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Mr. Roy Johnston 12-31-41

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INSTITUTE FOR FISHERIES RESEARCH Mr. Paul Eschmeyer

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ALBERT S. HAZZARD, PH.D.  
DIRECTOR

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A FISHERIES SURVEY OF DEADMAN LAKE,

ONTONAGON AND GOGEBIC COUNTIES

by

Paul Eschmeyer

Introduction

#### Location and Accessibility

The principal portion of Deadman Lake is located in Haight Township, Ontonagon County, T. 46 N., R. 39 W., Section 36. The southeast end of the lake juts into Section 1 (T. 45 N., R. 39 W.) of Watersmeet Township, Gogebic County. The lake lies about 5 miles north and east of the Village of Watersmeet. The popular Bass Lake, site of Bonifas C.C.C. camp, is 3 miles southeast of Deadman Lake. The latter water has neither inlet nor outlet and is located between the drainage systems of the south and middle branches of the Ontonagon River. The latter branch passes within two miles of the south end of the lake.

Deadman Lake may be reached by following a gravel highway (U.S.-2 previous to 1940) east and north from Watersmeet for a distance of slightly over 3 miles. At this point a narrow gravel road known as the Perch Lake Road, turns almost due north, crosses the middle branch of the Ontonagon River, and veers to the northeast. About 2 miles to the northeast, at a

point 500 feet west of this road's intersection with the grade of the Choate spur of the Chicago and Northwestern Railroad, a C.C.C. truck trail again leads to the north, more or less following the railroad grade. The trail is about a mile long and terminates on the south-central shore of Deadman Lake.

The railroad nearest Deadman Lake is the Chicago and Northwestern, which stops at Watersmeet.

#### Map and Survey

The map of Deadman Lake was supplied by the United States Forest Service, the physical survey having been made by the C.C.C., under the direction of members of the staff of the Ottawa National Forest, within the boundaries of which the lake lies. The lake shoreline, shore features, bottom types and depths were mapped.

A regular biological inventory of the lake was made by Dr. A. S. Hazzard and the writer on August 26, 1941.

#### History of Deadman Lake

The south-central shore of Deadman Lake has, in the past, been the site of a logging camp, probably dating back to the latter part of the 19th century. Little else is known concerning the past history of the lake. It appears to have been somewhat of a problem water for many years, and the fishing has never been particularly good. Other than the occasional catches of small perch, the capture of a single small walleyed pike and an occasional largemouth bass has been reported, but none of these latter catches can be verified. Yellow perch have apparently been abundant in the lake throughout its recent history. Fishing in the lake at the present time is very poor. The water is lightly fished in summer and not at all in winter.

No cottages, boat liveries or resorts are present at Deadman Lake, and the entire area is completely undeveloped. Although the shores of the lake are rather readily accessible, the body of water and its surroundings offer little in the way of recreational potentialities to stimulate development. The scenic beauty of the area is not outstanding. Although proper management may lead to a substantial improvement of the fishery there, and thus encourage its use by anglers, it seems doubtful whether the lake will ever be of outstanding importance as a public fishing water or recreational area.

#### Physical Characters of Deadman Lake

##### General Physical Characters

Deadman Lake has a relatively deep, somewhat oblong basin which is slightly over  $\frac{1}{2}$  mile long and averages about 750 feet in width. The lake has an area of slightly over 43 acres and a maximum depth of 35 feet. The surrounding country is of rolling topography and is from moderately to densely wooded, with the exception of the area adjacent to the southwest end of the lake, which is swampy. Aspen, maple, birch, and a variety of evergreens constitute the timber species of the immediate vicinity of the lake. Most of the soil is predominantly sand, with varying mixtures of organic matter and clay.

The rolling, glaciated topography of the vicinity of the lake, the glacial soils, the lake's considerable depth with relation to its size and the absence of an inlet or outlet, combine to make it appear quite likely that the lake is of the "pot hole" type formed by glacial action.

##### Drainage

The drainage basin of Deadman Lake is not very extensive, surface waters reaching the lake being limited to direct run-off from adjacent hills. A small, intermittent stream drains the swamp area lying south

and west of the lake. The drainage area has sandy soils supporting moderately dense growths of second-growth timber.

