

Orchard Lake

Oakland County, T2N R9E Secs. 9, 10, 11, 14, 15
Clinton River Watershed, last surveyed 1994

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Environment

Orchard Lake is a kettle lake spanning 788 acres in south-central Oakland County, about 3 miles southwest of Pontiac (Figure 1). A kettle lake is a depression in the earth which was created by partially buried glacial ice blocks and became filled with water after the glacial ice melted. Orchard Lake lies in West Bloomfield Township and the Village of Orchard Lake encompasses the lake. The lake is within the Clinton River watershed, but lies right on the divide between the Huron River and Clinton River watersheds. Upper Straits Lake is less than $\frac{1}{4}$ of a mile to the west, but is in the Huron River watershed.

Orchard Lake is the 7th largest lake in Michigan's Lake Erie watershed, however the drainage area is relatively small. Two small inlets enter the lake on the west side and a small inlet from adjacent Pine Lake flows into Orchard Lake at times of high water. An intermittent outlet that is seldom active connects Orchard Lake with Cass Lake. A water level control structure was installed at this outlet in 1968. There is a legal lake level established for Orchard Lake, with a summer elevation of 930.50 feet and a winter elevation of 930.20 feet. At times of low water level, water is pumped from Cass Lake into Orchard Lake at the water level control structure.

The lake has three islands totaling 35 acres, with Apple Island (33 acres) in the center of the lake making up the majority of the island land. While there are extensive shoal areas, the lake consists of two deep basins; an 80-foot deep basin east of Apple Island and a 111-foot deep basin south of Apple Island (Figure 1). The two basins are separated by a shallow shelf which extends from Apple Island to the northwest corner of the lake and is less than five feet deep, and a second shelf from Apple Island to the southeast side which is between 5 and 10 feet deep. Sand and gravel substrate predominate in the shallows, except for marl bottom on the northwest side of the lake. From the 10-foot to 30-foot depths, a band of marl circumscribes the muck-bottomed areas of deep water.

The lake has a mean depth of 23.1 feet, a volume of 17,402 acre-feet, and a shoreline length, not including the shorelines of the islands, of 28,861 feet. The size of the drainage area, which includes the lake, is 2,764 acres. The watershed to lake ratio is 2.62:1, which is lower than the average for Michigan inland lakes. Because of this, the lake flushes slowly (about once every 8.6 years). That means the water volume in Orchard Lake is replaced on average once every 8.6 years.

The water of Orchard Lake is fairly clear and moderately hard. During surveys in 1940, the depth limit of visibility was about 14 feet, alkalinity ranged from 93 to 115 ppm, and pH values ranged from 8.4 to 7.3. In summer, dissolved oxygen of sufficient quantity to support fish life occurs to a depth of about 40 feet. Good water clarity and extensive shoal areas provide good conditions for aquatic plants which are abundant.

There are a surprisingly few homes along the shoreline of the lake considering the population density and development in the area. There are a cluster of homes on the northwest shore, the western shore, and some on the southeast shore. There is a DNR public access site located on the southwest side of the lake, off Orchard Lake Road. The access site has a hard-surfaced ramp with sufficient water depth and lake size to accommodate most trailerable boats, and includes parking for 63 vehicles.

History

Early settlers are reported to have named this lake from an apple orchard they found on the central island. Native Americans are credited with planting the trees and the vicinity is rich in legends of Native Americans. A stone monument near the junction of Commerce Road and Indian Trail Road, at the northeast side of the lake, marks one end of a trail between Mt. Clemens and Orchard Lake. The monument commemorates the great Chief Pontiac and his warriors who are said to have come here after the Battle of Bloody Run.

Chief Pontiac and his followers are rumored to have used Apple Island as a home site, although there is no proof to substantiate this. Stories are told of Native Americans escaping from their enemies by riding across the lake on the shallow bars out to the island, because they knew where the bars were and their enemies did not.

The first fish survey on Orchard Lake was conducted by the Michigan Fish Commission in 1890. Gill nets were lifted daily over a three day period and the catch consisted of cisco, bluegill, rock bass, largemouth bass, sunfish (likely pumpkinseed), bullheads, and grass pike (likely northern pike). Ciscoes were the most abundant fish in the catch. The report indicated, "Fish are very large and well fed; show great growth."

Coolwater fish species including bluegill, walleye, yellow perch, and smallmouth bass were stocked regularly from 1934 until 1942 (Table 1). There were even two years (1939 and 1940) that crayfish were stocked. It is uncommon for these species to be stocked today, because research has demonstrated that once established, these species are usually ubiquitous and self sustaining.

