see report 722a

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REPORT NO. 722

FISHERIES SURVEY OF EIGHT OGEMAW COUNTY LAKES

by

C. J. D. Brown

Introduction

The eight Ogemaw County Lakes included in this report are divided between three drainages. Johnson and Henderson Lakes are headwater lakes of the Au Gres River System; Peach, George and Rifle are near the headwaters of the Rifle River System, while Clear, Ambrose and Horseshoe Lakes are in the AuSable River System. This latter group, however, are three of a dozen small, landlocked lakes which lie on a plain between the Rifle River drainage on the east and south, and the AuSable River drainage on the north and west. The actual contour of the ground places them in the AuSable drainage, although they are without any connections to it. The location of each lake, along with the nearest town and highway, is given in the following table.

Lake	Tier	Range	Sections	Nearest Highway	Nearest Town or Village
Johnson	21 N.	4 E.	16, 21	Co. Highway 590	Prescott
Peach	22 N.	2 E.	14, 15, 22	M 55	West Branch
Henderson	23 N.	3 and 4 E.	36, 31	Co. Highway 459	Selkirk
George	23 N.	4 E.	8	Co. Highway 459	Lupton
Rifle	23 N.	4 E.	5, 8	Co. Highway 598	Lupton
Clear	23 N.	1 E.	2, 3, 10, 11	Co. Highway 598	Rose City
Ambrose	23 N.	1 E.	1, 12	Co. Highway 598	Rose City
Horseshoe	23 N.	1 E.	2	Co. Highway 598	Rose City

These lakes were mapped during the summer of 1938 by the same Institute for Fisheries Research Survey Party* which made the biological studies. The inclusive dates on which each lake was studied are given below:

Johnson Lake	June 30 - July 1, 1938
Peach Lake	June 24 - 29, 1938
Henderson Lake	July 9 - 12, 1938
George Lake	July 2 - 7, 1938
Rifle Lake	July 5 - 9, 1938
Clear Lake	June 16 - 22, 1938
Ambrose Lake	June 21 - 23, 1938
Horseshoe Lake	June 20 - 22, 1938

We have no information on the past history of these Ogemaw County lakes with reference to their place in lumbering operations or other industries. At the time of the survey none of these lakes was the site of any industrial establishment. It should be mentioned, however, that Peach Lake lies in the general region of some small oil and gas wells.

There is likewise very little information on fishing conditions in earlier times, except the usual remark of the old timer that fishing used to be good or much better than it is today.

Some of these lakes are used quite extensively by vacationists. A summary showing their accessibility, cottage development, resorts and boat liveries at the time of the survey is given below.

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* The survey party included the following: George Moore, leader; W. C. Beckman, G. Stanley Baker and Floyd Ames, assistants.

Lake	Public or private	Accessibility	Cottages	Resorts or parks	Boat liveries
Johnson	*Public	½ mile of unimproved road from Michigan Highway #70	2	1	1
Peach	Public	Good road from Michigan Highway #55	18	...	3
Henderson	Public	1½ miles of good road from M-55	15	1	1
George	Public	Good roads - County road #459	23	2	4
Rifle	Public	Good roads - County road #459	40	2	3
Clear	Public	County roads from Rose City and West Branch	60	2	2
Ambrose	Public	Unimproved road from Clear Lake and Rose City.	2	1	1
Horseshoe	Public	County road from Rose City	12	1	1

* Only road to the lake is a private lane through John Finger's farm.

Clear, George and Rifle Lakes receive the most use. There is considerable opportunity for the expansion of cottage and resort developments on most of these lakes. This is particularly true on Peach, Horseshoe, George, Rifle and Clear, all of which have a desirable shore and fairly good beaches. Henderson, Johnson and Ambrose Lakes, on the other hand, have low-lying shores mostly unfit for cottage sites.

Physical Characteristics

The basins of these Ogemaw County Lakes are somewhat variable in size and shape. George, Peach, Rifle and Clear Lakes have deep basins. The "drop-off" is somewhat regular and sharp in George Lake and in each of the two basins of Rifle Lake, while in Clear and Peach Lakes it is severely interrupted by the uneven topography of the bottom. Johnson, Henderson, Horseshoe and Ambrose Lakes all have shallow basins which are regular in the first two and which is divided into two parts in Horseshoe Lake. Ambrose Lake has a very shallow, regular basin with a maximum depth of about 10 feet.

There is no available information on the geological history of these lakes, but it is reasonable to assume that they were all of glacial origin. The wide difference in their depths and shape may have existed at the time the lakes were formed or may have come about, at least in part, by subsequent filling or erosion.

