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Report 203

REPORT ON TUCKER AND JUPA LAKES, PRICE COUNTY WISCONSIN

The two lakes mentioned above were investigated by three members of the Institute for Fisheries Research of the University of Michigan, during the latter part of July, 1932.

The two lakes will be considered separately.

Tucker Lake

Description

Size, and Location — Tucker Lake is an excellent lake. It is surrounded partly by virgin timber and partly by second growth timber. A swamp borders a portion of the west shore. The lake has an area of slightly over 74 acres and is more or less square to circular in shape.

Inlets and Outlets — The lake has one very definite inlet, Roger's Creek, which has its mouth at the northeast "corner" of the lake. This stream has a relatively small volume of water.

A spring enters the lake on the north side. There are very likely other small springs, since the outlet of the lake has a considerable flow. There is a probable considerable seepage from the swamp on the west side.

The outlet, Tucker Creek, which leaves the lake at the southeast "corner", empties into Rice Lake. Drainage is into the Mississippi via Rice Lake, Rice Creek, Pike Lake, Round Lake, South Branch Flambeau River, Flambeau River and Chippewa River.

Both inlet and outlet have a dam.

Water The water appears to be free from pollution. This is in a region with very little population and the possibilities of pollution through human agencies is very slight. The inlet water is clear and clean.

Use of Water This lake is used only for recreation. A cabin has been built on the south shore. This is a private lake and is sued only by members of the owner's family and his guests. It is not fished extensively. Several boats are kept at the landing near the cabin.

Temperature Surface temperature is warm (76°, air temp. 76°). Temperature at 5 meters was 72°. Below five meters the water was much colder, the bottom temperature (at 10 meters) being 53°. Definite summer stratification is evident.

Oxygen. Oyxgen is high in the upper warm water layer which extends to a depth of about 17 feet. In the lower cold water layer almost no oxygen was found. This fact immediately eliminates any hopes that trout or other cold-water fishes will do well in the lake, even though temperature conditions are satisfactory for these species. Oxygen content for warm water fishes is good.

Other chemical conditions Conditions are quite different in the two layers. The warm layer was quite alkaline and contained no free carbon dioxide, while the cold layer was acid and contained an abundance of carbon dioxide. This indicates much decay of organic material. The water is quite soft, much softer than in most lakes which have been investigated by the party.

Depth Tucker Lake has a relatively large amount of shoal. Approximately 1/3 of the lake has a depth of less than 5 meters (16-17 feet). A very small portion has a depth of over 30 feet. Maximum depth found is 33 feet. Relatively shallow lakes are generally more productive than deep ones, and, since conditions in the deeper parts of this lake are unsatisfactory for fish life, any greater depth in this case would very likely benefit the lake very little if any. The lake is deep enough and is of such a nature that there need be no fear of its "filling up" or getting too shallow for a few more generations at least.

Bottom All portions of the lake which have high ground beyond the shore have excellent gravel in shallow water along the margin, as is generally expected in glacial soil. Along the marshy shore peat extends to the water's edge. Elsewhere a strip of sand and gravel, generally fairly wide, extends around the shoal. The bottom beyond this sandy margin is pulpy peat. The soil of the submerged island is sand and gravel similar to that along the shore. Peat found was of two kinds. A small amount of it along the swamp and elsewhere is fibrous peat. Most of it is pulpy peat. Both types have an organic origin. The pulpy peat is more completely decayed and disintegrated than the former.

Cover Unfortunately cover is unsatisfactory. Except for the vegetation, which is present in fair amount but is not especially abundant, almost no protection for young fish is available. The margin has a very few fallen trees. This very important factor will be discussed in detail later.

