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CONTENTS

1940

ATLANTIC SALMON AND TROUT INVESTIGATIONS 1940

Report No. I. Miner river salmon and trout, 1940. An analysis of the catches and life histories.

By W. S. Manr

Salmon Smolt

Life histories as determined from the scales of 89 salmon smolt are given in detail in appendix The data are summarized in the following table.

Date	No. fish	% 3-yr old	Average length 2 yr olds cm.	3-yr olds cm.	all ages cm.	Spring growth % present	Spring growth [illegible] cm.
May 27	67	13.5	17.6	19.5	17.9	93.5	3.6
June 2-4	16	31.3	18.5	19.5	18.8	87.5	3.0
Total	83	16.9	17.8	19.5	18.0	93.9	3.8

In general, the data agree with those of 1939. Of the smolt examined 97.6% migrated to the sea as either 2- or 3-year old fish. The percentages of the 2- and 3-year old smolts are similar and indicate that the majority (83%) of the Miner river smolt go to the sea at the end of their second year.

Smolt collected from the main river on May 27th were 13.5% 3-year olds, while those collected on June 2-4 were 31.3% 3-yr olds. This suggests that the younger smolt go to sea earlier in the season. Since the younger smolt are probably from the lower and warmer stretches of the river where growing conditions will be at their

best, the condition is not unexpected. A similar condition has been noted for the Margaree river smelts in 1937. The May smelts of that river were 19.6% 3-year olds, while smelt taken between June 10 and 15 were 43.5% 3-year olds. These facts are of particular interest in connection with the distribution of the salmon in the sea. In our study of the Bay of Fundy salmon in 1938 we concluded that the younger smelt tended to go farthest out in the bay. That the same principle applies to the Miner river salmon will be apparent in the consideration of the life histories of the mature fish.

Two fish which migrated to the sea as particularly old smelts are of interest. One of these was 28.6 cm. long and the other was 33.3 cm. long. The former was four years old, the latter six. The 6-year-old fish had grown relatively little during the past three years and showed evidence of two recent spawning marks. The most remarkable thing about the two fish was that they were both females.

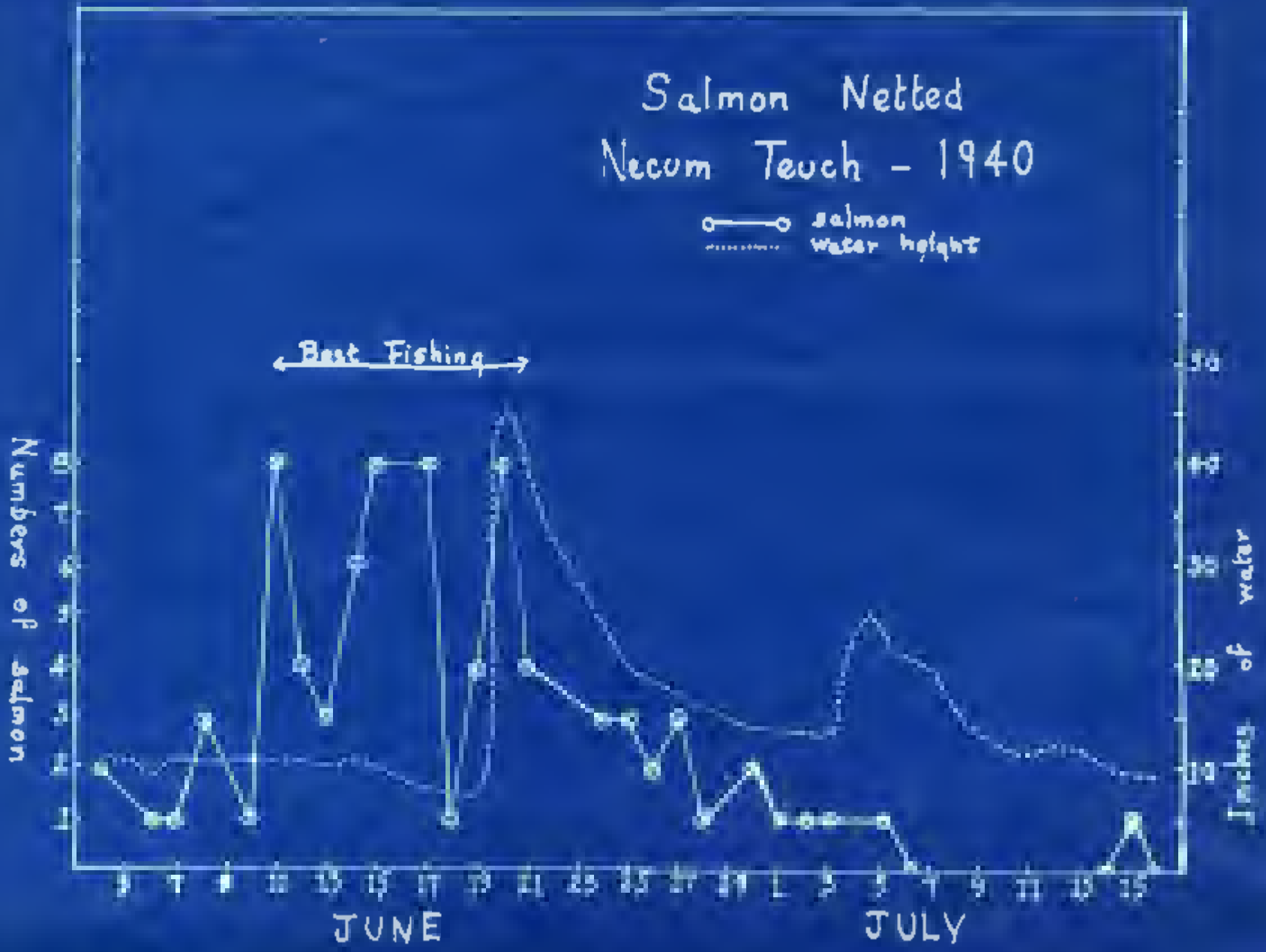
Net fishery for salmon.

Approximately 116 salmon were taken in the salmon nets this year as compared to 93 taken in the summer of 1939. The following table gives approximate totals for the individual nets in 1939 and in 1940. Details may be found in the appendices at the end of the report.

Location	Catch in 1939	Catch in 1940
Clifford Smith, Naqum Touch	30	71
Ernest Smith, Naqum Touch	17	13
William Smith, Naqum Touch	10	not not operating
William Moser, Moser river estuary	4	8
Raymond Drillio, Moser river estuary	10	7
Totals	71	106

It is rather difficult to be sure of the periods of effective fishing of the different nets; consequently it would be unwise to stress the individual differences in the table. However, it would seem safe to say that the fishing outside the estuary, at any rate, was better in 1940 than in 1939. Either one of two factors may have been responsible for this. Fewer smelts may have gone to sea in 1938 than in 1939, or the very low condition of the water in the Moser River in 1939 may have delayed the return of numbers of fish until 1940. It is quite possible that the smelt population of 1938 may have been small following the very dry summer of 1937, but we have no definite evidence in this direction. The scales were studied very carefully in connection with the other alternative for evidences of false spawning marks or other marks that might indicate that the stay in salt water had been prolonged. Certain scales show false spawning marks. These, however, are neither constant nor pronounced. As yet there is no precise explanation for the differences in the catches of the two years.

That the salmon net fishery at Moser River is influenced by the water discharge of the Moser river is evident from figure 1. It is clear


Salmon Netted
Necum Teuch - 1940
salmon
water height
Best Fishing
Numbers of salmon
Inches of water
JUNE
JULY

that the numbers of fish taken fell precipitously after the twentieth of June. In detail the nets in Neeum Touch Bay took 58 salmon between June 4 and June 20, but only 28 between June 21 and July 20. Likewise, the nets in the estuary took 10 salmon between June 5 and June 20, and 7 between June 21 and July 15. The explanation is clear. On June 20 nearly 4 inches of rain raised the water in the Moser river to torrential heights. Such a large discharge of water took the salmon away from the nets and, as will be evident later, into the river. The salmon of Neeum Touch bay are definitely related to the Moser river, and an early spring freshet will mean poor commercial salmon fishing. It may be difficult to have large numbers of salmon available both to anglers and commercial fishermen at the same time.

The salmon and trout angling

Comparative figures for fish passing through the Moser River Experimental trap are not available for 1940 since the trap did not operate during the mid-June freshet. That there was a large run of fish at this time will be evident from the angling results. It seems rather certain that salmon were more plentiful in the river in 1940 than in 1939. Either trout were less plentiful or conditions less favorable for their capture. The following table is pertinent. The figures were obtained from Guardian Raymond Drillio and are for fish taken by anglers on that stretch of the river between the mouth of Mill brook and the mouth of the Moser river itself.

Year	Salmon	Grilse	Sea-trout
1939	8	21	304
1940	5	187	153

Considerable time was devoted to a study of conditions under which fish are most readily available to the angler. It is not enough to produce large numbers of fish - nor yet to bring these into the river at a proper time - but, finally, we must know under what conditions the angler can cast his fly with a fair chance of arousing a fish. It is often too true that large numbers of fish are in the river, but the angler works in vain. This problem has never been given the scientific attention which it merits. The anglers ideas on the subject are many. He recognises high water, cool days, morning and evening fishing, fresh-run fish, and proper fly as essential to good angling. We have analysed the salmon and trout catch of the Moser river in relation to the height of water, the time of the day, and hence also the temperature.

Water height and the salmon and trout angling

In figure 2 water heights and temperatures are plotted in relation to the salmon and trout catches of 1940. Salmon angling will be considered first.

Three abrupt rises in the water level of the Moser river occurred during the angling season of 1940; one on June 19 and 20, another on July 4, and the third on July 18 and 19. The first two were caused by rainfall, the last by opening the dam at Rezzy lake in the upper reaches of the river. Each rise in water level had its effect on the salmon angling. The first rise was extremely pronounced and the action of a freshet on angling can best be seen from a consideration of this. Although one grilse was hooked on June 18, the first fish were taken on June 20. After June 22 grilse were taken in large numbers for about two weeks. The catch of salmon then declined. This rather exceptional angling was evidently related to the spate of June 19 and 20. This rain started in the early

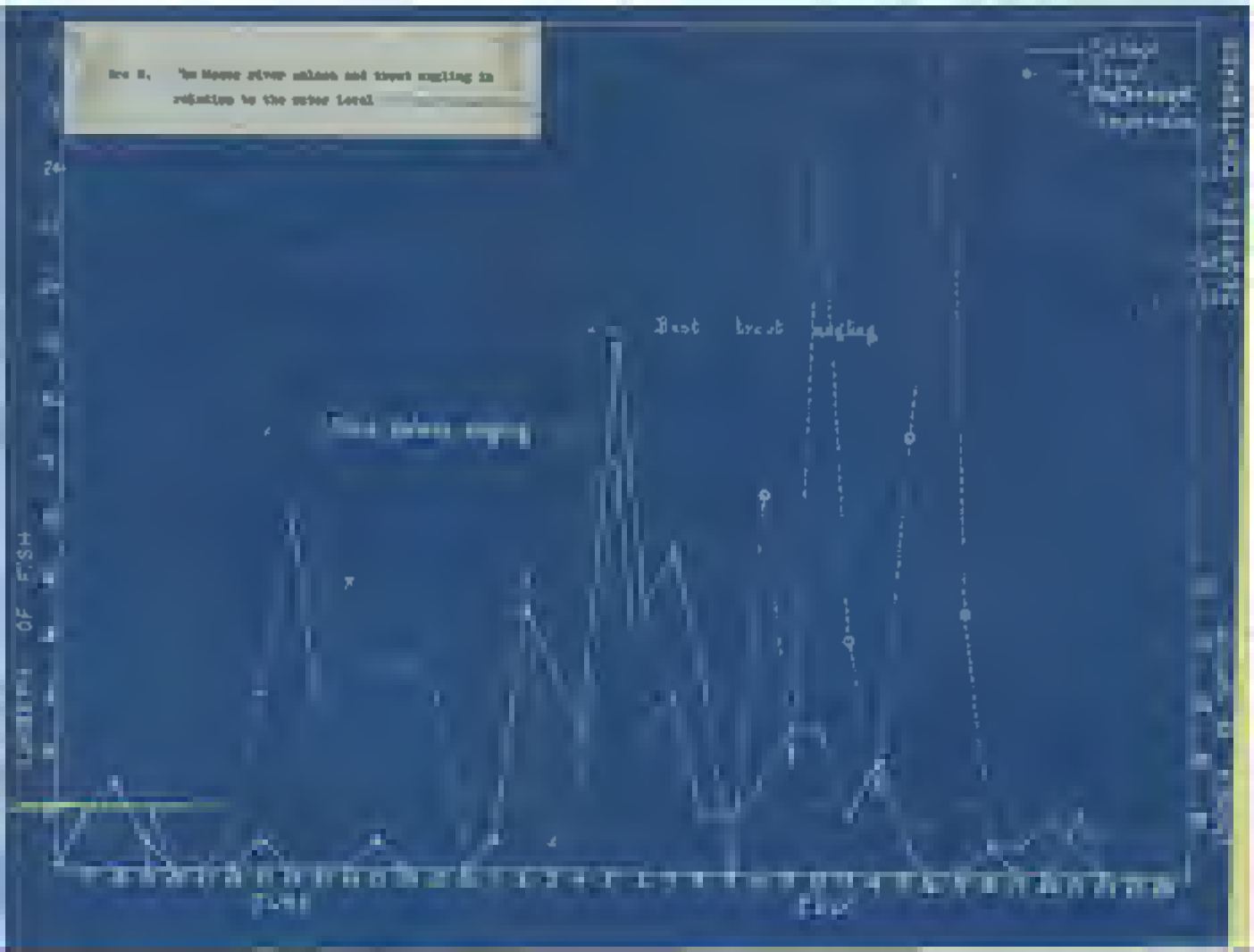
afternoon of June 19 and continued for almost exactly 24 hours. Two grilse were taken at 8.30 a.m. on June 20, but none thereafter until the late afternoon of June 22 when one fish was caught. The next day, however, - the third day after the rain - grilse were rather plentiful. Worth-while fishing continued for some time thereafter. These facts agree with the common experience of the angler. He has noted that salmon take the fly for a short time during the early development of a freshet, then cease to bite until the water is definitely subsiding.

We have already noted that this freshet of June 20 took the fish away from the salmon nets of Mount Touch bay. It is evident that the salmon are brought into the river with the high water, and that they tend to take the fly best as the freshet is subsiding (cf. figs. 1 and 2).

The action of the rainfall of July 4 is less evident since angling was still good following the June spate. However, figure 2 suggests that the numbers of salmon taken were favourably influenced by this rise in water level. Certainly the artificial freshet of July 18 affected the angling, and this in spite of the fact that the temperature was rather unfavourable. This seems to indicate that so-called artificial freshets from water retained in lakes will be quite effective in arousing the salmon to the point of taking the fly if the temperatures are not too high. Temperature will be considered presently.

Conditions favorable to the capture of trout are not necessarily the same as those favorable to the capture of salmon. It has already been noted that trout angling in 1939 - contrary to the salmon angling - was three times as good as in 1940. Figure 2 shows that the period of best angling in 1940 came later than the period of best salmon angling. Although we have no definite proof for 1940 it seemed evident both this

Fig 8. The Moose river salmon and trout angling in relation to the water level



year and last that the trout did not enter the river until July. It is common experience among the fishermen of Moser River that the "trout come later". Figure 2 suggests two possibilities; either that trout enter the river when the water level is low, or that their entrance is more or less independent of water height and related to the season instead. In consideration of the fact that they come at approximately the same time in two years of highly different character the latter explanation seems to be the better. There are two possible explanations for the comparatively small number of trout taken during the present season. It may be that there were fewer fish in the river or that they were less readily available under the conditions of this year. Figures for the experimental traps are not yet available, but it can at least be said that large numbers of trout went up river. Figure 2 suggests that the greatest catches of trout were made when the water level was lowest. It is possible that the comparatively high water during the first 10 days of July was not favorable to the best trout fishing. A consideration of the comparative numbers of fish passing through the experimental trap during this period is pertinent. The probability that conditions for good trout and for good salmon angling are very different is all too evident.

An attempt was made to find some relationship between the height of the tides and the times when salmon and trout entered the river. A trap in the lower stretches of the river would be necessary for accurate information. However, an analysis based on the appearance of the fish (presence of sea-lice) and the periods of best angling in the tidal stretches of the river suggests that salmon are about three times as apt to enter the river on the flooding tide (3 hours after the tide is dead low) as on the falling tide (3 hours after the tide reaches a

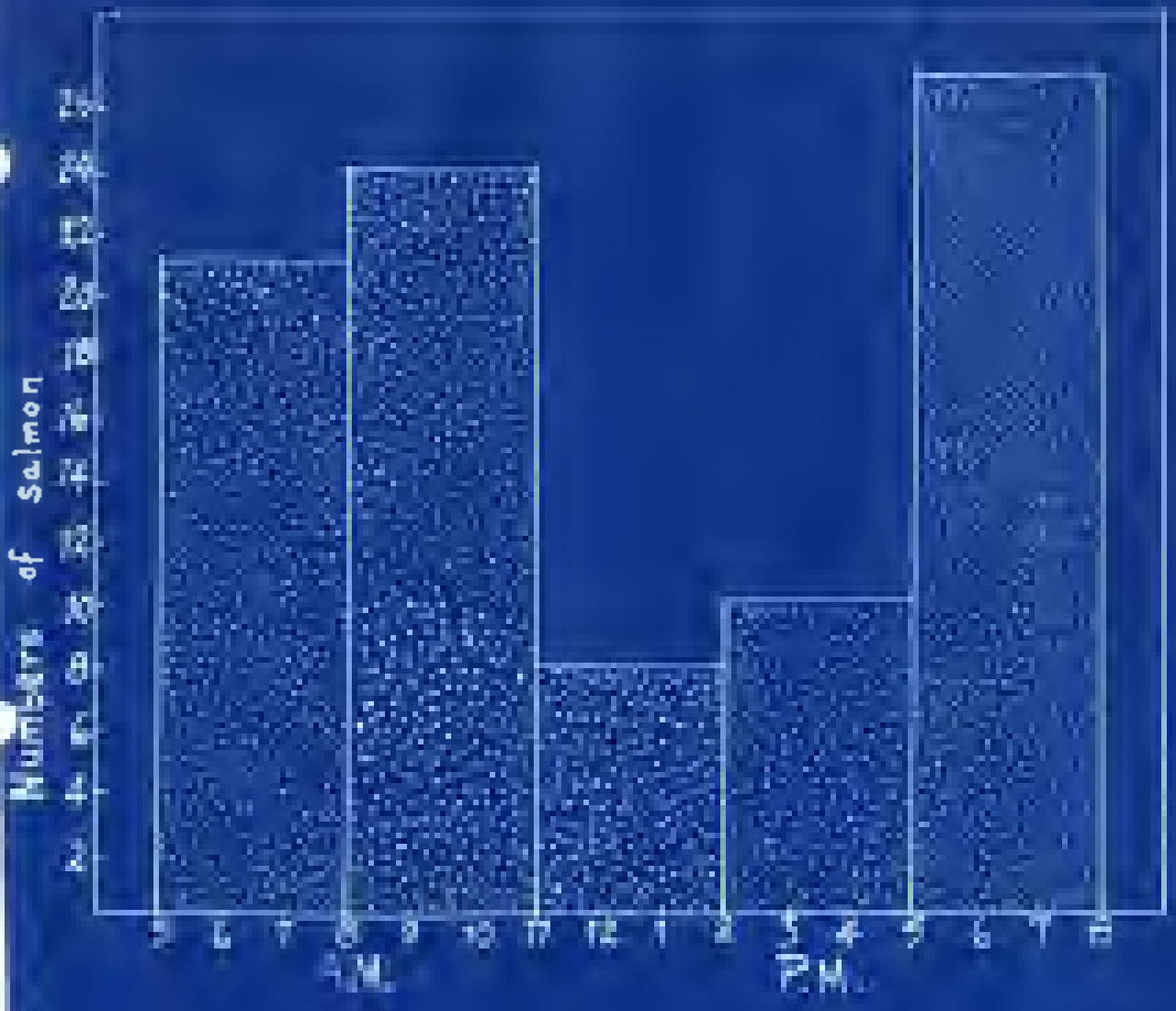


Figure 3. Salmon taken on the fly - June 23 to July 5, 1940 - from the Moser river between the mouth of Mill Brook and the mouth of the Moser river proper.

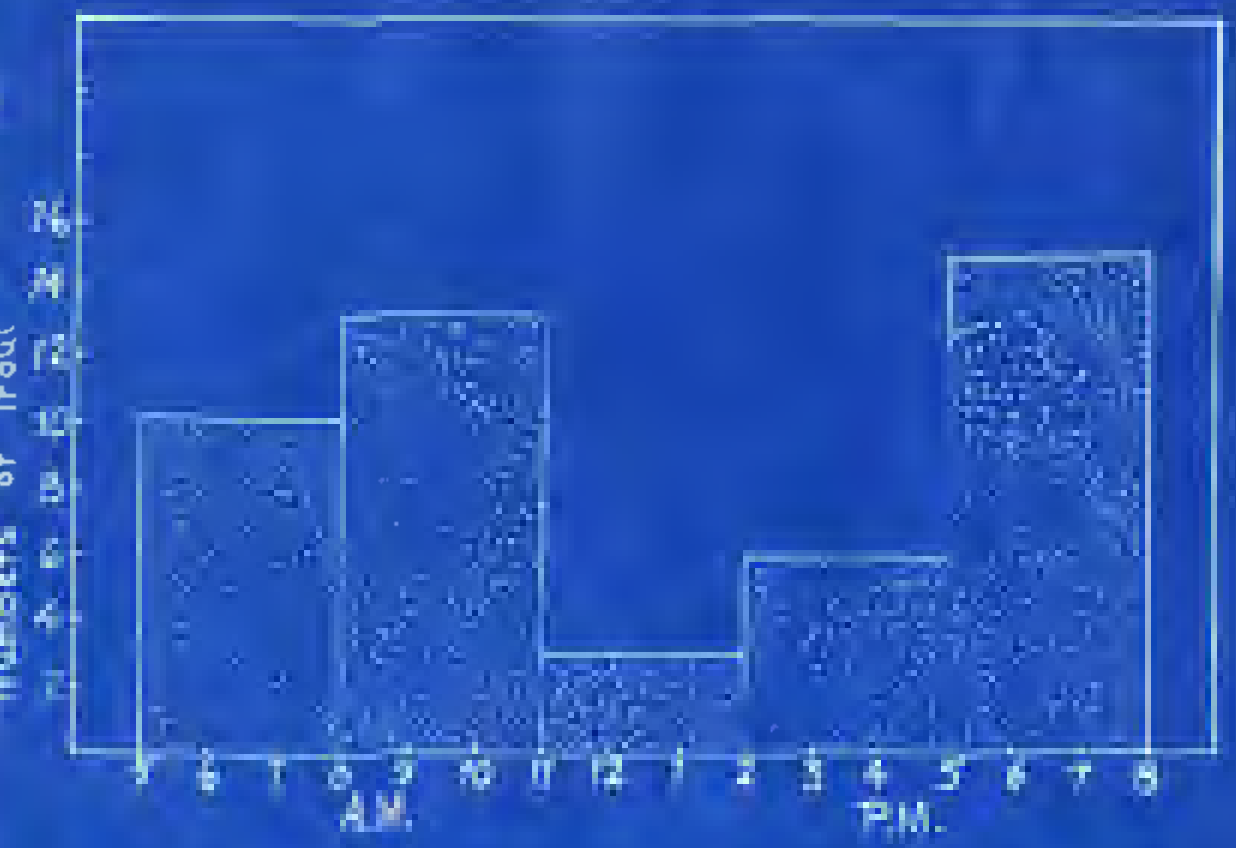


Figure 4. Trout taken on the fly - June 18 to July 5, 1940 - from the Moser river between the mouth of Mill brook and the mouth of the Moser River proper.

maximum height). We cannot be very certain of this from our available data.

Angling at different times in the day

It is evident from figures 3 and 4 that the probability of capturing salmon or trout on a fly varies considerably with the time of the day when the fishing is carried out. The records on which these graphs are based were obtained from fish captured between June 18 and July 3 on that stretch of the Moser river extending seaward from the mouth of Mill brook. The most active fishing is in Moser River village and the capture of salmon, at any rate, within this area under consideration is pretty much common knowledge. It is believed that records were obtained from at least 80% of the fish taken. Also, during this period of June 18 to July 3 angling was carried on almost continuously by eight or more different fishermen. On occasion as many as 21 anglers were counted whipping that area of water which can be seen from the Moser river bridge - less than one-half mile.

Figure 3 for salmon and figure 4 for trout indicate that for both of these fish the period of best fishing is from 3 to 8 o'clock in the evening, with the periods from 8 to 11 a.m., 3 to 8 a.m., 2 to 3 p.m. and 11 a.m. to 2 p.m. following in order of decreasing importance. In spite of the fact that the angling during this period was intense it is reasonable to expect that the graphs to some extent reflect different intensities of fishing. Certainly somewhat fewer anglers were out during the mid-day periods and probably most fishing was done in the evening. However, the bulk of the fish were taken by experienced anglers who knew when and where to fish; and that the graphs do picture fundamental truths is apparent from the following experiment.

To check the validity of the conclusions arrived at from our study of figures 3 and 5 angling under controlled conditions was carried on for four 1-hour periods on 10 different days. A rapids in the main river opposite Oak Island where salmon parr are fairly numerous was fished in a constant manner with a small yellow and brown fly. The angler walked down the middle of the river casting at each pace first to one side and then to the other, and letting the fly drift down stream in a wide arc. Fishing was carried on for periods of 1 hour beginning at approximately 5.30 a.m., 9.00 a.m., 1.30 p.m., and 6.30 p.m. Note was taken of the number of fish seen breaking the water, those jumping at the fly, those which took the fly-strikes, and those which were actually landed. The latter were put back in the water in order not to deplete the population. The detailed results are given in the appendices. The data are presented graphically in figure 5. The figure is in general agreement with figures 3 and 4 prepared from the angling catches of salmon and trout. Mid-day is the least favourable time to fish, and the early morning somewhat less productive than either mid-morning or evening. The relatively high evening catches of the salmon and trout anglers may be a reflection of greater intensity of angling at this time.

Although a consideration of the catches on individual days may show a marked variation from the general rule, it seems to be fundamentally true that fishing improves through the early morning and is depressed during the middle of the day. The following sets of experiments seem pertinent to an understanding of the mechanism.

Feeding Experiments on Salmon Parr and Trout

Since the taking of the fly is a feeding reaction, it is conceivable that factors involved in good angling might be elucidated by a study of the times when and conditions under which salmon and trout feed.

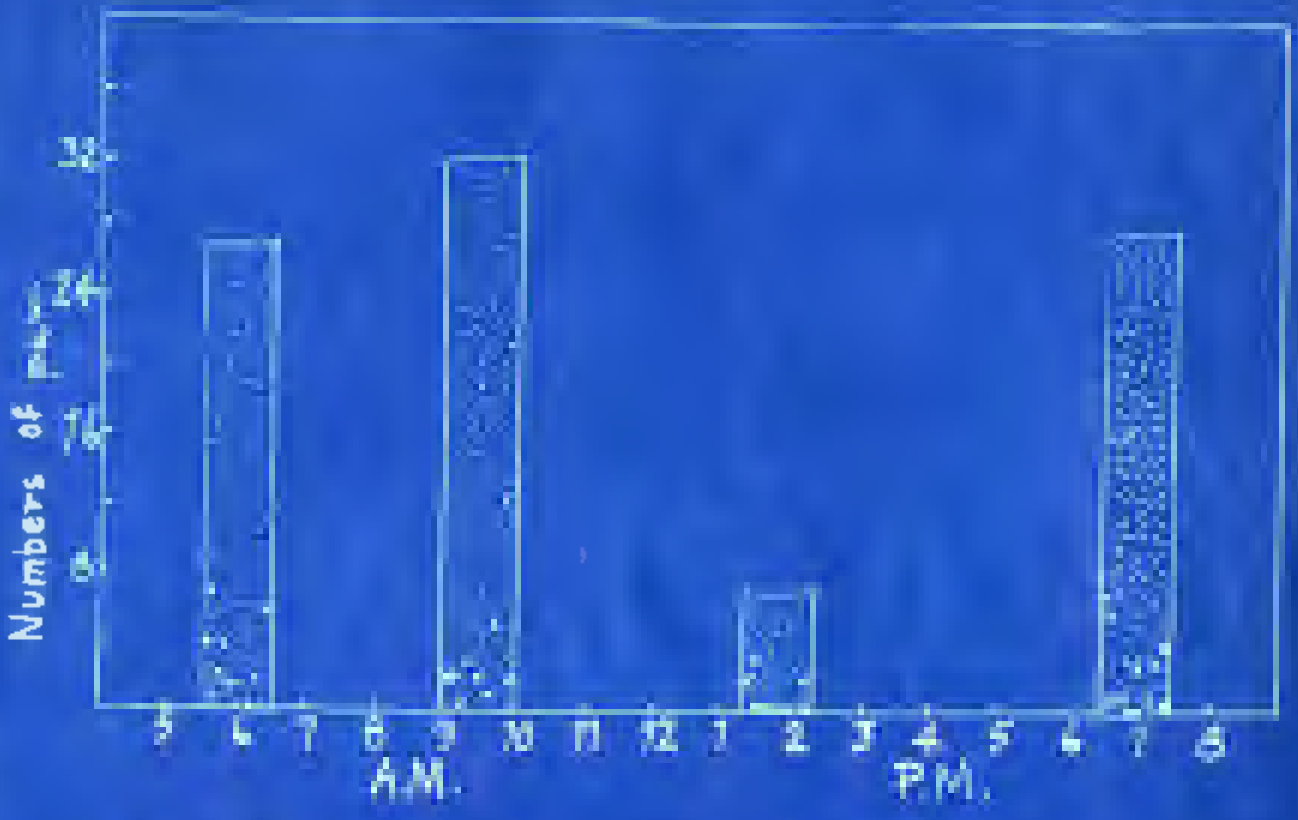


Figure 5. Experimental angling results for perr in relation to the time of day. The "x's" within the stippled blocks are for individual catches on the ten different angling days.

