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FISHERIES SURVEY FOR BAKER, DEEP, LONG, McDONALD, NOONDAY* (MUD) AND ROUND LAKES, BARRY COUNTY, MICHIGAN

by

John Funk

Introduction

Baker, Deep, Long, McDonald, Noonday (Mud) and Round Lakes are located in Yankee Springs Township of Barry County. Their specific location is as follows:

Baker	T. 3 N., R. 10 W., Sec. 16, 17
Deep	T. 3 N., R. 10 W., Sec. 26
Long	T. 3 N., R. 10 W., Sec. 20, 21, 28, 29
McDonald	T. 3 N., R. 10 W., Sec. 21
Noonday	T. 3 N., R. 10 W., Sec. 16, 17
Round	T. 3 N., R. 10 W., Sec. 17

All the lakes lie within a radius of two or three miles north and east of Gun Lake. All but Deep Lake drain into Gun Lake which is a part of the Kalamazoo River system. Deep Lake is tributary to the Thornapple River of the Grand River drainage. All of the lakes are within the Yankee Springs Recreational Area which is being developed by the National Park Service. They are approximately 10 miles from Hastings.

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* The name of this lake has recently been changed to Chief Noon-day.

Maps of the lakes were made by the Yankee Springs Project. These were used as a basis for soundings, vegetation and bottom surveys made by the Institute. The biological survey* was made in July and August of 1936. In addition the author visited the lakes on October 1, 1941.

Little information concerning the early history of the lakes is available. Extensive industrial use in the past seems unlikely. It is probable that they were all used to some extent in logging operations. Baker, Round, and Deep have the reputations of being good fishing lakes while in Long, McDonald, and Noonday, fishing is reputed to be rather poor. Since the lakes are within the Recreational Area, their potential importance as public fishing water is great.

Physical Characteristics

The land in the Yankee Springs area is rolling. The effects of glaciation are quite noticeable and the lake basins are undoubtedly of glacial origin. Mr. I. D. Scott in his book, "Inland Lakes of Michigan", describes Gun Lake and mentions Long Lake (which he calls Mud Lake) but gives only a general description of the surrounding country. He says, "This basin (Gun Lake) lies on the western border of a strong morainic ridge trending north-south. To the west is a triangular outwash plain which developed from the north and west and is very thin and incomplete near the border of the moraine." The soil is sandy and of rather low fertility. It is evident that farming was not good in the area before it was taken over by the Park Service. Much of the land is wooded and the planting of additional trees is one phase of the development of the area.

The relationship of the lakes to each other and the drainage basin is best shown by the accompanying sketch map of the Yankee Springs Area. Baker,

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* Personnel of survey party: C. M. Tarzwell, leader; L. A. Woodbury, G. M. Moore, assistants.

Round, McDonald and Noonday Lakes all empty into Gun Lake through Payne's Lake. Long Lake empties directly into Gun Lake. Gun Lake is the headwaters of the Gun River which empties into the Kalamazoo River at Otsego. The Kalamazoo flows into Lake Michigan. The outlet of Deep Lake flows north into the Thornapple River. The Thornapple is a tributary of the Grand which empties into Lake Michigan at Grand Haven.

The water levels of all the lakes are probably rather constant. Even slight fluctuations in lakes such as these may have serious consequences. However, no report of any important drop in water level has been received. A dam, which blocked fish movement, was reported in the outlet of Deep Lake. On the visit in 1941 this was found to consist of two logs which would in no way hamper fish movements and would have little effect on the water level.

Physical characteristics not discussed above are presented in the following table.

Lake	Area in acres	Maximum depth in feet	Shore development	Approx. per cent shoal	Bottom Type		Color of water	Secchi disc
					Shoal	Depths		
Baker	58.8	30+	1.45	35	Marl	Pulpy peat, marl	Brown	9
Deep	32.4	35+	1.34	40	Marl, fibrous peat, sand	Marl	Colorless	12
Long	146.0	3+	1.8	100	Marl, pulpy peat, sand	...	Light brown	Bottom
McDonald	16.8	10	1.15	100	Marl, fibrous peat	Pulpy peat, marl	Colorless	Bottom
Noonday (Mud)	50.7	5	1.2	100	Pulpy peat, marl, sand	...	Brown	Bottom
Round	6.7	25+	1.05	60	Fibrous peat, marl	Pulpy peat	Brown	11.5

It can be seen that these lakes are quite variable in their physical characteristics. Although they range in size from 6.7 to 146 acres, all are small enough to be free from destructive wind action. They are sharply differentiated in depth. Baker, Deep, and Round are fairly deep, but