The Lake was mapped during March 1940 and a fisheries survey was conducted in September of that same year. An extensive fisheries report for Orchard Lake was written in 1941 (Brown 1941). The following excerpt describes the fishery at that time:

"Fishing during the past 20 years is reported as good for smallmouth bass and perch. The lake has also produced a larger number of bluegills, largemouth bass, and northern pike, although this last named specie is reported as greatly reduced in recent years. The lake has not been heavily fished since public access has been restricted to one or two commercial resorts. It is expected that the fishing intensity will increase, now that the Department of Conservation has purchased frontage on the southeast side of the lake."

Results from the 1940 survey reported growth rates as above average for pike and perch, and slightly below average for bluegill and sunfish. A creel survey taken by Conservation Officers on Orchard Lake between 1928 and 1940 found the catch of 3.7 legal fish per hour. This catch rate was high compared to the state average of 1.1 fish per hour. Bluegill made up 75% of the catch, followed by largemouth bass, yellow perch, sunfish, smallmouth bass, rock bass, northern pike, bullhead, and

crappie. A recommendation was made in this report to begin stocking trout in Orchard Lake (Brown 1941).

Trout stockings began shortly after a public access site was acquired in 1941. Orchard Lake was managed for a trout fishery with rainbow trout stockings in most years from 1942 to 1980, and brown trout from 1981 to 1983 (Table 1). During the early part of the trout program, returns were reported as satisfactory. However, poor fishing results in the early 1970s resulted in suspending the trout stockings in 1973 and 1974. The goal was to let zooplankton populations rebound before stocking would continue. One time stockings of Chinook salmon and rainbow smelt occurred in 1975. Chinook salmon were stocked in an attempt to diversify the sport fishery, while rainbow smelt were stocked with a goal of establishing a population which would provide forage and to develop an inland smelt fishery. Evaluation surveys in 1975 and 1976 failed to detect either of these species.

Various fisheries surveys were conducted in 1958, 1969, 1971, 1972, 1975, 1976, 1981, and 1982 to evaluate the trout planting program. Results from the three latest surveys found that the stocked trout were not surviving and providing the fishery they once did. The trout stocking program was discontinued after 1983.

A creel survey was conducted on Orchard Lake in 1986. Anglers caught an estimated 8,649 fish, with one third of the catch being bluegill (Waybrant and Thomas 1988). Total effort and catch rates were low relative to other area lakes. One contributing factor may have been an ordinance by the City of Orchard Lake which prohibited leaving ice shanties up over night.

General fish surveys were conducted in 1984 and 1994. The surveys documented good numbers of bluegill, black crappie, pumpkinseeds, largemouth bass, smallmouth bass, and northern pike, although most were growing slower than the statewide average.

Current Status

A fish community survey was conducted on Orchard Lake by MDNR Fisheries Division during June 2002. Sampling consisted of 13 trap net lifts, 3 minnow seines, 4 experimental gill net lifts, and 3 fyke net lifts during June 4-7, 2002. Three sites were also surveyed by night time electrofishing on June 20, 2002. A total of 2,450 were caught, represented by 24 species (Table 2). Panfish such as bluegill, black crappie, pumpkinseed, rock bass, and yellow perch made up 40% of the total catch by number and 38% by weight. Large game fish such as northern pike, largemouth bass, and smallmouth bass accounted for 5% of the total catch by number and 14% by weight. Forage fish species like blackchin shiner, banded killifish, blacknose shiner, brook silverside, horneyhead chub, Iowa darter, Johnny darter, logperch and spotfin shiner made up 51% of the total catch by number. Rough fish species such as bowfin, common carp, longnose gar, and white sucker made up 2% of the total catch by number, but 46% by weight.

Bluegills were the most abundant game fish caught in the survey, accounting for just over a quarter of the total catch by number (Table 2). The average length in the combined trap net and fyke net catch was 6.7 inches, with 71% of the catch exceeding the minimum length acceptable to anglers of 6 inches. Just over 43% of the bluegill caught exceeded 7 inches and 13% were 8 inches or larger (Table 3).

The quality of the bluegill population in Orchard Lake was evaluated using Schneider's Index (Schneider 1990). This index provides a relative measure of the size of bluegills in a lake based on a relative scale of 1-7, with 7 being the best. The bluegill in Orchard Lake received a "good-excellent" rating (index 5.25).