Feeding salmon parr

Preliminary trials showed that salmon parr in captivity would take pieces of earthworm approximately three-quarters of an inch long. It was evident, however, that the salmon parr feed less regularly and consistently than trout under similar conditions.

In the experiments under consideration 5 salmon parr - 3-year olds - were kept in a box approximately 24 x 18 x 6 inches. The ends of the box were of wire screening and the bottom covered with oilcloth to prevent injury to the fish. The box was kept in Moser river or Holman's brook depending on the temperatures desired. Although it was impossible to control accurately the amount of light the box was shaded with alder branches to keep off the direct rays of the sun. A given number of pieces of earthworm - generally 5 pieces - were placed in the box. One hour later the box was examined, the number of pieces of worm eaten during that period recorded and any remainder removed.

The results are shown graphically in figure 6. In the first place it is evident that the fish cease feeding in the evening when it gets dark - usually by 9 p.m., although once they took food up until 11 p.m. They do not commence feeding again until 5 a.m. or later when it is getting quite light. The feeding activity increases in intensity throughout the morning up until about noon; then slackens off throughout the mid-day. The parr have another period of active feeding in the evening.

Two physical factors suggest themselves for consideration, viz., light and temperature. Cessation of feeding during the night might be due to an inability to see the food during the dark. However, it was evident that the fish sometimes fed after it became quite dark in the evening, but did not feed in the morning until well after day-break.

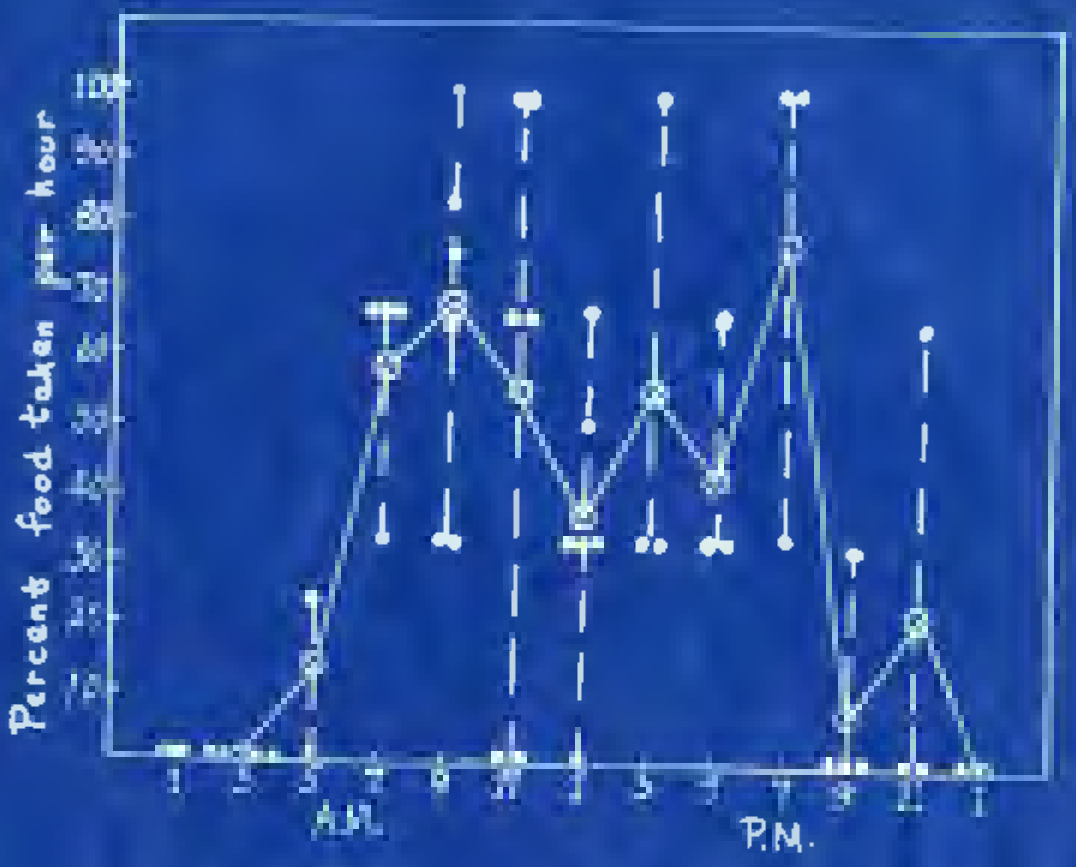


Figure 6. Percent of earthworms taken by 5 salmon parr during one hour in relation to the time of day. The continuous line is for average figures, the broken lines show the range, and the large black dots are the individual percentages.

In other words they do not feed with equal amounts of light in the morning and evening. Also, on two occasions feeding was carried out on very bright moonlight nights. The feeding ceased at approximately the same time or earlier than on the dark night and did not commence until after daylight. The hours of darkness are hours of inactivity, following which a maximum of feeding activity is attained gradually.

Although it is conceivable that light might be responsible for the mid-day depression in feeding, temperature is at least an associated factor. In figure 7 we have plotted the percentages of food taken by the parr against the temperature. The results appear rather inconsistent in places. However, at least two points are definite. In the first place these salmon parr ceased feeding between 23° and 26° C. In the second place, feeding activity is on the average less pronounced when the temperature goes above 21°C. It is evident that high temperatures do influence adversely the feeding activity of salmon parr, and, in spite of the inconsistencies in figure 7, it is believed that the midday depression in feeding is largely due to the mid-day rise in temperature.

Feeding brook trout

A small number of feeding experiments were carried on with two brook trout under conditions similar to those described for the salmon parr. The rather meagre results are presented graphically in figure 8. It is evident that brook trout may take food at any time day or night provided that the temperature of the water does not rise above 24°C. The fish under observation ceased feeding between 23° and 24° C. In relation to the time of day, however, it was apparent that feeding was somewhat less avid during the night. Sometimes food remained in the box at the end of the hour of observation but would be gone an hour later.

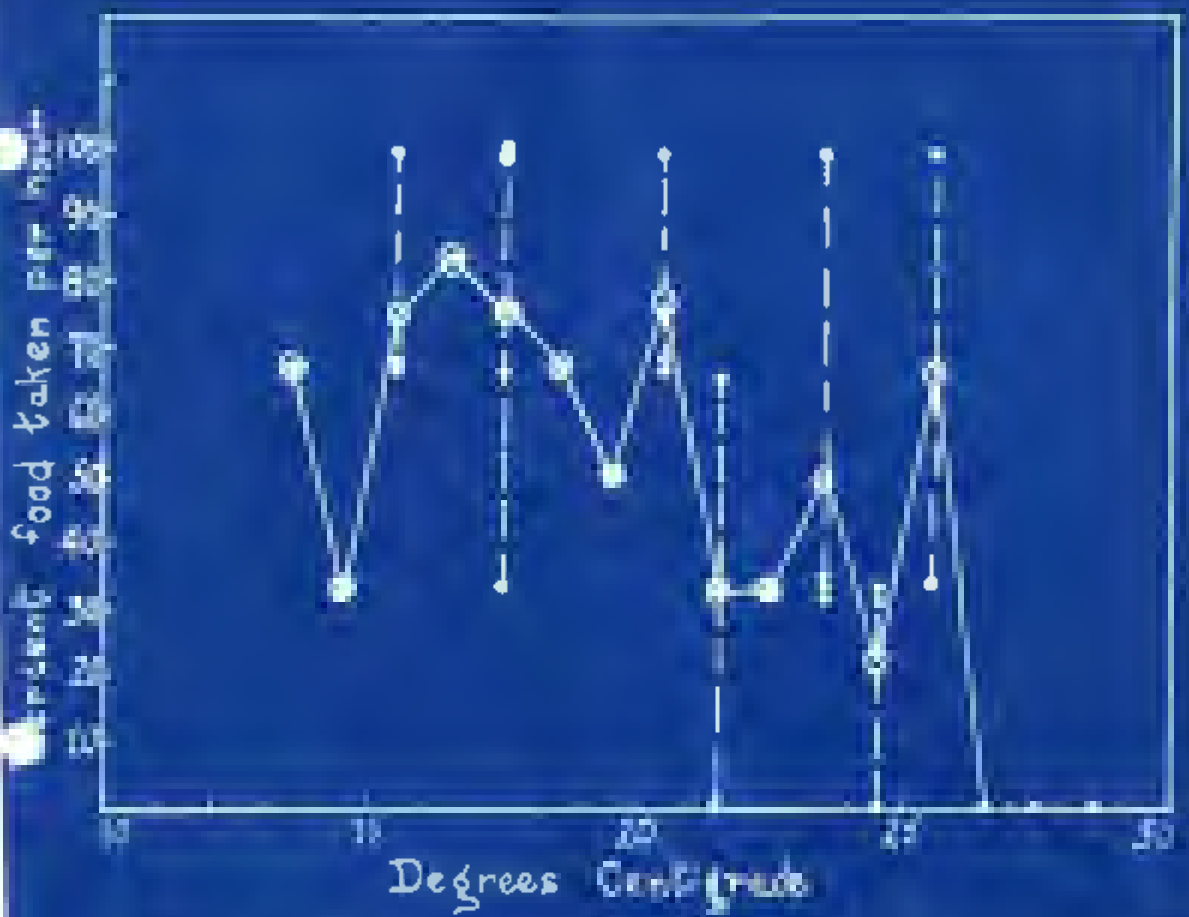


Figure 7. The feeding activity of salmon parr in relation to temperature. The continuous curve is for average figures, the broken lines represent the ranges, and the large black dots the individual percentages of pieces of earthworm taken during 1 hour.

Both of these evening feedings (experiments A and B) were carried out on moonlight nights.

Experiment C, figure 8, shows that fish which have ceased feeding due to high temperature will not commence feeding again until a somewhat lower temperature is attained than that at which feeding ceased when the temperature was rising. In this case feeding, which continued up to near 24°C., did not commence until the temperature fell to near 20°C. This point will be discussed more fully and further evidence presented in connection with the experiments on sea-trout.

Feeding sea-trout

Two sea trout (taken from the Moser River experimental trap in July) were kept under conditions similar to those described for the parr but fed on living Gammarus sp. It was found that these fish would take a dozen or more gammarids readily. By never feeding more than 2 gammarids at any one time the fish were kept hungry and fed consistently and very satisfactorily. The sea trout take Gammarus more satisfactorily than brook trout or salmon parr take pieces of earthworm. Brook trout and salmon parr do not feed well on Gammarus, but it is possible that a more satisfactory food than earthworms might be found for such experiments; for example, large stone-flies.

The results of the more important of the experiments on sea trout are shown graphically in figure 9. These fish took the food at any time during the day or night provided the temperature did not go above 24°C. (exp. A and C - first part - figure 9). The night feeding was carried on three times; once on a dark night and twice in moonlight. On one of the latter nights the box was covered with a canvas to keep out the light. The food was always taken promptly. Between 24° and 25° C.

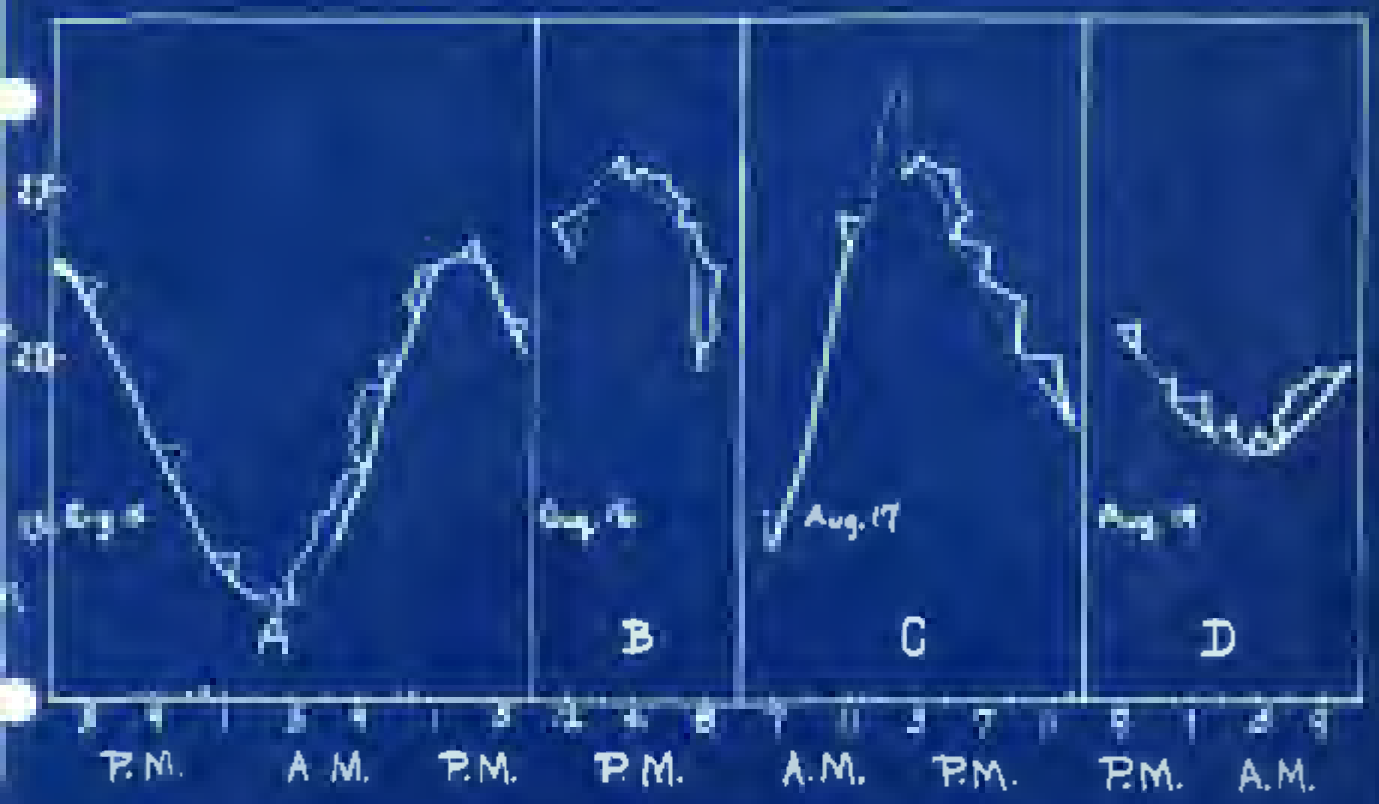


Figure 8. Feeding activity of brook trout in relation to the time of day and the temperature. The curves are temperature curves. The bracketed areas of the curves are for periods of feeding and observation. Food was placed in the cages at the beginning of the bracketed area and observation made at the end of the bracketed area. The continuous lines indicate feeding; the dotted lines that the food was not taken. The precipitous fall in temperature in experiment C was due to a transfer of the fish from the river to the brook.

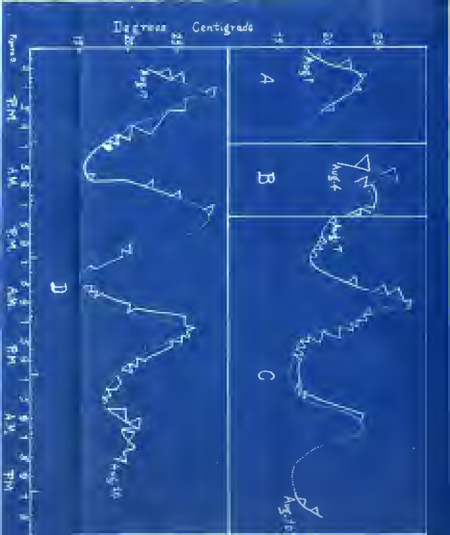


Figure 9
Degrees Centigrade
A
B
C
D
Aug 4
Aug 10
P.M.
A.M.

feeding becomes sporadic, that is the food may or may not be taken or may be partially taken. These sea-trout never took food at temperatures of 25°C. or higher. However, the relationship of temperature to feeding is somewhat more complex than this. Experiments B, C, and D, figure 9, shed some light on this relationship.

In experiment B the trout were exposed for 1 hour to temperatures higher than those at which they normally feed - temperatures rising from 23°C. to 27.2°C. They did not feed after such treatment when placed in cooler water - water at 22.5°C. - in which they would normally take food. In this experiment the temperature rose from 22.5°C. to 24°C. within the next 1½ hours, and remained between 24°C. and 24.5°C. - region of erratic feeding - for 5 hours. It then commenced falling and the fish took food for the first time between the temperatures of 23.5°C. and 22.5°C. Thus, recovery from a short - 1 hour - exposure to high temperatures occurred in 6 hours at most.

In experiment C the fish were exposed for 3½ hours to temperatures rising from 25.0°C. to 28.2°C., then transferred to water whose temperature was falling from 24.0°C. In this case recovery had not taken place within 23 hours which brought the experiment into the heat of the next day. Beyond this point it was impossible to follow the results in detail. However, on the second day the temperature did not rise higher than 23.5°C. and the fish were feeding the following morning, 39 hours after the end of their exposure to the very high temperatures. Recovery took place somewhere between 23 and 39 hours. The point is that a 3½ hour exposure to temperatures higher than 23.0°C. may cause the fish to suspend feeding for a period long enough to bring them into the heat of another day.

In experiment D the fish were first exposed for 5 hours to temper-

atures ranging from 25.0°C. to 28.8°C. In this case feeding was resumed at the end of about 7 hours - much sooner than we might expect from our considerations of the last experiment. However, two differences exist between the experiments starting on August 7 - experiment C - and that starting on August 17 - experiment D. In the first place the temperature for two days previous to experimentation was much higher in the case of experiment C (minimum daily temperatures of 19.0°C. as compared to 13.3°C. and 14.4°C.). In the second place, of the 5½ hours exposure of experiment C 2½ hours were at temperatures above 26.0°C, while of the 9 hours exposure of experiment D only 2 of them were at temperatures above 26.0°C. So the while temperature conditions were somewhat less favorable at the beginning of experiment C.

Continuing experiment D into the second day, the fish were exposed for 8 hours to temperatures above 25.0°C. For 6½ of these hours the temperature ranged from 26.0°C. to 28.0°C. After this treatment feeding was not resumed within 24 hours although the night temperature went down to 15.0°C. The third day of the experiment was cooler and involved a 2½ hour exposure to temperatures ranging from 25.0°C. to 26.0°C. Six hours later the fish took one gammarid, and 9 hours after that - during the fourth day of the experiment with a maximum temperature of 21.0°C. - started feeding sporadically.

It is evident from these experiments that feeding is not only suspended at temperatures above 25.0°C., but that prolonged exposures to such temperatures as may occur in the Moser river depresses feeding for 24 hours or longer, and that a series of hot days may cause feeding to become irregular even on succeeding cool days. All this is of importance in a consideration of those factors which make for good or bad angling.

Discussion of feeding experiments in relation to angling

Returning to figures 3, 4, and 5 the diurnal variations in angling results are more understandable. Salmon and, to a lesser extent, trout are inactive during the night. Their feeding activity gradually increases through the early morning (figure 6). This accounts for the fact that somewhat fewer fish are taken at 5 a.m. than at 9 a.m.

Although light may be partially responsible for the somewhat poorer angling at mid-day, it is probable that temperature is the important factor. The feeding experiments have shown that very high temperatures cause feeding to be suspended (fig. 7,8 and 9), and that somewhat lower temperatures depress it.

The fact that the salmon angling in the Moser river comes early and is practically over by the middle of July is most certainly due to the high summer temperatures of this river. Temperatures higher than 25.0°C. are not uncommon here. Our experiments have shown that such temperatures may depress feeding for longer or shorter times depending on the exposure. Thus, although cool days may occur, the fish will not necessarily bite if they have been subjected to several days of mid-day temperatures above 25°C. However, our results indicate that recovery will always take place if the fish are given suitable temperatures - 20°C. or less.

Figure 10, based on the results of our experimental perr angling discussed on pages 8 and 9, is pertinent in connection with this consideration of temperature. The variations in angling results are plotted both against water height and temperature. They are very definitely related to the latter factor. The water height may have been a contributing factor, although it was not of sufficient magnitude to produce a pronounced effect. The two periods of lowest daily temperatures - July 24, 25 and August 2, 3 - coincide with the best perr fishing. July 28

days of

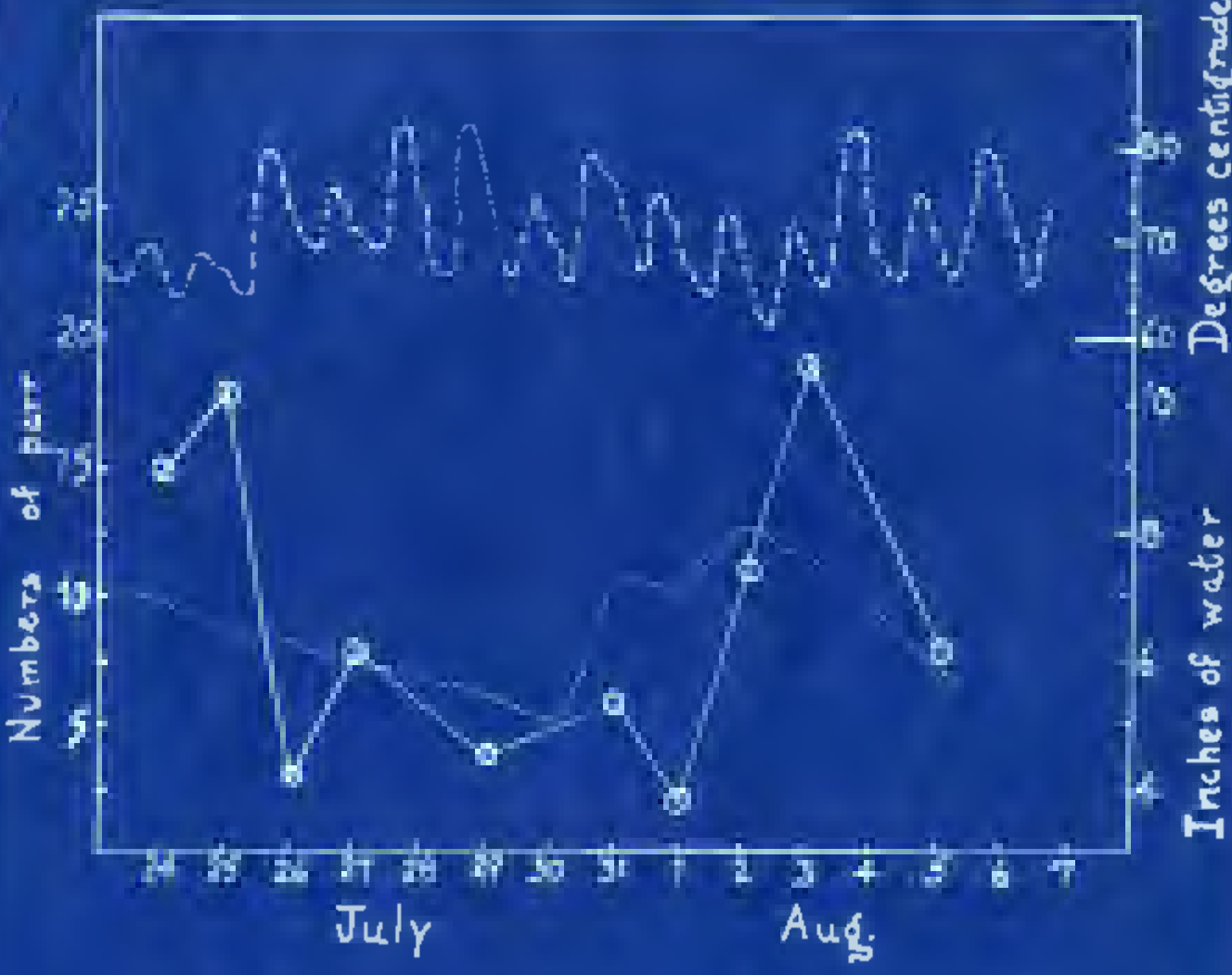


figure 10. Experimental angling for salmon parr in relation to water level and temperature. Continuous line is for numbers of parr raised, hooked and taken; the dotted line represents the water level; the broken and dotted line the temperature.

to August 1 was a period of very high temperatures, and few parr were taken.

Thus, to summarize briefly, suitable water heights, temperatures, and a proper time in the day is essential to the best angling.

The Condition of the Moser river Salmon

The condition of the fish was studied in the usual way through a comparison of the weight-length relationships. Results are summarized in the following table and detailed figures will be found in the appendices.

Place	No. of specimens	Length average	Length range	Coefficient average	Coefficient range
Nets in sea	86	76 cm.	59-94 cm.	1.13	0.98 - 1.45
Nets in estuary	15	74	55-95	1.07	0.87- 1.35
River angling	34	55	51-77	0.98	0.69 - 1.30

The figures are similar to those of last year and indicate reasonably good feeding conditions. A progressive decline in the coefficient of condition is evident as the salmon enter and ascend the river. Fattest salmon are out in the bay - presumably the feeding grounds. They lose weight when they cease to feed and return to the river.

Life Histories of the Moser river Salmon

The data are summarized in the table on the following page and given in detail in the appendices.

Scale studies show that approximately 90% of the fish entering the river are grilse. A percentage of 95.5% was given in last year's report on the basis of fish passing through the experimental trap. This per-

centage was reckoned from a consideration of the size of the fish. However, both tagging and scale studies show that between 3.8% and 4.8% of the fish of grilse size (55 cm. to 60 cm.) are spawned fish of a short absense type. Hence, our percentage of 90% grilse is probably more accurate for the Moser river.

A comparison of the percentages in the different salmon catches of the fish which migrated to the sea first as 2- or 3-year-old smolts, show definitely that the highest percentage of younger smolt (2-year olds) is found among the younger salmon. In other words there are more fish which migrated to sea as 3-year smolts in the grilse group than in the "salmon" group proper. This is suggestive of the distribution of the salmon in the sea. Study of the Saint John salmon in 1938 showed that the younger smolt from the lower stretches of the river went farthest out in the bay (M. S. reports of 1938). Likewise, here it seems that the younger smolt - presumably from the lower and warmer stretches of the river - go farthest out, and for this reason lose close contact with the fresh water and remain an extra year in the sea. Food might well be an associated factor - those fish which go farthest out finding better feeding conditions and for that reason remain longer.

A somewhat larger percentage of the 3-year smolt group of salmon is found in the fish which enter the river later in the season than in the group which comes earlier. In detail the fish taken by anglers during the early part of the summer of 1940 were 34.4% 3-year smolt group as compared to 37.3% in a collection of fish made in the fall of 1939. It was pointed out above that the younger smolt went to sea earlier in the season than did the older ones. On the basis of the fact that the numbers of 3-year smolt increases as the season advances

both for smolt going out and for salmon returning it is suggested that the last fish to go out are often the last to come back. Tagging results are tending toward the same conclusion (H.C.White, personal communication, 1940).

11.8% of the scales examined showed a spawning mark. 21% of the larger salmon - excluding the grilse group - showed evidence of having spawned. This figure is lower than that of last year (27.8% spawners in 1939) but indicates a high percentage of survivals in comparison with some rivers. Of the 22 large spawned salmon examined only one had survived two spawnings, and only one had spent two virgin years in the sea before spawning first. This year we found 3 additional examples of fish returning for a second spawning after a very short absence from the river. Tagging shows that these fish - only spawned grilse have yet been found in this group - may return early in August having made very little new scale growth.

Winter bands were very definite on the scales of the majority of the fish taken in the river after June 28. Absorption was pronounced on the scales of a fish (77 cm. in length) taken in the river on July 21.

Life Histories of the Moser River Sea trout.