The surrounding country is flat and partially wooded in the vicinity of Ambrose, Horseshoe and Clear Lakes, which are situated on a rather high plain in the western part of Ogemaw County. In the eastern portion of the county where the other lakes described in this report are situated, the topography is rolling, partly wooded, and partially cultivated. The soil is very sandy and as a result is rather poor from an agricultural point of view.

A great variety of conditions are found in these lakes with regard to their tributaries and drainage areas. These are summarized in the following table.

Lake	Approximate size of drainage square miles	Inlets	Outlets Name and status	Dams
Johnson	2	None	Johnstone Creek intermittent	None
Peach	2	3 or 4 small, spring-fed creeks.	Peach Lake Creek empties into Rifle River	None
Henderson	1	One small, intermittent	Corbin Creek, permanent	None
George	3	One small, spring-fed	Small Creek entering Rifle River	None
Rifle	3	None	Gamble Creek, intermittent	Small, 8-12 in. high. Private.
Ambrose	1	None	None	None
Horseshoe	$\frac{1}{2}$	None	None	None
Clear	2	Very small inlet from Elno Lake	None, except into marsh	Beaver dam near lake in swampy outlet.

As can be seen, all of these lakes maintain themselves mostly from surface drainage. None of them receive any significant amount of water from tributaries. Substantial outlets are not present but small, permanent outlets exist on Henderson, George and Peach Lakes.

The physical characteristics in general are varied in these lakes. A summary is given below.

Lake	Area in acres	Maximum depth in feet	Shoreline development	Approximate per cent of shoal	Bottom Types		Color of water	Secchi disc in feet
					Shoal	Depths		
Johnson	85.4	25	1.11	60	Pulpy peat, a little sandy shore	Pulpy peat	Colorless	7-8
Peach	208.0	74	1.44	50	Marl, a little sand and gravel	Marl and pulpy peat	Colorless	17
Henderson	171.6	24	1.32	60	Sand, gravel and pulpy peat	Pulpy peat	Colorless	6-7
George	186.0	95	1.51	40	Sand, gravel and some pulpy peat	Pulpy peat	Colorless	7
Rifle	182.7	72	1.62	34	Sand and gravel, a little pulpy peat	Pulpy peat	Colorless	13-14
Clear	171.2	52	2.06	50	Sand and gravel	Pulpy peat	Colorless	18
Ambrose	43.6	10	2.19	100	Pulpy peat, a little sand	...	Slightly brown	5-5½
Horseshoe	36.9	24	1.25	75	Sand and pulpy peat	Pulpy peat	Colorless	16-17

There is very little difference in size between Peach, Henderson, George, Rifle and Clear Lakes (171 - 208 acres). Johnson Lake is intermediate in size (85 acres) while Ambrose and Horseshoe Lakes are small (37 - 44 acres).

George Lake has the greatest maximum depth (95 feet) and Ambrose Lake the smallest (10 feet). Clear and Ambrose Lakes have rather high shoreline development while the others are moderate to low. A high shoreline development is an indication of high productivity, all other factors being favorable, because it means that the shoreline is long and there are many bays and protected areas.

All of these lakes have considerable shoal (water less than 15 feet). In Ambrose Lake the entire bottom is shoal while in Rifle Lake only approximately one third of the lake has shallow enough water to support aquatic vegetation. All of the lakes have some sand on the lake bottom in

the shoal areas. In Peach Lake the sand bottom is covered with a thin layer of marl, while Johnson, Henderson, George, Rifle, and Clear all have limited amounts of gravel. Small amounts of pulpy peat also exist on the shoals of all these lakes and, as well, form the predominant bottom type in the deeper areas.

The water is practically colorless in all these lakes except Ambrose, where it is slightly brownish. Its transparency varies a great deal, however. A Secchi disc was only visible down to 5½ feet in Ambrose Lake while in Clear Lake it could be seen as deep as 18 feet. Color and turbidity are the two factors largely responsible for the transparency of waters. The amount of suspended organic matter (mostly plankton) often influences transparency a great deal. While transparency is favorable to the growth and distribution of aquatic plants, it may also be an indication of poor productivity because when waters are rich in microscopical organisms, they are seldom very transparent. This condition is somewhat true in Clear and Peach Lakes.

The physical factors in general are favorable to good fish production in these lakes. This does not mean that conditions are ideal in all instances, but rather that no very unfavorable physical factors were discovered.

Temperature and chemical studies were made during the regular inventory. These data are summarized in the following table.