McDonald, Noonday, and Long are so shallow that plants grow all over the bottom. This is indicated by their being listed as 100 per cent shoal. The per cent of shoal (area potentially able to produce plants) is fairly high in the deeper lakes (35 per cent - 60 per cent). Since productive lakes usually have an abundance of vegetation, a high per cent of shoal is desirable, other conditions being suitable. Shore development varies from 1.05 - 1.45. This factor indicates the relationship between the actual length of the shoreline and the circumference of a circle of equal area. Baker Lake, for instance, has a shore development of 1.45. This means that the shoreline is 1.45 times as long as that of a perfectly round lake of the same area. A long, irregular shoreline (indicated by a high shore development) is in general desirable because the most productive areas of a lake are usually along shore and in protected bays and coves. There is little variation in the type of bottom soil in the different lakes. The Secchi disc gives an idea of the depth to which light penetrates the water. Since plants need light for growth, this also helps to determine the amount of the lake which is able to produce vegetation.

It is true, generally speaking, that the more vegetation there is in a lake, the more productive the lake is likely to be. This is true only within certain limitations, however. In deep lakes such as Baker, Round, and Deep, it is hardly possible to have too many plants. Shallow lakes such as Long, Noonday, and McDonald, on the other hand, may have too much vegetation.

Lakes are known to go through definite aging cycles. They start as more or less clean, water-filled depressions which later gradually become filled with sediment until the lakes become marshes and finally dry land. There are several ways by which the basin may be filled in. One results from the deposition of silt by streams. In lakes such as those under consideration,

however, the aquatic plants are probably the most important factor in the filling process. They grow up luxuriantly and then die and decay and become part of the peat deposit on the bottom. When the lake has become shallow enough for plants to grow all over the bottom, the process of filling is greatly accelerated and the life of the lake as fishing water is often rather short.

When lakes have filled in to such an extent that only a few feet of open water is left, winter kill is likely to occur. This is due to the exhaustion of the oxygen supply under the ice in winter. The oxygen is probably used up by the decomposition of organic matter and by respirative organisms present. Winter kill occurred in Long Lake in 1936 and might be expected to occur again in this or any other shallow, mucky-bottomed lake. Such waters, for this reason, are worth little as fishing lakes.

Temperature and Chemical Characters

The temperature and chemical condition of the water affects fish life in a number of ways. Temperature directly affects the growth rate of fish. Since they are "cold blooded" animals they are most active and feed most when the water is warm. Therefore, if other conditions are favorable, the warmer the water, i.e. within the toleration limits of the fish in question, the more rapidly they grow. Some fish, however, cannot live and grow under extremely high or low temperatures. Ciscoes and trout, for instance, generally require water colder than 70°F. and bluegills usually do poorly in water which does not exceed 70°F.

In the chemical analysis of water, the acidity (pH) and the amounts of dissolved oxygen (O_2), carbon dioxide (CO_2), and solids (M. O. Alkalinity) are usually determined. Oxygen is, of course, necessary for fish and most other forms of life and so its presence or absence in water may be a limiting factor. Carbon dioxide is a waste product of animals but seldom if ever

reaches a concentration in natural waters sufficient to seriously affect fish.

Dissolved solids are of importance to aquatic vegetation since it is believed that the plants obtain most of their minerals directly from the water rather than from the soil. pH indicates the general acidity or alkalinity of the water. In general, water which is moderately hard (contains considerable amounts of dissolved solids) and slightly alkaline water is generally the most productive.

The temperature and chemical conditions found in these lakes at the time of the survey are presented in the following table.

Lake	Station	Location	CO_2 Range	M. O. Alkalinity Range	pH Range		Surface	Thermocline Top	Thermocline Bottom	Bottom
Baker	I	Deepest part of west depression	0.0-21.0	143-181	8.7-7.2	Depth in feet	...	12	15*	28
						Temp. in °F.	75	68	58	45
						O_2 in p.p.m.	7.1	3.4	0.0	0.0
	II	Deepest part of east depression	0.0-17.0	145-174	8.7-7.3	Depth in feet	...	13	15**	24
						Temp. in °F.	76	67	61	49
						O_2 in p.p.m.	8.0	4.3	0.7	0.1
Deep	I	Near deep part of lake	0.0-11.0	152-190	8.4-7.4	Depth in feet	...	18	24	30
						Temp. in °F.	79	66	54	49
						O_2 in p.p.m.	8.4	13.6	6.1	0.7
Long	I	In deepest part of lake	0.0	105	8.9	Depth in feet	2	...	...	...
						Temp. in °F.	77	...	...	...
						O_2 in p.p.m.	6.4	...	...	...
McDonald	I	Near deepest part of lake	0.0	141-143	8.6-8.7	Depth in feet	...	...	...	8.5
						Temp. in °F.	77	...	...	76
						O_2 in p.p.m.	8.1	...	...	9.3
Noonday	I	Near deepest part of lake	0.0	131-134	9.1	Depth in feet	...	...	...	5
						Temp. in °F.	80	...	...	77
						O_2 in p.p.m.	9.9	...	...	9.9
Round	I	Near deepest part of lake	0.0-32.0	153-200	8.7-6.8	Depth in feet	...	12***	18	21
						Temp. in °F.	76	60	46	45
						O_2 in p.p.m.	7.9	2.0	0.3	0.0