The next most abundant gamefish was pumpkinseed. They made up 8% of the total catch by number and had an average length of 6.9 inches. All age classes from age-2 to age-11 were represented in the catch, with 40% of the catch age-6 and older (Table 4). Pumpkinseeds in Orchard Lake were growing slightly above the state average with a +0.2 mean growth index. The mean growth index is the average deviation from the state average length at age. So species with a positive mean growth index are growing faster than the average statewide growth rate and a negative mean growth index means they are growing at a rate below the statewide average.

Black crappie made up about 3% of the total catch by number and had an average length of 8.4 inches. The black crappie catch was comparable to the previous surveys in 1984 and 1994, but their growth rate has improved. In the current survey, black crappies were growing slightly better than the state average, with a mean growth index of +0.3 (Table 5).

Largemouth bass made up 4% of the total catch by number and 8% by weight (Table 2). The bass averaged 9.2 inches long with only 6% of the catch exceeding the minimum legal size limit of 14 inches (Table 3). The bass were growing well behind the statewide growth rates, having a growth index of -2.9 inches. Based on the statewide average growth rate, largemouth bass do not reach the minimum size limit until their sixth year. However, the age structure of the bass in Orchard Lake is heavily weighted towards fish age-5 and younger (85%) (Table 4).

Eleven northern pike were caught in the survey and they averaged 23.1 inches long, but over half of the pike were over the minimum legal size limit of 24 inches (Table 3). Not enough pike were caught to develop a mean growth index, but the pike appeared to be growing close to the state wide average (Table 5).

Rough fishes accounted for 46% of the total catch by weight (Table 2). Although the relative numbers of these fish were small, the average size of the fish caught was large. Common carp ranged in size from 16 inches to 28 inches and averaged 5 pounds apiece, and longnose gar ranged from 28 inches to 36 inches long.

There is a diverse forage base in Orchard Lake. Blackchin shiners in particular were abundant in the catch, accounting for almost half of the total catch by number. Other forage species included banded killifish, blacknose shiner, brook silverside, horneyhead chub, Iowa darter, Johnny darter, logperch, and spotfin shiners.

Other species that were caught in small numbers were smallmouth bass, yellow perch, brown bullhead, and yellow bullhead. Rock bass were fairly abundant, accounting for 3% of the total catch by number. No ciscoes were caught in the survey.

Limnology data was collected later in the summer after the lake had thermally stratified. On September 11, 2002, a temperature and oxygen profile was conducted, as well as conductivity, pH,

alkalinity, and Secchi depth (a measure of water clarity) data were collected. The temperature ranged from 75 degrees F at the surface to 43 degrees F at the bottom in 108 feet of water (Table 6). There was a well established thermocline which covered the portion of the water column from 24 feet to 39 feet below the surface. Oxygen levels ranged from 8.7 mg/l on the surface to 0.06 mg/l on the bottom. Conductivity ranged from 536 microSiemens/centimeter on the surface to 563 microSiemens/centimeter on the bottom, and pH ranged from 8.7 to 7.4. The Secchi depth reading was 14 feet and total alkalinity was 102 mg/l.

Analysis and Discussion

Bluegills continued to be one of the most abundant fish in the catch. Catch rates were good in the current survey (2002), but have declined compared to the 1994 and 1984 surveys (Table 7). Although catch rates have declined, both the average size of bluegills in the catch and the Schneider's Index score have improved over past surveys. It is interesting to note that while the sizes of the bluegill have increased, the mean growth index has declined. This discrepancy can be explained by a change in the age structure among surveys. In 1984, Age-7 was the oldest fish caught, and that accounted for less than 1% of the bluegill catch. Conversely, age-7 bluegill was the most abundant age class in the 2002 survey, and 45% of the catch was age-7 and older (Table 4). The number of older fish in the catch has improved the average size of the catch, even though growth rates declined. The abundance of older year classes may be an indication of light fishing pressure on Orchard Lake.

The trend in the catch rate of pumpkinseeds was opposite that of bluegills among surveys. The catch rate of pumpkinseeds was highest in 2002 (12 pumpkinseed/net), compared to 1984 (3 pumpkinseed/net) or 1994 (2 pumpkinseed/net). Similar to bluegills however, the average size was greatest in 2002 (6.9 inches), compared to 1984 (5.6 inches) and 1994 (5.7 inches). The big jump in average size among surveys is again attributed to a shift in the age structure of pumpkinseeds. The oldest pumpkinseeds caught in 1984 and 1994 were age-6 and age-7 respectively, whereas in 2002, 22% of the catch was age-7 and older, with fish up to 11-years old. Again, this provides further support that there is light fishing pressure on Orchard Lake.

