

Original: Fish Division
cc: Mr. Fortney
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INSTITUTE FOR FISHERIES RESEARCH
DIVISION OF FISHERIES
MICHIGAN DEPARTMENT OF CONSERVATION
COOPERATING WITH THE
UNIVERSITY OF MICHIGAN

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ANN ARBOR, MICHIGAN

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REPORT NO. 405

HIGH WATER TEMPERATURES AND MORTALITY OF BROOK TROUT FINGERLINGS

WHITE RIVER FEEDING STATION

July, 1936

by

Louis E. Wolf

During the month of July, 1936, the weather throughout Michigan was abnormally warm, all temperature records being broken in many places in the state. As was to be expected, the temperature of the water in several of the state trout feeding stations reached unprecedented heights, and it was feared that serious trouble would be experienced at a number of places. These fears did not materialize in most cases, but at the White River Station the temperatures went up and stayed up for such a long period that serious losses did occur. The following account of the events at the White River Station is given with the hope that it will add to what we already know about the heat tolerance of brook trout fingerlings, and thus aid the hatchery superintendent in forestalling trouble from adverse temperature conditions.

Water Temperature and Mortality Record for July
White River Station

<u>Date</u>	<u>Min. Temp.</u>	<u>Max. Temp.</u>	<u>Mortality</u>	<u>Date</u>	<u>Min. Temp.</u>	<u>Max. Temp.</u>	<u>Mortality</u>
1	54	68	12	17	60	74	Highest mortality
2	57	73	9	18	58	72	No count made
3	56	70	14	19	56	70	" " "
4	56	70	12	20	54	68	" " "
5	55	72	15	21	54	68	" " "
6	56	77	23	22	56	67	" " "
7	58	79	29	23	58	60	" " "
8	62	80	115	24	54	70	" " "
9	63	80	253	25	52	70	" " "
10	64	81	115	26	54	72	" " "
11	66	81	253	27	58	70	" " "
12	64	84	846	28	56	72	" " "
13	66	82	636	29	56	66	" " "
14	64	72	745	30	52	68	" " "
15	58	76	Too many to count				
16	60	72	" " " "				

Minimum temperature taken at 7 A.M.

Maximum temperature taken at 5 P.M.

The mortality reached a peak on July 17th, on which day the two lowermost ponds of a series of four were wiped out. It is interesting to note that the two upper ponds, although the mortality was high, withstood the temperatures fairly well, and most of the fish were saved. After the 17th the mortality began to drop in the two upper ponds, and within a few days was back to normal. It was estimated that of the 323,276 fish at the station on the first of July, 223,276 died from the heat, leaving 100,000 still alive at the end of the month.

The fish had been on a diet of 3/4 sheep liver and pork melts and 1/4 Balto. They were in very good condition previous to the hot spell and had reached a length of between 3 and 4 inches when the trouble occurred." The writer did not see the fish during the period of high mortality, but the following description was written by Mr. Jack Fee, one of the employees of the Paris Hatchery:

"Each fish had about the same symptoms...fungused areas, fins in many cases eaten away, prominent bloody areas about the head and around the eyes. The eyes were partly or wholly circled by bloody and ruptured areas. The mouth also seemed to be eaten away and bloody. Many specimens were found with one gill cover and the underlying gills entirely gone."

On August 10th the writer visited the station and found the fish in ponds 1 and 2 (the remaining ponds were empty) very lively, vigorous, and apparently none the worse for their experience. They had good appetites, were growing well, and no fungused or diseased individuals could be seen anywhere in the ponds. Recovery, on the part of those fish which survived the high temperatures seemed to be complete.

