INSTITUTE FOR FISHERIES RESEARCH
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Report 107

TEMPERATURE CONDITIONS ON THE PIGEON AND BLACK RIVERS (CHEBOYGAN, OTSEGO, AND MONTMORENCY COUNTIES)

I. Temperature Readings, Pigeon River

Summer temperature readings were taken at the Lansing Club dam on the Pigeon River during 1929, 1930, and 1931. A copy of these was given to the Institute by Mr. H. F. Harper, (appended to this report). The Fish Division also has a copy and Mr. Cook has constructed graphs of the temperatures during the three summer periods.

No comparable data have been obtained for the Pigeon River farther below, on the State Forest. The temperatures that are reached here are very certainly higher than they are at the dam, for the river is rather exposed and does not receive any great amount of cold springs in this section that could counteract the effect of warming by the sun. A reading taken by the writer on August 22, 1931 indicated a rise of 6 degrees between the road bridge just below the Lansing Club and the bridge at Forest Headquarters. These two points were visited between 5 and 5:30 P.M. on August 22, a day when the air temperature was 86 to 89 degrees. The water at the upper road bridge was 65 degrees against 71 degrees for the lower bridge. While a large number of readings, during very hot weather, should be taken at these points before the average amount of rise can be found, this one reading is quite significant. The stream mileage between the two points has not been accurately determined because of the numerous bends of the river. However, it takes at least one hour for the water to flow from the one

point to the other (this point was ascertained during the experimental flooding done there in September 1931).

Numerous temperature readings were taken by Mr. C. M. Tarzwell and the writer during the period from August 20 to September 8 1931. Aside from the one cited above, these readings are not particularly valuable in their bearing on maximum temperatures of the Pigeon River for the comparatively cool nights of late summer prevented the water from reaching very high points, even on hot days. For a river as large as the Pigeon to reach its peak temperature, there is required a series of hot days and warm nights. The peak reading of late June and early July, 1931, illustrates this point. A temperature of 78 degrees, the highest reading of the three summers, was reached on July 1st, at the dam. How much higher the water temperature on the State Forest reached on this date is not known but the one comparison of readings given above would lead one to predict that the point was several degrees higher.

On August 22, which was about the best temperature day that was encountered during the writer's visit to the Pigeon River, several readings were made between 1:30 and 5:30 in the afternoon for the purpose of getting some comparative data on temperature for different parts of the Pigeon. One reading was taken on the Sturgeon. The air readings between 1:30 and 5:30 were 86 to 89 degrees. The Pigeon River at Afton (trout scarce and only one, a rainbow was collected) was 69 degrees (1:30). The river at its mouth (practically lake conditions, and trout reported absent in summer) was 80 degrees (3 P.M.). The readings for the other two points (65 and 71 degrees) are cited in a preceding paragraph. The Sturgeon River where it parallels the road just south of Wolverine gave a reading of 64 degrees (3 P.M.).

In the opinion of the writer, the Pigeon River on the State Forest is to be classed as one of the warmer trout streams and one that runs dangerously high in very warm weather. The fishes which were collected during examinations made here include

several species which are typically absent in very cold streams (log perch, long-nosed dace) and the high numerical proportion of suckers, and several species of minnows also indicates that the stream is not very cold.

It is perhaps correlated with the rather warm conditions in the Pigeon, that this river is one of the few Michigan streams where the brook trout are heavily infected with a trematode worm parasite which causes black spots to appear on the fish. The parasite, a member of the family Strigaeidae, is probably not deleterious to the health of the fish but these small encysted worms, which cause the black specks, are a serious pest because of the dislike in which they are held by anglers. The first intermediate host of the parasite is a snail. Although the particular species of snail which acts as host here has not been isolated, it is probable that this mollusc is somewhat favored by warm water. No parasites of this nature were noted on trout seined from cold headwaters of the Pigeon, near the town of Sparr. On the State Forest, the infestation is practically 100%.

For the most part, the brook trout collected by the writer from the Pigeon River on the State Forest, are not in good condition. Why this is so, and whether the water temperatures there have any bearing on this trout condition is not known. The brook trout, particularly those in their second year, are conspicuously thin and the body is abnormally low in fat content. This condition is found in individuals lightly infested with the parasites. Also, at least one individual in good condition was heavily infested. The poor condition cannot be satisfactorily attributed to the trematode worms judging from these facts as well as the known ability of other fishes to carry the parasites without becoming thin. Growth rate of the large series of specimens that was obtained will be studied later, by means of the scales. It is quite clear, even before such study, that the second year brook trout are mostly below legal size and compare very poorly to fish of the same age from certain other rivers (such as the Pine). Rainbow

trout of the same age, and taken from the same waters are in plump condition and are mostly well above legal size.