Vegetation Outlet.--Vegetation is plentiful in most of the outlet, more plentiful than in the lake proper. A dense bed of bullrushes lies at the head of the outlet and along the shore for several rods in either direction. Due to the rather hard sand bottom in the first 150 feet of the outlet, little vegetation occurs there but beyond this point, in soft peat, there is an abundance of yellow pond lilies and a few white lilies, Nuttall's pondweed (Potamogeton epihydrous) is common to abundant and filamentous green algae is abundant. Several patches of pickerel weed also occur here. Cattails are present but sparse and so is arrowhead. Burreed and sedge grass are common along the banks or in shallow water. Leather-leaf is abundant along the banks where it appears in patches among the alders and the willows.

Inlet.--Vegetation is rather sparse in the inlet. Duckweed and sedge are common. Nuttall's pondweed is sparse and leatherleaf is abundant on the banks. Very little plant growth is found in the water at this point.

Blind Island.--No vegetation occurs here at present. A little filamentous green algae was found in deep water near here.

Spring.--In the spring north of the cabin, on the north side of the lake, we found

bladderwort, green algae, duckweed, muskgrass, and arrow-head, common leather-leaf abundant, and large blue flag sparse. There is little vegetation here which could be used in stocking other parts of the lake. The spring is very cold and retards the maturation of the oögonia on the muskgrass, thus rendering it unfit for seed planting even though there should be enough there to use in stocking Tucker Lake, which I doubt very much.

Tucker Lake Proper.--Vegetation is fairly good around most of the lake but several portions of this area, suitable for vegetation, could probably be improved for fish if more weeds were planted. Yellow pond lilies appear to be increasing this season and Nuttall's pondweed, present in a few small areas seems also to be spreading. Aside from yellow-lilies, pickerel weed and algae, which are fairly well distributed in all the bays around the lake, there is very little submerged or floating vegetation other than the one sizable weed bed in Muskellunge Bay near the inlet. This bed consists of an abundance of broad-leaved pondweed, Nuttall's pondweed, and dense mats of filamentous green algae.

The vegetation of Tucker Lake is recorded in greater detail on the green vegetation-analysis card. Each number on the card corresponds to the same number, in a circle on the map. The accompanying key to the symbols used on the vegetation card makes it possible to interpret the various weeds by both their common and scientific names and to determine which weeds may be found growing in the different parts of the lake, and their abundance.

List of vegetation of Tucker Lake

Emergent Vegetation: Cattail (Typha latifolia), leather-leaf (Cassandra calyculata) sedge grass (Carex sp. and Dulichium arundinaceum), alder (Alnus sp.), willow (Salix sp.), pickerel weed (Pontederia cordata), larger blue flag (Iris versicolor), arrow-head (Sagittaria latifolia), bulrush (Scirpus sp.), and burreed (Sparganium sp.).

Floating Vegetation: Yellow pond lilies (Nymphaea advena), Nuttall's pondweed (Potamogeton epihydrous), bladderwort (Utricularia sp.), duckweed (Lemna minor and

Spirodela polyrhiza) and water smart weed (Polygonum amphibium).

Submergent Vegetation: Water-weed (Elodea canadensis) and Ziz's pondweed (P. angustifolius), and Large-leaved Pondweed (P. amplifolius).

Bottom Vegetation: Algae, identified as the following: Spirogyra sp., Lyngbya sp., diatoms, Anabena sp., and Zygnema sp.

Natural Food — One would expect this lake to be quite productive. Undoubtedly its basic fertility is high. Conditions, however, are quite contrary to expectations. Natural food, for the species present, is very poor. The inlet and outlet have quite a few crayfish and aquatic insects. Snails, tadpoles and frogs are also common here. Elsewhere in the lake food is very limited. Minnows are few in number as well as in species. Suitable food for the muskallunge and wall-eyes is not abundant, perhaps owing to their own predation. Crayfish appear to be a chief food item of these fishes. Further reference to food will be made later.

Spawning — Conditions for bass spawning are quite satisfactory. Perch lay their eggs in bands on brush or vegetation. Conditions are fairly satisfactory for this species. It is possible that they will also use the brush shelters to some extent. Conditions for bluegills are good.

Muskellunge are reported to spawn similarly to the northern pike. Pike lay their eggs, in early spring, on weeds and brush. Evidently spawning conditions for the muskellunge would be better if weeds were more abundant.