* Actual bottom of thermocline at 21 feet, temperature 48°F.
** Actual bottom of thermocline at 21 feet, temperature 50°F.
*** Actual top of thermocline at 10 feet, temperature 68°F.

The shallow lakes (Long, McDonald, and Noonday) were uniformly warm throughout and showed more or less homogenous chemical characteristics. In all, oxygen was abundant, (6.4-9.9 p.p.m.), carbon dioxide was absent, the waters were moderately hard (Methyl Orange Alkalinity, 105-143), and strongly alkaline (pH 8.6-9.1). They should be fairly productive lakes if other conditions are favorable.

The deeper lakes (Baker, Round and Deep) showed marked thermal and chemical stratification; that is, the temperature and chemical conditions changed in a regular manner from top to bottom. A definite thermocline was present in each. This is a zone or layer of water in which the temperature changes rapidly (approximately $\frac{1}{2}^{\circ}$F. per foot). The thermocline is important because it acts as insulation between the lower and upper layers of water, preventing circulation as long as it is present. Decomposition and other processes going on in the bottom may greatly reduce or exhaust the oxygen, cause carbon dioxide to accumulate, and bring about other changes in the water below the thermocline.

In Deep Lake the surface water was warm (79°) but in the thermocline and below, the temperature was well within the range of tolerance for cold water fishes. Oxygen was abundant above and within the thermocline and was present even at the bottom. It seems probable that there would be enough for fish in the colder water throughout the season. The amount of carbon dioxide recorded for the bottom is not sufficient to produce any harmful effects. The degree of hardness (M. O. Alkalinity 152-190) and the pH (7.4-8.4) were near average for productive lakes.

Baker and Round Lakes are closely connected and were similar in their temperature and chemical characteristics. Although the water in the thermocline and below was cold, the amount of oxygen was reduced to the extent that fish could not inhabit this zone. Oxygen was abundant in the warm upper waters,

however, so that these lakes should be well suited for warm water fish such as bass and bluegills. The water was hard and moderately alkaline, near average for productive lakes.

Biological Characteristics

As was pointed out above, plants have a very important place in the ecology and economy of fishing lakes. Their photosynthetic processes add oxygen to the water, they support large numbers of fish food organisms, and they furnish protection and cover for fish of all sizes. It is a well known fact that the best fishing spots are near weed beds.

The following table lists the plant species collected on the lakes and their relative abundance. The plants of Baker and Round are listed together, since the lakes are so closely connected.