Name of lake	Date of sample	Surface			Bottom				Thermocline								M.O.Alk. range p.p.m.	pH range
									Top				Bottom					
		Temp. °F.	O_2 p.p.m.	CO_2 p.p.m.	Depth	Temp. °F.	O_2 p.p.m.	CO_2 p.p.m.	Depth	Temp. °F.	O_2 p.p.m.	CO_2 p.p.m.	Depth	Temp. °F.	O_2 p.p.m.	CO_2 p.p.m.		
Johnson	7/1/38	70	7.5	0.0	20'	66	0.0	3.5	...	...	...	...	...	...	...	...	111-121	7.3-8.5
Peach	6/28/38	69	9.03	0.0	60'	55	0.2	3.0	23'	67	9.03	0.0	30'	58	4.4	1.5	87-115	7.3-8.2
Henderson	7/11/38	77	6.5	0.0	20'	67	3.25	4.0	...	...	...	...	...	...	...	...	39-48	7.7-6.9
George	7/6/38	77	8.9	0.0	90'	44	0.0	15.0	15'	70	9.2	0.0	25'	56	0.5	5.0	87-94	6.8-8.7
Rifle	7/8/38	78	9.05	0.0	66'	46	0.0	9.0	10'	75	8.65	0.0	40'	47	0.85	9.0	73-78	7.0-8.5
Clear	6/20/38	69	9.9	0.0	45'	56	3.3	1.5	32'	62	2.3	Tr.	45	56	3.3	1.5	111-126	7.4-8.0
Ambrose	6/23/38	77	8.6	0.0	9'	70	7.1	0.0	...	...	...	...	...	...	...	...	79-91	8.2
Horseshoe	6/21/38	71	8.5	0.0	20'	67	7.1	0.0	...	...	...	...	...	...	...	...	108-111	8.2-8.4

While temperatures taken during late June and early July do not represent the critical or maximum summer temperatures, they are of value in predicting what sort of temperature cycles take place. During the period of the survey, marked thermoclines (zones of rapid change in temperature) existed in Peach, George, Rifle and Clear Lakes, which means that these lakes maintain low water temperatures in the thermocline and below throughout the summer. The other lakes in this group probably do not show any significant difference between the surface and bottom temperatures throughout most of the year. Their shallow basins and exposure to wind action, or both, prevent any stratification of long duration or consequence. Temperature stratification and thermocline formation are significant in fisheries management because when they exist, lakes which would be definitely suitable only for warm water fishes become suitable for cold water species as well. This, of course, depends upon the presence of sufficient oxygen in the lower waters to support fish life.

In the four lakes with thermoclines mentioned above, the oxygen supply even at the bottom of the thermocline is either near or below the minimum required by fish. Since the summer cycle was just beginning, it is safe to assume that practically all of the oxygen would disappear below the thermocline by late summer. This simply means that none of these lakes are suitable for cold water fish, not because of the temperature but because this zone does not contain sufficient oxygen to support fish life. The four lakes without temperature stratification have sufficient oxygen practically to the bottom, but in these the temperatures are only suitable for warm water fishes.

The amount of carbon dioxide present is so small that it has no significant effect on the fish in any of the eight lakes. There is considerable variation in the hardness of the water in these lakes. Henderson Lake has soft

water; Rifle and Ambrose Lakes have moderately soft water and all of the others moderately hard water. Likewise, there is some difference in the alkalinity of these lakes. They range from a low of about 7.0 pH in Henderson Lake to a high of pH 8.7 in George Lake. Both the factors of hardness and alkalinity are favorable in these lakes for good fish production. Other conditions being favorable, moderately hard and moderately alkaline waters are the most productive of living organisms, including fish.

Aquatic Vegetation

The aquatic plant collection made by the survey party included 59 different species. Clear Lake had the largest number of species with 23, while Horseshoe supported only 10. No single species was found in all the lakes, but the yellow water lily, pondweeds, pickerel weed and cattails occurred most often. A summary of all the species taken, and their relative abundance, is given below.

