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REPORT NO. 704

FISHERIES SURVEY OF BIG HASTINGS, BIG COBB, BIG MOSHERVILLE LAKES, HILLSDALE COUNTY

by

John Funk

I. Introduction

Big Hastings, Big Cobb, and Big Mosherville Lakes are situated in Scipio Township of Hillsdale County. They may be located more specifically as follows:

Big Hastings	R. 3 W., T 5 S., Sec. 22
Big Cobb	R. 3 W., T. 5 S., Sec. 15
Big Mosherville	R. 3 W., T. 5 S., Sec. 4, 9.

These lakes lie in the Kalamazoo River drainage, being tributary to the South Branch of the Kalamazoo. They are, respectively, 3, 4, and 5 miles north of Jonesville.

The lakes were mapped and a biological survey was made by an Institute for Fisheries Research party* during the summer of 1937.

At present these lakes do not appear to be utilized for any industrial purpose. A dam in the outlet of Big Mosherville was apparently used at one time to produce a head of water to run a mill, but the mill is no longer in operation. An abandoned factory on the shores of Big Cobb

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* Personnel of party: David C. Chandler, leader; Walter Crowe and E. L. Cheatum, assistants.

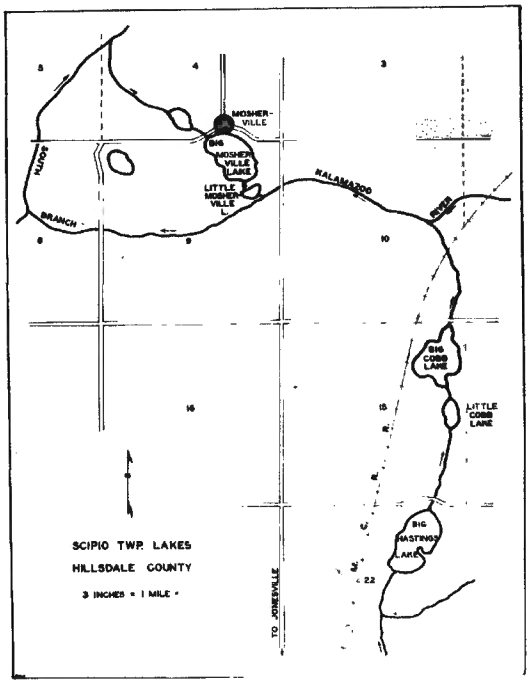
appears to have been a cement plant which no doubt utilized marl dredged from the lake. They may have been used in lumbering operations but the small size of the lakes and connecting streams would limit such use.

Reports concerning the early fishing history vary. However, it seems that they have always furnished fair fishing but that there has been a general falling off in recent years. Big Mosherville is the only one of the lakes suitable for any extensive resort development. The hamlet of Mosherville is located on the north shore of this lake. Judging from the number of boats and boat liveries, Big Cobb and Big Mosherville are the most frequented, but all the lakes appear to be of considerable importance as public fishing waters.

II. Physical Characteristics

In spite of the "big" names these lakes are all small, averaging about 30 acres in area. All are more or less oval in outline with rather regular bowl-shaped basins. The original depressions which the lakes now occupy were undoubtedly of glacial origin and at one time were probably much larger. They have since filled in to the present small size. The surrounding country is rolling. The soil appears to be of moderate fertility, making fair farm land.

The relationship of the lakes to the drainage is best explained by the accompanying sketch. (See Fig. 1) The stream through Hastings and Cobb empties into the South Branch of the Kalamazoo about a mile east of Mosherville. Just above Mosherville the South Branch divides. Part of it flows through the Mosherville lakes and part makes a loop around them. The two parts of the stream reunite about a mile to the northwest.


MOSHER-VILLE
BIG MOSHER-VILLE LAKE
LITTLE MOSHER-VILLE L.
SOUTH
BRANCH
KALAMAZOO
RIVER
BIG COBB LAKE
LITTLE COBB LAKE
BIG HASTINGS LAKE
TO JONESVILLE
SCIPIO TWP. LAKES
HILLSDALE COUNTY
3 INCHES = 1 MILE

The Hastings and Cobb system drains most of the southeastern half of Scipio Township, while part of the water from the entire headwaters of the South Branch of the Kalamazoo passes through Mosherville. Rather large fluctuations of water level are reported for the lakes. Of course this might be expected with such an extensive fluctuating drainge system. On the other hand, a large, stable drainage tends to ensure a more constant water supply. Fluctuations probably are limited to cases of high water or freshets in the spring or after heavy rains and are probably of short duration. The streams between the lakes are permanent so that the level of the lakes does not fall below a reasonable minimum. Fluctuations of the above type do not seriously affect the productivity of the lake.