A sample of the Pigeon River brook trout, iced, was sent to Dr. Krull for pathologic examination. No disease organisms were found however, and if disease is the cause of the poor condition of the fish it may prove to be one that is difficult to detect by such examination.

The temperature and other conditions of the Pigeon River on the State Forest form a basis for concluding that construction of additional dams would injure the stream as a trout stream. The character of the banks is such that the construction of a dam would make a shallow, wide pond which would increase stream temperatures below it. Any increase of temperature would be dangerous. A further effect of a dam in the part of the river which is already rather warm would be to make a shallow marginal zone of warm water which would produce a heavy snail population. As noted above, snails carry the young stages of an undesirable parasite. The heavy numerical ratio of minnows and suckers as compared with trout in these waters would also argue for no further warming of the water. For the production of trout of an average size of 10 inches or less, it is not desirable to favor the very great increase of these other fish, because they are competitors of these smaller trout; even though very large trout are able to utilize these fish for food, the general run of stream trout cannot do so, to any great extent. In a river such as this, the "coarse fish" eaten by the trout are not commensurate with the trout food destroyed by these fish.

II. Temperature Readings, Black River

While making a preliminary survey of the Black River, preceding the trout-pool improvement work which was done on the Black River Ranch under the direction of Mr. C. M. Tarzwell, the writer obtained temperature data at several points on the river. A full list of temperature readings has been given in report No. 87, a copy of which was sent to the Fish Division. As the work was carried on during July, 1929, a time of unusually hot weather, the temperatures include some which represent peaks for the unusually hot season.

Temperatures taken on the Black River and East Branch of the Black River are appended (copied from report No. 87).

The main Black River, which was investigated at several widely separated points on July 6, a very good day for temperatures, is certainly to be regarded as one of the warmer trout streams. It is a brook trout stream, no rainbow or other trout having been established.

There are several beaver dams on the upper Black River and in the course of a few miles the river was found to rise 2 degrees in the section where these dams are located. (Refer to attached temperature sheets, readings for Ponemah Club and Beaver Dam Club, July 6). There is no appreciable rise in temperature in the main Black River in the many miles between the Beaver Dam Club and the Clark Bridge). On July 6, the several points at which readings were made were all at 75 degrees. Apparently no springs of size sufficient to cool the river are located in this long section of the stream. If dams were constructed the resulting ponds would be shallow ones, which would tend to warm the water. At the Beaver Dam Club several Hewitt type dams were constructed for the purpose of making good trout pools. In the opinion of the writer, these dams do not accomplish this purpose for they spread the water over a large area, forming a shallow

pond which contributes to the warming of the water. The spreading of the water has been increased, in at least one of these dams, by the effect of beaver work. The animals have piled cuttings on the dam and increased its height.

If dams could be constructed at points where the resulting pool would be comparatively narrow and deep, good trout pools could be formed. The height of the stream banks and the nature of the surrounding country are not conducive to the formation of pools of this nature. The amount of flooding that can be accomplished without putting the stream over its flat banks is slight. (Note blueprint of upper dam site, Black River Ranch, which is enclosed).

The infestation with black spot parasites (Strigaeidae) is very light in the Black River and the brook trout there (many examined from the East Branch, several from the Black) are in good condition. The writer took brook trout, rising well to flies, on one afternoon in July when the water temperature was 75 degrees in the pools from which trout were taken. One deleterious effect of high temperature in Black River waters is the heavy population of minnows and suckers, a point discussed under the Pigeon River report. It would be undesirable to increase stream temperatures here, for this reason, and there are additional reasons in that disease and parasite might be favored.