During the summer of 1940 no special study was made of the sea trout scales. However, several scale samples from very large sea trout (44.0 cm. fish) were examined in an attempt to determine whether these fish had been to sea continuously for more than one summer. Results were not conclusive. Although this may have been the case, it seemed even more probable that they had gone to sea as larger smolts - 4-year olds. It is believed that a large collection of scales with accurate measurements of relative growth on the same would settle the question. Tagging and trapping would be the best method.

Table summarizing the scale studies of the Exeter river salmon.

Source of Material	No. of Specimens	% of 3-year olds Total Grilse	Maiden Escapement	% Grilse	Total Grilse of spawning Short Absence	Long Absence	% repeaters 2-sea-year of spawning Short Absence	Long Absence
Fish netted in 1940	105	21	14.5	45.5	—	21	86.4	9.1
Angling catch June and July 1940	61	34.4	32.9	100 (2 fish)	91.8	3.3	100	
Experimental trap Sept.-Nov., 1939	73	37.5	37.1	33	89	4.1	100	

SUMMARY

1. The majority of the salmon smolt (83%) go to sea at the end of their second year. Only 2.4% of the fish remain longer than 3 years in the fresh water. Some few, however, may migrate to sea after 6 years in the river. It is suggested that the younger smolt go to sea earliest in the season.

2. Commercial fishing for salmon was slightly better this year than last. This is very definitely influenced by the discharge of the Moser river. It may be difficult to make large numbers of salmon available to both net fishermen and anglers in the same years.

3. Anglers took approximately six times as many salmon in 1940 as in 1939; but only about one-third as many trout.

4. The capture of salmon and trout on the fly is definitely related to the height of the water in the river, the time of the day when fishing is carried out, and the temperature of the water both on the day of fishing and on the preceding days. The best conditions for salmon fishing are not necessarily the best conditions for trout fishing.

5. Experimental angling confirmed the conclusions arrived at from a study of the angling results; viz., that high temperatures are unfavourable to good angling, and that the angling improves throughout the early morning, is depressed during the middle of the day but is again good during the evening.

6. Feeding experiments on young salmon indicate that feeding is suspended entirely during the night, that it gradually increases

in intensity during the morning hours, is depressed at mid-day but active again during the evening. Feeding for trout is not entirely suspended during the night, but probably somewhat depressed.

7. Feeding experiments show that for both salmon and trout, high temperatures first depress then bring about a complete cessation of the reaction. Also, after exposure to temperatures above 25.0°C. fish do not feed again for considerable lengths of time - 24 hours or longer, depending on the exposure to high temperatures - even when the temperature falls within the normal feeding range.

8. Studies of the length-weight relationship show the Moser river salmon to be in reasonably good condition. There is an evident decline in fatness as the fish enter and ascend the river.

9. 99% of the salmon enter the Moser river are grilse. None of the fish spend more than 2 years in the sea as virgin fish. The large salmon (70+ cm.), for the most part, belong to the two year smolt group, or there are more of the three year smolts in the grilse group. It is suggested that the fish from the lower part of the river go furthest out in the bay and may remain for the extra year. It is indicated also that the last fish to go out as smolt are the latest to return in the fall. 11.3% of the scales examined showed a spawning mark. Small salmon (56-60 cm.) returning to spawn for a second time after a very short absence in the sea are not uncommon.

Appendix A.

Scale Readings - Moser River Salmon, 1940

Collection from the salmon nets of Clifford Smith, Moose Tooth, N. S. The sex may not be accurate.

No.	Date	L. cm.	W. lb.	K.	Sex	History
1	June 4	77	10½	1.84	F	2.2
2	4	76	11	1.15	F	2.2
3	6	74	[illegible]	1.06	F	2.2
4	6	74	[illegible]	1.06	F	2.2
5	8	84	[illegible]	1.03	F	2.2+(4)
6	8	80	13½	1.19	F	2.2+[illegible]+1
7	8	75	11	1.18	F	2.2
8	11	73	9½	1.11	F	2.2
9	11	74	10	1.12	F	3.2
10	11	75	10	1.16	F	2.2
11	11	74	10	1.12	F	2.2+(4)
12	11	73	9½	1.11	F	2.2
13	11	80	11	1.06	F	2.2+[illegible]+1+(3)
14	11	75	10½	1.13	F	2.2
15	12	78	13	1.24	F	2.2+[illegible]+1+(3)
16	12	77	11	1.19	F	2.2+[illegible]+1
17	12	77	11	1.09	[illegible]	2.2+[illegible]
18	12	75	10	1.07	F	2.2+[illegible]
19	13	79	10	1.07	F	2.2+[illegible]
20	13	75	10	1.07	[illegible]	2.2+[illegible]
21	13	77	9½	1.02	-	2.2+(3)
22	14	76	10½	1.07	F	2.2
23	14	72	[illegible]	1.09	F	2.2+(4)
24	14	73	[illegible]	1.05	F	2.2+(2)
25	14	76	[illegible]	1.09	[illegible]	2.2+(4)
26	13	84	21	1.20	F	3.2+[illegible]+1
27	13	79	12½	1.13	F	2.2
28	15	78†	10	1.00	F	2.2
29	15	74	[illegible]	1.06	F	2.2+(4)
30	15	78	11	1.24	F	2.2+[illegible]+1
31	15	81	13	1.19	F	2.2
32	15	81	14	1.17	[illegible]	2.2+[illegible]+1+(2)
33	15	80	12½	1.10	F	3.2
34	17	78	[illegible]	1.07	[illegible]	2.2
35	17	73	[illegible]	1.05	[illegible]	2.2
36	17	71	[illegible]	1.14	[illegible]	2.2+(2)
37	17	74	-	-	-	2.2
38	17	78	12	1.15	F	2.2
12	11	72	9	1.09	F	2.2

Appendix A (continued)

No.	Date	L. cm.	W. lb.	K.	Sex	History
[illegible]	16	73	11	1.03	-	3.1+[illegible]+(4)
[illegible]	17	71	11	1.03	F	2.1
[illegible]	17	69	10	1.04	F	2.2
[illegible]	17	70	9.75	0.99	F	1.1+[illegible]
[illegible]	20	72	11	1.06	F	1.2
[illegible]	20	73	11	1.14	M	1.1+[illegible]
[illegible]	20	74	11	1.17	M	
[illegible]	20	76	11	1.13	F	2.1+(2)
[illegible]	20	68	11	1.01	F	1.1
[illegible]	20	73	11	1.10	F	2.1+(3)?
[illegible]	20	71	11	1.01	F	2.2
[illegible]	21	76	12	1.24	F	1.1+(3)
[illegible]	21	74	11	1.14	M	1.1+[illegible]
[illegible]	21	73	11	1.19	F	1.1
[illegible]	21	72	10	1.21	F	1.1+(2)
[illegible]	21	72	12	0.99	M	1.1+[illegible]+(3)
[illegible]	24	76	11	1.07	F	1.1
[illegible]	24	74	11	1.01	F	1.1+(2)
[illegible]	24	76	10	1.03	F	2.1+(3)
[illegible]	25	75	10	1.01	F	1.1
[illegible]	25	74	10	1.15	F	1.1+(4)
[illegible]	25	76	[illegible]	0.98	F	1.1+(5)
[illegible]	26	[illegible]	[illegible]	1.12	F	1.1+(6)
[illegible]	27	76	[illegible]	0.91	F	1.0
[illegible]	27	73	10	1.09	F	1.1+(4)
[illegible]	27	74	[illegible]	0.97	F	1.1+(5)
[illegible]		72	[illegible]	1.01	F	1.1+(6)
[illegible]		71	[illegible]	1.20		2.1
[illegible]		68	11	0.98		1.1
[illegible]		74	11	1.11		1.1
[illegible]		74	[illegible]	1.13		2.1
[illegible]		71	[illegible]	1.20		2.1
[illegible]		76	12	1.33		2.1+[illegible]+(4)
[illegible]		73	10	1.04		1.1
[illegible]		72	11	1.13		1.1+[illegible]
[illegible]		73	11	1.06		2.1+(4)
[illegible]		72	12	1.14		2.1+(4)
[illegible]		76	12	1.14		2.1+[illegible]

* No accurate data for #67 to 77 inclusive; about one fish per day from June 27 to July 3 - then only one in two weeks.

Appendix A (continued)

No.	Date	L. cm.	W. lb.	K.	History
(From Ernest Smith, Nooun Touch, N. S.)					
1	June 10	777	8	-	S.S
2		[illegible]	10	1.58	S.S
3		[illegible]	10½	1.45	S.S+(4)
4		[illegible]	15	1.28	S.1+[illegible]+(2)
5		[illegible]	9½	1.89	S.1+[illegible]+(3)
6		[illegible]	11	1.28	S.1+[illegible]+1+(2)
7		[illegible]	10	1.36	S.S+(2)
8	July 2	[illegible]	10	1.27	S.S+(2)
9		[illegible]	15	1.89	S.S
10		[illegible]	9	1.81	S.S+(1)
11	9	75	10	1.17	S.S+(3)
(From W. H. Moser, Moser River Estuary)					
0	June 6	667	8½	??	S.S
1		[illegible]	10	1.06	S.S
2		[illegible]	9½	1.12	S.S
3		[illegible]	10	1.32	S.S
4		[illegible]	10½	1.15	S.1+[illegible]
5		[illegible]	?	1.19	S.S+(4)
6		[illegible]	?	??	S.1+(1)
7	July 2	85	10	1.02	S.1+(3)
(From R. Willis, Moser River Estuary)					
	June 7	73	6	0.93	27.S
		[illegible]	10½	0.91	S.S
		[illegible]	8	0.97	S.S
		[illegible]	10½	0.89	S.1+[illegible]
		[illegible]	21	1.41	S.S+[illegible]
		[illegible]	[illegible]	0.87	S.S+(3)
		[illegible]	[illegible]	1.02	S.S
		[illegible]	[illegible]	1.06	S.S+(4)
	July 1	74	[illegible]	1.06	S.S+(2)

Appendix A (continued)

Collection from the Moser River experimental traps in the fall of 1959. Salmon were taken in 4 traps - Moser River Up (M.R.U.), Moser River Down (M.R.D.), Mill Brook Up (M.B.U.), and Mill Brook Down (M.B.D.). The sex was sometimes questionable. All scales show considerable peripheral erosion.

No.	Place and Date	Length cm.	Sex	History	
1	M. R. U. Sept. 18	57	F	3.2+	
2	" "	48	F	3.2+	
3	" "	53	M	2.2+	
4	" "	53	M	2.2+	
5	" "	55	M	2?.2	
6	" "	54	M	3.2+	
7	" "	60	F	2.2+SW+	
8	" Sept. 19	55	F	3.2+	
9	" "	56	M?	3.2+	
10	" "	70	F	2.2	
11	" "	54	F	2.2+	
12	" Sept. 20	55	M	3.2+	
13	" "	56	M	2.2+	
-	" Sept. 21	71	F	(SW+ scales)	
1	" Sept. 22	57	F	2?.2+	
2	" "	55	F	3.2+	
3	M. R. D. Sept. 19	54	F	3.2+	
4	" "	55	M	3.2+	
5	" "	54	F	3.2+	
6	M. R ?	55	M	3.2+	
7	" "	56	M	3.2+	
8	" "	56	F	3.2+	
9	" "	55	F	3.2+	
10	" "	56	F	3.2+	
11	M. R. U.	52	F	3.2+	
12	" "	58	F	3.2+	
13	" "	58	M	2?.2+	
14	" "	57	F	3.2+	
15	" "	60	F	3.2+	
16	" "	60	F	3.2+SW+	
17	" "	53	F	3.2+	
18	" "	55	M	3.2+	
19	" "	58	F	3.2+	
20	" "	61	F	3.2+	
21	" "	71	F	3.2+	(Tag # 8051)
22	" "	74	F	3.2+	(Tag # 8047)
23	" "	75	F	3.2+	(Tag # 8048)
24	" "	75	F	3.2+	(Tag # 8046)

Appendix A (continued)

No.	Place and Date	Length	Sex	History
	M. R. V. Sept. 30	(no data)		2.1+
1	M. R. R. Oct 2	58	M	(Tag #9032) 3.1+
2	M. R. V. "	54	F	2.1+ (Pin)
3	" "	39	F	2.1+
	M. R. D. Oct. 3	56	M	3.1+ (Tag #9036)
	M. R. V. Oct. 16	53	F	2.1+ (Pin)
8157	M. R. D. Oct. 23	56	F	2.1+
2 pin	M. R. V. "	55	F	2.1+
[illegible]	M. R. D "	53?	F	3.1+
4 pin	M. R. V. "	50	F	2.1+
5 pin	M. R. Wh "	54	M	1.1+
6 pin	" "	54	M	2.1+
8158	M. R. D.	57	M	3.1+
8 pin	M. R. V.	56	M	3.1+
9	" "	56	M	2.1+
8154	M. R. D.	56	M	2.1+
8157	" "	54	F	2.1+
8155	" "	53	F	2.1+
13 pin	M. R. V.	49	M	2.1+
14 pin	" "	58	M	2.1+
8162	M. R. D. Oct. 24	54	F	2.1+
8161	M. R. V. Oct. 25	73	F	3.2+
2	" "	54	M	1.1+
3	" "	53	F	2.1+
4	" "	54	F	2.1+
5	" "	54	F	2.1+
6	" "	56	M	1.1+
7	" Oct. 28	54	F	2.1+
8	" "	53	M	27.1+
9	" "	56	M	1.1+
10	" "	53	F	2.1+
11	" "	51	F	2.1+
12	" Nov. 1	53	F	1.1+
13	" "	50	M	1.1+
15	" "	56	F	27.1+

Appendix A (continued):

Scale readings from salmon taken on the fly at and near the Homer River Bridge - 1940. The sex was determined from an examination of the gonads. First two fish taken in E. Brillia net in estuary.

No.	Date	L. cm.	W. lb.	K.	Sex	History
	June 7	54	10½ cm.	1.30		2.1+(5)
	11	59	11 "	1.82		3.1+(4)
	22	54	8"	0.90	M	2.1+(10?)
	23	53	" "	0.85	M	2.1+(8)
		55	4 "	0.69	M	2.1+(3)
		54	10 "	0.95	F	3.1+(12)
		57	" "	1.80	M	2.1+(4)
		56	" "	0.90	M	2.1+(8)
		56	12 "	0.95	M	2.1+(7)
		55	" "	0.96	M	2.1+(7)
		55	" "	0.93	M	2.1+(4)
		57	13 "	0.90	M	2.1+(9)
		54	" "	1.11	F	2.1+(8)
		52	" "	0.85	M	2.1
		51	" "	0.84	M	2.1+(6)
		54	" "	0.87	M	3?.1+(9)
		58	" "	0.93	M	2.1
		56	" "	0.97	M	3.1+(6)
		57	11 "	0.92	M	3?.1+(10)
		55	13 "	0.96	M	3.1+(12)
		56	" "	1.05	M	2.1+(7)w
		55	" "	0.98	M	2.1+(6)
		54	" "	0.95	M	2.1+(10)
		57	" "	1.02	M	3.1+(7)
		55	" "	1.10	M	no scales
		55	11 4	1.02	M	2.1+(8) w
		54	14 "	1.01	M	3.1+(5)
		57	4 "	0.86	F	2.1+(7) w
	July	53	" "	0.92	M	3.1+(5) w
		53	" "	0.92	M	3.1+(6) w
		55	11 "	1.13	M	2.1+(10)w
		54	" "	1.13	M	2.1+(8) w
		52	" "	1.07	M	4.1+(6) w
		54	" "	0.97	M	3.1+(7) w
		54	14 "	0.92	M	2.1+(8) w
		54	" "	1.15	F	2.1+(7)

Appendix A (continued)

No.	Date	L. cm.	W. lb.	K.	Sex	History
1	July	2	[illegible]	[illegible]	-	[illegible]
[illegible]		[illegible]	[illegible]	[illegible]	-	[illegible]
[illegible]		[illegible]	[illegible]	[illegible]	-	[illegible]
[illegible]		[illegible]	[illegible]	[illegible]	-	[illegible]
6		[illegible]	[illegible]	[illegible]	-	[illegible]
	10	[illegible]	[illegible]	-	♀	[illegible]
	11	[illegible]	[illegible]	0.96		[illegible]
	12	[illegible]	[illegible]	0.92		[illegible]
	13	[illegible]	[illegible]	0.97	M	[illegible]
	13	[illegible]	[illegible]	0.89	M	[illegible]
	13	[illegible]	[illegible]	0.86	M	no scales
	14	[illegible]	[illegible]	-	-	[illegible]
	14	[illegible]	[illegible]	-	-	[illegible]
	15	[illegible]	[illegible]	-	-	[illegible]
	16	[illegible]	[illegible]	0.96	-	[illegible]
	18	[illegible]	[illegible]	-	-	[illegible]
	21	[illegible]	[illegible]	0.84	♀	[illegible]
June	24?	[illegible]	[illegible]	0.97	-	[illegible]

Note: "w" winter bands for the current year; "s" erosion of the scale in the current year.

Appendix B.

Data collected from smelt taken in the trap on Eener River, 1948.

No.	Date	Length	History	No.	Date	Length	History
1	May 27	18.8	2-(4)	41	May 27	16.8	2-(4)
2		18.3	2-(4)	42		18.5	2-(4)
3		17.4	2-(4)	43		18.4	2-(4)
4		18.0	2-(4)	44		14.7	2-(4)
5		18.4	2-(4)	45		18.4	2-(4)
6		19.0	2-(4)	46		18.0	2-(4)
7		18.6	2-(4)	47		18.3	2-(4)
8		19.0	2-(4)	48		18.3	2-(4)
9		17.8	2-(4)	49		16.9	2-(4)
10		18.2	2-(4)	50		17.8	2-(4)
11		18.0	2-(4)	51		16.0	2-(4)
12		17.0	2-(4)	52		17.4	2-(4)
13		19.8	2-(4)	53		17.5	2-(4)
14		18.5	2-(4)	54		16.0	2-(4)
15		18.0	2-(4)	55		19.2	2-(4)
16		17.0	2-(4)	56		18.7	2-(4)
17		18.2	2-(4)	57		17.0	2-(4)
18		18.8	2-(4)	58		15.4	2
19		17.8	Regenerated scales	59		18.2	2-(4)
20		24.0	2-(4)	60		17.7	2-(5)
21		18.2	2-(4)	61		17.0	2-(4)
22		14.6	2-(4)	62		14.4	2-(4)
23		18.7	2-(5)	63		14.5	2-(4)
24		16.2	2-(5)	64	June 2	19.0	2-(5)
25		17.0	2-(5)	65		19.0	2-(5)
26		18.6	Regenerated scales	66			
27		23.5	2-(4)	67		19.5	2-(4)
28		20.2	2-(4)	68		18.9	2-(4)
29		20.0	2-(4)	69		20.2	2-(4)
30		16.1	2-(4)	70		19.0	2-(4)
31		18.2	2-(4)	71		19.5	2-(4)
32		14.5	2-(4)	72		18.0	2-(4)
33		16.0	2-(4)	73		17.9	2-(4)
34		18.3	2-(4)	74		18.2	2-(4)
35		18.2	2-(4)	75		15.8	2-(4)
36		14.2	2-(4)	76		14.2	2-(4)
37		18.0	2-(4)	77		19.0	2-(4)
38		18.4	2-(4)	78		20.5	2-(4)
39		16.2	2-(4)	79	June 3	19.7	2-(4)
40		19.4	2-(4)	80	June 4	18.7	2-(4)
41		17.6	2-(4)	81	May 4	18.1	2- Female
42		17.2	2-(4)	82	May 10	18.6	2- "
43		16.5	2-(4)	83	May 11	21.5	4- "
44				84	June 16	14.3	3- Male

Appendix 6.

Salmon and trout angling seaward from the mouth of Mill brook

Note: The letter "g" in the following table is for "grilse"; "s" for "salmon" - fish which has spent more than one full year in the sea - and "t" for "trout".

Date		5-8 a.m.	8-11 a.m.	11 a.m. - 2 p.m.	2-5 p.m.	5-8 p.m.	Time doubtful
June	17	-	-	-	-	-	2t
	18	2t	1t	-	-	-	-
	19	1t	-	-	-	-	-
	20	-	2g	-	-	-	-
	21	-	-	-	-	-	-
	22	-	-	-	1g	-	-
	23	2g	2g 1t	2g	1g	1g	2g
	24	2g	2g	2g	1g	1g	-
	25	3g	- 1g	-	4g	2g	-
	26	2g	3g	1g	1g	2g	-
	27	2g	1g	2g	-	2g	-
	28	2g	3g	2g	-	1g	-
	29	1g	3g	2g	-	2g	1g
	30	-	1g	-	2t	2g 1s	2t
July	1	3g	3g 3t	-	-	1s	-
	2	1g 4t	- 1g	2t	1g	1g	-
	3	-	1g 3t	1g	2g 4t	1g 1t	-
	4	1g 1t	1g 4t	-	-	4g 5t	-
	5	2g 3t	2g 4t	1t	-	2g	-
	6	4g 3t	2g 1t	-	-	-	-
	7	2g 4t	1g -	-	1g	2g	-
	8	1g -	1g 1t	-	-	1g 1t	-
	9	- 1g	-	2g	4t	1g	-
	10	-	1g 1t	-	-	1g	-
	11	1g 4t	- 1g	2g	2g	1g	-
	12	- 2g 3t	1g 4t	1g	-	1g	-
	13	-	1g 3t	2g	-	1g	-
	14	-	-	-	-	1g 1t	-
	15	-	-	-	-	1g	-
	16	-	-	-	-	-	-
	17	-	-	-	-	-	-
	18	-	-	-	-	-	-
	19	-	-	-	-	-	-
	20	-	-	-	-	-	-
	21	1g	-	-	-	-	-

Appendix C (continued)

Salmon and trout angling above the mouth of Hill Brook (Moser River)

Note: The letter "g" in the following table is for "grilse," "s" for salmon, and "t" for "trout".

Date	5-8 a.m.	8-11 a.m.	11 a.m. - 2 p.m.	2-5 p.m.	5-8 p.m.	Time doubtful
June 23						2g
June 25					2g	
June 26						7g
June 27						2g
July 1						2g
July 2		2g				
July 6						1g
July 9	2g					1g 8t
July 11		1g 9t			1t	3g
July 13						4t
July 14					2t	4t
July 16						4t
July 17						2g
July 18						1g
Aug. 11						2g*
Aug. 13						28*

* Rocky Island Pool by Bob Donaseen.
* Taken in East Brook by H. O. White and Dick Wilder

Appendix D

Results of Experimental Perr Angling

Date	Fish Taken				Strikes				Rises				Breaking Water			
	5.30	9.30	1.30	6.30	5.30	9.30	1.30	6.30	5.30	9.30	1.30	6.30	5.30	9.30	1.30	6.30
July 24	0	-	0	2	4	-	2	4	0	-	0	1	1	-	2	10
25	1	0	0	0	3	2	3	4	1	0	0	2	0	0	0	3
26	1	0	0	0	1	0	0	1	0	0	0	0	0	2	1	1
27	2	1	0	0	2	2	0	1	0	0	0	0	3	2	1	0
29	0	0	0	0	1	3	0	0	0	0	0	0	2	1	0	6
31	0	0	0	1	1	2	0	1	0	0	0	1	0	0	1	2
Aug. 1	0	1	0	0	0	0	0	1	0	0	0	0	0	1	2	0
2	1	0	0	1	0	3	0	2	1	2	0	1	0	2	0	16
3	0	1	0	0	0	2	2	3	0	3	0	2	4	5	3	12
5	0	0	0	0	4	2	0	0	2	0	0	0	1	2	0	0

Appendix B.

Miscellaneous Notes - 1940

June 2 Sheet ore said to be more plentiful than usual in the nets in Moser river estuary.
Young eels observed opposite the Parlee House and at the Moser River bridge. Trout fry seen at Moser river bridge.

June 7 First report of salmon seen above the Moser river bridge.

June 8 to June 15 Smelt eggs found in very large numbers in Smith brook. Salmon parr collected there are extremely fat. Stomach analyses show them to be feeding voraciously on smelt eggs. Trout are also numerous in the lower part of Smith brook and are feeding on smelt eggs.

June 7 The medusa Tiaropsis diademata very common at Moosa Touch wharf on the evening high tide.

June 18 First grilse of the season was hooked just above the Moser river bridge at 5.30 a.m.

June 19 28.5 cm. sea trout taken just above the bridge at 5.30 a.m.

June 20 The day of the spate. Frank Moser took 2 jumpers at 8.30 a.m. from the Mill pond just above Moser river bridge. Salmon seen jumping above the bridge in the evening.

June 21 Salmon raised twice between 11 a.m. and 2 p.m. just below the bridge. Much angling but no fish taken.

June 22 9 a.m. jumper hooked and lost below the bridge. 4.30 p.m. H. C. White took a jumper from the Mill Pond. Salmon seen jumping by bridge in evening. Five fish said taken from Sheet Harbour river.

June 23 10.30 a.m. sea trout (24.5 cm.) taken below Moser river bridge. Salmon took 2 jumpers and lost one below bridge at 11 a.m. H. C. White 1 jumper below bridge at 12.30 noon.
Ottie Parlee 1 jumper below bridge at 1 p.m.
Leeve hooked and lost a jumper below bridge at 11 a.m.
All these fish were fresh run with sea lice on them.
7 fish said taken from Sheet Harbour river.

June 24 5.30 a.m. Ottie Parlee took one jumper and lost another below bridge.
5 a.m. Bezanson took a jumper below the bridge.
10.30 a.m. Frank Moser 2 grilse below bridge.
11.30 a.m. E. Drillio 1 grilse below the bridge.
1 p.m. Frank Moser took a Mill brook marked grilse above Mill dam.
7.30 p.m. Mill brook marked fish taken just above the bridge
Leeve took 2 jumpers at Clay Bank pool in evening.
Shellnut took 2 jumpers above Mill dam in evening. Two

Appendix 2 (continued)

June 24 (continued) others hooked and lost in evening above bridge.

Note: Constant angling all day - in morning fish taken below Moser river bridge in tide waters; in evening above the bridge and in the pools.

June 25 6 a.m. Holman took 1 grilse and lost 3 other in Mill Pond. Fish had sea lice on it.
One fish reported raised below bridge in early morning (4-6 a.m.)
Benanson 1 jumper at Clay Bank in morning.
2.30 p.m. Frank Moser rose 2 jumpers above dam but none taken.
8.30 p.m. 1 jumper taken at Clay Bank pool.
Ottie Parlee took 3½ lb. salmon and 1 grilse at Gaspereaux Falls in the evening.

June 26 Ottie Parlee raised 4 jumpers at Gaspereaux Falls in morning but lost them all. In afternoon 7 grilse in vicinity of Gaspereaux Falls.
4.30 p.m. 1 jumper taken at Oak Island, another there at 5 a.m.
6.30 p.m. White took 1 jumper in tidal area below the bridge.
7 - 7.30 p.m. many fish seen jumping in tidal waters below bridge.
One jumper taken just above bridge at 6 a.m., 9.30 a.m. and 11 a.m.

June 27 5-6 a.m. 1 grilse hooked and 2 raised above the bridge; 2 lost in the tidal waters.
8 a.m. Benanson took 1 below the bridge
9 a.m. Holman took jumper below the bridge
1 p.m. Moser took a sea-trout above the bridge
8 p.m. Ragler took jumper in Mill pond
3 grilse taken at Gaspereaux Falls in morning and 2 in p.m.

June 28 8.30 a.m. Brillie took at Mill Brook marked fish in tidal stretch below Moser river bridge.
Noon - 2 grilse taken from Clay Bank pool.
5.00 p.m. White took a Mill brook marked fish just below the Moser river bridge.

June 29 Benanson took 2 grilse on the bend of the river below the bridge.
9.30 a.m. Shellgent took a jumper below the bridge.
During the past week Frank Moser took 9 grilse; Ken Ragler took 8.

June 30 Specimen of Ulvaria subbifurcata taken by P. F. Elson at West Head [illegible].
It is said that one fisherman took 22 grilse from the Lissamb river in the past 3 days - and that 13 of these were taken yesterday (June 29).

Appendix E (continued)

July 1 — 1 grilse taken below and 1 above the bridge in the early morning.
9 a.m. grilse taken from Clay Bank pool.
Carver took a grilse at Gaspereaux Falls in a.m.
Two large salmon hooked and lost above the bridge today.

July 2 — Moser took 3 large sea trout in the lower tidal stretch of river in the morning.
Many fish seen jumping in the pool above Moser river bridge today, but few were taken.
11.30 a.m. Parlee took 3 jumpers at the head of tide.
9 a.m. Zwicker and Shellnut each got one jumper at Gaspereaux Falls.
4 jumpers taken below the bridge during the morning.
10 lb salmon taken from the pool above bridge in evening.