#### Water Fluctuation

Water fluctuation in Deadman Lake is minimal, as might be expected in view of the absence of a permanent inlet or outlet. A normal, stable water level is maintained during all seasons of the year except at the time of the spring break-up, when water levels temporarily rise somewhat above normal.

#### Other Physical Properties of Deadman Lake

Deadman Lake has a total area of 43.4 acres and a shoreline which is 6,650 feet (or about 1.3 miles) in length. This indicates a shoreline development of 1.36 which means that the lake has a shoreline which is 1.36 times longer than that of a perfectly circular lake of the same area. Other factors being equal, the greater the shoreline development of a lake, the greater is its productivity. The additional bays and coves present provide added food, shelter and space for fish.

The lake has a single depression of slightly over 35 feet, in the west-central portion of the lake. The entire middle area of the lake for well over half the lake's length is over 25 feet deep. The slope from shore to the depths is quite steep, although narrow shoals which range up to 150 feet in width at some points, border the periphery of the lake, and constitute about 10 per cent of its total area. Bottom types on the shoal areas are largely sand, mixed with limited amounts of gravel. Muck soils encroach to the shoreline from the depths for short distances at the southwest, northeast, and south-central portions of the lake. Muck and pulpy peat soils are most prevalent in the depths of the lake.

The color of the water in Deadman Lake differs decidedly at different seasons of the year. On July 1, as well as at the time of the survey, the color was an opaque, dull green, with a general appearance much resembling the color of the broth from split pea soup. By October 15, an observation made at the lake showed the water to be very clear and white, without a trace of its former color. At the time of the survey, a Secchi disk (white metal disk about 6 inches in diameter, used to measure the degree of transparency in the water) disappeared from view after being lowered to a depth of  $3\frac{1}{2}$  feet. In mid-October a reading of 10 or 12 feet would have been obtained. Transparency of the water determines to a large degree the depth to which aquatic vegetation will grow in a given lake.

#### Temperature and Chemical Characters of Deadman Lake

##### Significance of Temperature and Chemical Data

Temperature and chemical data are important in assisting the fisheries worker to predict the suitability of a given water for the various fish species. Optimum requirements, with respect to temperatures as well as dissolved gases and other chemical factors, differ among various fish species as well as among fish food organisms, plants, etc. Temperature and chemical data frequently offer important clues as to the reasons for the presence of existing fish populations, and sometimes suggest means for improving the water's production of desirable game fishes. Such data most generally show whether fish present in a lake are the most suitable for that lake.

##### Temperatures of Deadman Lake

A series of temperatures was taken at Deadman Lake on August 26, in connection with a water analysis made on that date. The temperatures are shown in Table I. The series shows that the lake is thermally stratified,

being divided into an epilimnion (area of warm, circulating surface waters, in this case extending from the surface to a depth of 15 feet), a thermocline (an area of rapid change in temperature, e.g. one degree centigrade or more per meter of depth, in this case extending from 15 feet to 24 feet in depth), and a hypolimnion (area of cold, non-circulating water extending in Deadman Lake from 24 feet to the bottom). Temperature at the surface of the lake was 64.7°F., while at the bottom the temperature was 50.4°F. Air temperature at 11 A.M. was 59.7°F.

#### Chemical Character of Deadman Lake

The principal reason for the survey of Deadman Lake was to determine whether or not it might support trout. The temperature series as shown in Table I indicates a sufficiently low temperature in and below the thermocline to support this species. Water analyses made in this area, however, showed insufficient oxygen to permit further consideration of the establishment of trout in Deadman Lake. At 17½ feet, near the top of the thermocline, only 3.6 parts per million of oxygen were found, while progressively less of the dissolved gas appeared with increasing depth below this point. Four parts per million are considered a minimum requirement for the survival of trout.

Some carbon dioxide was present at the greater depths in Deadman Lake, but it was insufficient in amount to be of significance in the consideration of the fishery there.

The water of Deadman Lake was found to be very soft, with a Methyl Orange Alkalinity ranging from 8 to 15 parts per million. (Methyl Orange Alkalinity tests measure various mineral and buffer salts in the water. From 100 to 200 parts per million are sometimes considered necessary for high productivity).

Hydrogen ion concentration, or pH, a measure of the acidity or alkalinity of the water, was found to range from 5.9 to 7.0 (i.e., from quite acid to neutral). Slightly alkaline waters are generally more productive than neutral or acid waters because of the requirements of certain plants and fish food organisms, particularly snails and clams.