Wall-eyes seem to prefer spawning in streams on gravel bottom but will also spawn in lakes. Conditions for this species appear to be fair.

Suckers generally spawn in streams. Spawning behavior varies with different species. It is possible that some suckers would spawn in the outlet above the dam. Some times suckers also spawn in land-locked lakes.

Spawning conditions for the blunt-nosed minnow are now unsatisfactory.

In general, spawning conditions are more or less favorable and adequate.

Spawning facilities cannot be considered responsible for the present depletion of fishes in this lake.

Predators — No obnoxious predatory species of fish were found. Turtles, fish-eating birds and water snakes are very few, and do not constitute a serious menace. Apparently there is no predatory problem, except for the muskallunge. It is to be remembered that the muskellunge is a voracious predator, and would very likely interfere seriously with the bass, bluegill or perch population, but since the muskellunge is especially desirable and is preferred, the welfare of the other species is given secondary consideration.

History of Fishing — According to reports, muskallunge, walleye and bass fishing was good 18 years ago. Bass fishing declined. About 9 years ago large-mouth bass were planted and bass fishing again improved. Bass have been planted off and on since. Recently bass fishing declined and now no bass are taken. Wall-eyes are decreasing. Muskallunge are reported to have been much larger than at present, and about equally abundant. Muskellunge are abundant now but are small.

Species of Fish Present — Game fish.--Muskellunge are abundant but are small, averaging about 4 to 8 lbs. Wall-eyes are fairly abundant and appear to be in good shape. Perch, bluegills and pumpkinseed sunfish are present but are not abundant and apparently do not become very large. Bass have been present for years but none could be taken by our party. If still present, they are rare.

Coarse fish.--A half dozen or so very large suckers were seen. These had scars on them, apparently having been attacked by muskies, but were probably too large to be taken. The species could not be determined certainly.

Obnoxious fish.--No obnonious fish were seen or reported.

Forage fish.--Forage fish are present in limited numbers. The desirable blunt-nosed minnow and golden shiner were taken here; also black-nosed shiners, log perch and Iowa darters. The number of species present is relatively small and none of

the species can be considered abundant.

Discussion and Recommendations

History

In the last 18 years this lake has apparently gone through more changes than lakes generally do in so short a time. This is due to a number of factors. The following history has been obtained from Mr. Doering and Mr. Leibelt, the caretaker:

In 1920 the beaver built a dam in the outlet which raised the water to its present level or slightly above it. This dam was blasted out in 1922 or 1923. The water was down to its normal level for several years. A dam was then constructed 6 or 7 years ago. Few changes were noticed. Four years ago the dam was enlarged and the lake was raised to its present level. Muskrats were plentiful formerlly but are now almost completely absent. Weed beds shifted. Many old beds left, new beds began to form. One of the narrow-leafed pond weeds was present in a dense bed. Much of this was removed. Quite a few small muskellunge were seen in the weeds. This species of aquatic plant has now apparently disappeared entirely from the lake.

Changes in vegetation were probably largely due to changes in water-level. The present shifting of weed beds is also very likely the result of establishing a new water level 4 years ago.

Changes in fish population are listed above under History of Fishing.

Changes in bottom were quite extensive. Wherever land is high immediately behind the shore line, gravel now occurs on the margin in abundance. This gravel is reported to have been present only for the last several years. The introduction of gravel was recommended by J. Clyde Brown in 1916. Apparently the gravel has always been present but was covered by peat and sand. The establishment of the present water level evidently changed conditions in such a way that wave action removed the peat or sand and exposed the gravel.

Changes in vegetation and bottom are attributed to the changing of water level

from time to time. It is possible that this explanation is not sound but no better reason for these changes presents itself.

The most important change in the lake has thus far not been discussed. This is the quite apparent breakdown of the normal balance between fish and food, through either natural or artifical agencies. The part played in this by changes in water level, vegetation, and bottom cannot be clearly determined. The problem of rehabilitating fish conditions in this lake now resolves itself around one important point: the restoring of this balance.