Plants*	Baker and Round	Deep	Long	McDonald	Noonday (Mud)
Water shield (Brasenia Schreberi)	...	...	...	...	Common
Coontail (Ceratophyllum demersum)	Few	Few	...	...	Common
Swamp loosestrife (Decodon verticillatus)	Common	Few	Common	Few	Common
Spike rush (Eleocharis calva)	...	...	...	...	Rare
Spike rush (Eleocharis equisetoides)	...	Few	...	...	...
Water pennywort (Hydrocotyle umbellata)	...	...	Few	...	Few
Blue flag (Iris versicolor)	...	...	Few	...	...
Star duckweed (Lemna trisulca)	...	...	...	...	Rare
Lesser duckweed (Lemna minor)	...	...	...	...	Rare
Water milfoil (Myriophyllum spicatum)	Few	**	...	...	Common
Bushy pondweed (Najas flexilis)	Abundant	Common	Common	**	Abundant
White water lily (Nymphaea odorata)	Common	Few	...	Few	Common
Yellow water lily (Nuphar advena)	Few	Few	Few	...	Common
Arrow arum (Peltandra virginica)	Rare	...	...	...	Few
Smartweed (Polygonum amphibium)	...	...	Rare	...	...
Pickerelweed (Pontederia cordata)	...	...	Few	...	Few
Pondweed (Potamogeton angustifolius)	Abundant	Common	Common	Common	Common
Leafy pondweed (Potamogeton foliosus)	...	...	...	...	Rare
Pondweed (Potamogeton Friesii)	Common	Common	...	...	Rare
Variable pondweed (Potamogeton gramineus)	...	...	...	...	Rare
Floating-leaf pondweed (Potamogeton natans)	Common	Common	Few	...	Few
Sago pondweed (Potamogeton pectinatus)	Common	Common	Common	**	Common
Clasping-leaf pondweed (Potamogeton perfoliatus)	...	...	...	...	Rare
Pondweed (Potamogeton pusillus)	Common	...	Rare	...	Rare
Flat-stemmed pondweed (Potamogeton zosteriformis)	Common	Common	...	...	Common
Arrowhead (Sagittaria latifolia)	...	...	...	...	Few
Big bulrush (Scirpus acutus)	Common	Common	Common	Abundant	Common
Three-square bulrush (Scirpus americanus)	...	Few	Few	**	...
Big duckweed (Spirodela polyrhiza)	...	...	...	...	Few
Cattail (Typha latifolia)	...	Rare	...	...	Few
Bladderwort (Utricularia purpurea)	...	...	...	Few	...
Bladderwort (Utricularia vulgaris var. americana)	...	Rare	...	Few	...
Wild celery (Vallisneria spiralis)	...	...	...	...	Few
Water moss (Drepanocladus aduncus var. polycarpus)	...	...	...	...	Few
Musk grass (Chara contraria)	...	...	...	Abundant	Common
Musk grass (Chara sejuncta)	...	...	...	...	Abundant
Musk grass (Chara vulgaris)	Abundant	...	...	...	...
Musk grass (Chara sp.)	...	**	**	...	...

* Species determined by C. O. Grassl

** Mentioned as common on fish card and noted in 1941.

All of the lakes seem to have had an abundance of plants. The more extensive list for Noonday may be explained in part by the fact that the staff botanist visited the survey party and assisted in making the collections on this lake. However, Noonday does have an extremely abundant plant population. It is interesting to note that in 1936 Long Lake was reported to be taken over by dense weed beds except in a few small areas. When this lake was visited in October, 1941, vegetation was found to be quite sparse. Although it was rather late in the season, it seems unlikely that the plants had already completely died down. This had not occurred in the other lakes. Another explanation might be that Long Lake has passed the stage in its development where it can produce an abundant plant population. This lake is undoubtedly "on the way out".

Plankton organisms were abundant in all the lakes. These are plants and animals of microscopic or nearly microscopic size which float or swim freely in the water. They have an important place in the food chain, being eaten by very young fish, by larger fish food organisms (insects, etc.) and forage fish, and to some extent by game fish.

The relative abundance of the bottom dwelling animals which fish may use as food is given in the following table.

Lake	Baker		Deep		Long	McDonald	Noonday	Round	
Location of Samples	Shoal	Depths	Shoal	Depths	Shoal*	Shoal*	Shoal*	Shoals	Depths
Area Sampled	3/4 sq. ft.	1/4 sq. ft.	2 sq. ft.	1½ sq. ft.	2½ sq. ft.	2 1/4 sq.ft.	1 1/4 sq.ft.	3/4 sq. ft.	1/4 sq. ft.
Depth Range	1.5-12 ft.	25 ft.	1.5-14 ft.	18-33 ft.	½-3 ft.	½-10½ ft.	1½-5 ft.	2-7 ft.	15 ft.
Bottom Type	Pulpy peat, fibrous peat, marl	Pulpy peat	Marl, fibrous and pulpy peat, sand	Pulpy peat, marl	Pulpy peat, marl, sand	Pulpy peat, marl, fibrous peat	Pulpy peat, sand	Fibrous peat, Marl	Pulpy peat
Organisms									
Aquatic earthworms (Oligochaeta)	Rare	...	Rare-few	Rare	Rare	Few-rare	...	...	Rare
Leeches (Hirudinea)	Rare	...	...	...	...	...	...	...	...
Snails (Gastropoda)	...	...	Rare	...	Few-rare	...	...	...	...
Clams (Pelecypoda)	...	...	Rare	...	...	...	...	...	...
Scuds (Amphipoda)	Rare	...	Few	...	Common-abundant	Few-rare	Rare	Few	...
Mites (Hydracarina)	Few	...	...	...	...	...	...	Rare	...
Mayflies (Ephemeroptera)	Rare	...	Common	Common	Few-rare	Few	Rare	Rare	...
Dragonflies (Anisoptera)	...	...	Rare	...	Rare	Rare	...	Rare	...
Damselflies (Zygoptera)	...	...	...	...	Rare	...	...	...	...
Fish flies, etc. (Neuroptera)	...	...	...	Rare	...	...	...	...	...
Caddisflies (Trichoptera)	...	...	...	...	Rare	...	...	Rare	...
Beetles (Coleoptera)	...	...	Rare	...	...	Rare	...	...	...
Phantom midge (Corethra)	Few	Rare	...	Common	...	...	...	...	...
Midges (Chironomidae)	Common-abundant	...	Abundant	Abundant	Few	Common	Few	Few	Rare
Other flies (Diptera)	Rare	...	Rare	Few	...	...	...	...	...