The catches of black crappie were relatively consistent among surveys. The growth rates showed a similar trend to pumpkinseeds in that the mean growth index improved from 1984 (-1.2), to 1994 (-0.5), to the most recent survey in 2002 (+0.3) (Table 5). However, the age structure differed from the pattern seen in bluegill and pumpkinseeds. In 2002, 75% of the black crappie catch was age-3 fish. So it is not weighted heavily toward older fish, like bluegill and pumpkinseeds.

Largemouth bass fishing in Orchard Lake is reported as good. However, in 2002 the average size in the survey catch was 9.4 inches and the mean growth index was -2.9. The poor growth index is a contributor to the low average size of largemouth bass in the catch. The reduced number of younger year classes of bluegills and pumpkinseeds which are primary food for bass are likely contributing to some of the reduction in the growth rates of bass. Another reason why the average size was small was due to the abundance of younger fish in the catch; one half of the bass caught were age-3 or younger.

It is difficult to comment on the abundance of larger gamefish like bass and pike, because a general fisheries survey is designed to target bluegills when they are spawning in the shallows. Bluegills are targeted because they play a key role in community structure and overall sportfishing quality

(Schneider 1981). Other gear, such as seines and gill nets are also incorporated into a general survey to get a better evaluation of other species, because these gear are not as specific at targeting bluegill. During the course of a survey, sample sizes of larger gamefish and other less common species are typically sufficient to evaluate relative abundance and determine growth rates. Relative to other area lakes, the catch rate of 5.1 largemouth bass per trap net lift for the Orchard Lake survey is about average.

Several year classes of northern pike were represented in the catch, so there is successful natural reproduction. The pike caught had good growth and there were a good percentage of fish over the legal size limit of 24 inches (45%). The fisheries report from 1941 indicated that there was a big drop in pike numbers at that time due to filling of marsh area along shore for development. Loss of marsh habitat along inland lakes is a common problem today, due to the continuing advance of urbanization. It is interesting that this issue was documented as being a problem in Orchard Lake 60 years ago. Even if pike are in reduced numbers relative to historic levels, pike continue to exist in Orchard Lake. This is good because in addition to being a popular sport fish, pike play an important role in helping maintain a balanced fish community through predation.

Five yellow perch were caught in the current survey. Based on previous survey data from Orchard Lake, it appears that perch were never very abundant and remain only a small part of the fish community. Even fewer smallmouth bass were caught than perch. Smallmouth bass are not sampled very effectively during a general fish survey like this one, but it would be safe to conclude that smallmouth are present, but not prevalent. Even though smallmouth bass are not plentiful in Orchard Lake, it is good to note that they are present. Smallmouth are not common in southern Michigan lakes and are typically only found in lakes with good water quality.

Rough fishes made up a significant proportion of the biomass in the current survey. Although bowfin and gar are classified as rough fish because they are not targeted by anglers, these species are native predators which help balance the fish community in lakes. Common carp on the other hand are a nuisance. This fish is not native to Michigan, but was introduced in the United States in the late 1800s. This fish reproduces rapidly and grows quickly feeding primarily on insects in the sediments. They have a negative affect on the environment by suspending sediments in the water column (causing turbidity) and disturbing aquatic vegetation.

Ciscoes were the most common species caught in a gill net survey of Orchard Lake in 1890; however, no ciscoes were caught in the current survey. Because cisco is a deepwater fish, they would only be expected to be collected in the gill nets from this survey. Although only 4 gill net lifts were done in the 2002 survey, it is expected that at least some ciscoes should have been caught. A limiting factor for ciscoes in many lakes is a lack of sufficient oxygen levels in the cold water in the upper part of the thermocline. The temperature and oxygen profile for Orchard Lake in 2002 found adequate oxygen levels (>5 mg/l) in the upper part of the thermocline to support fish (Table 6). Ciscoes are likely still present, but it appears their numbers are reduced.

Management Direction

Panfish appear to be doing well in Orchard Lake. The survey found good numbers of both pumpkinseeds and black crappies, and both have growth rates that are better than the state wide

averages. Bluegill growth rates have deteriorated, but the abundance of older year classes has resulted in an improvement in the average size of bluegills. Overall, the abundance and size of panfish in Orchard Lake will continue to support a good fishery.