Fish which were caught in the past were almost invariably returned to the lake. Muskellunge taken by the owner in neighboring lakes were also, at times, placed in this lake according to reports. This fact may have had considerable bearing on the matter.

Whatever may have been the cause (there were probably a number of causes), the lake now is almost depleted of food. The disappearance of the bass, the present small size of the muskellunge, and the scarcity of forage fish, are all probably due to the fact that food is insufficient for the present musky population.

Unless steps are taken to change existing conditions it is almost safe to predict that (1) the wall-eye will also decrease in numbers and perhaps finally disappear completely as the bass apparently have done, (2) that the muskies will continue to be small or will be even smaller than at present.

It is repeated that the important problem is that of restoring a balance between the muskellunge and the food present. That the owner has recognized food deficiency is apparent. He has had suckers placed in the lake from time to time as food for the fish. It is reported that these suckers are taken by the muskies in short order and in a manner which indicated that the fish are quite hungry. The willingness with which the musky takes a surface bait, or follows it also indicates that he is hungry.

The recommendations which follow will be directed chiefly toward the increase of food. It is to be remembered that should the food become abundant, through efforts to increase it, fishing may not be so good since the muskies will not be in search

of food so much of the time. But, the fish can, with increased food, grow to a larger size and, when they do strike, larger fish may again be expected.

It is to be remembered too, that with the balance so far to one side, no improvements which we may suggest will be able to change conditions overnight. It is believed, however, that in a reasonable length of time, these improvements will have a decided effect on the conditions and will improve them quite noticably.

There is an alternative to improvement of conditions. If most of the muskellunge were removed from the lake, food would gradually increase of its own accord. It is assumed, however, that the removal of most of the fish is contrary to the wishes of the owner. The removal of a few of them, for the next several years, is, however, considered advisable.

Previous report

The rather extensive report made in 1916 by Ernest Clive Brown of New York indicates that Mr. Brown was well acquainted with his work. At that time, however, work of this sort was not nearly so far developed as it is at present and it is now quite obvious that certain of his suggestions, such as stocking with cisco, would almost certainly be unsuccessful if carried out, and some other suggestions made by him are now considered inadvisable. The lake has also changed very decidedly since his investigation was made. It is suggested that his report, now very much out of date, be disregarded in the future.

Recommendations

1. Stocking — The present stocking of game fish is considered inadvisable. The lake now contains more game fish than the food warrants.

It is suggested that more shelter (see Rec. No. 5) be provided before fish be planted, except the planting of fish for immediate consumption. The lake is sadly in need of some fish which will utilize the aquatic insects or microscopic plants and animals, and which will, in turn, serve as food for the muskellunge. Golden-shiners would serve well, but no doubt the obtaining of this species in

large enough numbers would be extremely difficult.

As a means of obtaining food fishes for the lake it is recommended that the river be seined repeatedly and that the suckers and perch so obtained be placed in Tucker Lake in or near the brush shelters. It is here assumed, of course, that such seining is permissable. Any small wall-eyes so obtained might also be placed in the lake. We do not know how many fish can be obtained in this way and are not familiar with the legal aspects of the matter but, the only alternative to this, would be the purchase of fish, which might prove more or less costly.

It is assumed of course that such seining need not be carried on indefinitely. It could hardly be overdone the first season. The more fish introduced by this means, the better for the lake. It is difficult to state how many to be planted or how long the planting should continue. This depends on how fast they are consumed. Planting should be carried on until fish, other than muskellunge, are seen to be fairly abundant. Once the fish have become established and reproduce as fast or faster than they are eaten, further planting will be unnecessary and the lake will have been very decidedly improved.

Seining in the outlet below the dam, when the minnows are running up stream is also advisable. Since obnoxious species of fish appear to be absent in this region, there is little danger of doing harm by transferring all minnows taken below the dam, to the water above the dam.