Information on the inlets and outlets of the lakes is given in the following table.

Lake	Stream	Width	Depth	Current	Remarks
Big Hastings	Inlet	30 ft.	1 ft.	Not perceptible	Choked with water lilies
	Outlet	15-20 ft.	Few inches	Moderate	Weedy
Big Cobb	Inlet	12-15 ft.	Few inches	Slow	Weed choked
	Outlet	15-20 ft.	8 inches	Moderately slow	Weedy
Big Mosherville	Inlet	20 ft.	1 ft.	Slow	Choked with Anacharis
	Outlet	12 ft.	Few inches	Swift	Dam

As was mentioned above, the dam in the outlet of Mosherville formerly furnished power for a flour mill and now is used as a road. It serves to raise the level of the lake four or five feet and is a complete barrier

to fish. No provision has been made for the passage of fish. This has no serious effect on the river system as a whole, however, since one branch of the river by-passes the Mosherville lakes, and the fish have access to the lake and stream above by this means.

Other physical factors not mentioned above are given in the following table.

Lakes	Area in acres	Depth in feet	Shore Development	Per Cent Shoal	Bottom types		Color of water	Secchi disc
					Shoal	Depths		
Big Hastings	37.6	40	1.35	25	Marl and fibrous peat	Marl	Amber	14
Big Cobb	36.2	30	1.57	15	Marl, fibrous peat, sand	Marl	Amber	3
Big Mosherville	26.8	40	1.12	60	Marl, sand	Marl, pulpy peat	Amber	16

While these lakes are small, all are rather deep, insuring a long future as fishing lakes. Shore development varies from 1.12-1.57. A shore development of 1.57 means that the shoreline of the lake is 1.57 times as long as that of a perfectly round lake of the same area. Since the most productive areas of a lake are usually along shore and in protected coves and bays, a long shoreline or a high shore development is conducive to a higher productivity, all other conditions being favorable.

That area of a lake which is potentially capable of producing plants is considered as shoal. The amount of shoal in a lake varies greatly, being dependent on the form of the bottom, penetration of light, etc. Since the shoals are the most productive parts of the lake, a high percentage of shoal is desirable in a fishing lake. The Secchi disc reading

indicates the depth at which a white disc disappears from sight, and gives an idea of the penetration of light in the water. This is important because light is necessary for growth in the higher plants. The low reading for Big Cobb is due to the fact that the survey was made just after a heavy rain and the water was very muddy. The water in this lake appears to be normally somewhat more turbid than in the other lakes considered here, however.

III. Temperature and Chemical Characteristics

Temperature and chemical factors influence to a large extent the productivity of a lake. Temperature has a direct effect on the growth rate of all fishes. Other things being equal, the warmer the water, the more rapid the growth. Some fish, such as trout and cisco, however, are unable to tolerate for long periods water much warmer than 70°F. Chemical factors include dissolved gases (oxygen and carbon dioxide), dissolved solids (hardness) and acidity (pH). Practically all aquatic organisms require idssolved oxygen in varying amounts. Dissolved solids furnish minerals necessary for the growth of aquatic plants. Extremes of either acidity or alkalinity have a detrimental effect on all water life. In general, those lakes which are moderately hard and slightly alkaline are most productive.

The following table summarizes the temperature and chemical characteristics of the lakes under consideration.