A possibility to improve panfish opportunities in Orchard Lake would be through the introduction of redear sunfish. Redears have been established successfully in many southern Michigan lakes, providing trophy panfish opportunities for anglers (Towns 2003). Redear sunfish grow faster than either bluegill or pumpkinseeds and attain a larger size. Redears reach a length of almost 9 inches by age 5, where a bluegill takes about 10 years to reach a similar size. Most lakes where redears have been established produce redear sunfish greater than 10 inches long (Towns 2003). Redears have similar requirements to pumpkinseeds and do well in lakes that have large areas of marl. The presence of a good pumpkinseed population and large areas of marl in Orchard Lake make this a good candidate. The habitat in Orchard Lake is present to support a trophy panfish such as redears without significantly impacting the existing panfish species. Stocking is recommended for a three year period, at which point the redear population usually becomes self-sustaining.

Northern pike numbers have remained steady over the past 60 years. However, a fisheries report on Orchard Lake in 1941 indicated that northern pike numbers were lower than previous years due to marsh filling for shoreline development. The loss of wetlands and marshes, which are required for northern pike reproduction, continue to threaten pike populations today. Pike are self-sustaining in this lake, providing sufficient number to provide a fishery and a predator to maintain balance in the fish community. Remaining marshes and wetlands should be protected to maintain existing habitat. Furthermore, wetlands should be restored where possible to maintain or expand habitat for this important species.

Orchard Lake has a good reputation for largemouth bass fishing. A good number of largemouth bass were caught in the current survey, but growth rates were well below the statewide average. Previous surveys found growth rates only slightly lower than the statewide average. This fishery should be monitored to see if growth rates improve or if there is an underlying reason for the decline in growth rates.

With the number of predators, both game fish (northern pike, largemouth bass, and smallmouth bass) and rough fish (bowfin and gar), additional predator stockings are not warranted. Based on the good catch of panfish with acceptable growth rates, and the good catch of predators and their growth rates, there appears to be sufficient predators in the lake to maintain a balanced fish community.

Ciscoes have a limited distribution in southeast Michigan. They are limited to deep lakes which have sufficient oxygen in the thermocline. This species is important to monitor because they are sensitive to environmental changes and pollution and changes in cisco numbers may be an indicator for changes in water quality. Future fisheries surveys should make a more targeted effort to evaluate the status of ciscoes in Orchard Lake.

References

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Figure 1. —Lake map of Orchard Lake, Oakland County.