In brief, suckers, red horse and perch, as well as minnows, should be introduced in as large a number as possible, taken, if permissable, from adjoining waters.

After it is evident that food has greatly increased, stocking with small-mouth bass might well be resorted to, if this species is desired. In such case stocking with 500 yearling bass per year is recommended.

2. Predator control -Predators are very few and apparently have little affect on the fish population. Efforts to control predators appear to be unnecessary.

3. Gravel spawning beds — Gravel is now present in abundance and is quite sufficient for any species which use gravel for spawning.

4. Slabs for minnow spawning — The blunt-nosed minnow is now present in limited numbers. It should by all means be encouraged. This species spawns on the under side of slabs or other flat objects. Slab devices such as shown in the accompanying diagram or individual slabs or old boards may be used. The construction of 25 such devices is recommended. These should be placed on the sand or gravel (flat side down) in water 1/2 to 1 1/2 feet deep. These minnows now have very few suitable spawning areas in the lake. The devices should be placed at mordor less regular intervals around the shore.

4. Vegetation increase — Planting recommendations: Considerable planting can be done to advantage in Tucker Lake. For fall planting it has already been suggested, in a previous letter, that muskgrass, Naias, and Valisneria seed might be planted. Muskgrass can be planted by just throwing small bunches into the water at a depth of 2 to 6 feet. Since Naias will not sink when thrown in, it must be mixed in clay balls to sink or pushed into a soft bottom by hand. Both the muskgrass and Naias plants will propagate by ripe seed contained in them. Oögonia (in case of muskgrass) are the fruiting bodies. Valisneria or wild celery seed occurs naturally and will be found in long slender seed pods which terminate a whitish, spirally coiled stem, at the surface of the water.

Valisneria seed pods may be collected, I believe in sufficient quantity in Round Lake. Warren Liebelt may recall the large bed of Valisneria which was examined by me (Ashley) on the day our party left. This weed bed is across Round Lake from the boathouse and toward the point near the channel from Round to Pickerel Lake. Valisneria seed from here might be used. To plant this seed the pods must be chopped, sliced, or broken into small bits which may be soaked in water until they sink and then scattered in water 2 to 6 feet deep over sandy or peaty soil. Another method is to mix the chopped seed-pod in with plastic clay soil and plant little balls of this clay mixture. They may be dropped into the water about a foot apart.

Spring planting: Several species of plants from Round Lake may be planted in Tucker Lake in the spring. These plants will grow from roots or tubers, if given an early start as soon as the water warms sufficiently. This will not be before about the first of June at the latitutde of Tucker Lake. It will be well worth while to plant 50 or 100 small yellow pond lily tubers on the Blind Island. Some may be planted within the frame of a brush heap shelter, which has been submerged and had rich soil dumped in. These should do well. The lily tubers should be weighted first, or if small, wrapped in clay balls, and buried in the rich soil. They may also grow if buried in the gravel on the Blind Island. The planting of Yellow pond lily tubers in places other than the Blind Island is not urged, the reason being that this plant appeared to be spreading and regaining a firm hold in many of the bays along the shore line of Tucker Lake.

If Valisneria seed was not planted in the fall, winter buds or tubers of this plant may be planted in the spring. These might be obtained from the same beds mentioned above in Round Lake, or they may be purchased from Clyde Terrell's Aquatic Nursery as can any other plants herein referred to. There is one disadvantage in moving plants from Round to Tucker Lake, that is, that in so doing the species of algae responsible for the "water bloom" which we saw on Round Lake might be introduced with them. This might result in the occurrence of a similar water bloom on Tucker Lake, which would of course, be very undesirable.

Two other plants for spring planting are Red-head grass (Potamogeton perfoliatus) and Sago pondweed (Potamogeton pectinatus). These are planted from roots and tubers. They may be wrapped in clay balls, or sunk in weighted berry boxes containing rich peat soil mixed with an equal part of sand.

An outline of Tucker Lake with a diagram of suggested vegetation accompanies this report.