No signs of pollution were found at Deadman Lake. None could logically be expected.

Table I  
Summary of Chemical and Temperature Conditions  
in Deadman Lake, August, 1941

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Date: August 26, 1941	
Air temperature, °F.	59.7
Surface temperature, °F.	64.7
Bottom temperature, °F.	50.4
Thermocline	
Location	15-24 feet
Temperature, °F.	
Top of	63.0
Bottom of	51.6
Oxygen, p.p.m.	
Top of thermocline	3.6
Bottom of lake	0.0
Methyl Orange Alkalinity	
Surface	8.0
Bottom	15.0
pH	
Surface	7.0
Bottom	5.9

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#### Biological Character of Deadman Lake

##### Vegetation

Vegetation in Deadman Lake is all but absent. Only scattered individuals of very few species of water plants are present, and these are in very shallow water close to the shoreline. Quillwort (Isoetes Braunii) is the least sparse of the species present. Needle rush (Eleocharis acicularis) and occasional single yellow water lilies (Nuphar advena) were found by the survey party.

This extreme sparsity of vegetation is certainly not of advantage to the lake, and more water weeds would be a very desirable asset. However, the establishment of adequate vegetation presents a problem which, in lakes such as Deadman Lake, does not readily lend itself to solution.

#### Fish Foods

Plankton (microscopic free swimming or floating plants and animals) of some types is super-abundant in Deadman Lake, at least during some seasons of the year. The sparsity of vegetation, the opaque, soupy green color of the water during the summer, and the sparsity of oxygen in and below the thermocline may probably all be partially attributed to the presence of extremely large numbers of diatoms and desmids in the water during a portion of the summer. Their concentration in the upper stratum of lake water is great enough to color the water; by prevention of light penetration they may hinder plant growth; their decay, presumably in the vicinity of the thermocline, consumes large amounts of residual oxygen which cannot readily be replaced, soon lowering it below the toleration point for fish.

During seasons other than summer, plankton is of average or somewhat less than average abundance in the lake.

Bottom foods in Deadman Lake are quite restricted in amount. Chironomids are most plentiful in the pulpy peat bottom covering much of the lake, and large numbers of their cases cover portions of the substratum. Bottom foods are quantitatively and qualitatively much restricted.

#### Fish Present in Deadman Lake

Only 2 fish species are present in Deadman Lake, insofar as can be determined from authentic collection records there. These are the yellow perch (very abundant) and the pumpkinseed sunfish (rare). Only 2 adults of the latter species were taken, although large numbers of fry were seen at the time of the survey. No seining for forage fish and young game fish was attempted at the time of the survey, but some seining was done in



mid-October. Deadheads, logs, branches of trees, etc. are so thickly scattered along the shoreline that it is difficult to seine effectively. No fish were taken in the seining, and none were seen along the shores of the lake. Good visibility was present to a depth of about 8 or 10 feet. The failure to observe young-of-the-year fish at this time might have been due to their retreat to deeper water, as a result of the change in temperature of the shoal water and the increase in size of the fish themselves. However, it seems easier to convince oneself that this is not the case, but that the following sequence is more nearly correct: Upon hatching, the fry find ample quantities of food in the form of an exceedingly dense plankton population. Ample shelter is also provided by the plankton, which is thick and "scupy" enough to cause potential predators (older perch) great difficulty in locating their quarry. Toward the end of the summer, as the unusual plankton "bloom" disappears, however, this shelter is withdrawn, and the large overpopulation of ravenously hungry, stunted and starved perch enjoys the luxury of ample food, which is easily obtained in the absence of protective vegetative cover. Continued search by the perch probably eliminates all but a very few of the fry by the time the ice cover forms, and most of the remainder is probably devoured during the winter, since perch are relatively active winter feeders. It is easy to believe that a similar sequence of events has attended all of the fry plantings made in Deadman Lake by the Department of Conservation in the past. Being well established in the lake, the perch apparently produce sufficiently large quantities of fry to insure the survival of adequate numbers to perpetuate the species.