July 3 — 4 to 5 a.m. 3 sea trout taken below the bridge and 2 just above it.
7.30 a.m. jumper taken below the bridge.
Sea trout taken from Clay Bank pool during the morning

July 4 — Noon - Drillio took 1 grilse and 2 trout from the Mill pond
2.30 p.m. Parlee took 1 jumper from the pond.
Spears took 1 jumper at the head of tide in the evening.

July 5 — 8.30 a.m. 2 trout taken below the bridge.
9 a.m. Spears took a Mill brook marked fish at the mouth of the river.
9 a.m. F. Moser took a trout from the Mill pond and raised a grilse.
11.30 Shellnut took a jumper from the Mill pond.
4 p.m. 4 trout taken above the bridge.
5 p.m. a jumper taken at the mouth of the river and another half way up to the bridge.
Between 5.30 and dark there were 10 jumpers and 14 trout taken mostly below the bridge

July 6 — A fisherman says that he once saw the sea trout die on a very warm day in Halfway brook (near Short Harbour).
It is also said that about 8 years ago a number of trout were found dead on the shore of Kelly lake.

July 7 — Parlee took 2 grilse in the early morning below the bridge with sea lice still on them.
Noon - 1½ lb. trout taken at Clay Brook pool by O. Parlee
6 a.m. Bonnaven took 2 grilse and 3 trout at Clay Bank.

Appendix B (continued)

July 9 4 p.m. Moser took a jumper at Clay Bank

July 10 8.30 p.m. White took 1 jumper and raised another below the bridge.
Fish seen jumping in Mill pond today and yesterday but few could be taken.
A small sturgeon (22 inches) was taken in a 6 inch mesh net set at Smith beach. Clifford Smith says that he once took a 50 lb. sturgeon in his salmon net.

July 11 Moser hooked and lost 2 grilse in pond at noon.
Parise took 1 trout and lost 2 grilse at Gaspereaux falls in evening.
1 Mill brook marked and 1 unmarked jumper taken from Mill pond in the evening.

July 12 Moser took 1 jumper from Mill pond about 5 a.m.
Parise took 1 jumper below the bridge about noon.

July 17 2 grilse taken about 1½ miles up river.

July 18 Grilse said to be taken at Long Lake last week.
11 a.m. 1 jumper taken and 3 raised at salmon hole.
8.20 p. m. grilse taken just above the bridge (water temp. 73.2°C.).
Another grilse was lost and a trout taken at approximately the same time. Another grilse raised above bridge at 8 p.m.
Many salmon seen concentrated at the mouth of Salmon brook this evening. The temperature of the brook was 15.5°C., that of the river 23.2°C.

July 21 6 a.m. C. Parise took a 9½ lb. salmon from the Mill pond. This fish was very dark and had apparently been in the river a long time. 2 trout also taken above the bridge at about 6 a.m.

July 22 Seining in Smith Brook for young salmon and trout. The salmon parr are as numerous as on the previous occasion (June 13), but not as soundly fat. No trout could be found below the road bridge. They were numerous here on June 13. Trout, however, were found farther up the river where the water was cooler.

July 26 Young gaspereaux of the year first seen just above the Moser River experimental trap.

Appendix E (continued)

July 27 - Many fish were seen jumping in John Louve's Still but none taken.
7:30 p.m. G. Perlee found an almost dead salmon on the slope just above the Mill Pond. This fish apparently died of the very high temperature (29.0°C. or more) during the late afternoon. During the afternoon I saw trout kept in a box near the thermograph above the Moser river bridge died.

July 28 3.30 p.m. temperature in Moser river at the mouth of Holman brook was 27.3°C; while at other points in the river above the bridge it ranged from 29.8° to 29.8°C.
Many parr and fry were observed in the water at the mouth of Holman brook.
Salmon were observed in numbers under the bridge in the afternoon and many of them came into the smaller areas of water near shore.
During the morning grilse were seen jumping above the bridge.
Ottie Perlee fished in North Brook in afternoon and took 3 small trout.

July 30 Grilse seen jumping in Mill pond at 10 a.m. and observed almost every day for the next three weeks while the water was very warm and its level low. This jumping could be observed at almost any time. It was no use, however, to try to take the fish on the fly.

Aug. 6 10 a.m. trout taken on fly in Second lake.

Aug. 7 3 trout taken in late afternoon at the head of Mill lake.

Aug. 11 Benneson took 2 jumpers at Rocky Island pool.

Aug. 13 Dead grilse found at Moser river bridge with large recent spear marks.

Aug. 14 Ctenophores very common at Marie Joseph in the afternoon. Aurelia and Cyanea were very common at Marie Joseph on June 30.

ATLANTIC SALMON AND TROUT INVESTIGATIONS 1940

Report No. II. Further studies of the smolt metamorphosis - 1940

By W. S. Hoar

In our report of 1939 it was stated that salmon parr treated with potassium iodide, with thyroid tablets, or with thyrotropic pituitary hormone showed certain changes similar to those seen in the parr transforming to a smolt.[1] Histological examination of the material dealt with in that report has shown that the thyroid gland was very definitely stimulated by such treatments. The thyroid pictures were the ones expected from the studies of other workers on different vertebrates.[2] Iodides result first in a marked storage of colloid then in a degeneration of the gland, thyroid tablets bring about a pronounced involution of the organ, and pituitary hormone an active hyperplasia. This summer an attempt was made to check the former experiments, to carry them out on smaller fish, and to obtain material for histological studies on tissues other than the thyroid.

Since the change from parr to smolt is a gradual one, the prime difficulty in connection with the work is to determine just when the fish ceases to be a parr and becomes a smolt.[3] Parr cannot tolerate full strength sea water while the smolt can, and the sea water test should be crucial in determining which fish we are dealing

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1 HOAR, W. S. 1939 MS Report, Fisheries Research Board of Canada.

2 SCHREIBER, E. A., Quart. Rev. Biol., 14, pp. 189-213; 451-458; 1939
WARREN, H. B., J. Exp. Zool., 83, pp. 117-139, 1940.

3 HOAR, W. S., and W. A. HOAR, J. Fish. Res. Bd. Can., 4, 1939.

with. However, the following experiments on sea trout and salmon smolts have shown such a test to be inadvisable.

In the tests, sea trout and salmon smolts were exposed to full strength sea water. Control fish were kept under similar conditions in fresh river water. The results may be summarized as follows:

11.2 cm. salmon parr - lived from 12 to 20 hours - temp. range 11.2°C. - 12.1°C.

17.3 cm. salmon smolt - lived 32 hours - temp. range 10.3°C. to 12.1°C.

19.0 cm. salmon smolt - lived from 60 to 63 hours - temp. range 13.3°C. - 14.3°C.

18.0 cm. brook trout - lived from 11 to 22 hours - temp. range 10.2°C. - 11.4°C.

22.5 cm. Miner River somewhat silvery trout. - lived 36 to 48 hours temp. rang 10.2°C - 11°C.

14.5 cm. Miner River somewhat silvery trout - lived 12 to 22 hours temp. range 10.2°C. - 11°C.

18.0 cm. Miner River sea trout smolt - lived 24 hours - temp. range 12.3°C. - 13.6°C.

19.0 cm. Miner River sea trout smolt - lived 24 hours - temp. range 12.3 - 13.3°C.

In every case the smolt died when exposed for a long time to salt water. These results do not agree with the findings of others[1] and it is suggested that our specimens may have been somewhat weakened through retention or that they were confined in too small a space. It may be emphasized, however that the control fish lived in every case. The smolt did survive somewhat longer than might be expected from our studies of salmon parr (between 32 and 60 hours as compared to a computed 28 hours for salmon parr of corresponding size). The work should be carried further. From our studies we

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1 Huntsman, A. G. and W. S. Hoar, J. Fish. Res. Bd. Can., 4, pp. 409-411, 1939.

conclude only that the smelt is not immediately and completely adapted to salt water, and that we cannot rely on this test in connection with our experimental fish which are frequently in a weakened condition through the prolonged treatments.

In the thyroid experiments proper, eleven pair of two sister-yearling and 2-year old fish were treated as follows:

a. with intraperitoneal injections of 0.75% solution (aqueous) of potassium iodide once daily and once every second day.
b. feeding of thyroid tablets (Burroughs Wellcome and Co. preparation of compressed thyroid gland) once fish daily and once every second day.
c. with daily intraperitoneal injections of anterior pituitary thyrotropic hormone (procured through courtesy of Dr. J. B. Collip, Dept. of Biochemistry, McGill University).
d. with intraperitoneal injections of the thyrotropic hormone and the 0.75% solution of potassium iodide given on alternate days.
e. with intraperitoneal injections of 0.75% aqueous solution of sodium chloride for a control.

In addition to the eleven pair, nine for brook trout were treated by each of the methods mentioned above. All fish were fed from time to time with pieces of earthworm, liver, or living gammarids.

A complete report of the experiments will be submitted when the various tissues have been examined microscopically. The results evident macroscopically may be summarized as follows:

Treatment with Potassium Iodide - Experiments with 10 fish were commenced on June 25 and continued until August 20. The yearling parr received injections of 0.25 cc. of 0.7½ potassium iodide and the 2-year olds 0.5 cc. of the same solution. Changes in some fish are apparent after from 10 to 15 treatments. Parr bands and pigment spots are less definite. The fish become lighter and gradually assume a bluish silver colour in contrast to the golden silver of the parr. The scales seem off more readily and mucus is poured out more copiously from the skin when the fish is handled. These changes take place gradually, the degree of change being dependent on the number of treatments. Although the changes described seemed definite enough in some fish, none of the fish could be classed as typical smolts even at the end of 3 months. It will be recalled that one of the parr treated last year was classed as an almost typical smolt at the end of the experiment.

The trout treated with potassium iodide showed no external changes at the end of 1½ months.

Treatment with Compressed Thyroid Gland - Thirteen salmon parr and 2 trout were treated for varying lengths of time up to almost 3 months. Different sized fish were tested with 2 different sized tablets, one containing the equivalent of 0.065 gm. of fresh gland substance - 1/3 gr. U.S.P. thyroid - the other 0.13 gm. of fresh gland substance - 2/3 gr. U.S.P. thyroid. The initial response was similar to that described for the fish treated with potassium iodide. Moreover, three of the fish - one yearling parr and 2 two-year-olds-which had been treated for from 45 to 50 days showed

such extreme changes that they could no longer be classed as parr. The parr markings were well chlorotod on these fish, the silver deposits being particularly heavy below the lateral line. The fins, top of the head and nose were rather black. Black spots were prominent on the operculum. The scales examined under the binocular showed heavy deposits of guanin crystals.

No certain changes could be traced in the tank treated with the emphysaed gland.

On the whole, the results with the thyroid gland seemed more consistent than those with potassium iodide. This may be due to the fact that iodine eventually causes a degeneration of the thyroid of the fish - after a longer or shorter time - and the result transformation is a very slow process. The threshold dose of emphysaed gland necessary to cause change in parr was not determined. A parr of 13.8 cm. responds to as little as 0.065 gm. of fresh gland substance every second day.

Treatment with Thyreotropic Hormone and with Hormone plus Pot. Iodide

From July 13 to August 17, ten fish were treated daily with 0.3 cc. of thyreotropic hormone and ten fish with injections of 0.3 cc. of hormone and 0.3 cc. (or 0.35 cc. depending on the size) of 0.75% potassium iodide on alternate days. Little difference was noted between the two series. Because of the scarcity of hormone the treatments were not carried on as long as we would like to have. The most pronounced change noted in these fish was a decreased resistance to the growth of fungus. Several fish died before the close of the experiments with heavy growth of fungus on the tail and back. It may be stated here that smolt cannot be confined

to hosts because of their low resistance to fungus. The slightest injury results in a luxuriant growth.

Summary - The results are less spectacular and consistent than we had at first expected, and until the material has been studied histologically we cannot say just what has taken place. However, it still seems from external appearance that certain changes - deposition of gumin crystals, loosening of scales, decreased resistance to fungus - can be induced in scales pore through treatments with iodine and thyroid substances.

ATLANTIC SALMON AND TROUT INVESTIGATIONS 1940

Report No. XII. Temperatures, water heights and Round Lake dam, 1940.

By A. Colin Nicol.

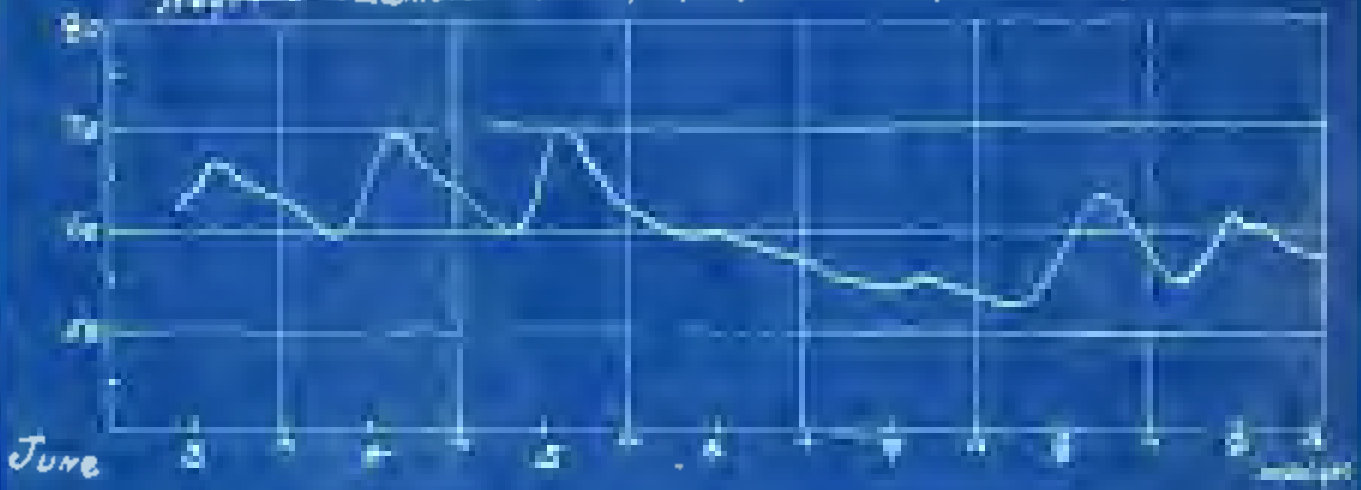
1. Thermograph Record, Moser River at trap.
   Negretti and Zambra Thermograph
   Corrected by adding 1.5° F. to bring into correspondence
   with "Margaree A."

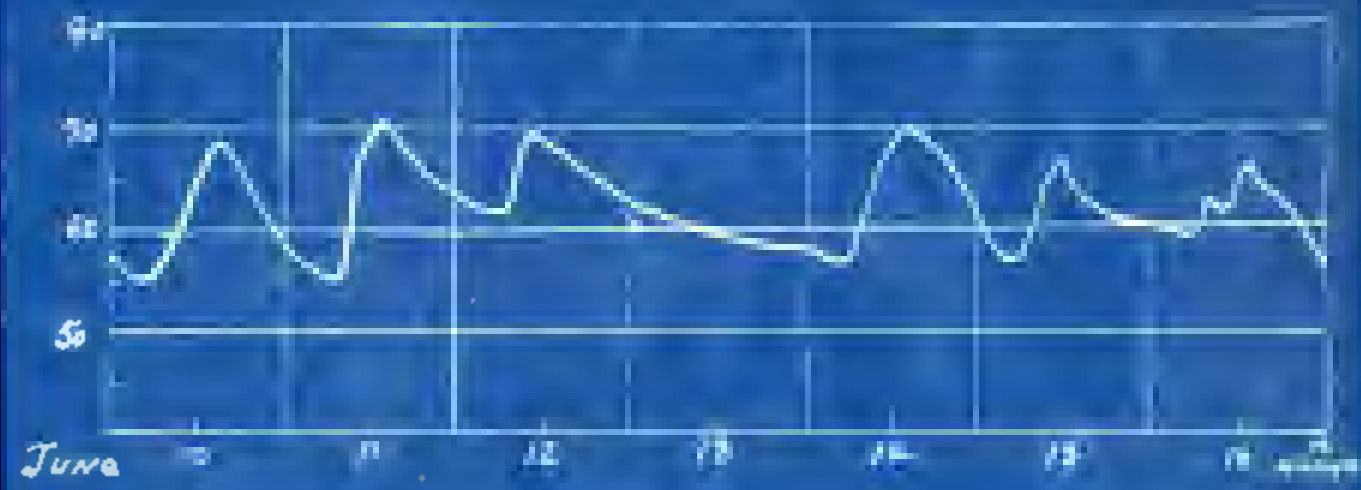
Thermograph Record Moser River, 1940.

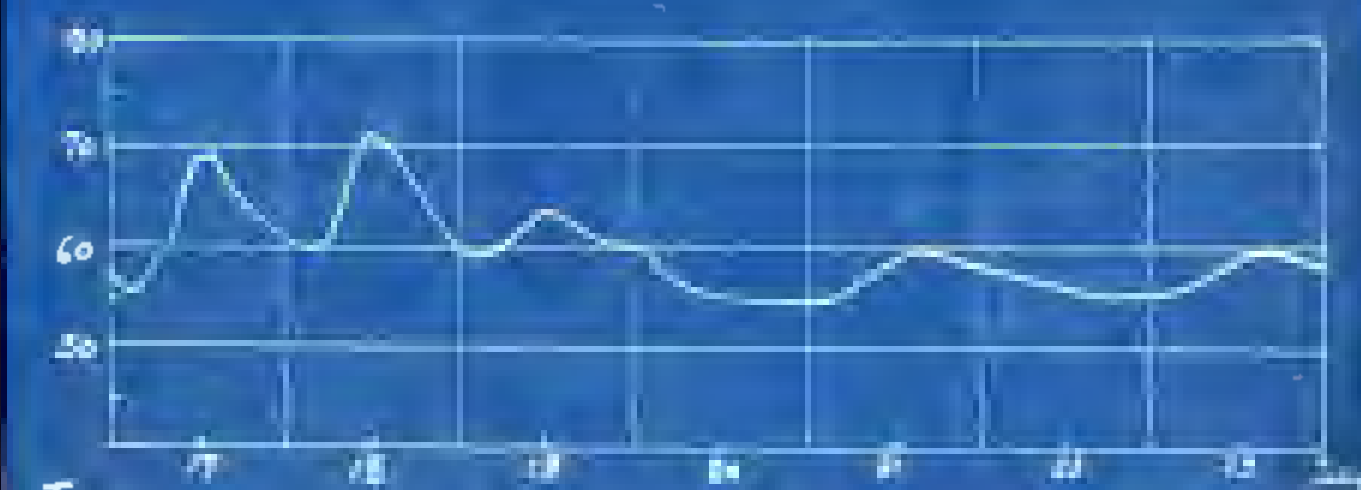
Trap above Mill Lake Brook

°F

Negus "Zembra" Thermograph (Corrected against "Morgrove A")





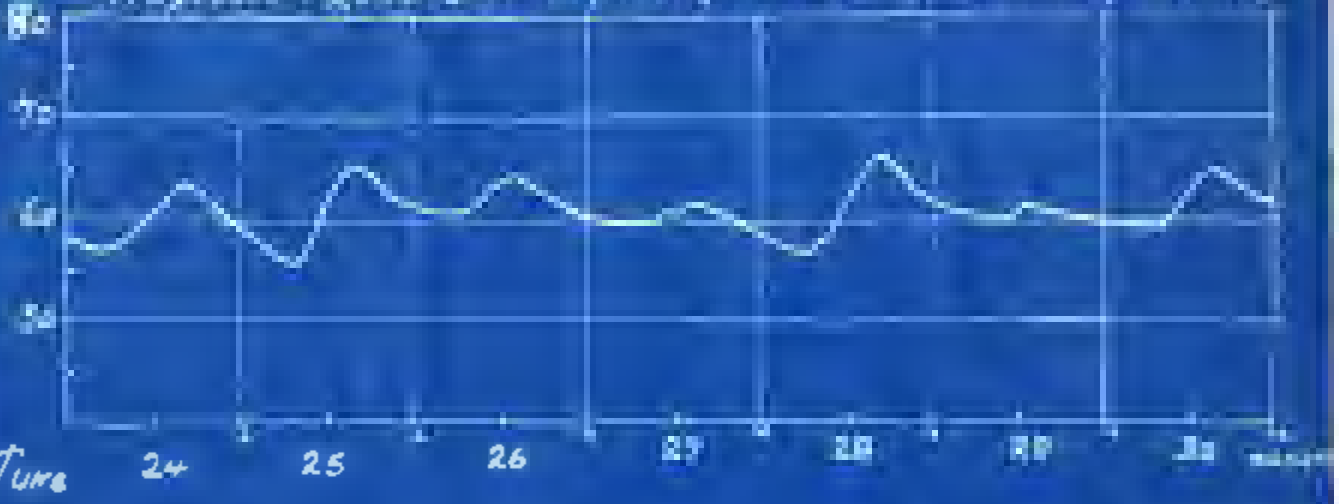


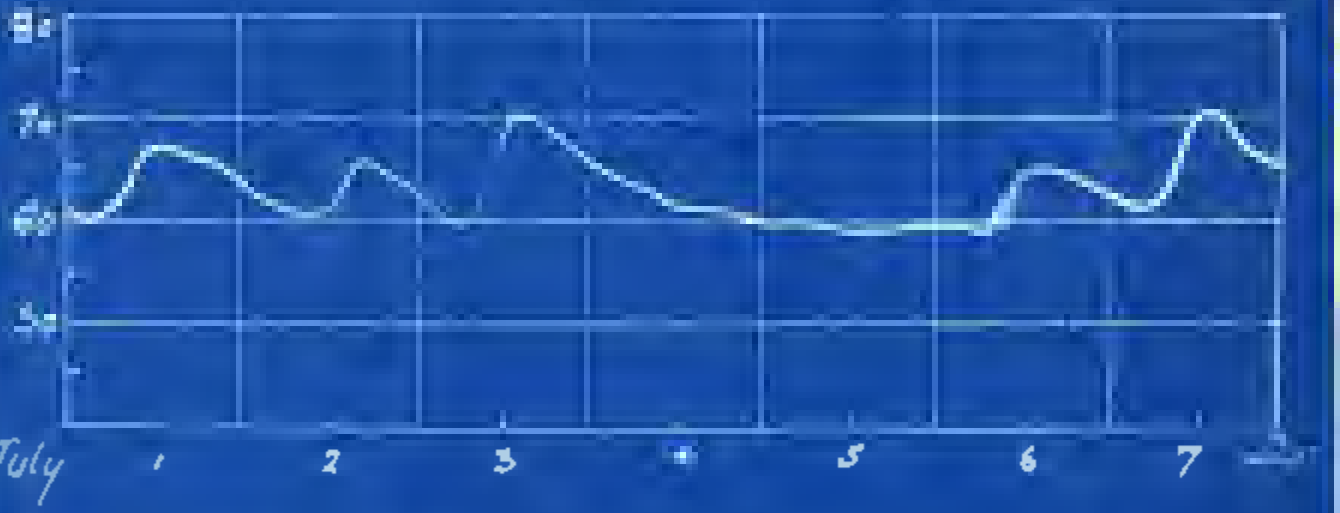
Thermograph Record - Water Temp. 1912

Trap above Mill Lake Brook

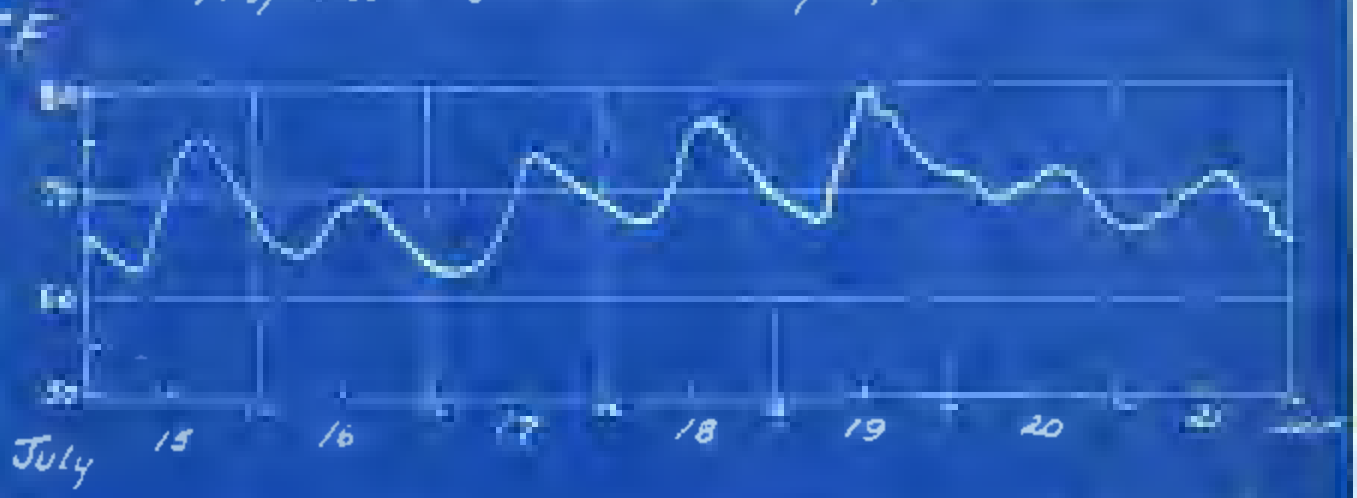
°F

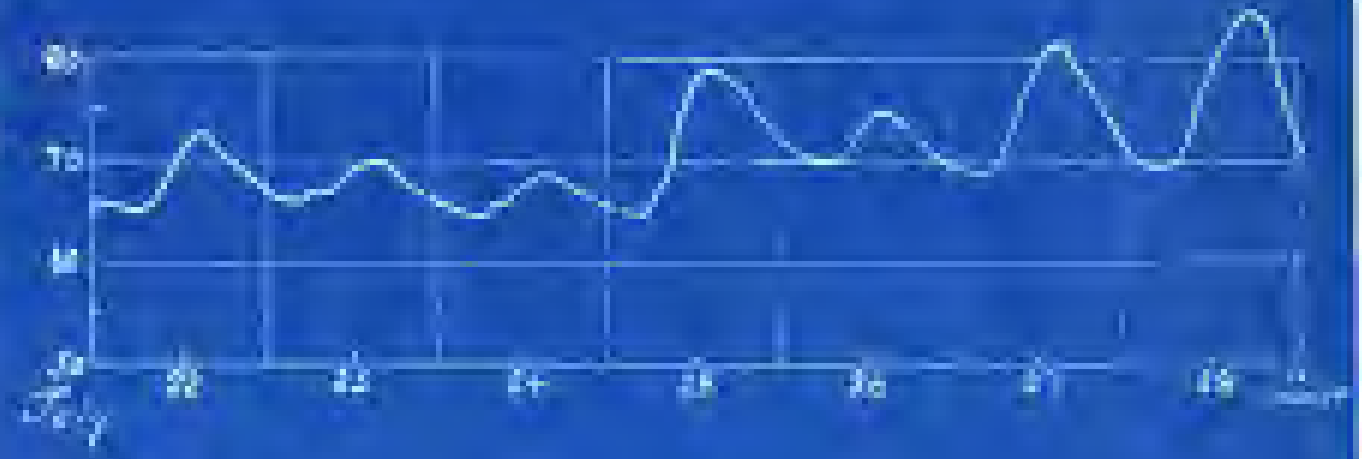
Taylor's Tower Thermograph (Corrected against Mercurial Thermometer at 7)





Thermograph Record Moser River, 1940
Trap above Mill Brook.
Negretti & Zambra Thermograph (Corrected)