INSTITUTE FOR FISHERIES RESEARCH

John R. Greeley

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Temperature Data for Black River and Tributaries

July 3-9, 1931, John R. Greeley

Location	Air	Water	Time	Date	Remarks
Main Black, entering Ranch	72	64	9:45 A.M.	July 4	
Spring run, 55 paces long, (No. 2)		55	10:45 A.M.	"	Young trout
Spring pool (No. 3)		70	(surface)	"	
" " "		48	(bottom)	"	
Main Black, Vanderbilt Bridge	87	75	2:30 P.M.	July 6	
Steward Creek, lower part	"	70	2 P.M.	"	Young trout
Small Beaver Dam, Seward	"	"	"	"	" "
Feeder below Seward, upper Beaver	"	81	(surface)	"	
dam (trout planted here earlier)	"	77	(outlet)	"	
Lower beaver dam (trout planted)	"	81	(edges)	"	
" " " "	"	77	(surface)	"	
" " " "	"	70	(bottom)	"	
Feeder to Black near Kings	"	73	3 P.M.	"	
(above Ranch)					
Main Black, Beaverdam Club	-	76	5 P.M.	"	
Main Black, Ponemah Club	-	73	5:20 P.M.	"	
(a natural beaver dam between these two points)					
Main Black, old R. R. bridge					
above last locality.	-	72	5:30 P.M.	"	
Little McMaster Creek	-	67	6 P.M.	"	
Main Black (lower), Clark Bridge	-	75	6:15 P.M.	"	
East Branch, at rearing station	87	76	3 P.M.	July 3	
Lower end rearing station pool	"	"	"	"	
Main Black at "the Sand Bar"	"	76	4:30 P.M.	"	
East Branch, at rearing station	72	64	9:30 A.M.	July 4	
East Branch, upper dam (on flats)	77	76	3:45 P.M.	"	
" " " " (midstream)	"	74	"	"	
East Branch nursery	77	66	11:00 A.M.	July 5	
East Branch, 1/4 mile above nursery	"	69	4:15 P.M.	"	
East Branch, "The Ford"	-	66	10 A.M.	July 6	
East Branch, between "Ford" and					
lower dam (about halfway)	-	67	10:30 A.M.	"	
" " "	80	69	12 P.M.	"	
Small spring here	"	56	12 P.M.	"	
East Branch, above Ranch, on					
Atlanta-Vanderbilt road.	-	69	10:30 A.M.	July 7	
Canada Creek, upper part, on					
S. line of 14,000 acre tract	-	78	10:45 A.M.	"	
Canada Creek, Lower part, on					
state reserve.	80	72	12 P.M.	"	
East Branch, at nursery	84	74	3 P.M.	"	
" " 1/2 mile above	"	75	4 P.M.	"	
Small spring here	"	58	"	"	
Spring pool, 15 paces long, here	"	65	"	"	Young trout
East Branch, near "the Ford"	77	65	11 A.M.	July 8	

Temperature data on Black River

July 1931, C. M. Tarzwell

East Branch, Black River Ranch property:

Date	Time	Remarks	Air	Water	Trout nursery
July 2	12:30 P.M.			73.2 F.	73.2 F.
" 3	12 "			73.6	
" 5	4:15 P.M.		79.5	71.5	
" 6	5 "		81.3	75.9	
" 7	8:15 A.M.		75.9	65.5	
" "	12:30 P.M.		81.3	72.7	
" "	5 "			75.9	
" 8	4:45 P.M.		71.8	74.5	
" 9	8 A.M.	Cool night	69.1	64.2	
" "	4 P.M.		75.9	74.1	
" 10	8 A.M.	" "	63.3	60.6	
" "	6 P.M.			70.5	
" 14	7:30 A.M.		66.	60.5	
" 15	9:15 A.M.		84.9	70.5	
" 15	10:30 A.M.		86.7	70.5	
" "	1:30 P.M.		92.1	77.2	
" "	3 P.M.		95.7	79.5	
" "	4:20 P.M.		95.7	80.8	81.6
" "	5:00 P.M.			80.8	
" 16	9:30 A.M.		79.	70.5	
" 16	4:30 P.M.		88.5	75.9	
" 17	7 A.M.		84	69.6	
" 17	1:30 P.M.		96.6	78.6	
" "	4:30 P.M.		94.8	82.2	
" 18	7:30 A.M.		74.1	69.6	
" 18	4:30 P.M.		84.9	81.3	
" 20	7:30 A.M.	Cloudy, rain*	72.3	68.7	
" "	4 P.M.		79.5	79.5	
" 21	10:45 A.M.	Cold night	81.3	71.8	
" "	4:30 P.M.		75.9	75.4	
" 22	7:30 A.M.		63.3	63.3	
" "	1 P.M.		77.7	71.4	
" 23	7:15 A.M.		63.7	62.8	
" "	4:15 P.M.		70.5	70.	