5. Cover Increase Increased protection for young fish is especially desirable. It is necessary that the fish "get a start" in life and grow a while before being eaten by the muskellunge. The young fish take readily to these

shelters and receive both food and protection in and near the brush. Diagrams of several types of shelters will be found attached to this report. The construction of 15 large shelters and the placing of these in water 5 to 10 feet deep is recommended. One or two should be placed on the Blind Island. These shelters are especially important and it is recommended that at least some of them be constructed as soon as time permits.

6. Regulation of water level — It is advised that the water be kept at as near a constant level as possible. We suggest that it be kept at its present level. Changes in level seriously alter other conditions in the lake and efforts should be made to keep the dam at a more or less even height.

7. Dams and screens in inlet and outlet — The screen in the inlet is especially desirable if the inlet is to be maintained as a trout stream.

The dam and screen in the outlet also appears to be desirable. Were the dam removed it would permit minnows and fish to enter the lake from below. Since food is now scarce in the lake it would probably also cause many of the muskellunge to pass down stream to other lakes where food is more plentiful. Changes in vegetation for better or worse would probably also result. We consider such a dam desirable and feel that it should not be removed.

Self cleaning revolving screens would save labor and serve the purpose admirably.

8. Fertility Increase — Increase of fertility is considered unnecessary.

The lake is quite satisfactory in most respects other than food. As stated above, we consider that the best means of increasing food may be brought about by:

1. Introduction of large numbers of forage fish in order that they may become established.

2. Construction of brush shelters.

3. Construction of slab devices for minnows.

4. Increase of aquatic vegetation.

Not so many years ago the muskellunge caught weighed from 12 to 16 lbs.

These were almost invariably returned to the water. Now the muskellunge average 4 to 8 lbs. They cannot escape from the lake. Poaching is reported to be little if any (the lake is patrolled). Why then, are larger muskellunge no longer taken since they were taken previously and were not removed from the lake? This question was asked and was not answered. After considerable thought and investigation the question still cannot be answered in definite terms.

Some naturalists contend that animals do not die of natural causes and that they are killed by some enemy or disease. They do not, however, explain the dying of salmon and eels after spawning. It seems quite possible and probable that fish may die a natural death. The length of life of the muskellunge is not known to us but it is our guess (only an assumption which we cannot prove) that the large muskies have died, due to starvation, disease or old age. It is possible that a fish, even of that size, might die and not be found dead. If washed ashore, various scavengers generally bring about disintegration in fairly short time. If they die under the ice in the winter it is possible that they may sink to the bottom before the ice leaves in the spring. Crayfish would eat at least part of the flesh.

As mentioned above, no definite statement can be given in answer to this question, but that the fish may have died and their carcasses escaped attention is regarded by us as the most plausable explanation we can make with our present limited knowledge on this matter.

The Institute for Fisheries Research will be glad to try to answer any further questions which may arise or to explain further any portions of the report which are not clear.

Jupa Lake

Description

Size, Inlets and Outlets — Jupa Lake is a typical bog lake. It has an area of 11.7 acres. The lake has no inlets and no outlet. Its water supply is undoubtedly received from swamp seepage.

Water — The water is quite dark (muskeg) and is silty. It is decidedly acid, is soft and contains a large amount of carbon dioxide at all depths. Oxygen is low at the surface and is entirely absent near the bottom. Temperature is high in the upper 3 meters (72^{o}F when air was 73^{o}F) and is fairly low (58^{o}F) at the bottom.

Depth and Bottom — The bottom is quite uniform in depth. A large portion of the lake was found to be 3.7 meters (12 feet) deep. At the overhanging boggy shore the water is less than 1 meter deep. Pulpy peat (decayed organic matter) constitutes the bottom in all parts of the lake, except for a very narrow border of fibrous peat.

Cover — There is no protection for young fish except that provided at the margin by the encroaching swamp vegetation.