Lake	Station	Location	Carbon dioxide range	M. O. alkalinity range	pH range		Surface	Thermocline Top	Thermocline Bottom	Bottom
Big Hastings	1	Outlet	0.0	110	8.1	Temp. in °F.	77	...	...	...
						Oxygen in p.p.m.	7.6	...	...	...
	2	Near deepest part	0.0 - 0.7	173 - 205	8.2 - 7.5	Depth in feet	...	15	21	30
						Oxygen in p.p.m.	7.5	5.6	5.5	1.5
						Temp. in °F.	77	66	58	51
	3	Inlet	0.3	225	7.8	Temp in °F.	72	...	...	...
						Oxygen in p.p.m.	6.8	...	...	...
Big Cobb	1	Deepest part of lake	0.0 - 0.7	126 - 198	7.9 - 7.5	Depth in feet	...	15*	...	27
						Temp. in °F.	73	59	...	54
						Oxygen in p.p.m.	6.4	5.3	...	0.3
	2	Outlet	0.0	180	7.9	Temp. in °F.	73	...	...	...
						Oxygen in p.p.m.	6.4	...	...	...
	3	Inlet	0.3	148	7.6	Temp. in °F.	68	...	...	...
						Oxygen in p.p.m.	4.3	...	...	...
Big Mosherville	1	Near deepest part	0.4 - 1.2	185 - 215	7.9 - 7.4	Depth in feet	...	12	27	36
						Temp. in °F.	72	65	50	50
						Oxygen in p.p.m.	6.4	...**	0.6	0.0
	2	Outlet	0.4	185	7.9	Temp. in °F.	72	...	...	...
						Oxygen in p.p.m.	6.3	...	...	...
	3	Inlet	0.5	215	7.9	Temp. in °F.	69	...	...	...
						Oxygen in p.p.m.	7.6	...	...	...

* Thermocline 6-21 feet, only record from middle.

** At 18 feet, temperature 58°F., oxygen 5.6 p.p.m.

The surface water of all these lakes is warm. Thermoclines were present in all. A thermocline is a zone in which the water temperature decreases very rapidly (approximately 1°F. or more per yard). This zone rather effectively shuts off circulation so that the lower waters of the lake become practically stagnant. Decomposition of organic matter in the bottom may use up the dissolved oxygen until the water below and even in the thermocline becomes oxygenless by the end of the summer. It will be noted that in all the lakes this has started to take place, being most advanced in Mosherville. During the course of the summer the water above the thermocline probably gets considerably warmer than it was at the time of the survey. Since the upper water is probably warm and the colder lower water may have its oxygen supply reduced below the requirements of fish, there is some doubt if trout could tolerate conditions in any of these lakes, although a series of temperatures and oxygen tests should be taken late in the summer to throw more light on this point. The fact that trout have been reported to be present may be proof of favorable conditions.

Carbon dioxide is a product of decomposition. It is present, particularly in the deeper water. The amounts are so small, however, as to have no significant effects. The water of all the lakes is rather hard (M. O. alkalinity averaging between 151 and 200 p.p.m.), indicating an adequate supply of dissolved minerals for plants. The water is slightly alkaline (pH range 7.4-8.1), which, as was mentioned above, will allow high productivity.

IV. Biological Characteristics

Every fisherman knows that good fishing lakes have abundant weed beds. The plants add oxygen to the water by their photosynthetic processes, support large numbers of insects, etc., which are easily utilized by the

fish for food, and provide shelter and protection for fish of all sizes. Lakes of the type under consideration could hardly have too many plants.

A summary of the plant species collected and their relative abundance are given in the following table.

Species	Hastings	Cobb	Mosherville
Waterweed (Anacharis canadensis)	...	...	Common
Sweet flag (Acorus calamus)	...	...	Rare
Coontail (Ceratophyllum demersum)	Rare	Few	Common
Musk grass (Chara sp.)	Common	Common	Common
Water moss (Drepanocladus adurcus)	Rare	...	...
Marsh fern (Dryopteris Thelypteris)	Rare	...	...
Spikerush (Eleocharis calva)	...	Rare	...
Blue flag (Iris versicolor)	Rare	...	...
Lesser duckweed (Lemna minor)	Rare	...	...
Star duckweed (Lemna trisulca)	Rare	Rare	...
Water milfoil (Myriophyllum heterophyllum)	...	Rare	...
Water milfoil (Myriophyllum verticillatum)	...	...	Common
Bushy pondweed (Najas flexilis)	Rare	Rare	Few
White water lily (Nymphea odorata)	Few	Few	Common
Yellow water lily (Nuphar advenum)	Rare	Few	Few
Pickerelweed (Pontederia cordata)	...	Rare	...
Large-leafed pondweed (Potamogeton amplifolius)	...	Few	Common
Pondweed (Potamogeton angustifolius)	Few	Few	Few
Pondweed (Potamogeton Friesii)	Few	...	...
Floating leaf pondweed (Potamogeton natans)	...	Few	Few
Sago pondweed (Potamogeton pectinatus)	Few	Few	Few
Flat-stemmed pondweed (Potamogeton zosteriformis)	Few	Few	Rare
Liverwort (Riccia fluitans)	Rare	Rare	...
Big bulrush (Scirpus acutus)	Common	Rare	...
Three-square bulrush (Scirpus americanus)	Rare	...	...
Water bulrush (Scirpus subterminalis)	Rare	...	...
Great bulrush (Scirpus validus)	...	...	Rare
Bur reed (Sparganium eurycarpum)	...	...	Rare
Big duckweed (Spirodela polyrhiza)	...	Rare	...
Cattail (Typha latifolia)	Rare	...	...
Bladderwort (Utricularia vulgaris var. americana)	Rare	Rare	Rare