Main Black, Black River Ranch property:

July 3	12: P.M.			72.7	
" "	2: P.M.			74.1	
" "	5: "			76.8	
" 4	9:45 A.M.		74.5	66.5	
" "	10:40 A.M.			71.	
" 15	5 P.M.			79.9	

*Rained night of July 19.

WATER TEMPERATURES

JUNE 1929

	Water 6 A.M.	Air 6 A.M.	Water 6 P.M.	Air 6 P.M.
1st				
2nd				
3rd				
4th				
5th				
6th				
7th			56	66
8th	55	44	57	74
9th	56-1/2	50	59-1/2	76
10th	58	59	58	66
11th	56	64	62	80
12th	59	52	58	62
13th	56-1/2	56	57	67
14th	57	58	56	58
15th-	55	60	61	80
16th	61	60	62	82
17th	62	65	63	73
18th	63	69	70	85
19th	65	70	69	81
20th	66	67	67	76
21st	65-1/2	60	68	79
22nd	67	62	67	70
23rd	63-1/2	63	64	80
24th	63	62	63	70
25th	62	51	63	70
26th	63	54	63-1/2	71
27th	62-1/2	53	60	52
28th	60	52	60	56
29th	60	55	63	68
30th	64	65	66-1/2	70
31st				

WATER TEMPERATURES

JULY 1929

	Water 6 A.M.	Air 6 A.M.	Water 6 P.M.	Air 6 P.M.
1st	65	61	66	67
2nd	64	50	63-1/2	65
3rd	63	61	63	70
4th	63	55	66	68
5th	64	60	65	69
6th	63	64	64-1/2	77
7th	64	69	65	67
8th	63	63	67	78
9th	66-1/2	70	68	78
10th	67	52	68	80
11th	67-1/2	56	68	81
12th	67	60	69	88
13th	67	59	69-1/2	80
14th	65	60	68	80
15th	65-1/2	45	66	82
16th	64	51	67	70
17th	65	50	69-1/2	80
18th	64	52	68	76
19th	66	45	68	65
20th	67	47	68-1/2	67
21st	67-1/2	48	68	70
22nd	67	60	70	73
23rd	68	64	70-1/2	81
24th	68	65	70	81
25th	66	59	69	80
26th	67	57	70	85
27th	68-1/2	64	71	87
28th	69	62	70	76
29th	67-1/2	60	70	87
30th	68	64	69	83
31st	68-1/4	70	69	80

WATER TEMPERATURES

AUGUST 1929

	Water 6 A.M.	Air 6 A.M.	Water 6 P.M.	Air 6 P.M.
1st	67	50	64	78
2nd	65	49	65	70
3rd	65	62	64	63
4th	63	49	60	78
5th	60	52	63	79
6th	62	51	64	78
7th	63-1/2	52	66	80
8th	64	53	66	81
9th	65	54	66	80
10th	65	55	67	86
11th	66	56	68	88
12th	66	50	67	87
13th	65	49	64	83
14th	63	48	65	80
15th	64	46	65	72
16th	64-1/2	47	64-1/2	70
17th	64	46	63	70
18th	63-1/2	44	64	69
19th	60	42	62	63
20th	59	43	61	67
21st	58	44	62	76
22nd	60	49	64	79
23rd	63	61	65	78
24th	64	70	65	81
25th	64	73	66	80
26th	65	51	65	79
27th	63	49	66	78
28th	64	50	67	80
29th	65	60	66	78
30th	63	54	68	82
31st	66	55	68	83

WATER TEMPERATURES

JUNE 1930

	Water 6 A.M.	Air 6 A.M.	Water 6 P.M.	Air 6 P.M.
13th	-	-	64	76
14th	62	71	66	75
15th	65	70	62	67
16th	58	65	60	65
17th	56	59	58	66
18th	58	68	56	60
19th	56	58	60	66
20th	56	59	66	82
21st	58	66	61	76
22nd	58	68	69	88
23rd	62	66	65	84
24th	60	64	68	79
25th	62	64	64	78
26th	60	66	58	66
27th	57	59	58	62
28th	55	58	64	78
29th	56	60	60	78
30th	58	64	62	72