* No deep water in lake.

In general, midge larvae appear to be most common, with mayfly nymphs and freshwater shrimps following in that order. No form was consistently abundant. Experience has shown that the plants in a lake usually harbor many more fish food organisms than can be found in the bottom material. It seems probable that these plant inhabiting organisms would also be more important since they should be more readily available to the fish. No samplings for food organisms on the vegetation was made, but since plants were abundant in all the lakes, it is believed that they harbored an animal population adequate for the fish present.

The species of fish, their relative abundance and stocking since 1933, for these lakes, are included in the following table.

Species	Baker	Deep	Long	McDonald	Noonday	Round
GAME FISH						
Brown trout (Salmo trutta)	...	Few-common	...	...	...	...
Cisco (Leucichthys sp.)	...	Reported rare	...	...	...	...
Mud pickerel (Esox vermiculatus)	Rare	...	...	Rare	...	...
Northern pike (Esox lucius)	Reported rare	...	...	...	Rare	...
Yellow perch (Perca flavescens)	Common	Common-abundant	Few-common	Rare	Common	Few
Smallmouth bass (Micropterus dolomieu)	Reported rare	...	...	...	...	...
Largemouth bass (Huro salmoides)	Few	Rare	Rare	Rare	Rare	...
Warmouth bass (Chaenobryttus gulosus)	Few	...	...	Common	Rare	...
Bluegill (Lepomis macrochirus)	Abundant	Common	Rare	Rare	Common	Common
Long-eared sunfish (Lepomis megalotis)	...	Rare	...	...	...	...
Pumpkinseed (Lepomis gibbosus)	Rare	Rare	Rare	Reported rare	Few	Few
Rock bass (Ambloplites rupestris)	Reported rare	Rare	Rare	...	Rare	...
Black crappie (Pomoxis nigro-maculatus)	Few	Rare	Rare	...	Rare	Rare
Hybrid (Bluegill x Pumpkinseed)	...	...	Rare	...	Rare	...
COARSE FISH						
Common sucker (Catostomus commersonnii)	Few	Common	...	Rare	...	...
Brown bullhead (Ameiurus nebulosus)	Rare	...	Rare	...	Rare	...
Yellow bullhead (Ameiurus natalis)	Rare	Rare	Few	Rare	Rare	...
OBNOXIOUS FISH						
Short-nosed gar (Lepisosteus productus)	Rare	...	Rare	...	Rare	...
Long-nosed gar (Lepisosteus osseus oxyurus)	...	...	Rare	...	Rare	...
Dogfish (Amia calva)	...	...	Rare	...	...	...
Carp (Cyprinus carpio)	...	...	...	...	Reported	...
FORAGE FISH						
Black-nosed shiner (Notropis heterolepis)	...	Rare	Reported	Few	...	...
Black-chinned shiner (Notropis heterodon)	...	...	Reported	Few	Rare	...
Mimic shiner (Notropis volucellus)	...	Rare	...	...	...	...
Common shiner (Notropis cornutus frontalis)	...	Rare	Reported	...	...	...
Golden shiner (Notemigonus crysoleucas auratus)	Common	...	Few	...	...	...
Blunt-nosed minnow (Hyborhynchus notatus)	...	Abundant	Reported	Abundant	...	...
Fat-headed minnow (Pimephales promelas)	...	...	Reported	...	...	...
Menona killifish (Fundulus diaphanus menona)	...	Rare	Common	Rare	...	...
Iowa darter (Poecilichthys exilis)	...	Rare	Common	Rare	Abundant	...
Silverside (Labidesthes sicculus)	...	Abundant	Few	...	...	...
STOCKING - 1933-40						
Perch	1,500	9,400	...	...	...	...
Largemouth bass	...	900	...	...	500	...
Bluegills	34,000	15,500	...	8,000	18,500	...