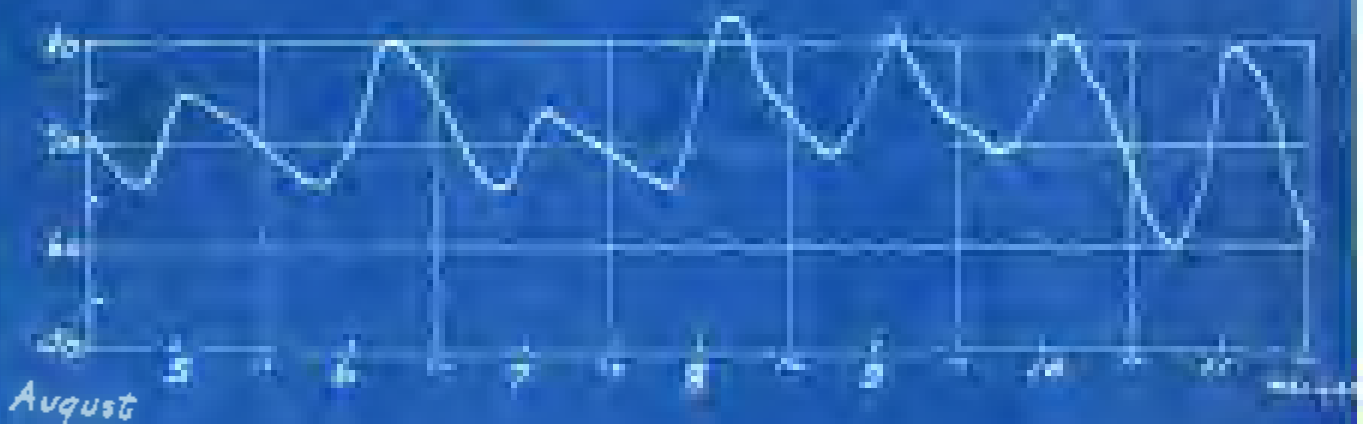




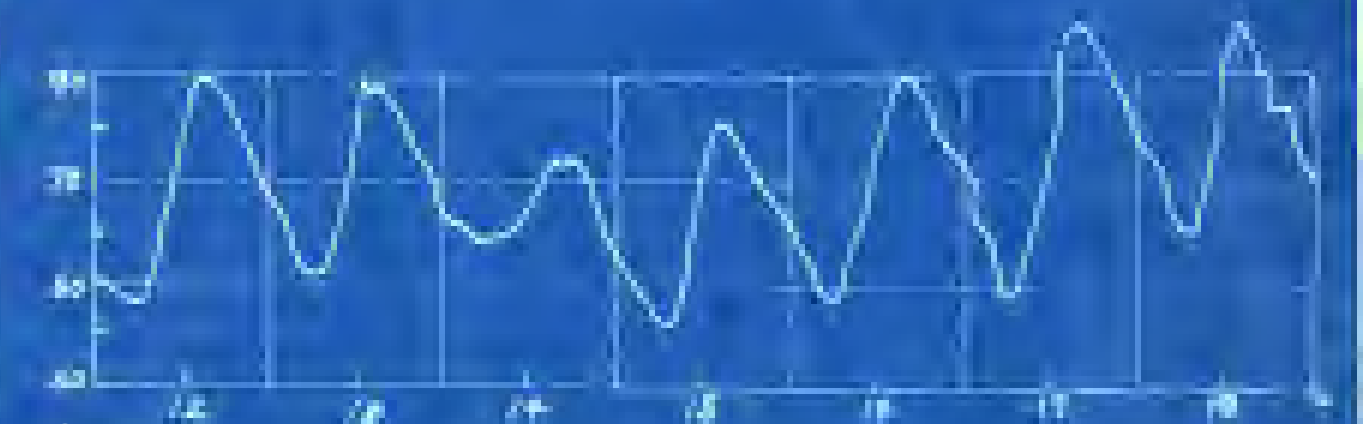
Thermograph Record, Moser River, 1940

Trap above Mill Brook

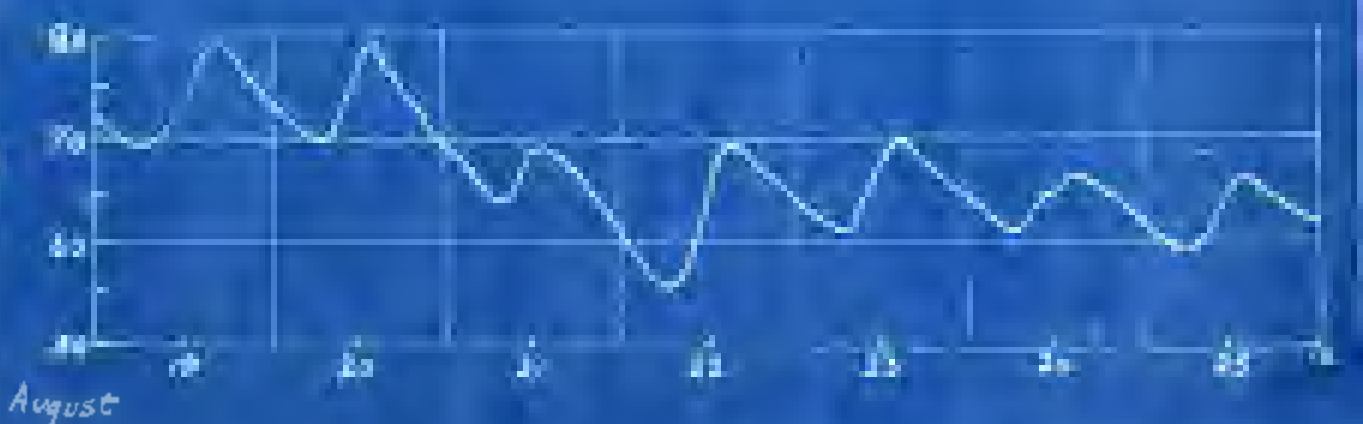
Negretti & Zambra Thermograph (Corrected)



August



August

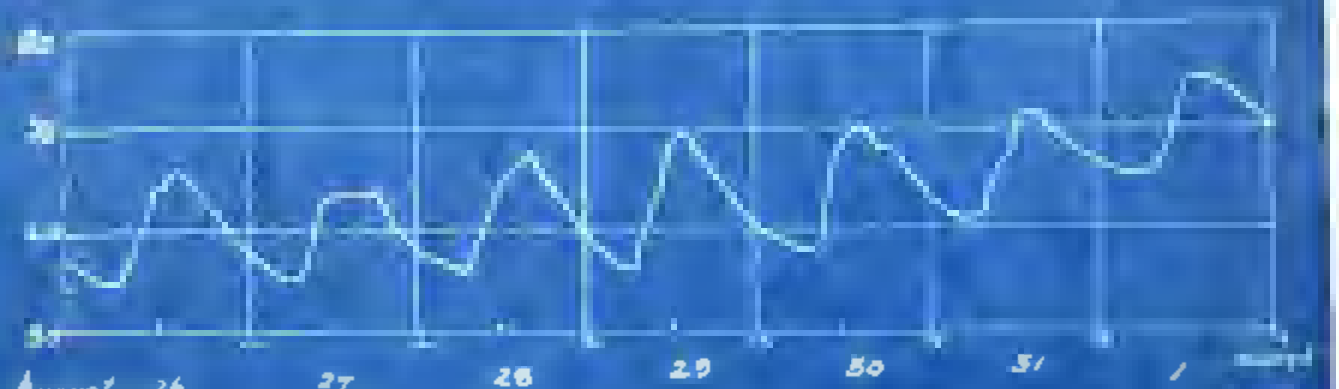


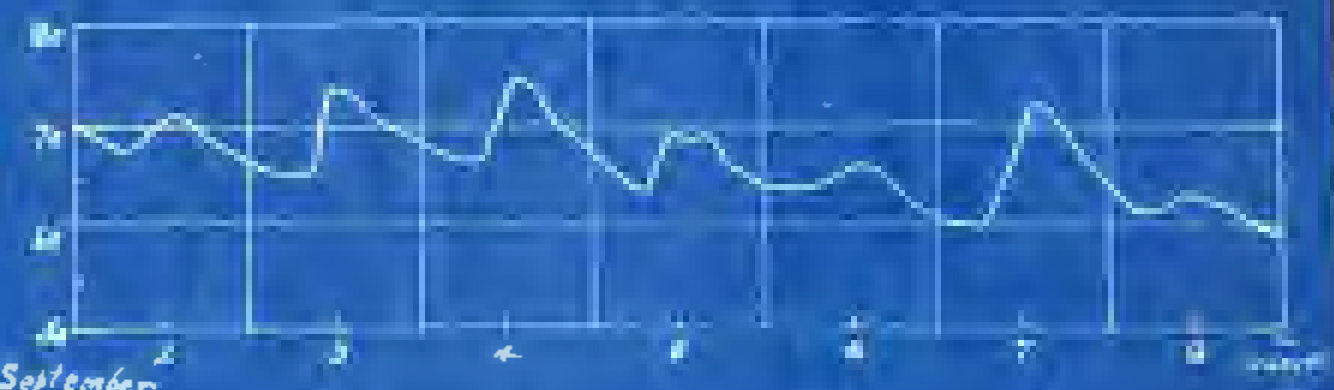
August

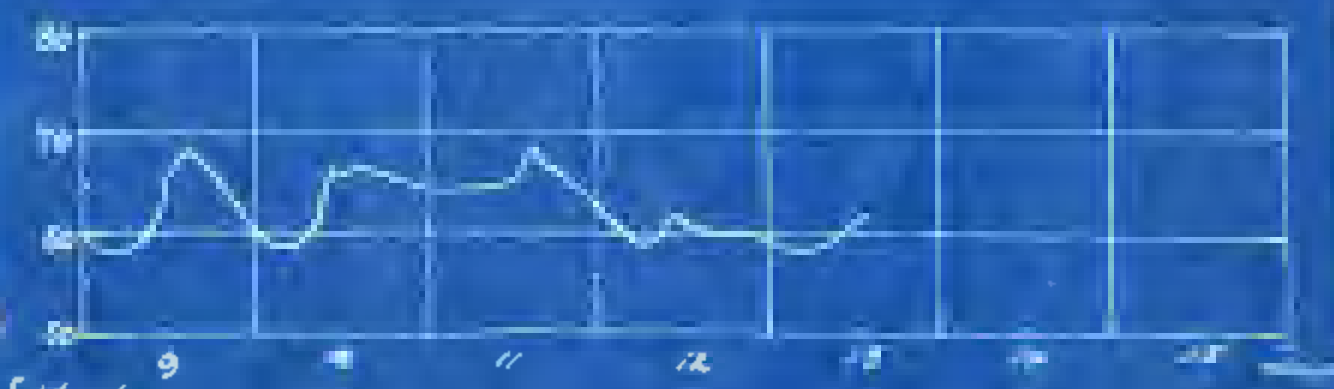
Thermograph Record Moser River, 1940

Trap above Mill Brook

°F







2. Temperature, Moser River at Bridge

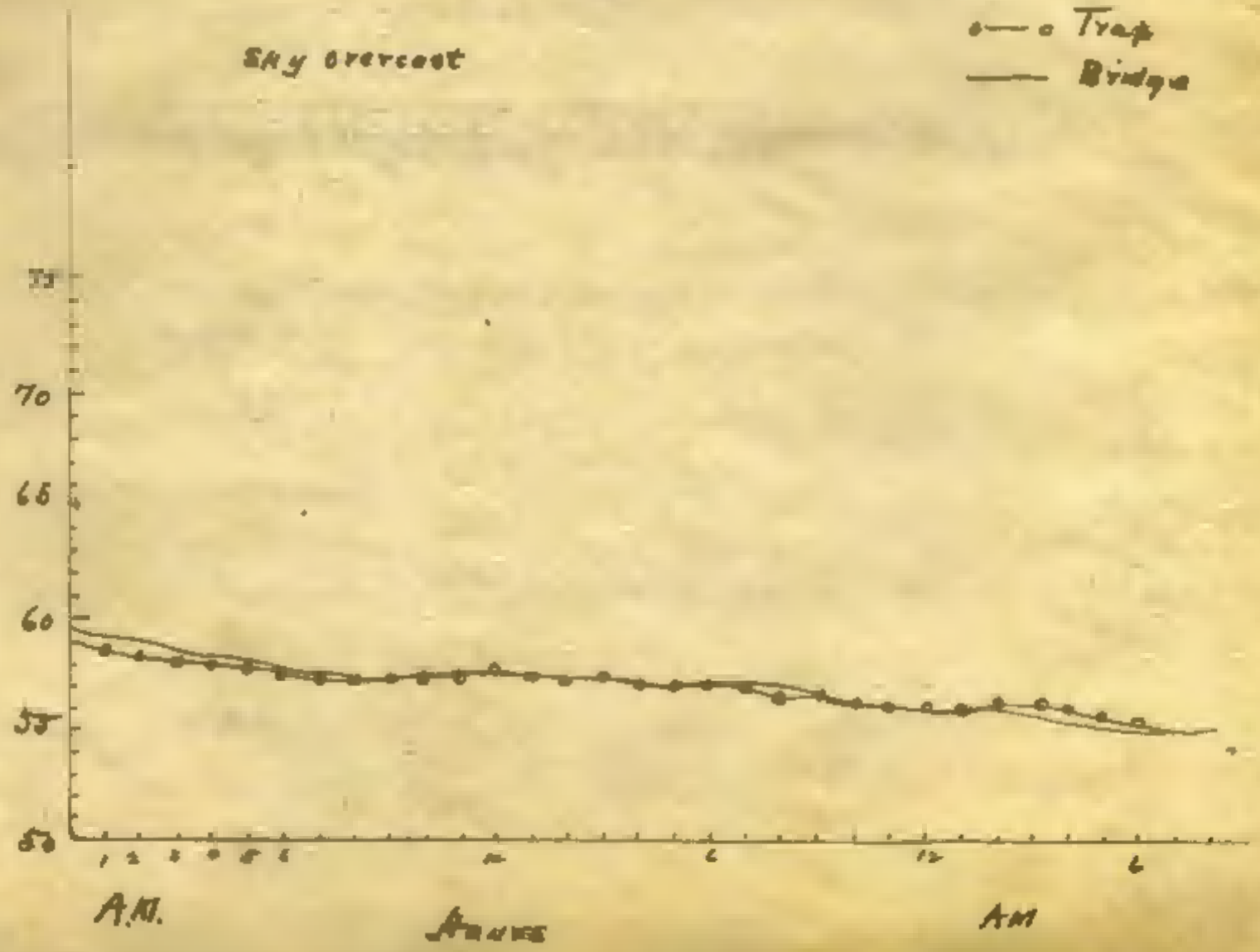
June 4 - July 16, Palmer Thermograph Records.

July 16-Sept. 13, Record constructed from Negretti and Zambra

thermograph further up river at camp.

°F

Comparison of thermograph records at bridge & trap



	Scale in 1/12 inches above 30°F.	Low (morning)	Scale in 1/12 inches above 30°F.	High (2 p.m.)
June 4	-		1.66	
	0.888	2/3	1.77	1/3
	0.833		0.944	1/3
	0.44	1/3	0.5	
	0.388	2/3	1.166	
	0.44	1/3	1.11	1/3
	0.5		1.38	2/3
	0.166	1/3	0.888	
	0.77	1/3	0.833	2/3
	0.611		1.72	2/3
	0.77	1/3	1.44	1/3
	0.83		0.888	2/3
	1.5		0.833	
	0.5		1.611	2/3
	0.833		1.94	1/3
	0.722	2/3	1.166	
	0.44		0.5	
	0.33	2/3	0.56	1/3
	0.22		0.33	2/3
	0.44	1/3	0.47	1/3
	0.47	1/3	1.88	1/3
	0.47	1/3	1.88	2/3
	0.88	2/3	1.166	
	0.833		0.944	1/3
	0.722	2/3	1.33	2/3
	0.88	2/3	0.938	
	0.833		1.5	
July 1	0.88	2/3	1.61	1/3
	0.88	2/3	1.61	1/3
	0.64	1/3	1.69	1/3
	1.166		1.88	
3	0.83		0.888	2/3
	0.77		1.77	1/3
	0.94	1/3	1.61	1/3
	1.27	1/3	1.69	1/3
	1.166		2.05	
	1.33		2.055	2/3
	1.38	2/3	1.88	2/3
	1.38		1.72	
	1.38		1.33	
	1.88		2.11	1/3
	1.11	1/3	1.44	2/3
	1.11	2/3	2.05	
	1.055	2/3	2.11	1/3
	1.33		2.11	2/3
	1.44	2/3	1.88	2/3
	1.55	2/3	2.05	
	1.88	2/3	2.05	2/3
	1.88	2/3	1.72	
	1.88	2/3	1.44	
	1.166		2.38	

		Scale in 1/12 inches above 30°F.	Low (morning)	Scale in 1/12 inches above 30°F.	High (2 p.m.)
July	25	0.77	2/3	2.11	75 2/3
	26	1.44	1/3	2.46	82
	27	1.48		2.81	84
	28	1.39	2/3	2.77	83 2/3
	29	1.41		2.144	76
	30	1.39	2/3	2.44	77 2/3
	31	1.39	2/3	2.144	76
Aug.	1	1.055	2/3	2.00	74
	2	0.83		1.94	73 2/3
	3	1.28	2/3	2.46	80
	4	1.55		2.055	74 2/3
	5	1.33		2.38	81
	6	1.39	2/3	1.94	73 2/3
	7	1.39	2/3	2.42	80 2/3
	8	1.38	2/3	2.42	80 2/3
	9	1.61	1/3	2.42	80 1/3
	10	0.88	2/3	2.83	80 1/3
	11	0.72	2/3	2.5	80
	12	0.86	1/3	2.5	80
	13	1.22	2/3	1.94	73 2/3
	14	0.5		2.144	76
	15	0.44	2/3	2.61	81 1/3
	16	0.46		2.055	82 2/3
	17	1.33		2.94	81 1/3
	18	1.55	2/3	2.5	80
	19	1.48	2/3	2.44	79 1/3
	20	1.11	1/3	1.83	68 2/3
	21	0.5		1.72	71
	22	0.80	2/3	1.77	71 2/3
	23	0.728		1.33	66
	24	0.722	2/3	1.39	64 2/3
	25	0.583	2/3	1.33	64
	26	0.44	1/3	1.28	64 2/3
	27	0.5		1.41	69 2/3
	28	0.5		1.72	70 2/3
	29	0.5		1.77	71 2/3
	30	1.00		1.94	73 2/3
Sept.	1	1.39	2/3	2.111	76 2/3
	2	1.5		1.77	71 2/3
	3	1.27	1/3	2.05	74 2/3
	4	1.22	2/3	2.11	75 2/3
	5	1.144		1.88	72 1/3
	6	1.144		1.88	72 2/3
	7	0.888		2.00	74 2/3
	8	0.94	2/3	1.144	74
	9	0.722	1/3	1.55	68 2/3
	10	0.722	2/3	1.44	67 1/3
	11	1.11	2/3	1.61	69 1/3
	12	0.722	1/3	1.00	68
	13	0.75	2/3	1.055	68 2/3

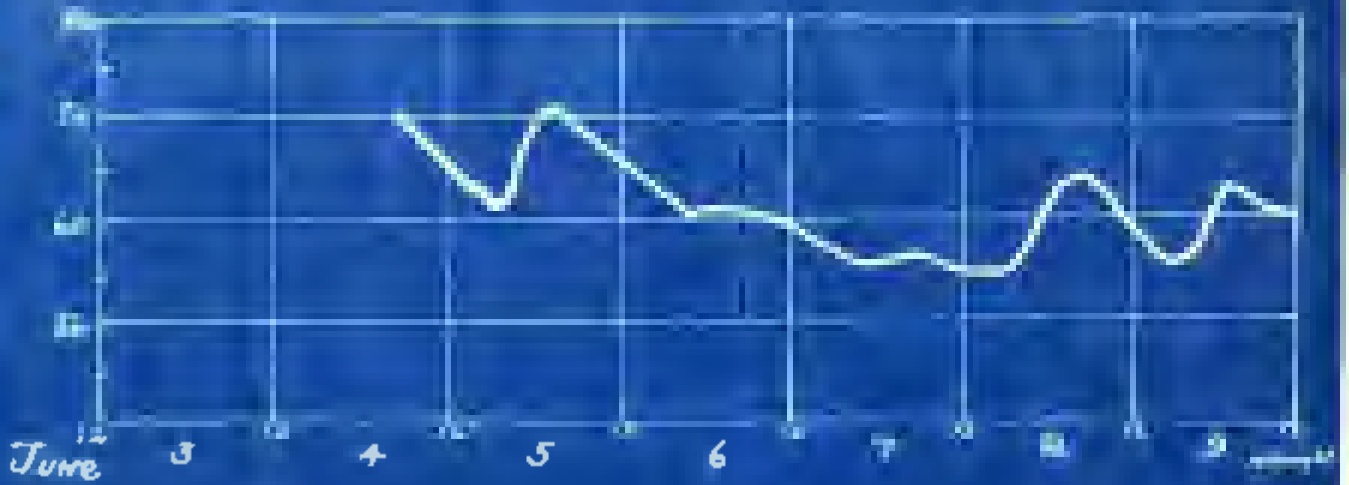
8. Temperature, Upper River at Bridge

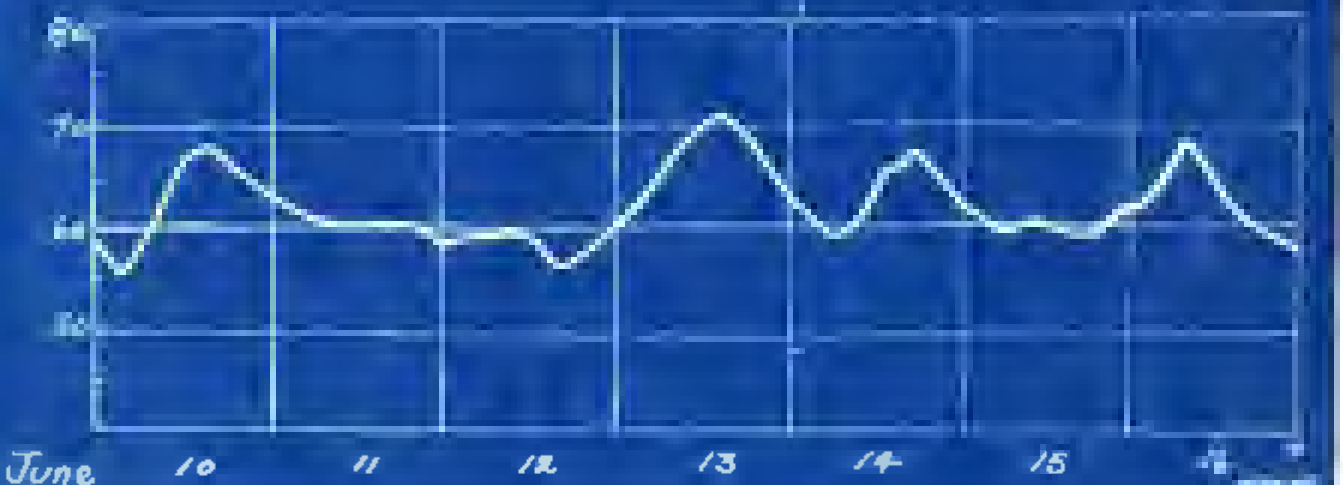
June 4 - July 16, Palmer Thermograph records.
July 16-Sept. 13, Record constructed from Negretti and Zambra thermograph further up river at trap.