Twenty species were collected from Hastings, 18 from Cobb, and 16 from Mosherville. However, the vegetation is much more dense in Mosherville than in the other two lakes. In Hastings and Cobb the only beds of dense vegetation are in the vicinity of the inlets and outlets, where water lilies (Nymphea, Nuphar) and submergent plants of various kinds are common.

Most of the shoal is covered with a sparse growth of musk grass (Chara) with a few pondweeds (Potamogetons) on the drop-off. Bulrush (Scirpus) is rather common around the margin of Hastings, especially along the west shore. In Mosherville the entire shoal along the west and south margin is covered with a dense growth of waterweed (Anacharis), Coontail (Ceratophyllum), musk grass, and water milfoil (Myriophyllum). Water lilies are common in the shallower water, while pondweeds are numerous on the drop-off. The north and east shoals are less densely vegetated. Judged by the vegetation, Mosherville should be the most productive of the three lakes.

The kinds and abundance of fish taken or reported for the lakes are listed in the following table.

Species	Hastings	Cobb	Mosherville
GAME FISH			
Mud pickerel (Esox vermiculatus)	...	Rare	...
Northern pike (Esox lucius)	Rare	Rare	Reported rare
Perch (Perca flavescens)	Common	Few	Rare
Walleyed pike (Stizostedium vitreum)	...	Reported rare	...
Smallmouth bass (Micropterus dolomieu)	...	Rare	...
Largemouth bass (Huro salmoides)	Rare	Common - abundant	Common
Warmouth bass (Chaenobrythus gulosus)	...	Few - common	Rare
Green sunfish (Lepomis cyanellus)	Rare	Few - common	Rare
Bluegill (Lepomis macrochirus)	Few	Abundant	Abundant
Long-eared sunfish (Lepomis megalotis)	...	Few	Abundant
Pumpkinseed (Lepomis gibbosus)	Rare	Common	Common
Rock bass (Ambloplites rupestris)	Rare - few	Few - common	Few
Black crappie (Pomoxis nigro-maculatus)	...	Few - common	Rare
Bluegill-pumpkinseed hybrid	...	Rare	...
Bluegill-green sunfish hybrid	...	...	Rare
Long-eared - green sunfish hybrid	...	Rare	...
COARSE FISH			
Lake chub sucker (Erimyzon sucetta)	...	Few	...
Common sucker (Catostomus commersonnii)	Reported rare	Rare	Reported rare
Golden mullet (Moxostoma erythrurum)	...	...	Rare
Mullet (Moxostoma sp.)	...	Rare	...
Yellow bullhead (Ameirus natalis)	...	Rare	...
Carp (Cyprinus carpio)	...	...	Reported rare
OBNOXIOUS FISH			
Dogfish (Amia calva)	...	Rare	Reported rare
FORAGE FISH			
Black-nosed shiner (Notropis heterolepis)	Few	...	Rare
Black-chinned shiner (Notropis heterodon)	Rare	Common	Abundant
Common shiner (Notropis cornutus frontalis)	Rare	Common	...
Common shiner (Notropis cornutus chrysocephalus)	...	Rare	...
Golden shiner (Notemigonus crysoleucas auratus)	...	Common	...
Blunt-nosed minnow (Hyborhynchus notatus)	Common	Rare	...
Pug-nosed minnow (Notropis anogenus)	Few	Few	Few
Horny-headed chub (Nocomis biguttatus)	...	...	Rare
Tadpole cat (Schilbeodes gyrinus)	Rare	Rare	...
Mud minnow (Umbra limi)	...	Rare	...
Johnny darter (Boleosoma nigrum)	...	...	Rare
Iowa darter (Poecilichthys exilis)	Rare	Common	Rare
Brook stickleback (Eucalia inconstans)	...	Rare	...