The material for Baker Lake includes data from an intensive creel census conducted there during the summers of 1936-1937*. Few game fish and no fish of other types were collected in Round Lake. However, this lake is so closely connected to Baker that it should contain the same species of fish. Difficulty was experienced in seining in Baker. This probably accounts for the small number of species of forage fish taken. Undoubtedly more were present. Baker, Round, and Noonday Lakes were all similar in that bluegills and perch appeared to be the dominant game fish. Deep Lake had a somewhat similar population but in addition had a moderate number of trout. In Long and McDonald, fish of all sorts were rather scarce. The apparently complete winter kill in Long Lake (1936) probably accounts for the condition there. The fish taken probably migrated from Gun Lake. Winter kill may also have occurred in McDonald. Since the lake is little frequented, the dead fish might not have been noticed.

Growth rate studies were made on the game fish taken. The following table shows the age group and length for each species in the various lakes.

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* See Institute Report No. 470, "Analysis of fishing in Baker Lake, Barry County, Summers of 1936, 1937."

Species	Age group*	Baker		Deep		Long		McDonald		Noonday		Round	
		No. of specimens	Length in inches	No. of specimens	Length in inches	No. of specimens	Length in inches	No. of specimens	Length in inches	No. of specimens	Length in inches	No. of specimens	Length in inches
Brown trout	III	...	...	11	16.3	...	...	...	...	...	...	...	...
	IV	...	...	3	18.1	...	...	...	...	...	...	...	...
	V	...	...	1	22.9	...	...	...	...	...	...	...	...
Northern pike	XI	...	...	...	...	...	...	...	...	1	30.5	...	...
Yellow perch	I	...	...	1	4.5	11	6.3	1	5.6	10	5.6	...	...
	II	10	6.9	30	6.0	5	7.4	...	...	3	6.9	2	6.9
	III	1	8.4	2	10.3	1	8.3	...	...	4	7.5	...	...
	IV	...	...	2	9.8	4	10.1	...	...	1	8.2	...	...
	V	...	...	2	11.6	...	...	...	...	...	...	...	...
	VI	...	...	4	12.5	...	...	...	...	...	...	...	...
Largemouth bass	II	...	...	...	...	...	...	1	6.4	...	...	...	...
	III	2	9.1	3	8.7	...	...	...	...	4	10.1	...	...
	IV	...	...	2	10.5	...	...	...	...	...	...	...	...
	V	1	12.8	1	13.2	...	...	...	...	1	13.0	...	...
	VI	1	14.1	...	...	...	...	...	...	...	...	...	...
Warmouth bass	II	1	3.9	...	...	...	...	...	...	...	...	...	...
	III	1	4.7	...	...	...	...	13	3.9	...	...	...	...
	IV	1	5.5	...	...	...	...	4	4.5	...	...	...	...
	V	3	5.1	...	...	...	...	4	5.7	1	6.2	...	...
	VI	...	...	...	...	...	...	...	...	1	6.2	...	...
Bluegills	I	...	...	1	3.4	1	3.7	...	...	...	...	...	...
	II	2	3.8	5	5.8	...	...	1	3.5	1	4.3	...	...
	III	1	5.4	12	7.9	...	...	2	4.4	4	5.6	...	...
	IV	9	8.0	4	8.6	...	...	1	5.2	8	6.7	2	7.2
	V	30	8.2	1	9.8	...	...	2	5.4	2	8.0	...	...
	VI	19	8.3	...	...	1	8.2	...	...	2	7.5	...	...
	VII	1	8.8	...	...	...	...	...	...	...	...	1	8.8
	VIII	...	...	...	...	...	...	...	...	...	...	1	9.0
Pumpkinseed	II	3	4.5	2	5.5	...	...	...	...	...	...	2	5.0
	III	...	...	1	7.4	...	...	...	...	...	...	...	...
	IV	...	...	1	6.6	...	...	...	...	...	...	...	...
	V	...	...	1	7.2	1	7.6	...	...	1	6.8	...	...
Rock bass	I	...	...	2	3.3	...	...	...	...	...	...	...	...
	V	...	...	...	...	1	9.4	...	...	...	...	...	...
Black crappie	I	...	...	2	4.7	...	...	...	...	...	...	...	...
	II	2	6.4	...	...	1	9.7	...	...	1	7.8	...	...
	III	...	...	...	...	...	...	...	...	...	...	1	6.3
	IV	1	10.2	...	...	...	...	...	...	...	...	...	...
Hybrid (Bluegill x Pumpkinseed)	V	...	...	...	...	1	9.1	...	...	...	...	...	...