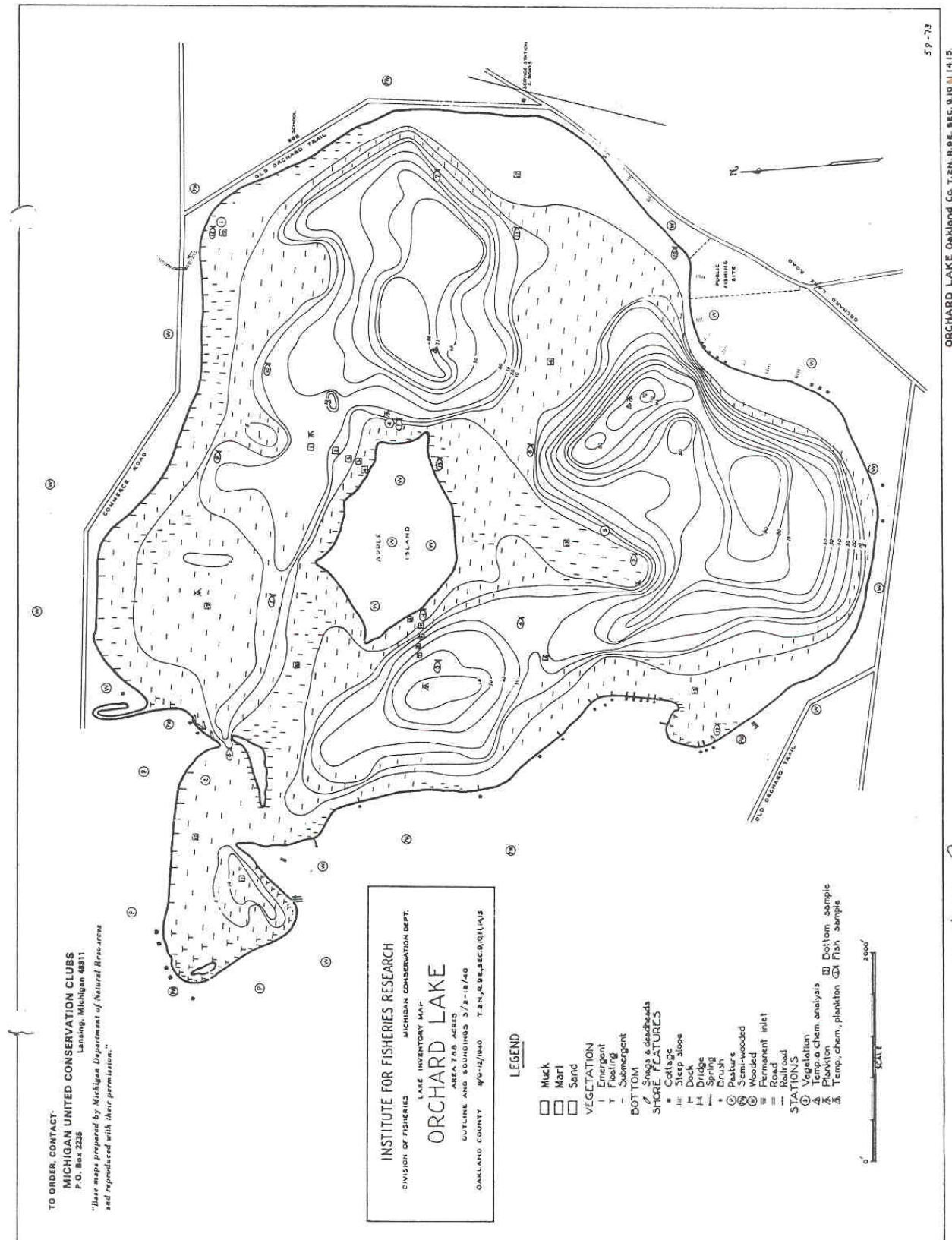


Table 1.—Summary of fish stocking into Orchard Lake, Oakland County.

Stocking year	Species	Number stocked	Average size (in)
1934	bluegill	20,000	1
	walleye	300,000	fry
	yellow perch	8,200	3
1935	bluegill	3,000	1
	largemouth bass	500	3
	smallmouth bass	750	2
	yellow perch	14,000	3
1937	bluegill	17,500	1
	largemouth bass	2,250	3
	walleye	286,000	fry
	yellow perch	10,000	3
1938	bluegill	20,000	1
	largemouth bass	225	3
	walleye	120,000	fry
1939	bluegill	19,000	1
	crayfish	4,200	--
	largemouth bass	400	3
	smallmouth bass	300	2
	yellow perch	1,500	3
1940	bluegill	63,000	1
	crayfish	1,625	--
	largemouth bass	2,500	3
1942	bluegill	10,000	1
1943	rainbow trout	1,000	8.5
1944	rainbow trout	1,000	8.5
1945	rainbow trout	6,000	8.5
1946	rainbow trout	900	9.1
1947	rainbow trout	570	7.8
1948	rainbow trout	4,000	8.0
1950	rainbow trout	6,000	8.0
1951	rainbow trout	3,000	8.0
1952	rainbow trout	5,000	7.4
1953	rainbow trout	3,000	8.2
1954	rainbow trout	5,000	8.0
1955	rainbow trout	8,000	8.8
1956	rainbow trout	5,000	8.4
1957	rainbow trout	5,000	8.9
1958	rainbow trout	5,000	8.4
1960	rainbow trout	2,000	8.2
1961	rainbow trout	5,000	8.7
1962	rainbow trout	4,500	8.6
1963	rainbow trout	5,000	9.8
1964	rainbow trout	42,500	--
1965	rainbow trout	29,250	3.8
1967	rainbow trout	15,000	7.6
1968	rainbow trout	20,000	5.3
1969	rainbow trout	19,680	6.7

Table 1.-Continued

Stocking year	Species	Number stocked	Average size (in)
1970	rainbow trout	20,000	4.9
1971	rainbow trout	23,000	7.2
1972	rainbow trout	30,146	3.0
1975	rainbow trout	10,000	5.0
	Chinook salmon	51,800	--
	rainbow smelt	3,600	--
1979	rainbow trout	20,000	4.5
1980	rainbow trout	20,000	7.5
1981	brown trout	7,000	4.8
1982	brown trout	10,000	6.6
1983	brown trout	40,000	6.4

Table 2.—Species catch and relative abundance of fishes collected with all gear types combined during the Orchard Lake fish community survey, June 4-7, 2002.