Deadman Lake has been abundantly stocked during the past 5 years\*. The impressive list includes 600 largemouth bass, 1,200 smallmouth bass, and 39,000 bluegills. In addition, in 1934, the unusual combination of 375,000 walleyed pike and 7,000 nine-month old brook trout were planted. Visible results of the plantings have been too close to nil to justify any claims in their behalf. The Centrarchids and perhaps the walleye fry were probably decimated by the perch in the lake very soon after they were planted. A few of the walleyes appear to have survived, since one is said to have been caught in the lake since that time. The survival would be expected to be better in the case of this species than in the case of the Centrarchids, since the latter are planted after the plankton bloom has disappeared, while the former, planted in the spring and sheltered by the plankton "bloom", reach a size sufficiently large to prevent their capture by at least the smaller perch in the lake, before the plankton leaves. Water analyses made at the time of the survey eliminate the possibility of the brook trout having survived throughout one summer period. All stocking done in recent years in Deadman Lake must be written down as a failure.

#### Growth Rate of Fishes of Deadman Lake

Table II records the average rate of growth of perch in Deadman Lake. The number of individuals upon which the averages are based is also shown. Several age groups are obviously too poorly represented to give good averages.

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\* Stocking records for Deadman Lake locate the water in T. 46 N., R. 38 W., Section 22, instead of T. 45-46 N., R. 39 W., Section 1, 36. The waters are without doubt identical, since no other Deadman Lake is known in this vicinity.

Table II  
Growth Rate of Perch in Deadman Lake\*

Age Group	No. of individuals	Average length in inches
III	4	6 1/4
IV-	24	6 5/8
V	23	6 3/4
VI	3	6 7/8
VII	1	8
VIII	2	8 1/4
IX	1	12

\* Growth determinations made by W. C. Beckman of the Institute Staff.

The two pumpkinseed sunfish taken in the lake were almost through their second summer of growth and averaged 3 7/8 inches in length.

The table above shows a severe case of stunting in a perch population. The 3-year old fish have passed through almost 4 growing seasons (since samples were taken in October) to reach legal size (6 inches), and the available scale samples of fish in the 6-year old group (7 summers old) indicate that the fish have not yet reached 7 inches in length, or in other words have averaged a growth of not quite one inch per growing season since hatching. This is extremely poor growth for fish in these particular age groups. It is immediately apparent that the lake produces insufficient food to support the over-balanced perch population.

#### Natural Propagation - Spawning Facilities

Natural propagation of perch in Deadman Lake is obviously very successful. A sufficiently large brood stock has been built up to produce such large numbers of fry that many of them are bound to survive to become adults. In the absence of vegetation, eggs are probably laid on brush, twigs, etc., of which materials large amounts are found in the lake.

Spawning facilities are adequate for all of the Centrarchid species, and the failure of representatives of this family in the past must be ascribed

to extensive predation on the part of the perch, rather than absence of spawning habitats.

The degree to which the average spring break-up raises the water level, and thus floods the swamp south and west of the lake, is not known. If the water level was raised a foot or two by the spring break-up and persisted for several weeks after the ice cover had left the lake, it is quite possible that northern pike, if introduced, would reproduce naturally in Deadman Lake.

### Management Suggestions

#### General Considerations

Deadman Lake presents a problem of more than average difficulty to the fisheries worker, with particular regard to the molding of recommendations for the improvement of the fishery there.

The productivity of the lake is very low. Probably the mid-summer plankton pulse or "bloom" as described above, the acid nature of the water and bottom soils, some unknown factor, or a combination of these factors, is probably responsible for eliminating most of the vegetation present in the lake and makes it rather futile to attempt to plant the submergent types which would be of most benefit to the lake. Floating types, such as the yellow water lily, now present in the lake, fail to multiply in number sufficiently to be of real benefit. The mere fact that no emergent weeds have yet established themselves in the lake makes their introduction by artificial means seem unlikely to succeed.

The over-population of stunted perch must be reduced or eliminated. The cost of its elimination by poisoning would be prohibitive, in view of the large size of the lake. Also, there is no positive assurance that any

other species of desirable game fish which might be introduced after the poisoning would ever provide good fishing in view of the lake's low productivity. The cost of fertilization in such a large lake to improve productivity would not be justified under existing fishing pressures or any which can be foreseen in the near future.

Biological control of the perch population by the introduction of a predator species seems the only logical approach to the problem at the present time. Good fishing for perch and the predator is to be hoped for, but the question of whether or not the predator will reproduce makes the project somewhat of a gamble. If no such reproduction occurs, however, the predator will soon die out and permit the introduction of adults of a different piscivorous species. It is with this in mind that the suggestions below are made.