Vegetation — No aquatic vegetation is now present in Jupa Lake other than filamentous green algae and microscopically minute plankton algae. Some plants are found growing on the shores, however, and these aid in furnishing some insect larvae to the shore waters and thence to the fishes of the lake. In the sedge and other overhanging, partially submerged grasses dragon fly and caddis fly larvae and their cases were found in fair abundance. Due to the large quantities of decomposing organic debris and the seepage of marsh waters in the lake, the water is unusually acid. Such waters are quite inadequate for a good growth of aquatic plants as well as for most species of fish. Vegetation planting is not advised for Jupa Lake. If however, it should be determined to attempt the improvement of this lake I should suggest that you plant one bushel of large healthy Bladderwort (Utricularia vulgaris). This is an acid water plant which grows well without roots. It has very finely dissected

leaves in whorls, along a more or less branched stem. It will float unless weighted at the base of the stem. Even though this weed should thrive in Jupa Lake it might be a hindrance to bait casting along the shore.

Natural Food — Almost no natural food was seen here. The fishes evidently receive a large portion of their food from insects dropping into the water. That those fish which are present are hungry and depend on surface food is well illustrated in the fact that they will take cigarette "butts" or any other object of a similar nature which are thrown into the lake.

Spawning Grounds — The bottom is all of soft peat. Spawning conditions for bass are very poor. Perch may be able to "hold their own" by spawning on the roots and stems of the marginal vegetation.

Predators — No predators were observed here. They are evidently very few.

Species of fish — No fishes were ever found except perch and bass.

Recommendations

E. C. Brown, in his Report of August 30, 1916, recommends:

1. The planting of vegetation--the amount to be about half the size of a big load of hay.
2. The introduction of fresh water mussels.
3. The introduction of snails.
4. The introduction of various forage fishes.
5. Stocking with small-mouth and large-mouth bass.
6. The use of spawning boxes, with gravel, mounted on fence posts.

At the time of Mr. Brown's report certain important items were still unknown or were probably unfamiliar to him. One very important matter was not considered. This lake is highly acid. All very acid bog-water lakes thus far examined by our organization have proven to be practically worthless so far as fishing is concerned.

Regarding Mr. Brown's recommendations:

1. The planting of vegetation from Tucker Lake would probably result in failure

because the chemical conditions in the two lakes are quite different.

2 & 3. The introduction of mussels, clams or snails would undoubtedly result in failure. These creatures use lime in their shells and cannot possible survive in highly acid lakes.

4. Very few forage fishes do well in waters such as this. Few results could be expected if the lake is stocked with golden shiners, gold fish, or similar fishes. These depend to a large extent on vegetation and almost no weeds occur in the lake.

5. Stocking with bass. No doubt bass, preferably large-mouth, will live in the lake. They cannot, however, be expected to thrive there. If bass fishing in this lake is desired--bass of the size expected to be caught should be planted. They might not grow, and might even lose weight in the course of time. The fish should take to fly fishing unusually well because they are undoubtedly hungry most of the time and because they depend to a large extent, on insects falling on the surface.

6. The construction of spawning boxes for small-mouth bass is not recommended. When small-mouth bass exist in such lakes, they are ordinarily runted.

Unless the owner wishes to plant bass, realizing that they can hardly be expected to increase in size and number, stocking is not recommended. If stocked at all, the planting of large-mouth bass or bluegills only is suggested.

It is fairly safe to assume that any efforts to improve this lake are quite apt to meet with failure because certain uncontrollable factors are unfavorable for fish life. It affords us no pleasure to inform the owner that we consider this lake of very little value for fishing, but we prefer not to make improvement recommendations which we could expect to fail.

INSTITUTE FOR FISHERIES RESEARCH

Examination of Muskallunge

Tucker Lake

Total Length	Estimated age
42 inches	8-9 years
34 "	7-8 "
29 "	5 years
32 "	6 "

Food:

1. Large adult sucker
2. 1 small perch, several large crayfish
3. Several large crayfish
4. Red worm - disintegrated, not identifiable.

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