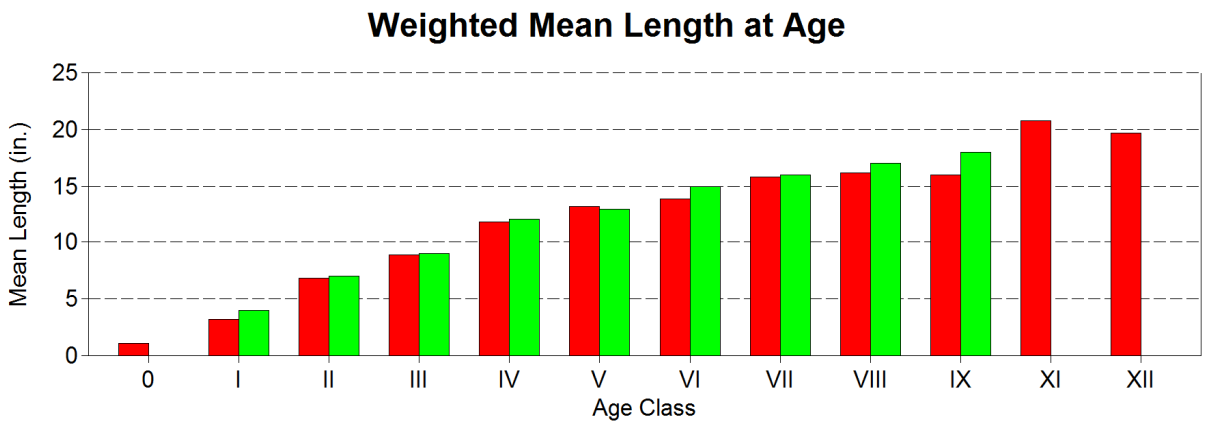

Figure 3. Growth of largemouth bass in Clear Lake, as determined from spine samples collected during May 7-9, 2012. Red bars are the mean length at age for Clear Lake, while the green bars are state average lengths from Schneider et al. (2000).

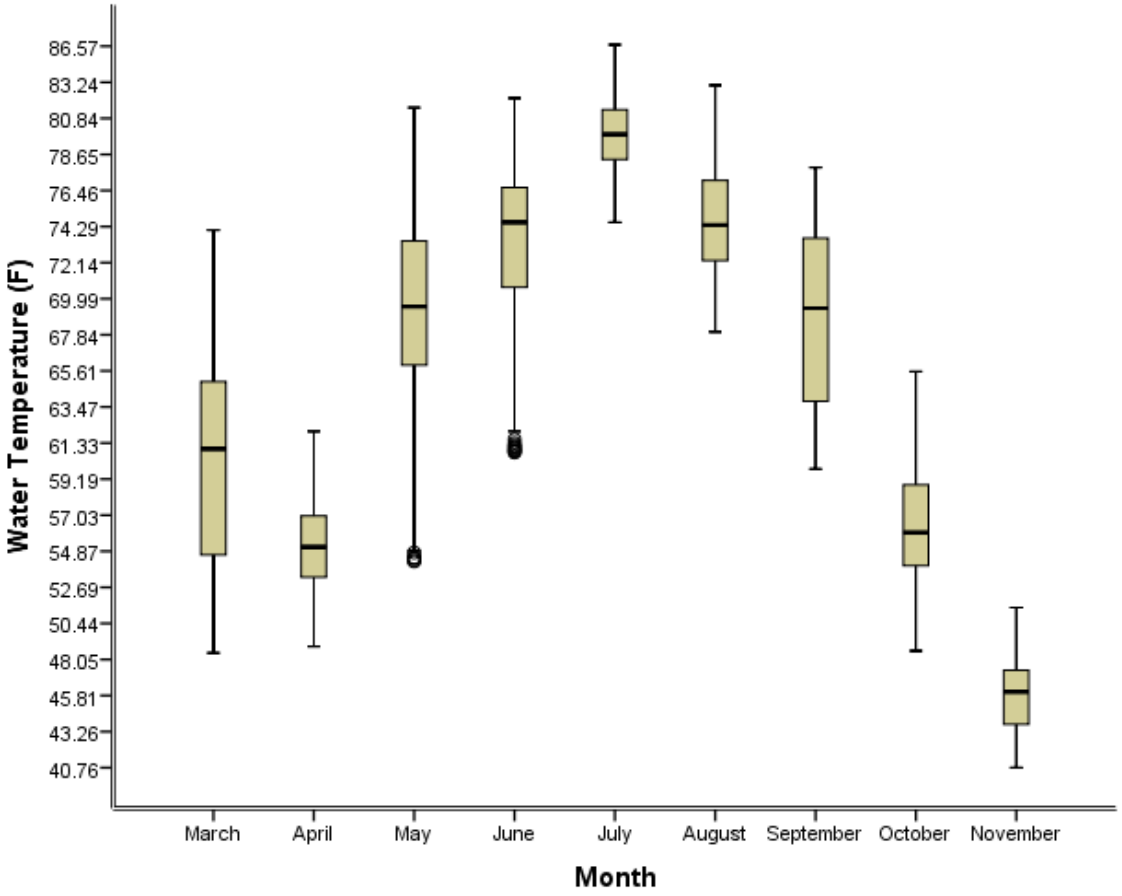

Figure 4. Monthly water temperature (2012) in littoral zone of Clear Lake, Van Buren County. The box represents 50% of the measured monthly temperature was found within that range, and the black band inside the box represents the median temperature. The whisker bars represent the 5th and 95th percentile values while the circles represent values that are outliers (rare temperatures) from the dataset.

Table 1. Fish species composition caught during the Status and Trends Survey in Clear Lake, Van Buren County.

Species	Number	Percent by number	Average length (in.)
Black crappie	113	8.4	6.9
Bluegill	662	49.2	4.4
Bowfin	1	0.1	22.5
Brown bullhead	7	0.5	12.6
White sucker	2	0.1	18
Golden shiner	4	0.3	5.8
Grass pickerel	1	0.1	8.5
Green sunfish	2	0.1	4.5
Hybrid Sunfish Hybrid	5	0.4	4.7
Lake chubsucker	2	0.1	7
Largemouth bass	139	10.3	7.3
Central mudminnow	8	0.6	2.5
Northern pike	9	0.7	17.9
Pumpkinseed	103	7.7	5.3
Spotted gar	9	0.7	22.7
Warmouth	42	3.1	7
Yellow Perch	65	4.8	4.4
Yellow bullhead	104	7.7	10.3
All species totals:	1,346	100	