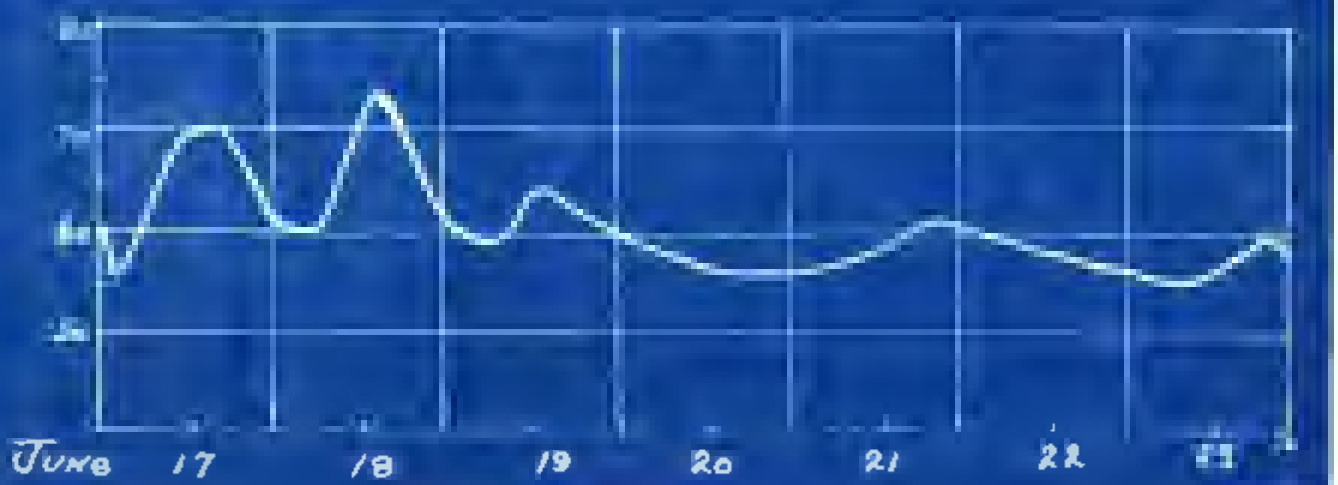
Thermograph Record – Moser River 1940

Bridge

°F Palmer Thermograph





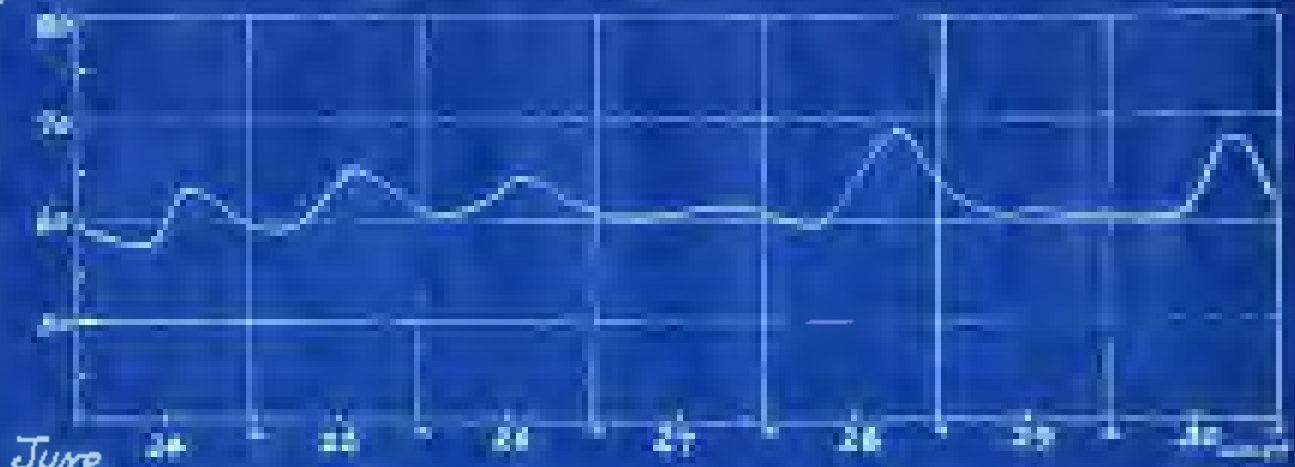


Thermograph Record Sheet

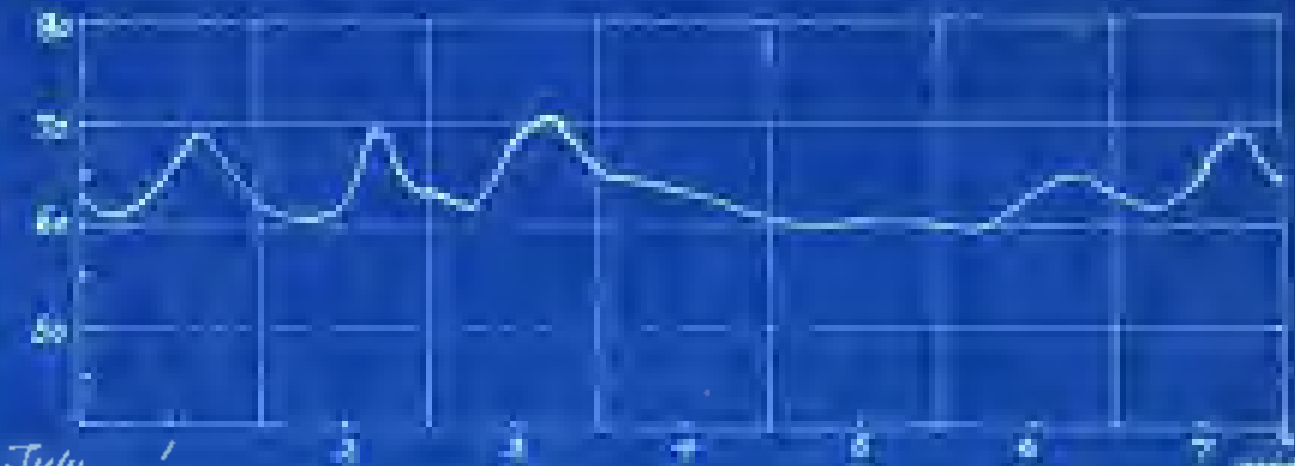
Bridge

Palmer Thermograph

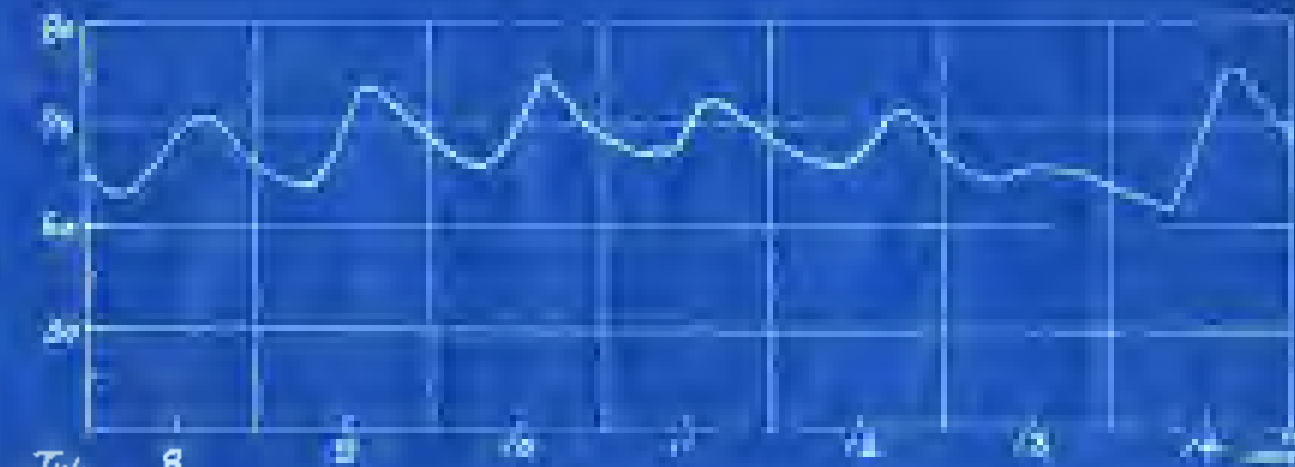
°F



June



July



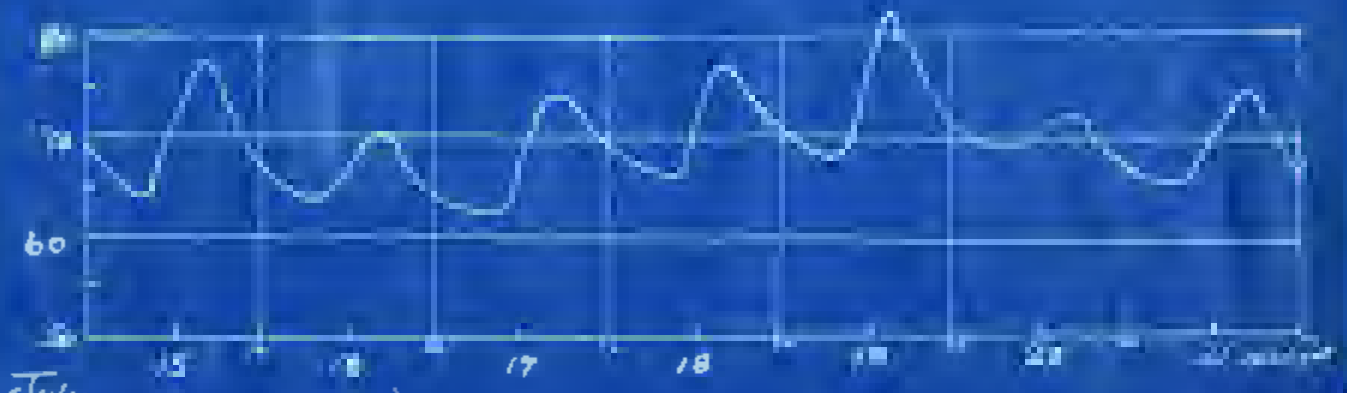
July 6

Thermograph Records Moser River, 1940

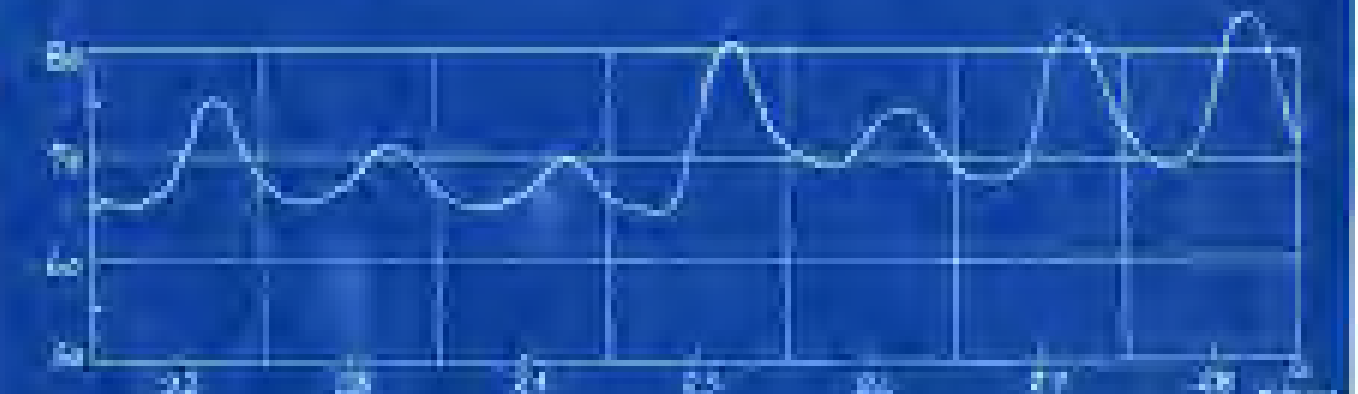
Bridge, Shore Road

Palmer Thermograph

°F



July

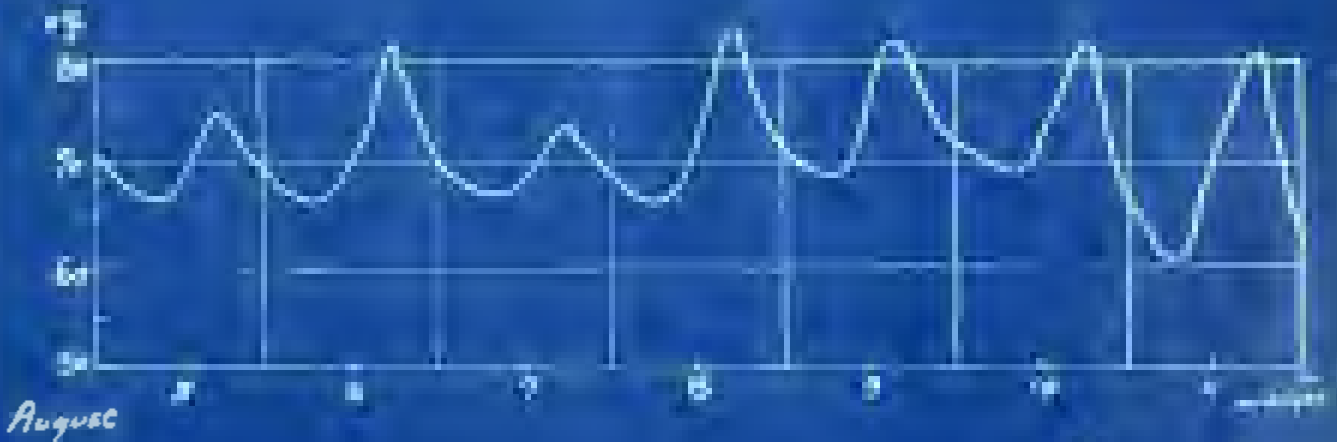


July

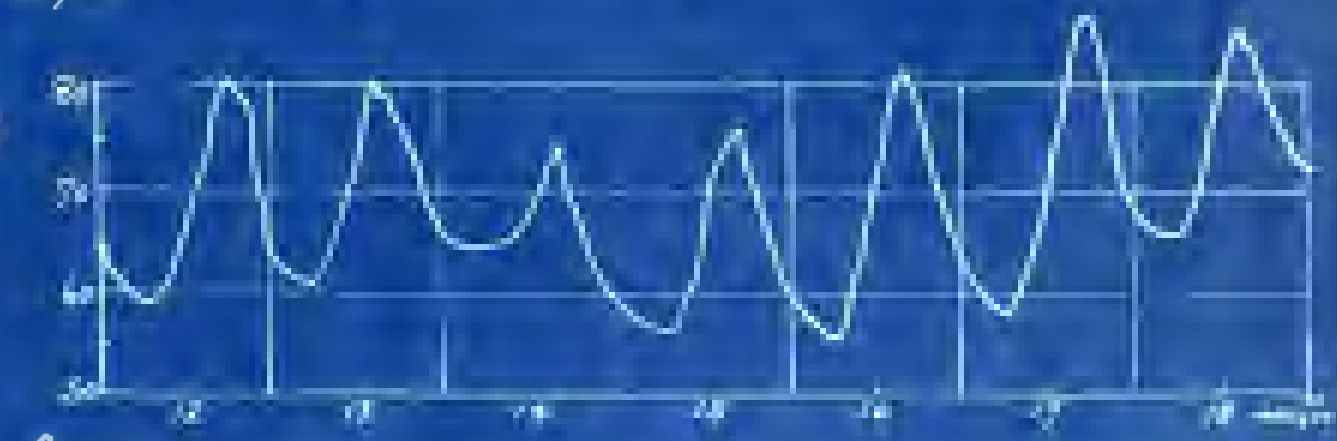
July

Thermograph Record, Moser River, 1940

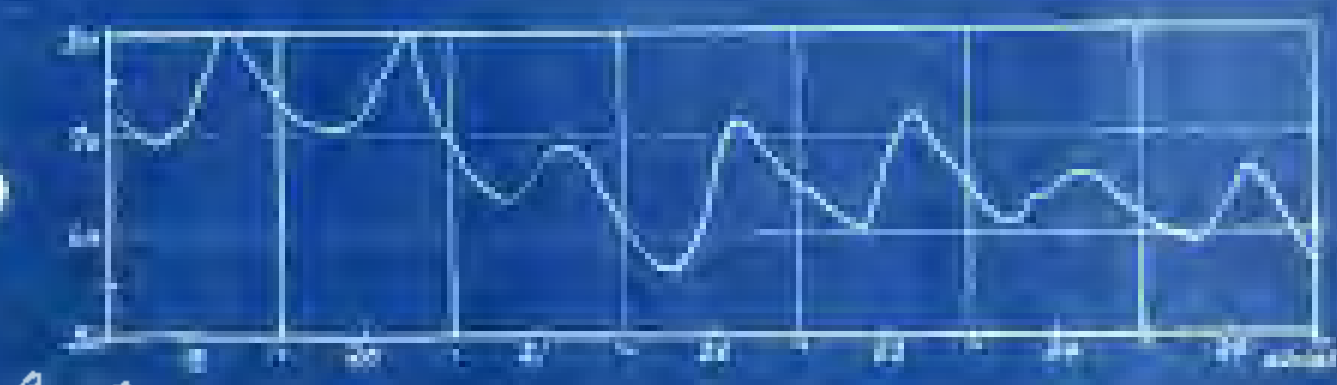
Bridge, Shore Road



August



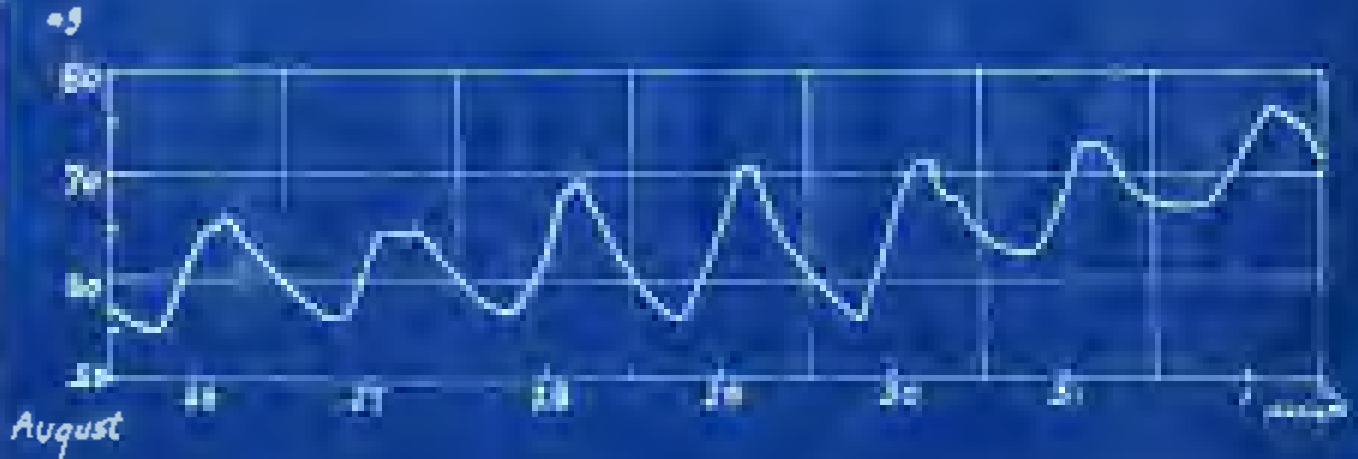
August

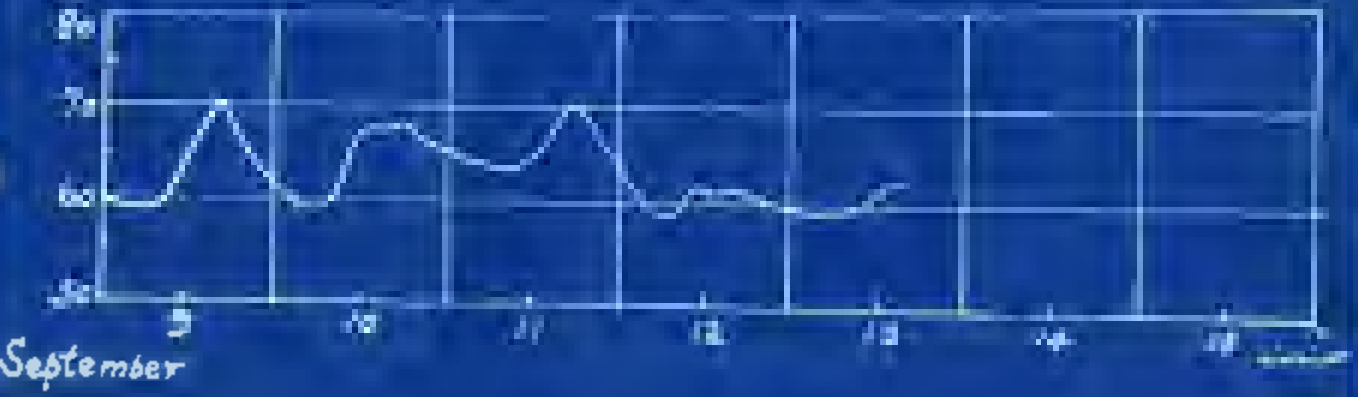


August

Thermograph Record, Moser River, 1940

Bridge, Shore Road





5. Temperature. Hill Brook at Trap.

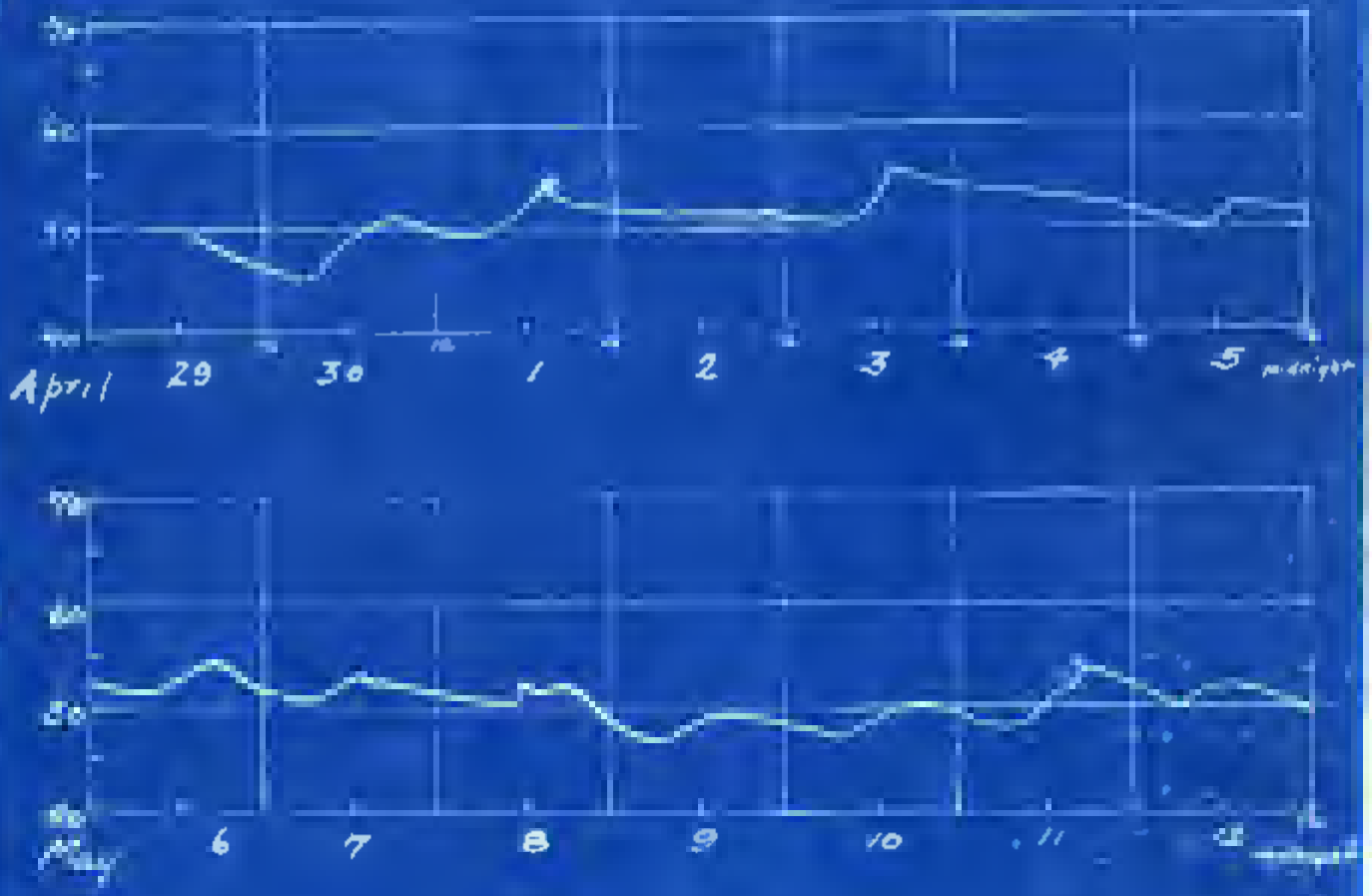
April 29 - June 8. Negretti and Zambra thermograph records, corrected to correspond with "Kew-pure I" standard by subtracting 0.5°F.

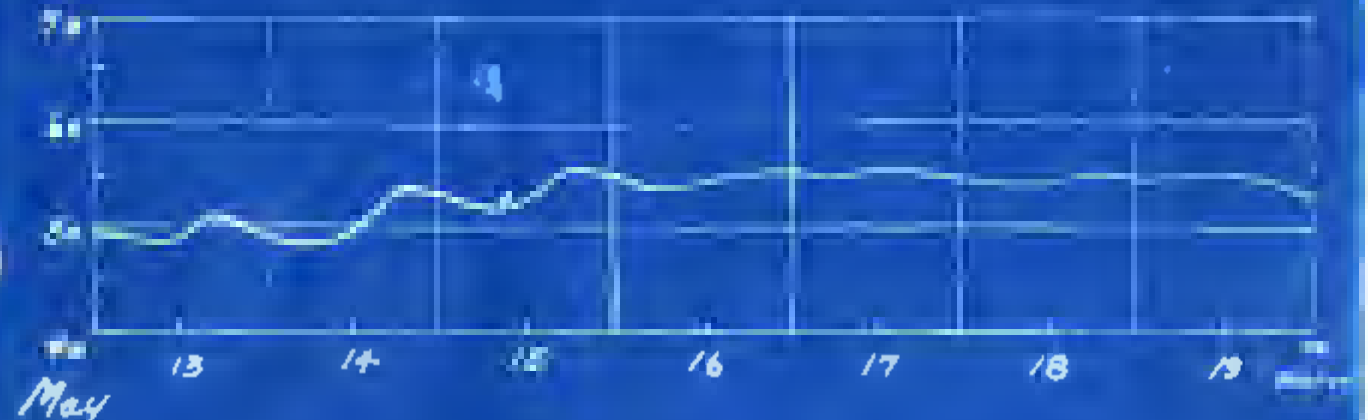
June 8 - July 15. Thermometer readings "Kew-pure I"

July 15-September 15. Palmer thermograph records. No correction necessary.

Temperature, Mill Brook, Trap, 1940

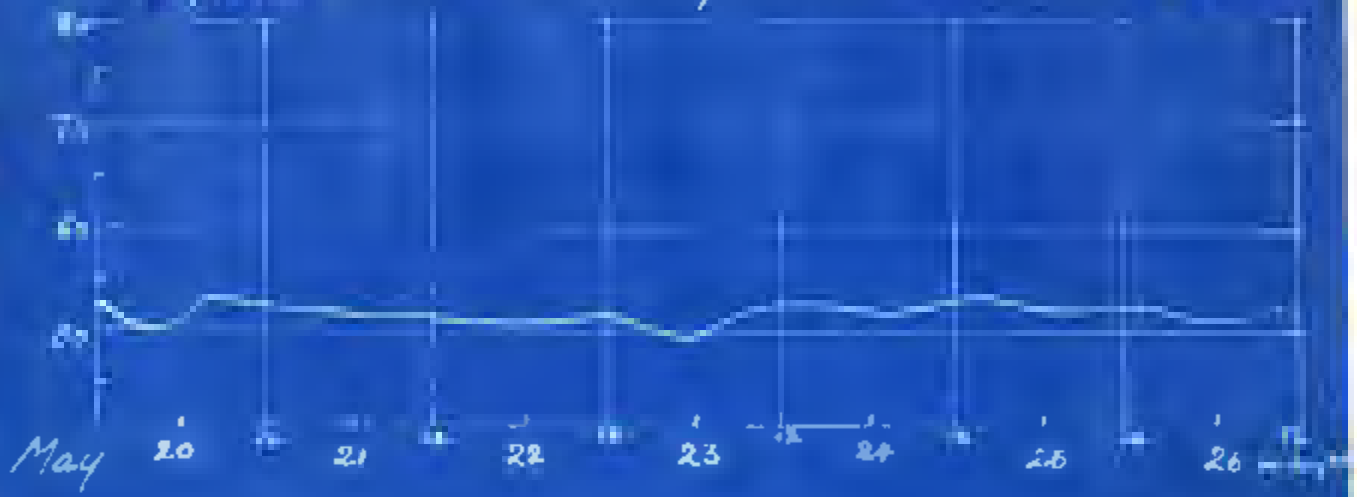
Negretti & Zambra Thermograph (corrected)

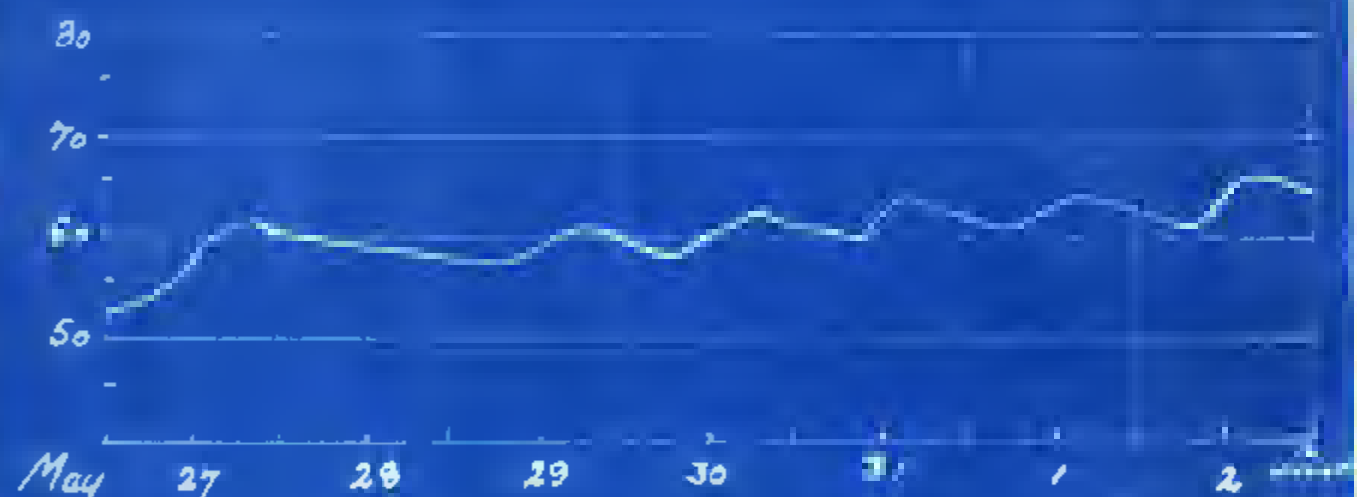


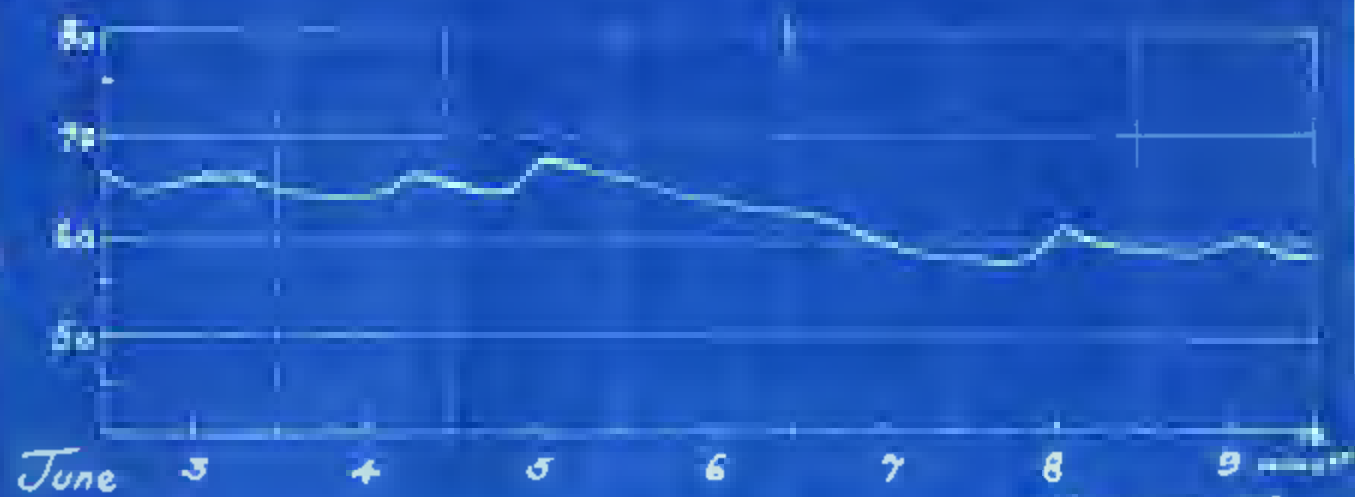


Temperature. Mill Brook Trap 1940

°F Margaretta & Zambra Thermograph (Corrected against [illegible])



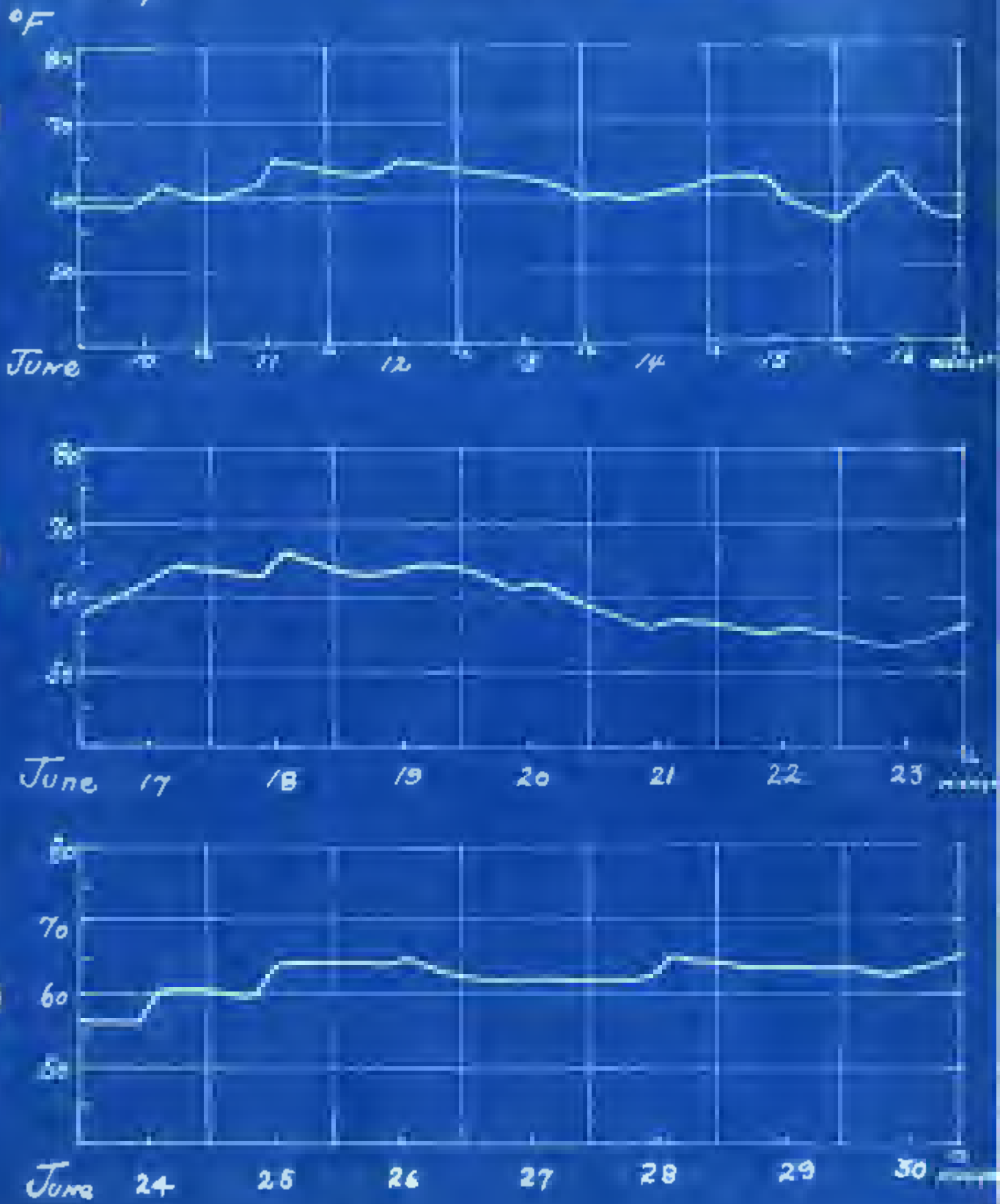




Margaretta P'