Common Name	Scientific Name	Johnson	Peach	Henderson	George	Rifle	Clear	Ambrose	Horseshoe
Waterweed	(Anacharis occidentalis)	...	...	...	...	...	S*	...	...
Swamp milkweed	(Asclepias incarnata)	...	C	...	...	...	...	...	...
Sedge	(Carex hystericina)	...	S	...	...	...	...	...	...
Sedge	(Carex rostrata)	...	...	...	...	...	C	...	...
Sedge	(Carex sp.?)	...	...	C	S	S	C	S	...
Bluejoint grass	(Calamagrostis canadensis)	...	...	...	...	...	...	...	S
Cladium	(Cladium mariscoides)	...	...	A	C	...	...	...	...
Water hemlock	(Cicuta bulbifera)	...	S	...	...	...	...	...	...
Coontail	(Ceratophyllum demersum)	...	A	...	...	...	...	...	...
Water willow	(Decodon verticillatus)	...	C	...	...	...	...	...	...
Three-way sedge	(Dulichium arundinaceum)	...	...	S	...	...	...	...	...
Needle rush	(Eleocharis acicularis)	...	...	...	...	...	S	...	...
Spike rush	(Eleocharis Smallii)	...	...	...	C	...	C	...	A
Spike rush	(Eleocharis calva)	...	C	...	...	...	...	...	...
Boneset	(Eupatorium perfoliatum)	...	...	...	...	...	S	...	S
Manna grass	(Glyceria borealis)	...	...	...	...	...	...	C	...
Water star grass	(Gratiola sp.?)	...	...	...	...	...	C	...	...
St. John's wort	(Hypericum boreale)	...	...	S	...	...	...	...	...
Iris	(Iris versicolor)	...	...	...	...	S	C	S	...
Quillwort	(Isoetes sp.)	...	...	...	...	...	C	...	...
Soft rush	(Juncus effusus)	S	...	...	...	...	...	...	...
Spike rush	(Juncus alpinus)	...	C	...	...	...	...	...	...
Spike rush	(Juncus nodosus)	...	A	...	...	...	...	...	...
Loosestrife	(Lysimachia thyrisiflora)	...	...	...	...	...	C	...	...
Water marigold	(Megalodonta Beckii)	C*	...	...	...	...	...	...	...
Water milfoil	(Myriophyllum sp.?)	S	...	...	...	S	...	...	...
Monkey flower	(Mimulus ringens)	...	...	...	S	...	...	...	...
Bushy pondweed	(Najas flexilis)	A*	C	S	...	C	...	...	...
White water lily	(Nymphaea odorata)	S	...	A	S	S	S	...	...
Yellow water lily	(Nuphar variegatum)	C	...	C	A	A	C	C	...
Pickerel weed	(Pontederia cordata)	S	...	S	S	C	...	...	...
Smartweed	(Polygonum natans)	...	...	...	S	...	S	S	...
Smartweed	(Polygonum sp.?)	...	...	...	S	...	...	...	...
Reed canary grass	(Phalaris arundinacea)	...	...	...	...	...	C	...	S
Large-leaf pondweed	(Potamogeton amplifolius)	C	...	A	C	C	C	...	C
Pondweed	(Potamogeton Friesii)	A	...	...	A	...	...	...	...
Sago pondweed	(Potamogeton pectinatus)	A	A	...	...	A	C	...	...
Flat-stemmed pondweed	(Potamogeton zosteriformis)	A	...	...	A	S	...	...	...
Variable pondweed	(Potamogeton gramineus)	...	...	C	...	S	C	...	S
Floating-leaf pondweed	(Potamogeton natans)	...	...	C	...	...	C	S	A
Clasping-leaf pondweed	(Potamogeton Richardsonii)	...	...	...	C	...	...	...	...
Pondweed	(Potamogeton illinaensis)	...	...	...	...	...	...	C	...
Whitestem pondweed	(Potamogeton praelongus)	...	...	...	...	...	...	...	A
Loosestrife	(Rotala ramsion)	...	...	...	...	...	...	S	...
Wapato	(Sagittaria latifolia)	...	S	S	S	C	...	...	...
Hardstem bulrush	(Scirpus acutus)	...	C	...	...	C	...	S	...

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Common Name	Scientific Name	Johnson	Peach	Henderson	George	Rifle	Clear	Ambrose	Horseshoe
Softstem bulrush	(Scirpus validus)	C	...	...	...	...	...	...	...
Bulrush	(Scirpus sylvaticus)	S	...	...	...	...	...	...	...
Goldenrod	(Solidago graminifolius)	...	...	...	...	...	S	...	C
Water parsnip	(Sium suave)	...	...	...	...	...	S	...	...
Skullcap	(Scutellaria epilobiifolia)	...	S	...	...	...	S	...	...
Bur reed	(Sparganium fluctuans)	...	...	C	...	C	...	...	...
Bur reed	(Sparganium eurycarpum)	...	C	...	...	...	...	...	...
Big duckweed	(Spirodela polyrhiza)	C	...	...	...	...	...	...	...
Cattail	(Typha latifolia)	...	C	...	S	C	C	S	...
Bladderwort	(Utricularia vulgaris)	...	S	C	...	...	...	...	...
Eel grass	(Vallisneria americana)	C	...	...	S	C	...	...	...
Musk grass	(Chara sp.)	...	A	S	...	...	A	A	A
Musk grass	(Nitella sp.)	...	...	...	A	A	...	...	...

*A = abundant; C = common; S = sparse.

It is interesting to note that although Clear Lake had the largest number of different kinds of plants, it also contained the smallest quantity of plants. Productivity probably depends far more upon the quantity of vegetation present than upon the number of different kinds. All of these lakes, with the exception of Clear Lake, have what seems to be adequate plant beds and are probably above the average in this respect for Upper Michigan lakes.