Species	Number	Percent by number	Weight (lb)	Percent by weight	Length range (in)	Average length (in)	Percent legal size*
Blackchin shiner	1,118	45.6	0.1	<0.1	0	0.5	100
Bluegill	648	26.4	127.2	21.7	0-9	6.2	60
Pumpkinseed	199	8.1	55.4	9.4	4-8	6.9	92
Largemouth bass	105	4.3	49.8	8.5	4-19	9.2	6
Rock bass	76	3.1	18.6	3.2	3-10	6.6	67
Black crappie	63	2.6	21.3	3.6	6-10	8.4	95
Spotfin shiner	57	2.3	0.1	<0.1	0-2	1.0	100
Blacknose shiner	56	2.3	0.1	<0.1	0-2	0.9	100
Common carp	39	1.6	193.7	33.0	16-28	21.7	100
Logperch	19	0.8	<0.1	<0.1	0	0.5	100
Yellow bullhead	17	0.7	8.8	1.5	5-11	10.1	94
Longnose gar	11	0.4	41.9	7.1	28-43	33.1	100
Northern pike	11	0.4	31.3	5.3	17-27	23.1	45
Bowfin	7	0.3	29.2	5.0	19-24	22.6	100
Brown bullhead	7	0.3	5.3	0.9	8-14	11.5	100
Yellow perch	5	0.2	1.0	0.2	5-9	7.5	60
Smallmouth bass	3	0.1	0.7	0.1	5-9	7.5	0
Brook silverside	2	0.1	<0.1	<0.1	0	0.5	100
Grass pickerel	2	0.1	0.1	<0.1	4-7	6.0	100
Banded killifish	1	<0.1	<0.1	<0.1	0	0.5	100
White sucker	1	<0.1	2.5	0.4	18	18.5	100
Horneyhead chub	1	<0.1	<0.1	<0.1	0	0.5	100
Iowa darter	1	<0.1	<0.1	<0.1	0	0.5	100
Johnny darter	1	<0.1	<0.1	<0.1	0	0.5	100

* Legal size refers to minimum legal size limit where applicable or minimum size acceptable to anglers.

Table 3.—Number per inch group of important game fishes collected with all gear types combined during the 2002 Orchard Lake fish survey.

Length (in)	Black crappie	Bluegill	Largemouth bass	Northern pike	Pumpkinseed	Rock bass	Smallmouth bass	Yellow perch
0		3						
1		14						
2		12						
3		35				4		
4		71	3		1	2		
5		123	1		14	19	1	1
6	3	163	2		103	17		1
7	13	160	21		73	26	1	1
8	37	66	30		8	5		1
9	5	1	24			2	1	1
10	5		10			1		
11			4					
12			4					
13								
14			3					
15			1					
16			1					
17				1				
18								
19			1	1				
20								
21				1				
22				3				
23								
24				2				
25				1				
26				1				
27				1				
28								
29								
30								

Table 4.—Weighted age frequency (percent) of selected fish species collected in Orchard Lake, June 4-7, 2002.

Species	I	II	III	IV	V	VI	VII	VIII	IX	X	Number caught
Black crappie		8	74	11	3	2	2				63
Bluegill	2	3	3	21	14	13	22	13	8	1	648
Largemouth bass	3	4	42	22	14	10	4	1		1	105
Northern pike		18	36	36				9			11
Pumpkinseed		1	1	5	53	18	11	9	1	1	199
Smallmouth bass	33	33	33								3
Yellow perch		20	40	40							5

Table 5.—Comparison of mean length at age for selected fish species from Orchard Lake 1984 to 2002. Number in parenthesis represents the number of fish aged.