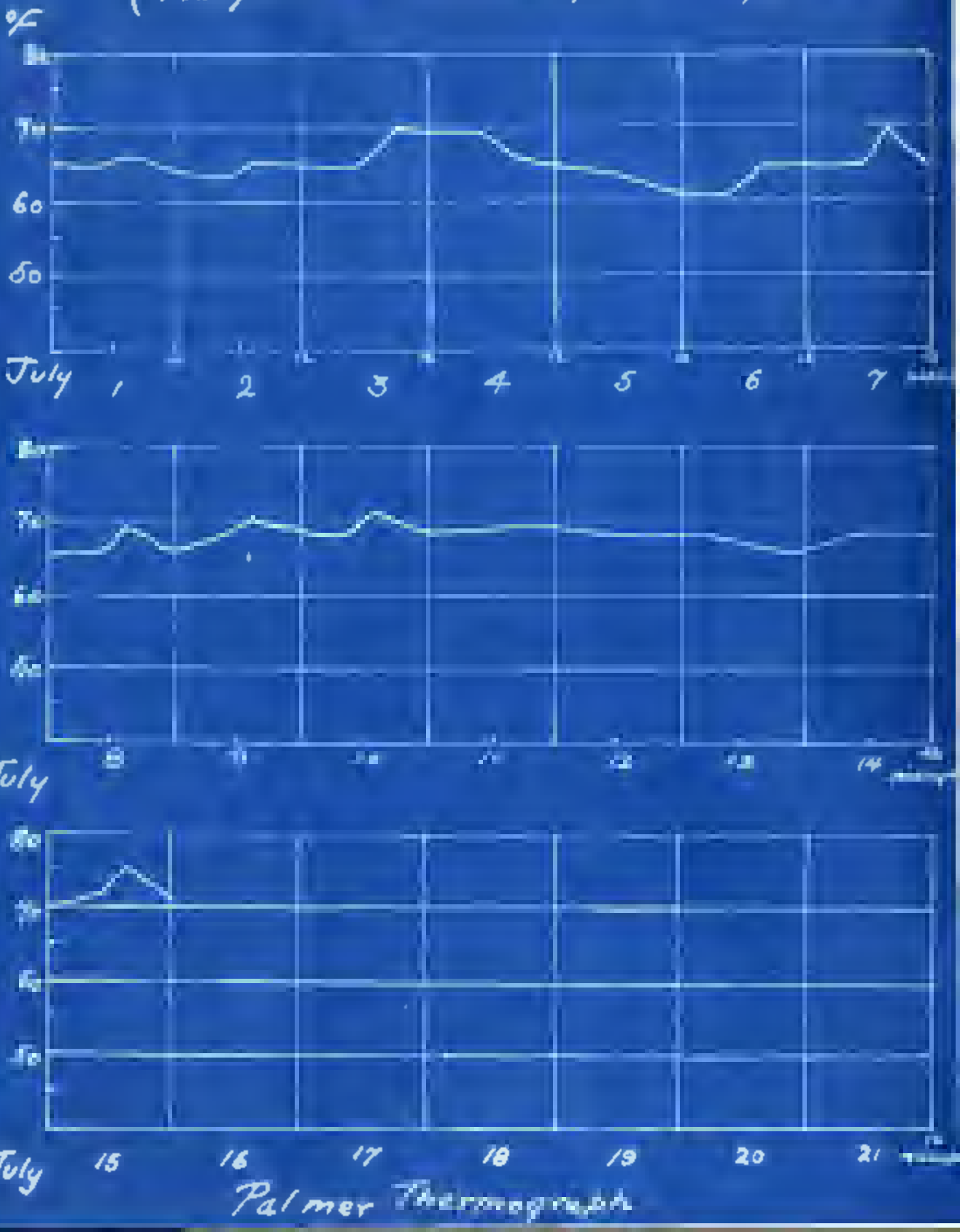
Temperature Mill Brook Trap 1940

Trap Margaree P (Corrected against "M.A.")



Temperature Mill Brook Trap 1940

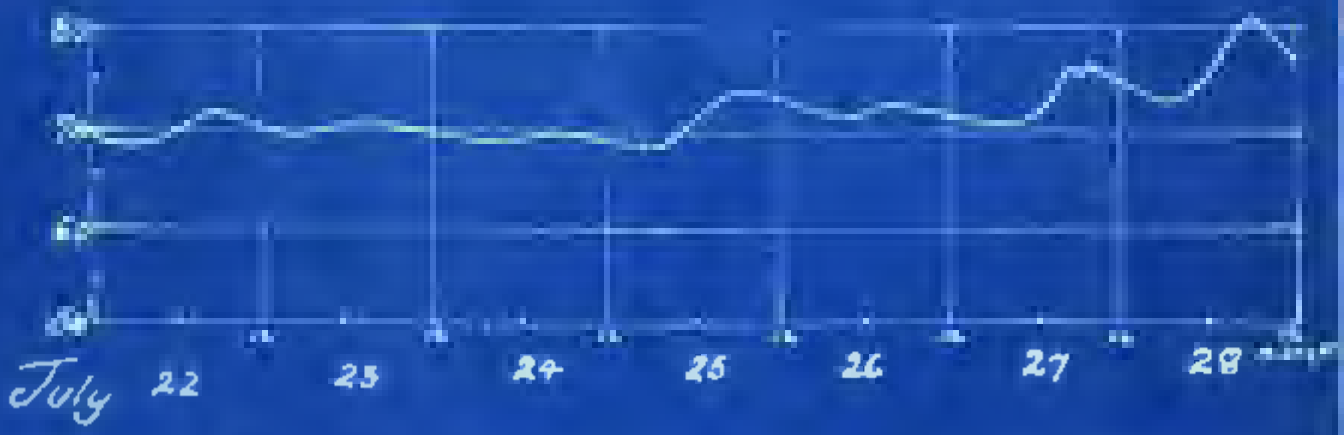
("Margaree P" corrected against "Margaree A")

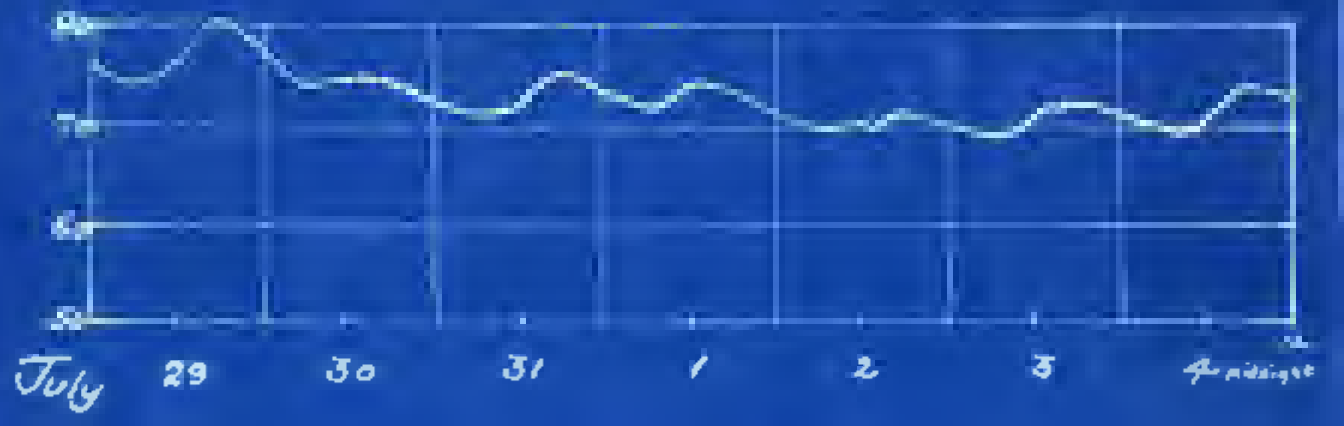


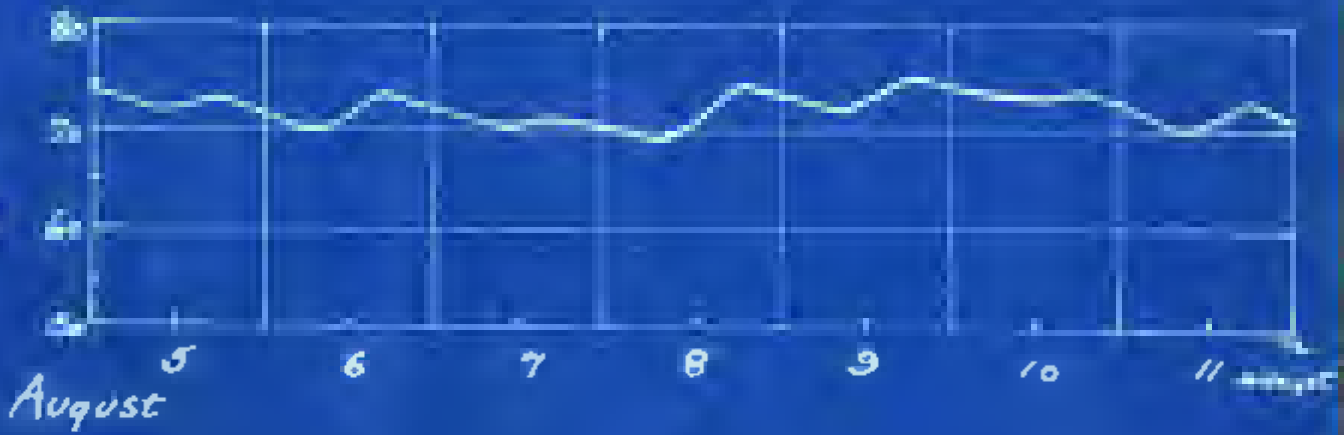
Palmer Thermograph

Mill Brook Trap 1940
Palmer Thermograph

°F



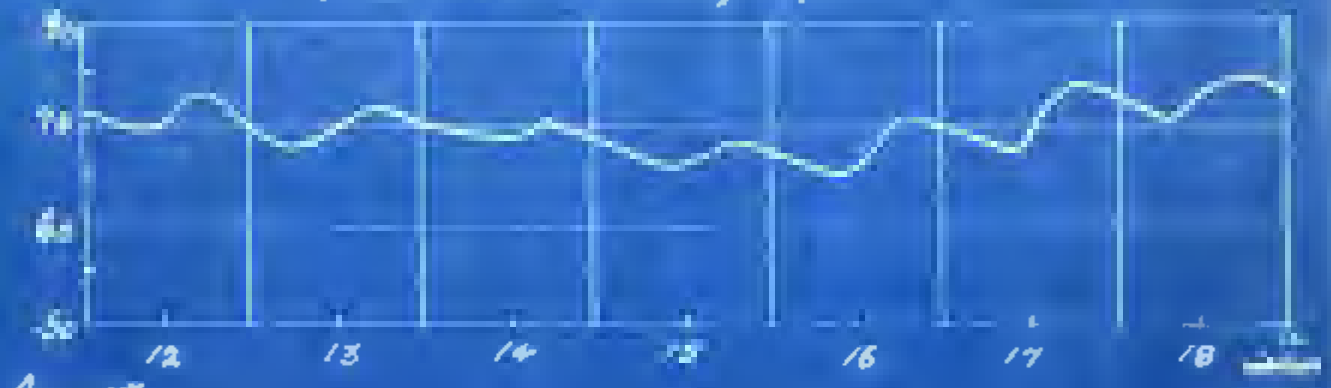


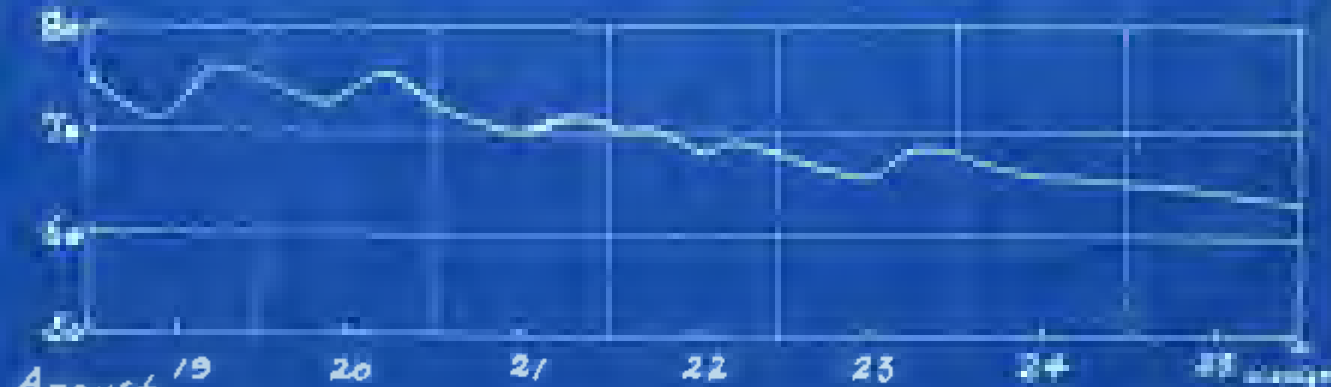


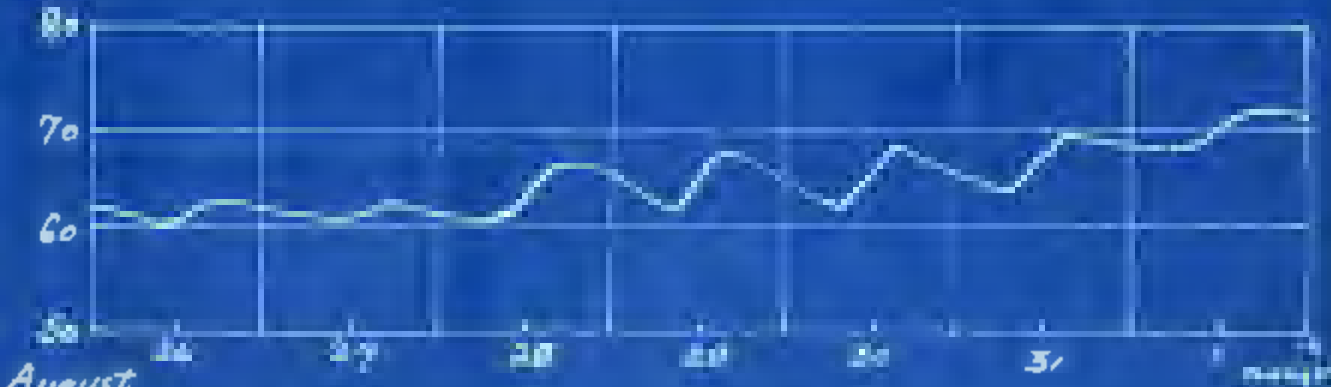
Thermograph Record Mill Brook Trap 1940

°F

Palmer Thermograph

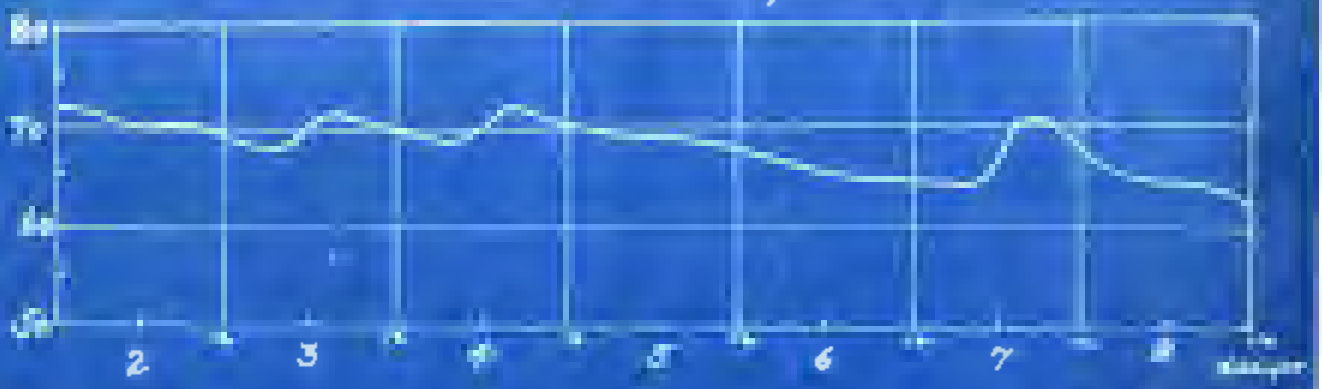




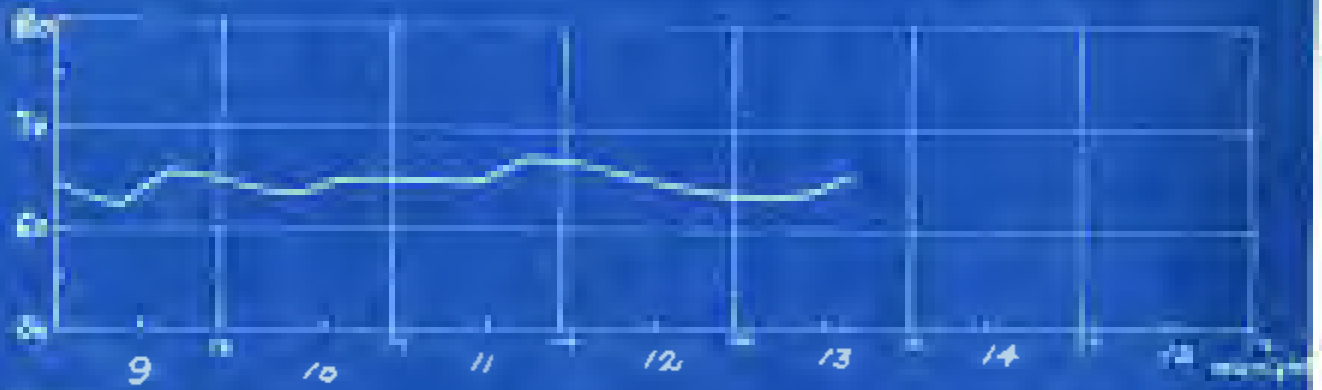


Thermograph Records Mill Brook

Palmer Thermograph



September



September

4. "Temperatures and Congregation of Salmon".

Miner River, Bridge, Shore road.

July 28, 1940. Clear, warm day.

3.05 p.m.

Hydrograph just above Mill pond dam.

West bank	29.8 °C.
Channel	29.1
Channel	29.2
East bank	29.8
East bank	29.8

No fish observed at this point.

3.15 p.m.

Temperature at mouth of Fisher Salmon's brook, 27.5°C.

One salmon parr and 5 or 6 fry observed at this point. No accurate count was possible but a noticeable school of fish were present here.

3.15 p.m.

Series of temperatures across the river from the mouth of Salmon's brook.

East bank	29.4 °C.
Channel	29.0
Channel	28.9
West bank	29.4

3.30 p.m.

Cool pool below the bridge on the west bank, 28.3 °C.

Series of temperatures across the river from this pool:

West bank 28.3 °C.
Channel 28.8
Channel 28.9

Temperature just under the bridge towards the west bank 27.9°C.

Three or four grilse were observed in the mid-river channel just below the bridge at this time and one grilse lay in shallow water on the west bank below the bridge. No fish died.

3.45 p.m.

Temperature at hydrograph, west bank, 28.9°C.

Fish dispersed.

July 29, 1948. Clear, warm day.

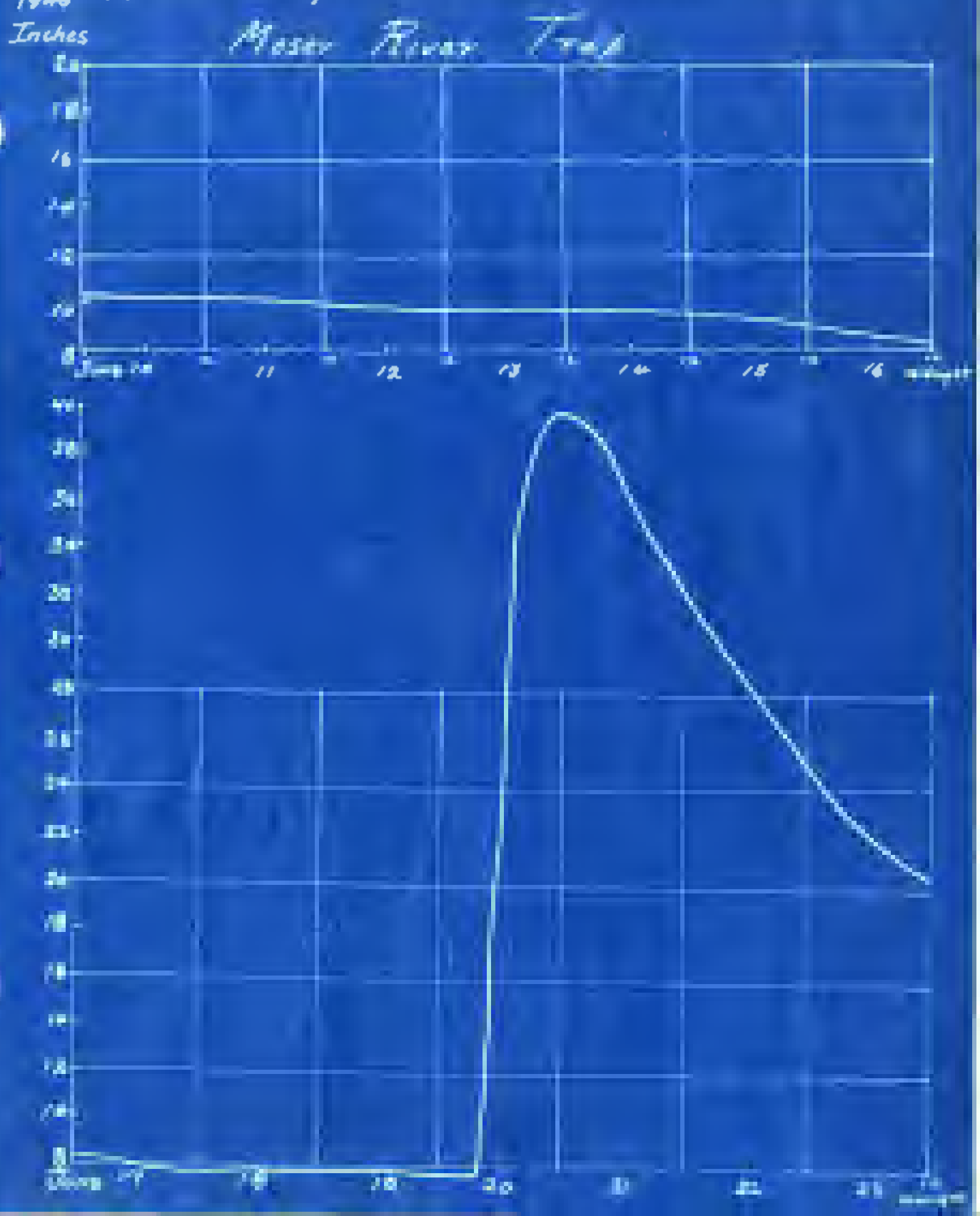
3.00 p.m.

Lower river, west bank, hydrograph 28.2°C.

The river on the 29th did not attain the peak reached on the 28th. No grilse were seen below the bridge.

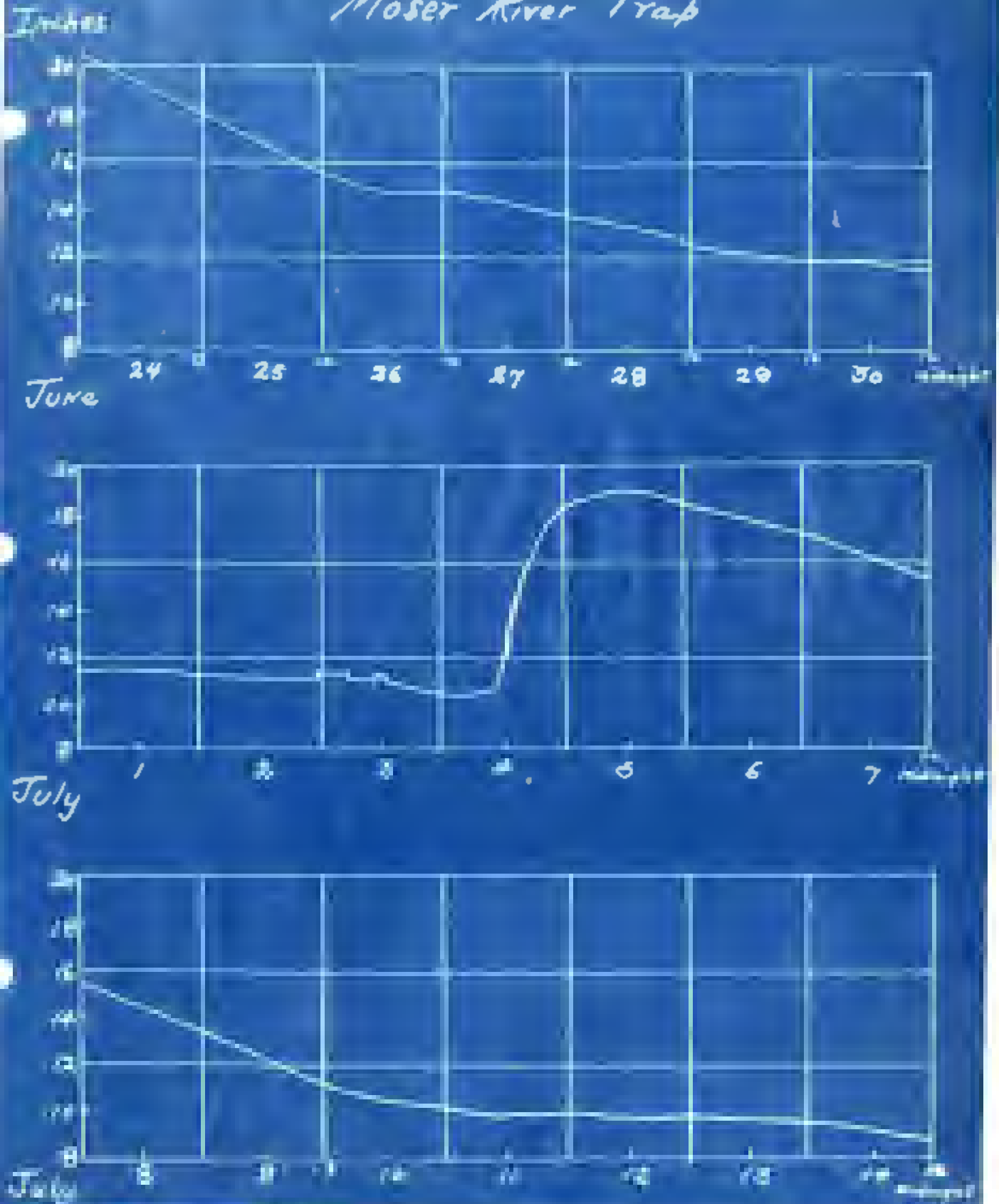
5. Water heights, Hoosac river, at Troy.