#### Designation of Deadman Lake

Deadman Lake is at present in the "all others" classification. Since none of the Centrarchid species, the spawning season of which this designation closes, are now present in the lake in significant numbers, there is no justification for the continuation of the designation.

In view of the fact that the yellow perch is the dominant species in the lake at the present time, and in consideration of the stocking recommendations below, it is suggested that the classification of Deadman Lake be changed to that of a pike lake.

#### Stocking

It is recommended that Deadman Lake be stocked with about 20 or 25 adult northern pike. Stocking with fry and fingerlings of several other species has been attempted but has failed to succeed. In the continued presence of the perch population, stocking with adult fish is necessary.

Over a period of several years the pike should reduce the numbers of perch in the lake to the point where the latter species will show much more rapid growth. It is hoped that the pike will spawn naturally in the swampy areas adjacent to the lake and that eventually a well balanced population of pike and perch will inhabit the water. Northern pike generally find their best habitat in relatively shallow, weedy lakes, and the degree of their success under conditions extant at Deadman Lake cannot be predicted with certainty. The stocking of the pike should be followed by careful checks to attempt to determine whether their introduction was successful.

#### Predator Control

No predators were seen at Deadman Lake at the time of the survey, and they do not appear to be a factor to be considered in the improvement of the fishery there..

#### Parasites

Both the familiar "black spot" parasite and the yellow grub are commonly found in perch in Deadman Lake, with the former occurring most frequently. Both parasites have water birds as alternate hosts and are very difficult to control. Attempts at their control cannot be justified at least while the present little valued population of fish persists in the lake.

#### Cover

Deadman Lake has almost no cover at all in the way of aquatic vegetation, as has been mentioned above. Almost the entire cover in the lake is composed of large numbers of deadheads, snags, branches of trees, stumps, etc., most of which no doubt date back to the time the shore of the lake was the site of a logging camp. It would be very desirable to establish further cover in the way of aquatic vegetation if this could be done, but, as mentioned above, the success of any attempt to introduce vegetation would

be doubtful under present conditions. Further study of the problem seems desirable.

No other cover seems required at Deadman Lake at the present time. In the event that pike become numerous in the lake in future years, the addition of a number of brush shelters might become necessary to insure the survival of adequate numbers of yellow perch to furnish a continuous broodstock.

#### Regulations of the Water Level

If northern pike are to be encouraged at Deadman Lake, it would seem desirable to obtain a water level at Deadman Lake from one to two feet higher than present average levels, to insure the flooding of the swampy lake shores. This would be true particularly if spring water levels are under present conditions too low to permit the spawning of pike in the swamps, a factor which has not as yet been checked. In the absence of an outlet, such rise in level would be difficult and costly to achieve. It is not recommended until such time as its need can be more fully recognized.

#### Improvement of Spawning Facilities

No improvement of spawning facilities, with the possible exception of an increase in water level, as suggested above, is necessary in Deadman Lake.

#### Further Investigations

As has been mentioned above, the unusually heavy mid-summer plankton bloom in Deadman Lake is partially responsible for making the problems attending the improvement of the fishery there somewhat more complex than would otherwise be the case. It is suggested that further data be collected at Deadman Lake regarding this phenomenon. Data should be collected concerning the time of year when the heavy plankton concentration first occurs, its duration, etc., and the temperatures of the water before, during, and

after its occurrence. Such data might suggest a way in which the plankton development could be controlled, and it is possible that species of water plants might be introduced which would conclude most of their growing season before the plankton "bloom" occurs (if it occurs in midsummer or thereafter), but whose stalks and leaves would provide cover later in the year.

Water levels should be observed, especially in spring, to determine whether an increase in the water level would be necessary for northern pike reproduction.

After northern pike have been stocked, observations should be made to determine whether natural reproduction is taking place.

After a study of the exact nature of the summer plankton "bloom", several types of water weeds which might have a chance of succeeding in the lake should be experimentally introduced, with the ultimate view in mind of establishing a more or less normal vegetative cover in the lake.

INSTITUTE FOR FISHERIES RESEARCH

By Paul Eschmeyer

Report approved by: A. S. Hazzard

Report typed by: R. Bauch