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A FISHERIES SURVEY OF LAKE OF THE WOODS, VAN BUREN COUNTY

by

R. C. Ball

Introduction

Location and Drainage

Lake of the Woods is situated in Hamilton and Decatur Townships, Van Buren County (T. 4 S., R. 14, 15 W., Sec. 13, 18, 19, 24), just at the west edge of the Town of Decatur. It is the primary source of Dowagiac Creek which is part of the St. Joseph River drainage. The lake is accessible on all sides by roads and is within walking distance of Decatur.

Acknowledgments

A map of this lake showing the shoreline, soundings and bottom types was made by an Institute party* on February 14, 1940. This map was used to locate sampling stations and vegetation beds by the biological survey party** which made an inventory of the lake July 1-4, 1941. Fish collections were made on June 3-5, 1941.***

Past and Present Uses

There is no evidence that the lake has ever had any industrial use. It is devoid of resorts and hotels and has only 23 cottages. This does not give a true picture of the importance of the lake as a public fishing water, however. Due to its proximity to the town of Decatur which has adequate tourist accommodations and camp grounds, there has not been a need for resort and cottage development. The lake, through its tourist and fishing attraction, is an important financial adjunct to the city.

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* Mapping party personnel included: Lyle O. Newton, leader; Richard Wilson and Royal Howe, assistants.

** Survey party personnel included: John Funk, leader; Eugene Roelofs and Stanley Lievense, assistants.

*** Fish party personnel included: W. C. Beckman, leader; Lee Anderson, Raymond Buller and Donald Thomas, assistants.

Lake of the Woods is described by some fishermen as "the best bass lake in Michigan" and the creel census records of the past indicate a catch that would be considered good on any lake of the state, although reports indicate that fishing was better in the past than at the present time. The chief value of the lake lies in its fishing attraction rather than for other uses. Fishing is heavy both winter and summer. Much of the winter fishing is spearing.

Physical Characteristics

Geological Origin

As far as is known, there are no data on the geological origin of the lake.

Shape of the Basin and Extent of Drainage

The irregularly shaped basin of this lake has a maximum depth of 34 feet, the greatest depth being located near the west end of the lake. The sides of the basin are quite steep on the west but have a gradual slope on the east side. The immediate shoreline is low and marshy with some wooded areas, and the surrounding country is mostly low, level ground which is partially wooded. Much of the area is under cultivation and produces good crops. The lake is fed by seepage, springs, and one small weed-choked inlet. The outlet is a shallow stream about twenty feet wide. This is one of the headwater streams of Dowagiac Creek, a tributary of the St. Joseph River. The drainage area of Lake of the Woods is approximately ten square miles.

Water Fluctuation

From the available reports there is only slight fluctuation of the water level. There is no dam in the outlet and the inlet supplies a rather constant volume of water gathered from run-off and springs.

Physical Characteristics in Relation to Fisheries

Lake of the Woods has a surface area of 284 acres. About twenty per cent of the lake is less than ten feet deep. The shoreline is irregular with a development of 1.6. This indicates that the shoreline is 1.6 times longer than that of a perfectly round lake of the same area. This figure is considered moderate. A high shoreline development indicates the presence of coves and protected areas which increase a lake's productivity. The zone in this lake with a depth of less than ten feet produces most of the aquatic plants. The size of this zone is an index to fish productivity because the vegetation beds are of prime importance in the production of fish food. Marl is the most abundant type of bottom material in both shallow and deep water. In many areas this is mixed with plant material in various stages of decomposition. This type of bottom is fairly productive of vegetation and of bottom-dwelling animals.

The water was light brown in color at the time of the survey. The effect of water color on the biology of the lake is not well understood but in minimal amounts such as occur here, the effect is probably negligible.

A Secchi disc (a black and white disc 8 inches in diameter) disappeared from view at 7-8 feet which roughly indicates the depth to which plants can flourish in this lake.

Very little wave or ice action is noticeable as evidenced by the well developed aquatic vegetation beds around most of the lake.

To summarize the physical factors of Lake of the Woods it can be said that all factors generally favor a high production of fish.