WATER TEMPERATURES

JULY 1930

	Water 6 A.M.	Air 6 A.M.	Water 6 P.M.	Air 6 P.M.
1st	58	60	58	62
2nd	53	49	60	70
3rd	53	48	63	75
4th	54	52	60	68
5th	58	68	65	74
6th	59	60	66	75
7th	58	59	65	75
8th	59	58	67	80
9th	62	68	68	80
10th	61	61	65	70
11th	60	62	67	76
12th	58	54	63	75
13th	60	60	58	62
14th	53	48	60	65
15th	52	48	60	60
16th	55	60	67	82
17th	60	62	65	80
18th	62	74	71	88
19th	62	64	71	86
20th	59	54	70	90
21st	61	62	68	78
22nd	61	64	66	76
23rd	58	58	68	82
24th	60	65	71	85
25th	64	56	69	72
26th	68	70	67	84
27th	68	72	70	78
28th	70	74	72	71
29th	70	60	70	76
30th	67	55	67	74
31st	65	55	66	77

WATER TEMPERATURES

AUGUST 1930

	Water 6 A.M.	Air 6 A.M.	Water 6 P.M.	Air 6 P.M.
1st.	65	58	67	80
2nd.	65	70	68	91
3rd.	69	78	71	86
4th	70	72	70	75
5th	68	59	70	87
6th	65	59	69	80
7th	66	69	67	80
8th	63	68	71	87
9th	62	60	66	67
10th	62	60	62	62
11th	61	50	61	66
12th	59	44	60	68
13th	60	50	60	65
14th	59	64	61	74
15th	62	56	62	69
16th	60	52	60	66
17th	60	54	62	72
18th	61	47	63	70
19th	61	49	61	70
20th	62	48	62	69
21st	60	52	62	70
22nd	61	50	62	82
23rd	61	52	63	78
24th	62	62	64	78
25th	63	54	63	76
26th	62	52	64	87
27th	63	58	65	88
28th	65	68	65	78
29th	64	55	65	75
30th	64	54	65	80
31st	63	65	65	72

WATER TEMPERATURES OF THE PIGEON RIVER

OTSEGO COUNTY - THE PIGEON DAM

for

June 1931

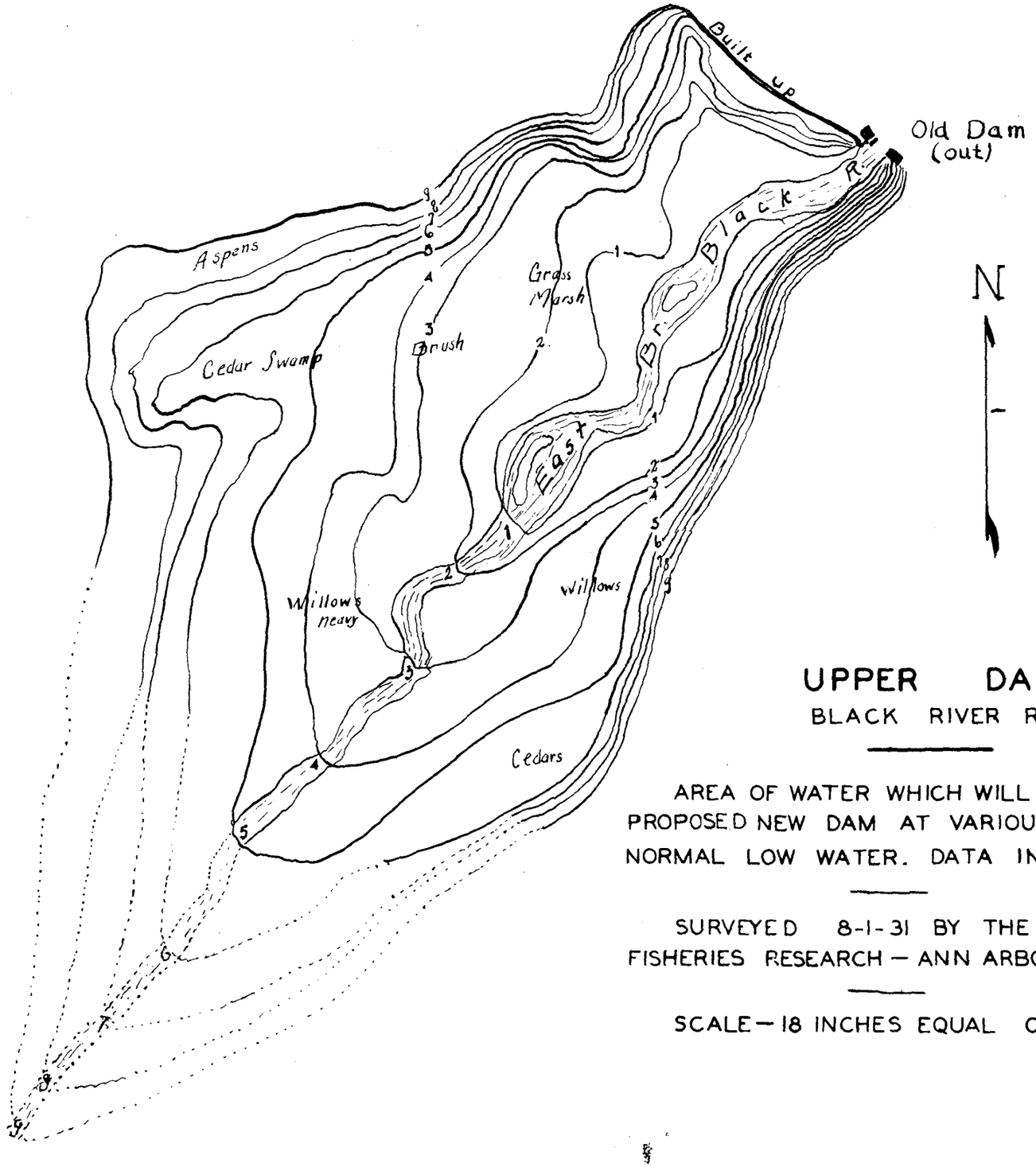
	Water 6 A.M.	Air 6 A.M.	Water 6 P.M.	Air 6 P.M.
1st	57	56	58	69
2nd	58	60	58	69
3rd	58	64	60	70
4th	58	66	64	70
5th	57	56	64	66
6th	56	60	64	70
7th	54	52	52	56
8th	52	50	54	58
9th	56	56	58	66
10th	58	62	60	70
11th	60	68	64	80
12th	64	70	66	82
13th	65	68	67	83
14th	64	68	64	74
15th	64	62	66	72
16th	63	48	65	72
17th	61	52	64	74
18th	61	68	68	84
19th	68	78	73	86
20th	71	75	71	76
21st	66	58	70	74
22nd	64	56	60	58
23rd	58	56	57	64
24th	55	54	63	74
25th	62	68	65	74
26th	64	62	67	81
27th	64	64	68	86
28th	68	70	69	80
29th	65	72	71	96
30th	71	80	71	92