It is difficult to make generalizations or draw conclusions from the events described above as so many other factors work together with temperature in affecting fish. For instance, fish in one station might withstand higher temperatures than fish in another for a number of reasons such as greater flow, or higher oxygen content of the water. Even in the same station the effect of high temperatures depends largely upon what has gone before. Thus, on the three days of highest mortality (July 15, 16, 17) the maximum temperatures were 76°, 72°, and 74° F. But on three other days (July 5, 6, and 7) the temperatures ran even higher-- 72°, 77°, and 79° F.--and yet there was little mortality those days. The difference was, of course, that the earlier hot spell had been preceded by favorable temperatures, whereas the later hot spell had been preceded by 9 days of exceptionally high temperatures. Thus the effect of high temperatures was not immediate, but rather lagged a few days behind the temperatures and was cumulative. The decrease in mortality also lagged a few days behind the drop in temperature. It is also probable that fish can stand a higher temperature during the day if the water cools off at night, so that the effect of the maximum day temperature depends somewhat upon the minimum night temperature. But no conclusion regarding this can be drawn from the above data.

Without attempting, therefore, to state a general law covering all the complicated factors involved, but merely to salvage what conclusions we can from the wreck caused by this year's weather conditions, the opinion might be hazarded that when water temperatures reach 72° F. at the White River Station (and possibly others) and the weather prediction is "warmer", or even "no change in temperature", the superintendent should take immediate steps to plant out fish. The resulting thinning of the fish in the ponds can only be beneficial, and may prevent such losses as occurred at the station this year.

INSTITUTE FOR FISHERIES RESEARCH

By: Louis E. Wolf

(Copy)

Mattawan, Mich.
August 31, 1936

Dear Al:

I think that Bob Fortney should read this over and add a paragraph or two of comment. My conclusions may not be justified in the light of experiences at White River in previous years.

Yours truly,

(Signed)

Louis E. Wolf

(Copy)

September 10, 1936

Mr. Robert Fortney, Superintendent
Paris Fish Hatchery
Paris, Michigan

Dear Bob:

We are sending you a copy of a report prepared by Dr. Wolf on the recent mortality which occurred at the White River Feeding Station. Dr. Wolf suggests that, in view of your long experience in this locality, you might be able to add several paragraphs of comment to the tentative report which he has prepared.

We would appreciate it if you would give this matter your attention and return the report to us, together with your comments.

Very truly yours,

INSTITUTE FOR FISHERIES RESEARCH

J. W. Leonard
Assistant Director

JWL:VA
Enc.

Paris, Michigan
November 10, 1936

Mr. J. W. Leonard, Ass't. Director,
Institute for Fisheries Research,
University Museums,
Ann Arbor, Michigan.

Dear Mr. Leonard:

Our Mr. Cook, Supervisor of Fisheries Operations, has asked me to make such recommendations as I see fit in regard to a report by Dr. Louis E. Wolf on "High Water Temperatures and Mortality of Brook Trout Fingerlings at White River Feeding Station" in July, 1936.

I would personally consider this report of doubtful Scientific value for the following reasons.

(a) Conditions surrounding the abnormal mortality was not observed by the author of the paper.

(b) The informant, Mr. Jackson Fee, while obviously sincere and honest in his deductions was a man of very limited experience in the field of Fish Culture having been in my employ only two months previous before he supplied certain information to Dr. Wolf.

(c) It does seem to me that I should have been consulted by either Dr. Wolf or Jackson Fee for my personal observations in regard to certain conditions existing in July at White River Station.

(d) Conditions have been noted in the past and are of a matter of record when temperatures have reached 72°F. at White River Station and the weather prediction was warmer and no abnormal mortality resulted. Perhaps, as valid a generalization would be--when the water temperature at White River Station attains a temperature of 80 degrees or over for a period of six consecutive days or more, serious mortality may be expected to fall within a few days.

It is my desire to convey to you the impression that everything possible was done by myself to prevent this mortality. We even lowered the water in the ponds, making a much swifter current in the hope of increasing the amount of oxygen and thus assisting in preventing heavier mortalities.

I will concede to Dr. Wolf that his generalization of conditions at White River Station during the month of July is quite ably presented with the exceptions I have noted.

Very truly yours,

STATE FISH HATCHERY,

Robert Fortney,
District Supt. of Fisheries Operations