Fish Foods

The small, microscopic food organisms (plankton) were found to be moderately abundant in Peach, George, Clear and Horseshoe Lakes, and very abundant in Johnson, Henderson, Rifle and Ambrose Lakes. The presence of this type of food is essential because it is used not only by the minnows and young of game fish, but also by the larger fish food organisms and, to some degree, by the adult game fish themselves.

Plankton samples taken at only one time of year and at only one place in a lake cannot be relied on too heavily, however, because it is a known fact that plankters vary greatly in numbers and kinds from place to place in a lake, and also from time to time.

Two or three of the most important kinds of the larger food items are listed for each lake in the following table.

Name of Lake	Kind of Organism	Abundance
Johnson	Fresh-water shrimp	Common
	Midges	Common
	Aquatic worms	Common
Peach	Snails	Abundant
	Midges	Abundant
Henderson	Fresh-water shrimp	Abundant
	Midges	Abundant
George	Fresh-water shrimp	Abundant
	Midges	Abundant
Rifle	Fresh-water shrimp	Common
	Midges	Common
	Snails	Common
Clear	Midges	Common
	Snails	Abundant
Ambrose	Midges	Common
Horseshoe	Fingernail clams	Common
	Fresh-water shrimp	Abundant
	Midges	Abundant

On the whole, the food conditions in these lakes was good at the time of the survey, but here again we cannot project exactly what collections at other times of the year would show. We do believe, however, that in general these lakes are favorable for a good annual fish food supply.

Fish

Fish collections were made by the survey party. From their records the following table was compiled showing the kind and approximate abundance of each species.

Species	Ogemaw Lakes							
	Johnson	Peach	Henderson	George	Rifle	Clear	Ambrose	Horseshoe
GAME FISH								
Perch	A*	A	C	A	C	A	A	C
Northern pike	C	R	Reported	R	C	C	...	C
Walleyes	R	C	...	...	Reported	C	...	C
Smallmouth bass	...	Reported**	Reported	Reported	Reported	C	...	Reported
Largemouth bass	A	Reported	A	C	C	A	...	A
Rock bass	C	R	A	C	R	C	...	...
Bluegills	Reported	R	C	C	A	C	C	C
Pumpkinseeds	C	C	C	C	R	C	A	C
Long-eared sunfish	...	C	...	...	C	C	C	C
Black crappie	...	...	...	Reported	...	C	...	...
FORAGE FISH								
Golden shiner	A	...	C	A	C	...	...	...
Black-nosed shiner	R	C	...	C	...	...	...	...
Black-chinned shiner	A	R	...	A	C	...	...	...
Common shiner	...	R	...	...	...	...	...	...
Blunt-nosed minnow	...	A	C	A	A	C	...	C
Mudminnow	R	R	...	...	R	...	...	C
Johnny darter	R	C	...	...	R	...	...	...
Iowa darter	C	...	C	R	...	...	A	...
Least darter	...	...	...	...	...	...	...	...
Creek chub	C	...	R	...	...	C	...	...
Brook stickleback	...	...	...	...	...	...	...	...
Menona killifish	...	C	...	R	...	...	...	...
Silversides	...	...	A	...	...	...	...	...
COARSE FISH								
Common sucker	R	...	...	R	...	C	...	...
Black bullhead	C	...	...	...	...	...	...	...
Brown bullhead	...	...	R	...	...	...	A	...
Yellow bullhead	...	...	C	...	...	R	...	...

*A = abundant, C = common, R = few to rare.

** The reports of bass in lakes by C.C.C. census clerksmay not be reliable as to species.

Few species of game fish were found to be present in these lakes. Clear Lake had the largest number of species (10) and Ambrose the smallest number (4). Perch, bluegills and pumpkinseeds were the only three game fish present in all 8 lakes. Thirteen species of forage fishes were found and of these the blunt-nosed minnow was the most common, occurring in 6 of the 8 lakes. The only coarse fishes present were the common sucker and the black, brown and yellow bullheads. The brown bullhead was the only one found to be abundant and this was abundant only in Ambrose Lake.

All of these lakes have been planted heavily during the last five years (1936 - 1940 incl.). A summary of this stocking is given in the following table.