Species	Age Group	State average	1984	1994	2002
Black crappie	II	6.5			6.7 (3)
	III	7.9	6.9 (17)	7.1 (4)	8.3 (20)
	IV	8.9	7.6 (18)	8.2 (14)	9.2 (7)
	V	9.7	8.2 (12)	9.1 (19)	10.8 (2)
	VI	10.4	8.6 (15)	9.6 (17)	10.9 (1)
	VII	11.1	9.1 (10)	10.1 (6)	10.8 (1)
	VIII	11.6	--	10.9 (1)	--
	Mean growth index		-1.2	-0.5	+0.3
Bluegill	I	2.4	--	--	1.8 (10)
	II	4.2	3.7 (321)	--	2.8 (13)
	III	5.3	4.5 (31)	3.8 (15)	3.6 (5)
	IV	6.2	5.6 (31)	4.6 (18)	4.8 (17)
	V	6.9	6.4 (26)	5.6 (15)	5.6 (7)
	VI	7.4	6.9 (22)	6.5 (12)	6.3 (6)
	VII	8.0	7.8 (1)	7.5 (24)	7.3 (12)
	VIII	8.4	--	7.7 (9)	7.8 (7)
	IX	8.7	--	8.2 (3)	7.8 (4)
	X	9.0	--	8.0 (1)	8.0 (1)
	XI		--	--	--
	XII		--	--	9.0 (1)
	Mean growth index		-0.3	-0.9	-1.1
Largemouth Bass	I	5.4	--	--	4.5 (3)
	II	8.7	--	7.2 (9)	6.8 (3)
	III	10.6	8.6 (10)	8.8 (12)	8.0 (19)
	IV	12.0	9.9 (2)	10.5 (9)	9.3 (10)
	V	13.7	11.9 (4)	--	10.4 (9)
	VI	15.0	10.6 (2)	--	12.1 (11)
	VII	16.7	15.0 (2)	12.9 (3)	12.4 (4)
	VIII	17.6	18.8 (1)	--	12.9 (1)
	IX	18.6	20.3 (1)	--	--
	X	19.3	--	17.1 (1)	19.3 (1)
	XI	--	--	18.6 (3)	--
	Mean growth index		-0.8	-0.5	-2.9
Northern Pike	II	19.0	16.0 (1)	--	20.2 (2)
	III	21.8	22.1 (3)	--	21.4 (4)
	IV	24.2	24.5 (4)	22.3 (5)	25.8 (4)
	V	26.1	25.4 (1)	24.8 (2)	--
	VI	27.8	26.7 (1)	26.7 (1)	--
	VII	30.0	34.3 (1)	--	--
	VIII	31.2	--	--	24.4 (1)

Table 5. –Continued

Species	Age Group	State average	1984	1994	2002
Pumpkinseed	II	4.2	--	--	4.7 (1)
	III	5.2	4.7 (16)	4.5 (1)	5.3 (2)
	IV	5.8	5.5 (29)	5.2 (3)	5.6 (8)
	V	6.3	6.2 (9)	5.4 (11)	6.6 (12)
	VI	6.8	6.6 (3)	5.8 (11)	6.9 (4)
	VII	7.2	--	6.3 (4)	7.6 (3)
	VIII	7.6	--	--	7.8 (5)
	IX	--	--	--	8.1 (1)
	X	--	--	--	8.5 (1)
	XI	--	--	--	8.1 (1)
	Mean growth index		-0.1	-0.8	+0.2
Smallmouth Bass	I	5.5	--	--	5.4 (1)
	II	8.8	--	--	7.8 (1)
	III	11.1	--	--	9.8 (1)
	IV	13.0	17.4 (1)	11.5 (1)	--
	V	14.7	18.0 (1)	--	--
	VI	15.5	--	--	--
	VII	16.6	--	15.0 (1)	--
	VIII	17.4	--	16.8 (1)	---
Yellow Perch	II	5.7	--	--	5.5 (1)
	III	6.8	--	--	7.0 (2)
	IV	7.8	--	6.0 (1)	9.2 (2)
	V	8.7	--	6.7 (2)	--

Table 6.–Temperature and oxygen data from September 11, 2002 from Orchard Lake, Oakland County.

Depth	Temperature (°F)	Oxygen (mg/l)
0	75.5	8.7
3	75.5	8.6
6	75.5	8.6
9	75.5	8.6
12	75.5	8.6
15	75.5	8.6
18	75.4	8.6
21	74.4	8.7
24	73.5	8.6
27	71.0	7.9
30	63.9	8.6
33	58.9	7.9
36	56.9	7.3
39	55.0	4.9
42	53.7	3.2
45	52.6	2.5
48	50.4	1.8
51	49.5	1.2
54	48.5	0.4
57	47.2	0.3
60	46.8	0.3
63	46.3	0.4
66	45.1	0.7
69	44.5	0.6
72	44.0	0.6
75	43.7	0.5
78	43.4	0.4
81	43.3	0.3
84	43.1	0.2
87	43.0	0.2
90	42.9	0.1
93	42.9	0.1
96	42.8	0.1
99	42.8	0.1
102	42.7	0.1
105	42.7	0.1
108	42.7	0.1

Table 7.—Population characteristics of bluegill collected with trap nets and large-mesh fyke nets in fish surveys from Orchard Lake, Oakland County.

Year	Average length (in)	Schneider's index score	Mean growth index	Catch per effort
2002	6.7	5.25	-1.1	32
1994	5.6	3.5	-0.9	41
1984	5.2	2.25	-0.3	65