WATER TEMPERATURES OF THE PIGEON RIVER
OTSEGO COUNTY - THE PIGEON DAM
for
July 1931

	Water 6 A.M.	Air 6 A.M.	Water 6 P.M.	Air 6 P.M.
1st	71	82	78	98
2nd	74	76	72	76
3rd	67	64	71	82
4th	66	64	71	80
5th	65	64	68	80
6th	64	62	70	84
7th	66	66	70	80
8th	64	62	68	78
9th	65	62	66	72
10th	63	56	66	76
11th	62	56	66	78
12th	62	56	68	80
13th	64	60	68	80
14th	65	62	68	84
15th	67	71	72	90
16th	70	70	72	86
17th	70	76	74	86
18th	71	72	70	84
19th	69	70	70	86
20th	69	71	73	82
21st	68	70	70	74
22nd	64	60	62	68
23rd	60	60	65	70
24th	60	54	64	78
25th	60	52	64	76
26th	60	60	69	88
27th	68	74	70	88
28th	72	79	76	90
29th	74	74	77	78
30th	71	64	70	74
31st	66	64	65	66

WATER TEMPERATURES OF THE PIGEON RIVER
OTSEGO COUNTY - THE PIGEON DAM
for
August 1931

	Water 6 A.M.	Air 6 A.M.	Water 6 P.M.	Air 6 P.M.
1st	62	64	62	66
2nd	62	64	64	71
3rd	63	62	67	76
4th	64	66	69	84
5th	68	69	70	84
6th	69	67	72	86
7th	70	66	68	76
8th	66	66	64	68
9th	63	66	64	68
10th	64	60	6?	66
11th	61	56	60	62
12th	60	54	64	76
13th	60	60	64	76
14th	61	60	66	80



UPPER DAM

BLACK RIVER RANCH

AREA OF WATER WHICH WILL BE PONDED BY PROPOSED NEW DAM AT VARIOUS LEVELS ABOVE NORMAL LOW WATER. DATA IN FEET.

SURVEYED 8-1-31 BY THE INSTITUTE FOR FISHERIES RESEARCH — ANN ARBOR.

SCALE — 18 INCHES EQUAL ONE MILE