* Ages determined by W. C. Beckman

In some cases the number of specimens is too small to give conclusive evidence. However, for the more important species, we believe conditions in the lakes are well represented.

The youngest brown trout taken from Deep Lake were in their fourth summer and over 16 inches long. This is very good growth and shows the possibilities of our southern Michigan lakes as trout waters. Good series of perch were obtained from all the lakes except McDonald and Round. The average Michigan perch reaches legal size near the end of the second or beginning of the third growing season. The perch in all these lakes then show about average growth.

While in no case was the series large, the largemouth bass taken from these lakes seem to be making about average growth for the state. Only two warmouth bass over six inches in length were taken in Noonday and they were in their sixth and seventh seasons.

The average Michigan bluegill reaches legal length in its fourth growing season. The series of bluegills from Baker, Deep, and Noonday Lakes are numerous enough to be considered representative. They show the fastest growth in Deep and the slowest in Noonday, but all are average or better. The few taken from the other lakes indicate that conditions may be about average in Round, possibly average in Long, and that the bluegills in McDonald are growing very slowly.

Little definite information can be given concerning the other species because the series are small. Pumpkinseeds seem to be doing well, especially in Deep Lake. All the crappies taken show average or better than average growth.

Spawning facilities are probably adequate for all species present in the various lakes with the possible exception of Long Lake. Spawning facilities on the various lakes for the more important types of game fish are given in the following table.

Species	Baker	Deep	Long	McDonald	Noonday	Round
Trout	*	Inlet and outlet may be used. Outlet has sandy bottom.	*	*	*	*
Pike	Marshy area near inlet and some along margin.	*	*	Marshy around much of margin, inlet, and outlet	Marshy around margin, inlet and outlet.	Marshy area along outlet stream.
Perch	Weed beds on solid shoal.	Weed beds on solid shoal.	Weed beds, bottom soft.	Weed beds, bottom may be solid.	Weed beds, bottom soft.	Weed beds, soft bottom.
Largemouth bass	Weed beds, soft bottom.	Weed beds, soft bottom.	Weed beds, soft bottom.	Weed beds, soft bottom.	Weed beds, soft bottom.	Weed beds, soft bottom.
Bluegills**	Abundant solid marl shoal.	Abundant solid marl shoal.	Little or no solid shoal.	Little or no solid shoal.	Little or no solid shoal.	Little solid shoal.

* Not present.
** Now known to be much less selective than was formerly believed. Frequently use soft bottom.

It seems likely that the brown trout have been spawning in the inlet or outlet of Deep Lake. This cannot be said with certainty, however. We have no record of any plantings of trout in the lake or in the inlet or outlet, but they have been planted in Hill Creek near by. Unrecorded plantings or migration are therefore possible. As pointed out in the table, bluegills are now known to be much less specific in their spawning ground requirements than was formerly believed. They could no doubt reproduce quite adequately in some of the softer bottom lakes.

Management Suggestions

At present all of these lakes are in the "all other lakes" classification. The results of the survey indicate that all should retain this designation for the present. If the following experimental program for Deep Lake is successful, it may be desirable to change its designation to that of a trout lake. If this is done the season should not be opened until May 15, but the lake should be put on the list of lakes open to fall fishing for rainbows. Before the

designation of the lake is changed, the extent to which it is used for winter fishing should be determined and the rights of the winter fisherman given consideration.

It has been said above that spawning facilities are probably adequate for all species in these lakes. An average bluegill nest produces about 18,000 fry, according to the findings of W. F. Carbine of the Institute Staff. Even allowing for a tremendous mortality among the young fish, it can be seen that our largest plantings look very small beside the possibilities of natural propagation. It is therefore recommended that all stocking be stopped in Baker, Long, McDonald, Noonday and Round Lakes.

It is not certain that trout are reproducing in Deep Lake. In any case, brown trout furnish very poor fishing in lakes. It is therefore suggested that 2,000 yearling rainbow trout be planted in Deep Lake each year for the next three years, starting in the spring of 1942. At the end of three years a check should be made to determine whether the rainbows have become established and whether it is necessary to continue stocking. Yearling trout are suggested because of the large perch population which would very likely make short work of a planting of fingerlings. No other species should be stocked in the lake during this three year period.

Predators were not numerous enough to warrant any control measures. Parasitized fish were not numerous. In any case the parasites seem to do little harm to the fish and are, of course, harmless to man. No practical means of control are known.