Fifteen species are listed for Hastings, 30 for Cobb, and 20 for Mosherville. The large number of species listed for Big Cobb does not necessarily mean that this lake contains more fish. It was much more

intensely fished than the other two lakes. On the other hand, Hastings and Mosherville were fished with approximately equal intensity, and the number of fish taken is probably somewhat proportional to their actual abundance. The species distribution in the lakes is rather interesting. The predominate fish in Hastings is perch. In Cobb and Mosherville, however, bluegills are most abundant with largemouth bass and pumpkinseeds in a secondary position. This is usually a popular combination for southern Michigan lakes. The abundance of long-eared sunfish in Mosherville is no asset since they seldom grow to legal size.

Data from the random creel census made by Conservation Officers is rather limited for the lakes other than Big Cobb. The data from Big Cobb Lake is extensive enough to have some value and indicate bluegills to be by far the most abundant fish in the catch.

All three lakes have been rather heavily stocked. From 1934-1940 Hastings received a total of 114,000 bluegills and Cobb 116,000. Mosherville was not stocked with bluegills until 1939 but received 30,000 in the period 1939-40. In addition, Mosherville received 10,000 perch in 1939. Cobb received 10,000 perch in 1938 and 3,000 largemouth bass in 1938-39.

Age and total length studies were made on the game fish. This material is presented in the following table.

Species	Age group[1]	Big Hastings No. of specimens	Big Hastings Length in inches	Big Cobb No. of specimens	Big Cobb Length in inches	Big Mosherville No. of specimens	Big Mosherville Length in inches
Northern pike	I	...	...	1	14.9	...	...
	III	1	34.6	1	20.9	...	...
	IV	...	...	2	27.6	...	...
Yellow perch	I	8	3.5	...	...	...	...
	II	2	6.2	...	...	...	...
	III	3	7.4	1	7.6	1	6.3
	IV	...	...	...	...	1	7.4
Largemouth bass	II	...	...	1	6.4	...	...
	III	1	9.4	3	11.5	...	...
	IV	...	...	1	12.4	...	...
	V	...	...	1	10.4	...	...
Bluegill	III	1	5.2	6	4.7	...	...
	IV	...	...	8	5.7	1	4.1
	V	...	...	8	6.7	1	6.3
	VI	1	9.6	3	6.8	...	...
	VIII	1	9.8	1	10.1	...	...
Pumpkinseed	III	...	...	3	4.7	...	...
	IV	...	...	1	4.9	...	...
Rock bass	II	4	4.0	...	...	...	...
	III	1	5.2	...	...	...	...
Green sunfish	III	...	...	1	3.9	...	...
	V	...	...	2	5.3	...	...
Warmouth bass	IV	...	...	2	4.0	1	4.3
	V	...	...	1	5.4	...	...
Black crappie	II	...	...	1	5.5	...	...
	III	...	...	1	6.0	...	...
	IV	...	...	1	7.2	...	...
	V	...	...	...	...	1	9.3
	VI	...	...	1	7.8	...	...

[1] Age determinations by W. C. Beckman.

In many cases the sample was too small to warrant making any definite conclusions. The material from Mosherville, for instance, can be trusted to give only a rough idea of conditions there. In the other lakes, however, material for the dominant species is, we believe, representative.

The series of northern pike is small but those taken were doing very well. The average Michigan pike seems to reach legal length in its second or third summer. The specimen which was almost 15 inches long in its second summer (age group I) was somewhat better than average, while the 34 inch, 3 year old from Hastings showed remarkably fast growth.

Yellow perch were the dominant game fish in Hastings and the series for this lake should be fairly representative. It shows that the perch reach legal length in their third summer (age group II), which is about average for the state. The one specimen from Big Cobb is growing at about the same rate, while the two from Mosherville are almost exactly one year behind.