Lake	Perch	Walleye	Largemouth bass	Smallmouth bass	Bluegills
Johnson	...	200,000	500	700	21,000
Peach	16,800	3,000,000	1,500	2,045 80 adults	87,600
Henderson	30,000	240,000	500	2,800	40,500
George	12,500	560,000	...	2,300	51,000
Rifle	12,500	...	1,000	500	29,500
Clear	11,500	...	2,550	1,500	83,600
Ambrose	...	...	500	300	34,000
Horseshoe	5,000	1,200,000	500	1,800	39,000

Walleye plantings seem to have been successful in Johnson, Peach, Rifle and Horseshoe Lakes, and this species was found to be common in Clear Lake even though no plantings have been reported for this lake since 1935. No walleyes were caught or reported in Henderson and George Lakes, although substantial plantings were made in these lakes. Clear Lake was the only lake in which smallmouth bass were taken, in spite of the rather large plantings of this species in all of these lakes. This species was reported, however, for Peach, Henderson, George, Rifle and Horseshoe Lakes. The stocking of 21,000 bluegills in Johnson Lake was either unsuccessful or else this species was present in such small numbers so that it was not taken or

observed by the survey party. Bluegills were present in all of the other lakes. It was found to be most abundant in Rifle Lake and least abundant in Peach Lake.

Growth Rate

An attempt was made to determine the ages of the game fish collected in order to get at some estimate of their growth rate. This is done by examining scales from each fish. The results are often not too reliable, since the fish samples are usually small and since a single, rough examination of any group of scales cannot produce the most accurate results. Time and expense does not permit a critical study of the growth rate in each lake, but it is believed that even incomplete studies of this kind have some value in determining the relative well-being of the game fish present. A summary of the age determinations and the size of the game fish collected is given in the following table.

Lake	Species	Age* Group	Number of Specimens	Average Total Length in inches	Average Weight in Ounces
Johnson	Perch	III	2	6.5	2.0
		IV	3	6.8	2.4
	Largemouth bass	VI	1	15.6	49.5
Peach	Perch	II	2	5.6	1.3
		III	4	6.2	1.7
		IV	2	8.3	3.6
		V	2	10.7	7.7
	Northern pike	I	1	16.2	15.6
		II	1	19.6	25.0
	Walleye	IV	3	18.6	32.5
		V	3	19.6	42.0
	Smallmouth bass	IV	1	14.3	26
	Largemouth bass	III	1	12.2	16
		IV	1	15.6	40
	Rock bass	III	2	6.0	2.6
		IV	15	6.8	4.0
		V	3	7.9	5.9
	Bluegill	III	2	6.1	2.9
	Pumpkinseed	III	1	4.7	1.3
		IV	3	5.2	2.3
		V	1	6.6	4.0
		VI	1	6.3	3.7
Henderson	Perch	III	1	5.7	1.2
		V	6	7.8	2.9
		VI	7	8.6	4.2

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Lake	Species	Age Group	Number of Specimens	Average Total Length in Inches	Average Weight in Ounces
		VII	2	9.5	6.4
		VIII	1	9.3	5.6
	Largemouth bass	II	2	7.1	2.6
	Rock bass	IV	1	6.9	4.3
	Bluegill	IV	2	5.0	1.3
		VI	1	6.1	2.3
	Pumpkinseed	V	2	6.3	3.1
George	Perch	II	16	6.0	1.4
		III	4	6.7	2.1
		V	4	8.5	3.7
	Northern pike	II	1	18.1	22
		VI	1	29.2	93
	Largemouth bass	II	2	7.1	2.2
		III	2	8.6	4.5
	Rock bass	II	1	5.3	1.5
		III	3	5.4	1.6
	Black crappie	II	1	5.9	1.5
		VI	1	9.3	6.8
	Bluegill	II	4	4.7	1.1
		III	7	5.9	2.2
		IV	1	7.2	6.0
		V	1	7.6	4.4
		VI	2	7.8	5.1
	Pumpkinseed	III	3	5.8	2.5
		IV	1	6.2	2.9
Rifle	Perch	III	4	6.4	1.5
		IV	1	7.7	2.8
		VII	1	7.9	10.4
	Northern pike	II	2	18.5	20.3
	Largemouth bass	III	4	9.0	5.3
		IV	3	11.3	10.9
		VII	1	14.9	25.6
	Bluegill	III	2	4.1	0.6
		IV	3	4.3	0.7
		VII	3	9.4	9.8
		VIII	2	10.0	11.1
	Pumpkinseed	III	2	3.8	0.6
		V	3	5.5	2.1
Clear	Perch	III	6	6.5	1.5
		IV	4	6.5	1.6
		V	7	7.6	2.6
		VI	1	8.5	3.3
	Northern pike	IV	1	32.0	122
	Smallmouth bass	III	2	9.3	5.9
	Largemouth bass	II	9	7.5	2.9
		III	6	10.0	7.9
	Bluegill	IV	1	8.3	6.1

(Continued)

Lake	Species	Age ✻ Group	Number of Specimens	Average Total Length in Inches	Average Weight in Ounces
	Pumpkinseed	II	1	4.1	0.9
		III	9	5.8	2.3
		V	1	8.3	7.7
Ambrose	Perch	IV	1	10.7	9.1
	Pumpkinseed	IV	1	6.1	2.5
		V	1	6.7	2.6
Horseshoe	Bluegill	II	1	3.9	0.6
		IV	1	9.2	8.9
	Pumpkinseed	III	1	5.1	1.5
		VIII	1	9.5	11.1

✻ Age determinations by W. C. Beckman.