Temperature and Chemical Characteristics

Temperature

A series of temperatures was taken from surface to bottom near the deepest point on the lake at the time of the biological survey (July 1-4, 1941). This showed only very little difference in temperature from the surface down to a depth of 13 feet. The zone of water between 13 and 30 feet showed a drop in temperature from 69°F. to 58°F. This is known as a thermocline and has the effect of isolating the water below it, thus shutting off the lower water from contact with the air which supplies the oxygen necessary for fish life. In some lakes during summer, the water below the thermocline and often times in the thermocline itself is devoid of oxygen. The region above the thermocline, largely because of its continuously rich oxygen supply, constitutes the major part of the productive area of the lake. This is especially true during the summer stagnation period.

Oxygen

At the time of the survey (July 4, 1941) there was sufficient oxygen in the water to support fish to a depth of approximately 20 feet. This is the maximum depth at which fish could continuously live in this lake during the summer, although they can probably go deeper during at least a part of the winter when the oxygen supply has been replenished in the lower levels by the fall overturn.

Alkalinity and pH

The water of the lake was hard (M. O. alkalinity 144-178) and ranged from slightly to strongly alkaline (pH 7.2 to 8.6). Moderately hard alkaline waters such as this are usually more productive of fish food and, consequently, fish than acid waters low in carbonate.

Pollution

No pollution of any kind was reported for Lake of the Woods.

Temperature and Chemical Factors in Relation to the Fisheries

The water temperatures in the inhabitable part of this lake are entirely suitable for warm-water fishes. Likewise, the chemical factors are favorable to high fish production.

Biological Characteristics

Vegetation

There was a total of 29 species of higher aquatic plants collected in Lake of the Woods. A complete list of the species appears in the following table.

Species	Abundance
Sedge (Carex lasciocarpa)	Sparse
Sedge (Carex comosa)	Common
Sedge (Carex substricta)	Rare
Coontail, hornwort (Ceratophyllum demersum)	Common
Musk grass (Chara sp.)	Abundant
Water willow (Decodon verticillatus)	Common
Spike rush (Eleocharis Smallii)	Rare
Lesser duckweed (Lemna minor)	Common
Water milfoil (Myriophyllum sp.)	Common
Bushy pondweed (Najas flexilis)	Common
Yellow water lily (Nuphar advena)	Abundant
White water lily (Nymphaea odorata)	Common
Reed canary grass (Phalaris arundinacaea)	Sparse
Pickerel weed (Pontederia cordata)	Sparse
Pondweed (Potamogeton angustifolius)	Abundant
Pondweed (Potamogeton crispus)	Common
Pondweed (Potamogeton longiligulatus)	Sparse
Sago pondweed (Potamogeton pectinatus)	Common
Flat-stemmed pondweed (Potamogeton zosteriformis)	Sparse
Dock (Rumex sp.)	Rare
Hardstem bulrush (Scirpus acutus)	Common
Three-square bulrush (Scirpus americanus)	Sparse
Softstem bulrush (Scirpus validus)	Common
Common cattail (Typha latifolia)	Common
Big duckweed (Spirodela polyrhiza)	Common
Bladderwort (Utricularia vulgaris)	Rare
Waterweed (Anacharis canadensis)	Rare

Musk grass, yellow water lily, pondweeds, and bulrush were most abundant at the time of the survey. Aquatic plants are highly important in the economy of the lake since they harbor food, as well as furnish shelter and spawning places for certain fishes. Plant abundance is generally associated with high fish productivity. Suitable and extensive shoal area combined with a high calcium content of the water makes possible the heavy vegetation beds which cover over one-fifth of the area of the lake.

Fish Foods

Food samples taken from the bottom and from the plants showed that the fish food organisms were varied and numerous in this lake. Scuds and

midge larvae were abundant and mayflies were common.

Larger forage is present in the form of numerous minnows, young of game fish, and crayfish. Indications are that fish food conditions in Lake of the Woods are good.

Fish

A total of 26 different species of fish were collected from the Lake of the Woods at the time of the fish survey. Of these, 8 were game fish, 5 were coarse fish, 4 were obnoxious fish, and 9 forage fish. A summary of the species found along with their relative abundance and stocking is given in the following table.