Cover on the lakes consists chiefly of dense beds of vegetation. This should be adequate. Water level seems to be fairly constant so no control measures are suggested. Spawning facilities apparently need no improvement.

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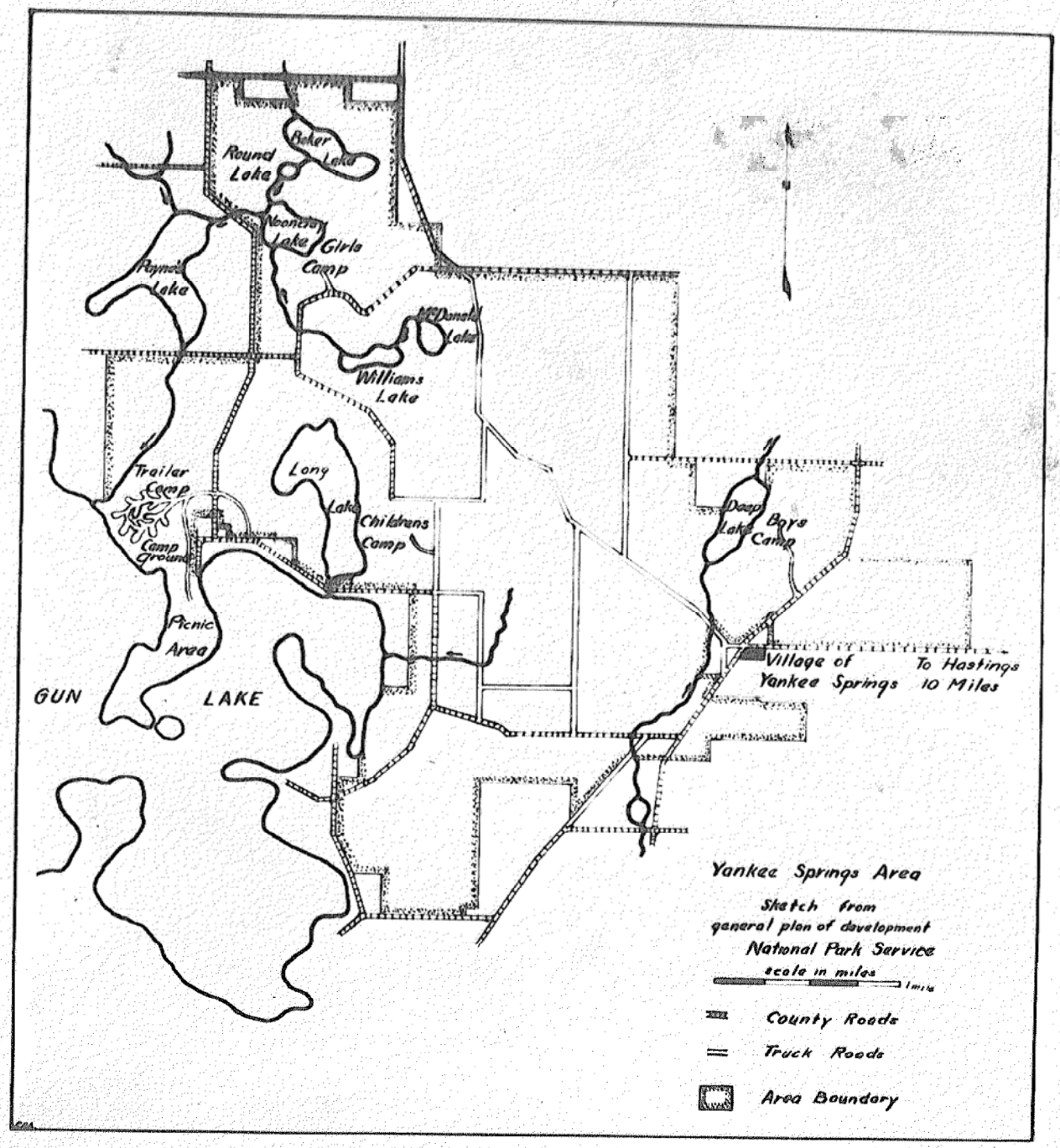
Round Lake
Baker Lake
Boomerang Lake
Girls Camp
Raymond Lake
McDonald Lake
Williams Lake
Trailer Camp
Camp Ground
Long Lake
Childrens Camp
Deep Lake
Boys Camp
Picnic Area
GUN LAKE
Village of Yankee Springs
To Hastings 10 Miles
Yankee Springs Area
Sketch from general plan of development
National Park Service
scale in miles
1 mile
County Roads
Truck Roads
Area Boundary