Yellow perch reached legal length in most of these lakes by the end of their second summer or early in their third growing season. As judged from three-year-old fish, the slowest growth occurred in Henderson Lake and the fastest in George Lake. This is probably somewhat slower than the average growth of the Lower Peninsula inland lake perch.

Two-year-old northern pike varied in total length from 16.1 inches (Peach Lake) to 18.5 inches (Rifle Lake). One four-year-old fish from Clear Lake was 32 inches in total length. This represents good growth for northern pike. So few walleyes and smallmouth bass were taken that nothing can be said about the growth rate of these species.

Largemouth bass reach legal length sometime during their third or fourth growing season. This is about average for this species in the Lower Peninsula.

Bluegills were growing slower than the state average in Henderson and Rifle Lakes, and about average in Peach, George, Clear and Horseshoe Lakes. Pumpkinseeds showed rather poor growth in all of the lakes where they were collected.

Creel Census

Clear Lake is the only one of the eight lakes considered in this report which has had a carefully conducted creel census. The others have a few catch records which are scattered over the period from 1928 to the present time.

The following information has been gleaned from creel census records and shows to some degree which species have appeared most often in the fishermen's creels.

Johnson Lake: Perch and northern pike predominant; largemouth bass common; bluegills and pumpkinseeds common in 1934 only.

Peach Lake: Perch, bluegills and sunfish predominant; rock bass, northern pike, smallmouth bass common; largemouth bass occasional.

Henderson Lake: Bluegill predominant; sunfish, largemouth bass, smallmouth bass and rock bass common; northern pike common only between 1928 and 1931.

George Lake: Bluegills and perch predominant; large- and smallmouth bass common to 1930. Only few since. Crappies common since 1930.

Rifle: Northern pike predominant to 1934, bluegills thereafter; largemouth bass occasional; smallmouth bass occasional after 1939; walleyes reported in 1928 only.

Ambrose: No census returns.

Horseshoe Lake: Largemouth bass predominant; northern pike and smallmouth bass occasional.

Clear Lake: A regular, intensive creel census was taken on this lake by the C.C.C. during the winter of 1933-1934 and during the summer of 1934. The results of this census may be found in Institute Reports 271 and 299. The 21-point summary which follows is quoted from the latter report covering the census for the summer of 1934.

"1. Six per cent of the fishermen used 2 lines each, 94 per cent used only one line.

2. The total fish caught (1817) represent a per acre catch of only 4.78 fish (assuming the area is correctly given as 380 acres in the Michigan Lakes and Streams Directory).

Note: Since the surveyed area is now known to be 171 acres, the catch per acre was 10.6.

3. There were approximately only two fisherman days per acre of water, all summer.

Note: 4.3 on basis of 171 acres.

4. The average catch per fisherman in June was almost double the average catch during the remainder of the summer.

The average catch for the years 1928-1932 inclusive on non-trout waters in Ogemaw County was .88 per hour. The per hour catch on Clear Lake (summer of 1934) was .81 fish.

7. The average fisherman day for the summer as a whole was 3 hours.

8. Twenty-one per cent of the fishermen were women.

10. Almost half of the fishermen took no fish.

11. The fish were of a rather small average size.

12. Two fish of each five caught were undersized. Undersized fish were not included in the other figures of the table except when definitely indicated.

13. Of those who fished with one kind of bait only, 285 fishermen (66 per cent) used worms. Sixty-eight used plugs exclusively while only 25 used minnows exclusively.

14. About half of those who fished used more than one method of fishing. This extent of diversity of fishing appears unusual, at least it was not evident in the fishing on Fife Lake during the same summer.

15. Two-thirds of all fish caught were perch. A large number of undersized perch (under 6 inches in length) were also taken.

16. Largemouth bass represented 8 per cent of the catch.

17. Smallmouth bass were slightly larger than the largemouth, but were not quite as well represented in the catch.

18. It is possible that some of the fish listed as sunfish were actually bluegills.

21. Only 14 northern pike were reported caught. Mr. C. H. Clipper states that the northern pike catch "dropped off" very decidedly in 1933 and 1934."

Natural Propagation and Spawning Facilities

It is always difficult to estimate the success of natural propagation in waters where regular and large plantings of fish have been made. This situation exists in the Ogemaw County Lakes discussed here. From experience in other places we feel quite certain that natural propagation of most species of fish is usually adequate to stock the lakes to their capacity, providing, of course, suitable spawning facilities exist. The table below describes the spawning conditions which exist in the Ogemaw County Lakes discussed in this report. It should be remembered, however, that our knowledge of the spawning requirements of several of our game fish is little known and somewhat of a conjecture.