Species	Abundance	Stocking 1934-1941	Stocking Age (Mo.)
GAME FISH			
Northern pike	C	...	...
Yellow perch	A	55,000	5-12
Smallmouth bass	F	10,650	3-4
Largemouth bass	C	16,000	3-12
Bluegill	A	43,000	3-12
Pumpkinseeds	C	...	...
Warmouth bass	R	...	...
Black crappie	A	...	...
COARSE FISH			
Lake chub-sucker	F	...	...
Mud pickerel	R	...	...
Common sucker	A	...	...
Brown bullhead	F	...	...
Yellow bullhead	F	...	...
OBNOXIOUS FISH			
Short-nosed gar	C	...	...
Long-nosed gar	C	...	...
Dogfish	C	...	...
Carp	A	...	...
FORAGE FISH			
Blunt-nosed minnow	A	...	...
Black-nosed minnow	A	...	...
Black-chinned shiner	A	...	...
Common shiner	R	...	...
Brook silverside	F	...	...
Iowa darter	F	...	...
Johnny darter	F	...	...
Menona killifish	F	...	...
Stickleback	R	...	...

C=Common, A=Abundant, F=Few, R=Rare.

Perch, black crappies, and largemouth bass were the most abundant game fish in the collections.

Liberal plantings of perch and bluegills have been made in recent years.

Creel Census

The few creel census records taken on this lake by conservation officers indicate that it compares favorably with the best bluegill lakes of the state.

Growth Rate of Game Species

The following table gives a summary of the growth rate data secured for the game fishes of Lake of the Woods.

Species	Age group ✱	No. of individuals	Average total length (inches)	Average weight (ounces)
Black crappie	II	34	5.2	1.20
	III	1	7.8	4.20
	IV	1	8.6	6.20
Perch	I✱✱	10	3.6	0.30
	II	24	5.6	1.20
	III	19	6.5	2.30
Bluegill	I	5	1.9	0.11
	II	19	4.0	0.87
	III	7	5.6	2.30
Largemouth bass	I	9	3.5	0.40
	II	9	9.0	6.70
	III	5	10.8	11.40
	IV	3	12.5	17.60
	V	1	15.8	29.00
Pumpkinseed	II	3	3.8	1.50
	III	9	5.9	2.50
	IV	2	6.1	3.20
	V	1	7.3	5.50
Smallmouth bass	I	3	3.9	0.50
	III	1	11.5	14.00
Northern pike	II	2	15.1	21.00
	III	2	17.3	29.30
Warmouth bass	III	2	4.4	2.00

✱ Age determinations by W. C. Beckman.

✱✱ Number of annuli. The fish of this survey were actually taken during July of the season following. Fish of the I age group are in their 2nd summer of life, etc.

The series of scales collected for age determinations of the game fish is not very large for some species and may not represent the growth rate exactly, but we believe they have at least general significance.

All species of game fish in this lake show a growth rate equal or better than the tentative state averages with the possible exception of the perch. The fish of this lake are heavier for their length than the tentative calculated weight-length relationship for the lakes of the state as a whole. Good growth and good condition are usually considered to indicate satisfactory food supply and a well balanced fish population.

Natural Propagation

There appears to be adequate spawning facilities for all species of fish in the lake with the possible exception of smallmouth bass. Young fish of all game species were collected, or at least observed, in the lake.

Management Proposals

Designation of the Lake

Lake of the Woods is in the "all other lakes" category and the findings of this survey show no reason for a change.

Stocking

No stocking of any species is recommended. Plantings of perch, bass, and bluegills are not needed to supplement the natural reproduction and population of the lake, and the slow growth of the perch may be evidence of too many of this species in the lake at the present time.

Predators and Parasites

The presence of a certain number of predators in a lake where natural reproduction of perch and bluegills is large is probably beneficial in preventing an overpopulation of these fish which in turn would result in slow growth. We therefore recommend no control of the predaceous fish or birds of the lake.

Shelter

The dense weed beds in the lake offer adequate shelter for the fish, and no improvements are recommended.

Regulation of Water Level

The level of the lake is subject to little fluctuation and no change in level is necessary from the fisheries standpoint.

Improvement of Spawning Facilities

The presence of young fish of nearly all species as found by the survey is evidence that the species in the lake are reproducing and no improvements or additions to the spawning areas are necessary.

INSTITUTE FOR FISHERIES RESEARCH

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