The series of largemouth bass from Big Cobb is too small to be trusted entirely but seems to indicate that these fish reach legal length early in their fourth summer. This compares favorably with the state average. The one from Big Hastings is growing more slowly. The error which may be introduced by too few specimens is well illustrated here where the fish in age group V is smaller than the average for age group III.

The series of bluegills from Big Cobb should present a rather accurate picture of conditions in that lake. The average Michigan bluegill becomes a "keeper" in its fourth summer. The growth of the bluegills in Big Cobb is below average since they do not reach legal size until early in their sixth summer of life. The three specimens from Hastings would seem to indicate a faster growth there, while the two from Mosherville are possibly growing more slowly than those in Cobb.

The series for the other species of fish are small and most of them are fish of secondary importance in the lakes. We have evidence which indicates that the average Michigan pumpkinseed and rock bass require four summers of growth to reach legal size. Green sunfish seldom reach legal size at all. The warmouth bass are not yet legal size in their sixth summer, while the crappies reach legal length in four summers.

Spawning facilities in the lakes seem to be good for most of the species present. Weedy shoals which are generally considered to be preferable for perch are abundant in Hastings as well as in the other lakes. The

same areas are probably utilized by largemouth bass. Recent studies indicate that bluegills are not restricted in spawning to gravel or other solid type bottom as was formerly believed. However, there is an abundance of this type of shoal in Mosherville and considerable in the other lakes. There would seem to be no reason why bluegills could not reproduce successfully in all the lakes. There is considerable weedy marsh area along the connecting stream and near the inlet and outlet of Hastings and Cobb which should be suitable for pike. Since the stream was rather warm at the time of the survey (June), it is not likely that it could be utilized by trout.

V. Management Suggestions

The lakes are now designated as "all other lakes" and the results of the survey show no reason why this designation should be changed even though a subsequent investigation might show the lakes to be suited to trout.

The species of fish now present in the lakes seem in most cases to be doing well. In Hastings 114,000 bluegills have been planted since 1934 but these fish are still secondary to perch in importance. It is recommended that plantings of bluegills in this lake be discontinued. The perch have adequate spawning facilities and have done well in the past, so no stocking should be necessary.

In Big Cobb the bluegills are growing slowly. This condition occurs rather frequently in our southern Michigan lakes and its cause is not definitely known. It is believed, however, to be a result of overcrowding; the population of bluegills becomes so large that the lake cannot produce sufficient food to permit normal growth. The presence of this condition is proof that natural propagation is adequate (or more than adequate) to maintain the population. Stocking is therefore not only wasted effort

but actually harmful since it aggravates the overcrowding. Stocking of bluegills in Big Cobb Lake should be stopped. Largemouth bass and perch have also been stocked in Big Cobb. Since spawning facilities for these species are apparently adequate, it seems probable that natural propagation should be sufficient to maintain the population. It is therefore suggested that stocking of largemouth bass and perch be discontinued in Big Cobb Lake.

Stocking in Big Mosherville has been limited to a small planting of perch and two plantings of bluegills. Since, as in the other lakes, natural propagation should be adequate, it is suggested that all plantings be discontinued.

Some predators of various types (turtles, water snakes, herons, kingfishers) were observed on the lakes. Since they were not numerous, and since there is doubt as to the extent to which the so-called predators are injurious to the fish population, no control measures are advised.

Some parasites were present but they were not numerous. Even where they are relatively abundant these organisms seem to cause little inconvenience to the fish and are certainly harmless to man. No control measures known would be practical.

The most important form of cover in these lakes is that provided by the dense beds of vegetation. In addition, some snags, deadheads, etc., are present. In Big Cobb the row of piling extending across the lake must provide good shelter. It is a favored fishing spot. No additional structures are suggested.

As pointed out above, water level fluctuation on the lakes is probably not very serious. No control measures are suggested. Of course the dam in the outlet of Mosherville should be operated so as to maintain as constant a level as is feasible.

Spawning facilities in the lakes are apparently adequate for the species of fish present so no attempts at improvement are advised.

The balance in nature is a complicated affair, the operation of which we still know relatively little. In lakes such as these, all factors seem to indicate that the balance will be able to maintain itself against any ordinary fishing pressure. If such is the case, the best management policy which we can suggest is that the lakes be let alone.

INSTITUTE FOR FISHERIES RESEARCH

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