Lake	Northern pike	Walleye	Perch	Smallmouth bass	Largemouth bass	Bluegills
Johnson	Good	Absent	Good	Absent	Good	Good
Peach	Good	Absent	Good	Absent	Good	Good
Henderson	Good	Poor	Good	Fair	Good	Good
George	Fair	Poor	Good	Good	Good	Good
Rifle	Poor	Poor	Good	Very good	Good	Good
Clear	Absent	Good	Fair	Very good	Fair	Fair
Ambrose	Fair	Absent	Fair	Poor	Good	Good
Horseshoe	Poor	Fair	Fair	Good	Good	Good

In summary it may be said that all of these lakes have fair to good spawning facilities for perch, largemouth bass and bluegills. Northern pike should be able to spawn successfully in Johnson, Peach, Henderson, George

and Ambrose Lakes. Clear Lake seems to be the only lake of this group having enough clean, rubble shoal for walleye spawning. Smallmouth bass should find conditions entirely suitable in George, Rifle, Clear and Horseshoe Lakes and mostly unsuitable in the rest.

Management Suggestions

Designation

All of these lakes are in the "all other lakes" classification and our investigations show no reasons why they should be changed. There is practically no possibility of any of them being suitable for trout because of either high temperatures or low oxygen supply.

As has been pointed out above, stocking during the past 5 years has been heavy. Much of this cannot be justified in the light of information now available on the subject. Most fish have proven themselves capable of maintaining a population near the maximum carrying capacity of lakes without artificial planting. The only time plantings need to be made is when disease, winter kill etc. removes most or all of the population.

It is recommended, therefore, that no plantings of perch, bluegills, sunfish or largemouth bass be made in any of these lakes for at least four years. This cessation of stocking should give evidence for or against this recommendation. Walleyed pike should not be planted in these lakes. Past plantings have been mostly unsuccessful, which is probably a good thing. This introduction of this species is known to have a very detrimental effect on the bass and bluegill populations of small lakes--sometimes almost to the exclusion of the latter. Johnson, Peach, Clear and Horseshoe Lakes contained walleye at the time of the survey, but there was no evidence of natural propagation in these lakes. It is possible that walleyes will disappear in all except Clear Lake if no further plantings are made. Clear Lake has conditions which may be favorable to the natural propagation of this species.

Smallmouth bass should find conditions suitable in Henderson, George, Rifle, Clear and Horseshoe Lakes, and some plantings in these lakes might be necessary to establish this species if this is considered desirable. The other three lakes are not suitable for smallmouth and should not be stocked.

The following table shows which species are best adapted to each lake.

Lake	Northern pike	Walleye	Perch	Largemouth bass	Smallmouth bass	Bluegills
Johnson	X	...	X	X	...	X
Peach	X	...	X	X	...	X
Henderson	X	...	X	X	...	X
George	...	...	X	X	X	X
Rifle	...	...	X	X	X	X
Clear	...	?	X	X	X	X
Ambrose	X	...	X	...	X	X
Horseshoe	...	...	X	X	X	X

No serious infestations of parasites were found except in Clear Lake where the bass had a very high incidence of the bass tapeworm. The presence of this worm in most of the smallmouth bass may mean that this fish will not be able to contribute much by natural propagation, since this parasite is known to prevent normal egg production. There is no practical means of control. The presence of parasites in fishes, however, does not seriously effect their edibility. None of the common parasites of fish can attack man.

Predators were so few in this region so as to be of no great consequence to fishing conditions.

Most of these lakes have adequate cover for fish. A description of cover conditions is given in the table below.

Name of Lake	Cover	Condition
Johnson	Good	Very abundant vegetation beds.
Peach	Good	Fair weed beds. Few brush shelters present.
Henderson	Excellent	Abundant vegetation and deadheads.
George	Good	Abundant vegetation and deadheads.
Rifle	Fair	Limited vegetation.
Clear	Poor	Sparse vegetation. Few brush shelters
Ambrose	Good	Abundant vegetation and deadheads.
Horseshoe	Good	Fair vegetation. Numerous deadheads.

It is possible that a few brush shelters in Rifle Lake and some additional ones in Clear Lake would improve cover conditions. None of the others need additional cover.

The water level in these lakes is fairly stable and cannot be greatly controlled since very few of the lakes have permanent outlet streams. The small (one foot) dam on Rifle Lake raises the water a little in the early part of the season and maintains a little higher water level during the summer. There was a beaver dam at the outlet of Clear Lake at the time of the survey which had little or no effect on the level of this lake. All in all, water level control is not a serious problem in these lakes.

INSTITUTE FOR FISHERIES RESEARCH

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