Water Height Moser River 1940



Water Height, Moser River 1940

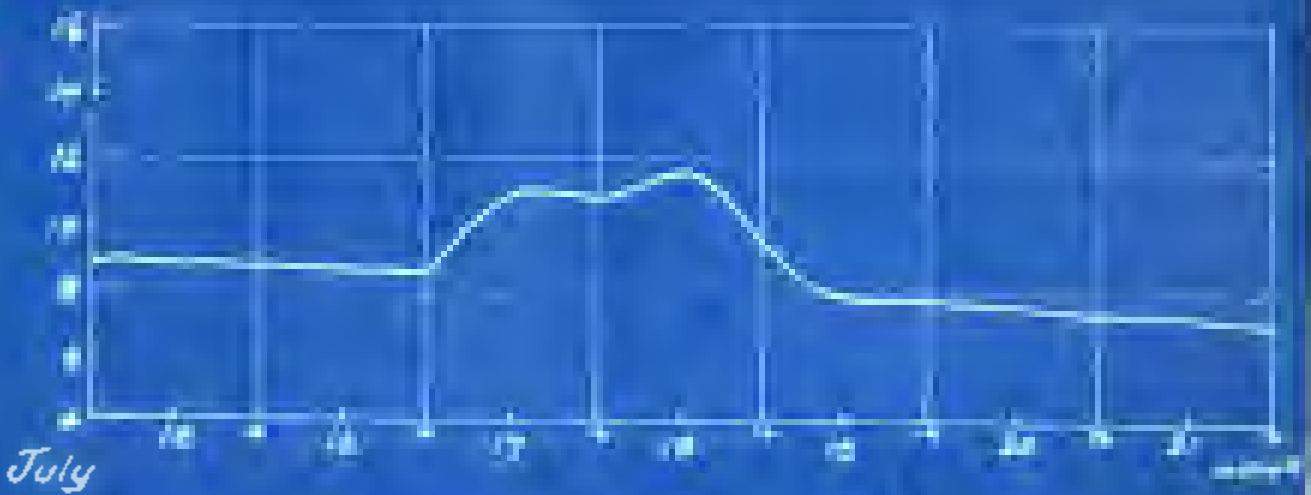
Moser River Trap



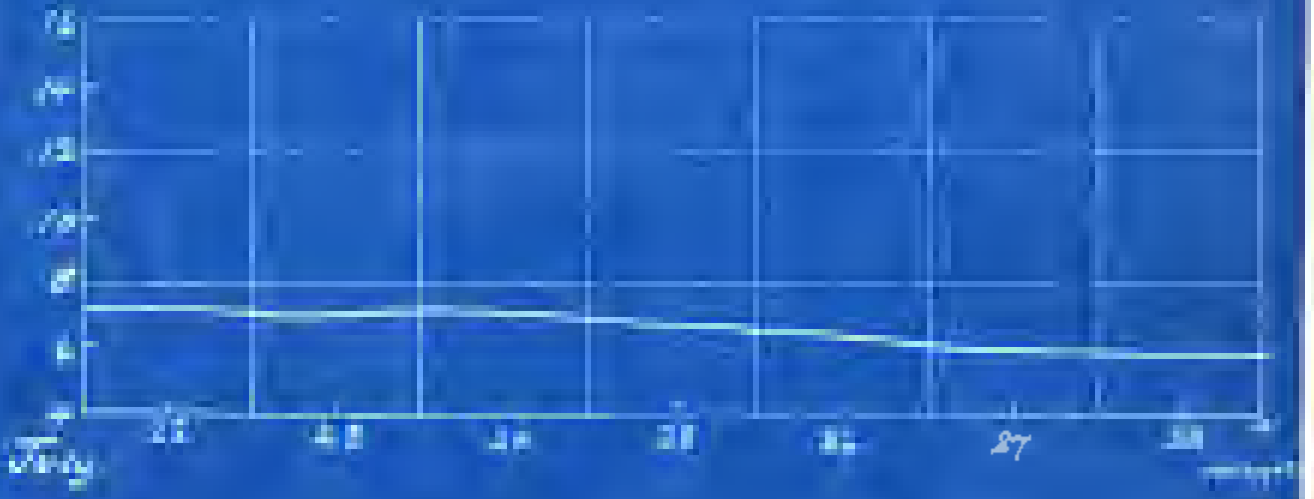
Water Height, Moser River, 1940

Moser River, Trap

Inches



July

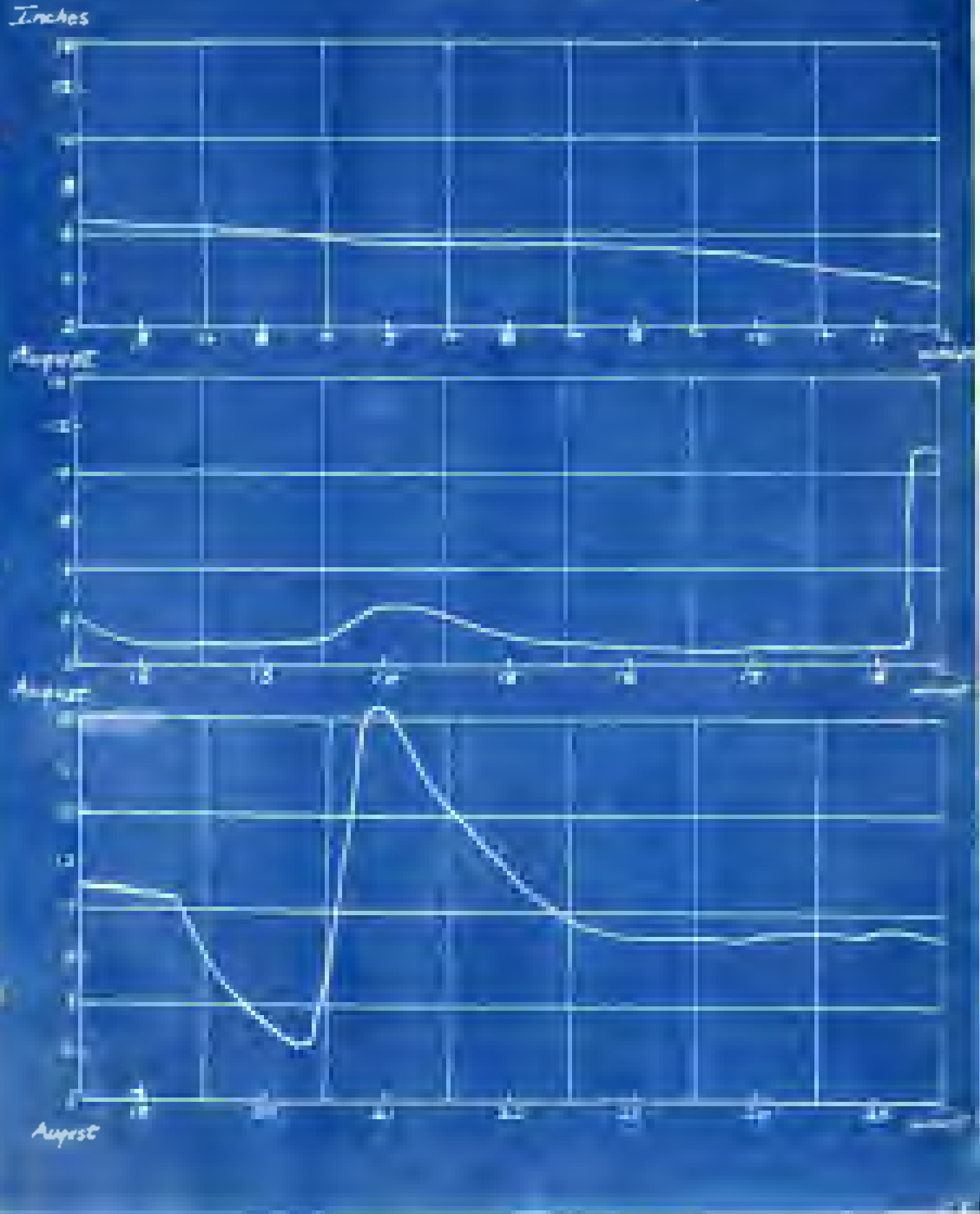


July

1940

Water Height, Moser River, 1940

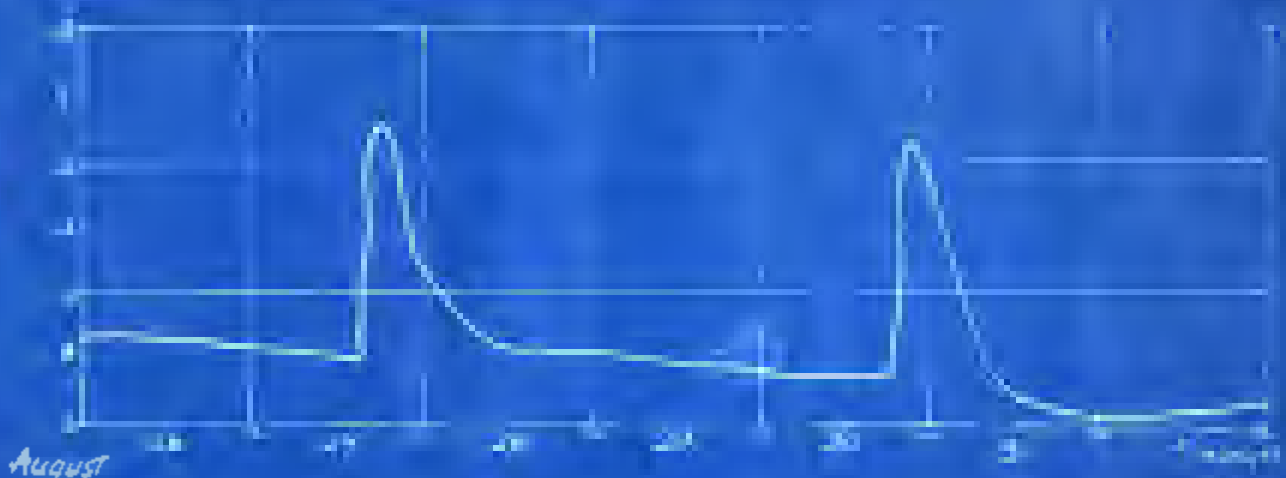
Moser River Trap



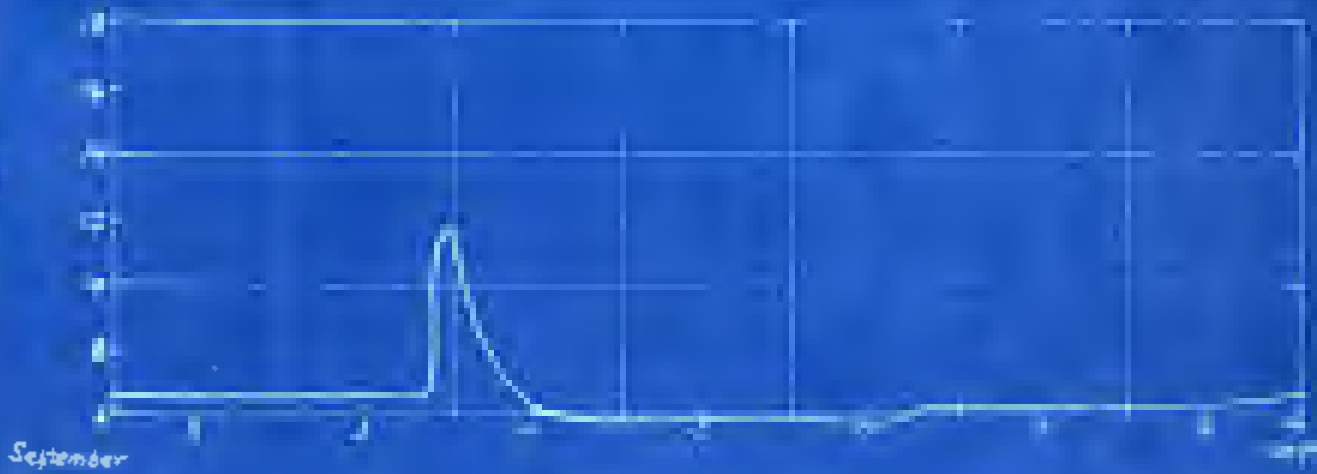
Water Height, Moser River

Inches

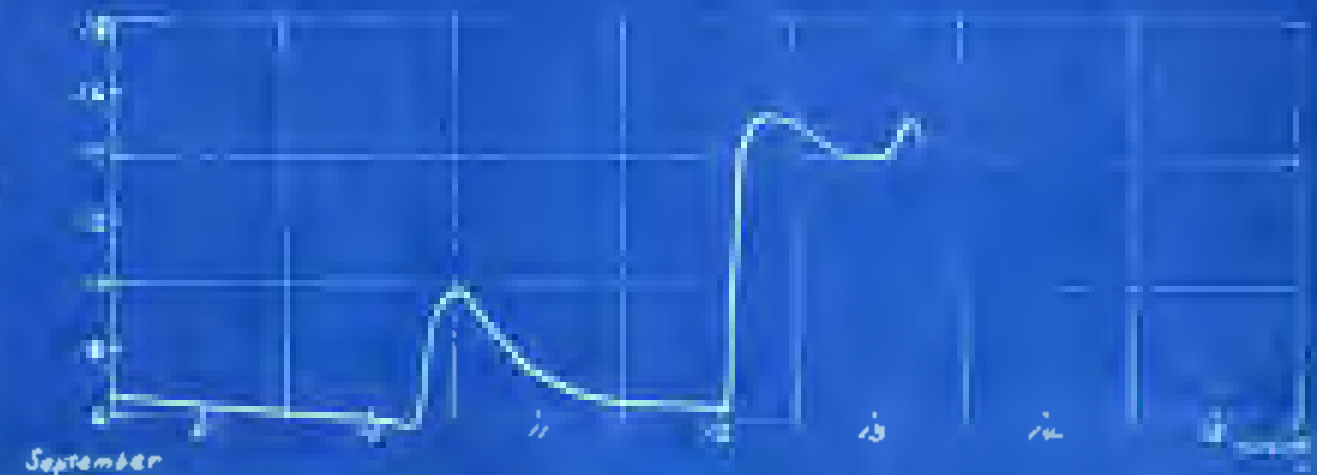
Moser River Trap



August



September



September

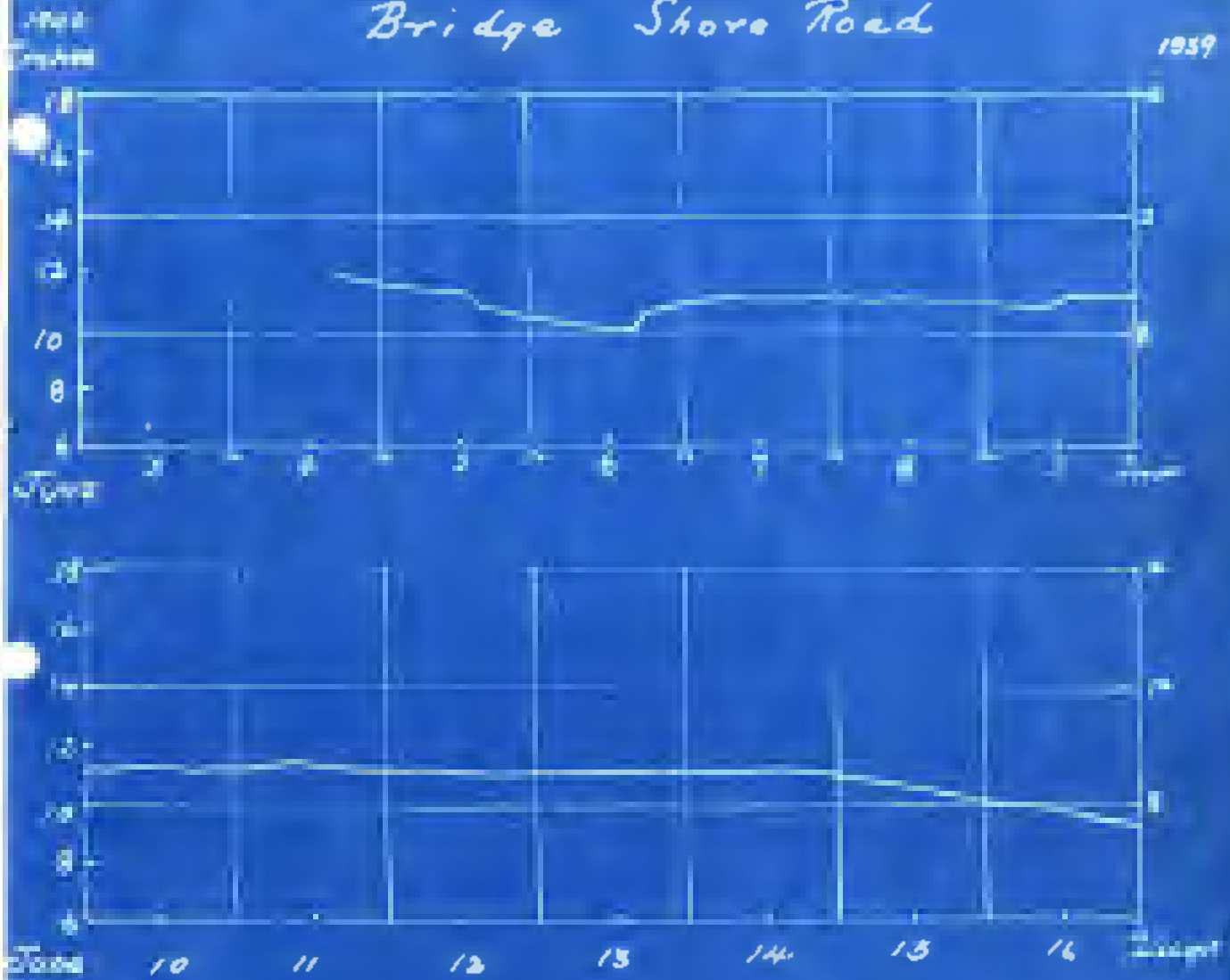
6. Water Heights. Humber river at bridge.

Where the record was incomplete, the graph was constructed from the hydrograph upriver at the trap, with suitable corrections.

Figures on the left are the heights recorded. Figures on the right represent levels in accordance with the scale used during 1939.

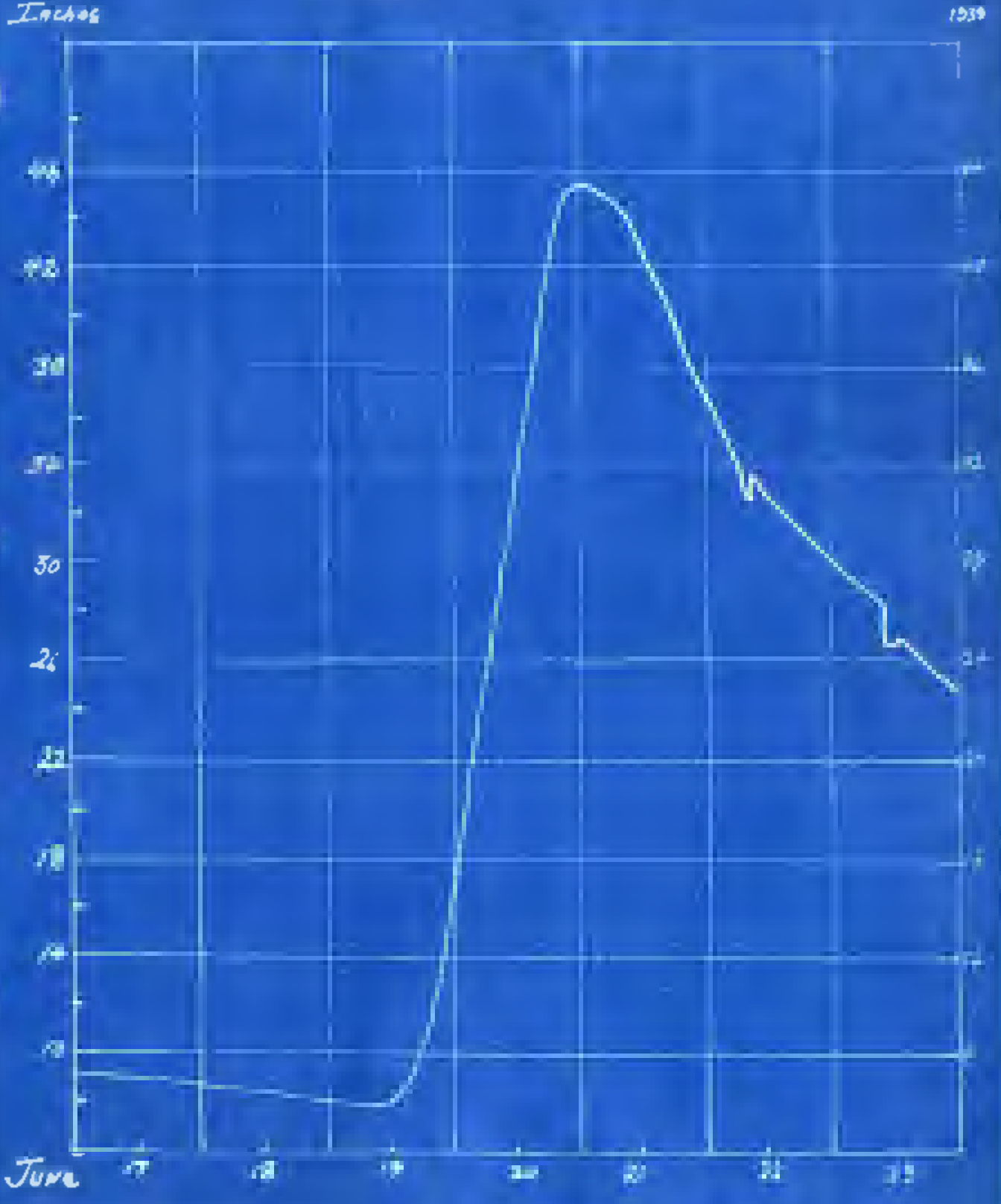
Water Heights Moser River, 1940

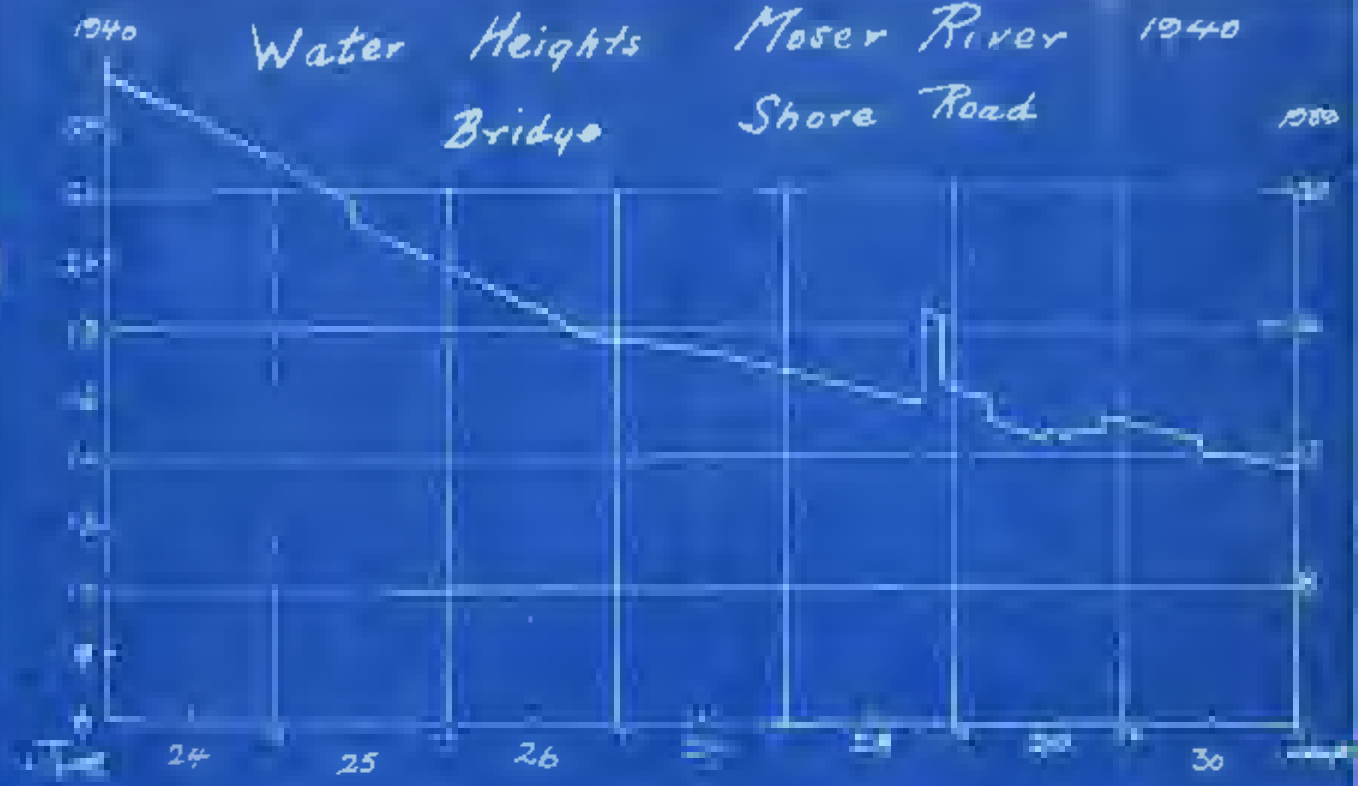
Bridge Shore Road

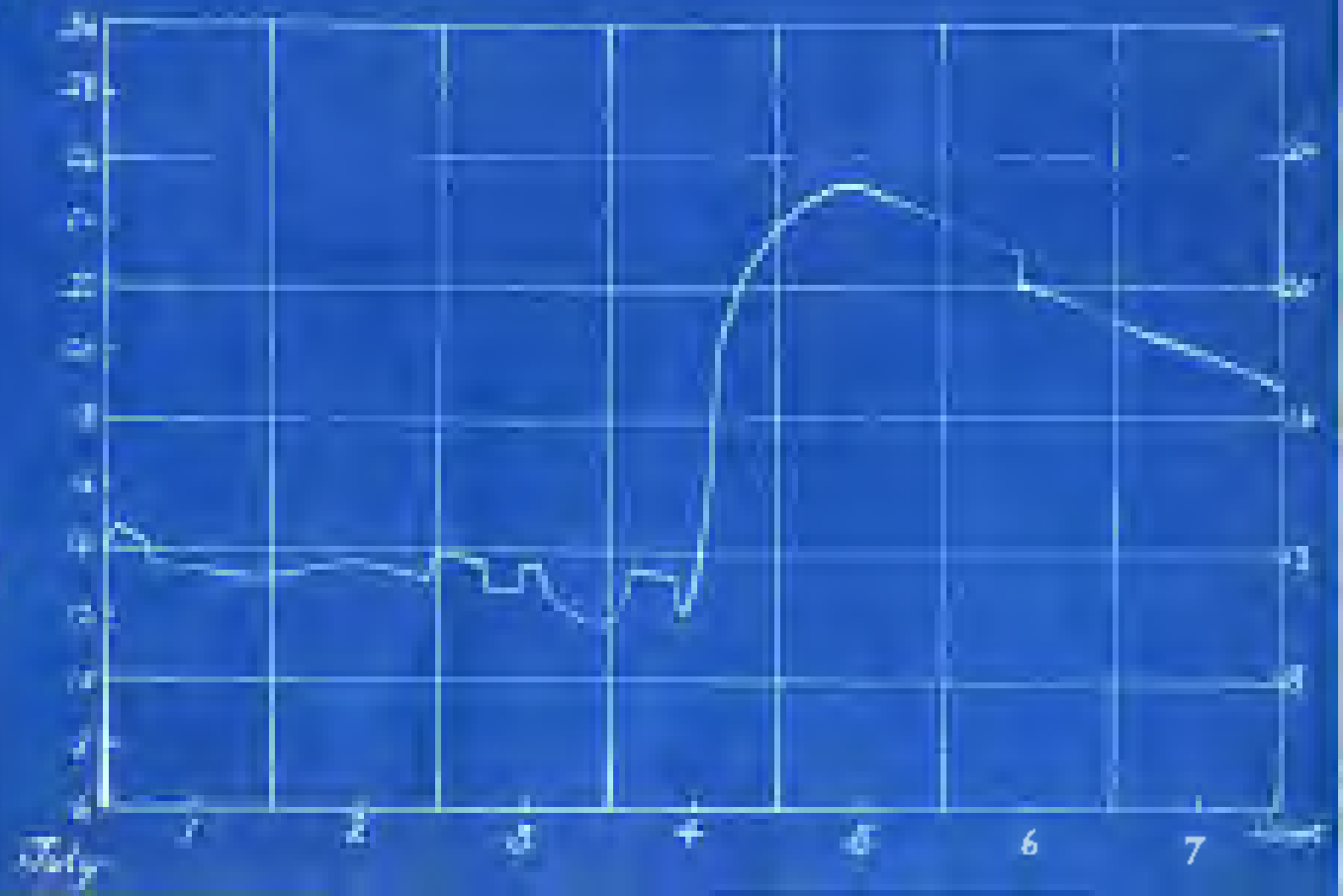


Water Heights Moser River, 1940

Bridge - Shore Road

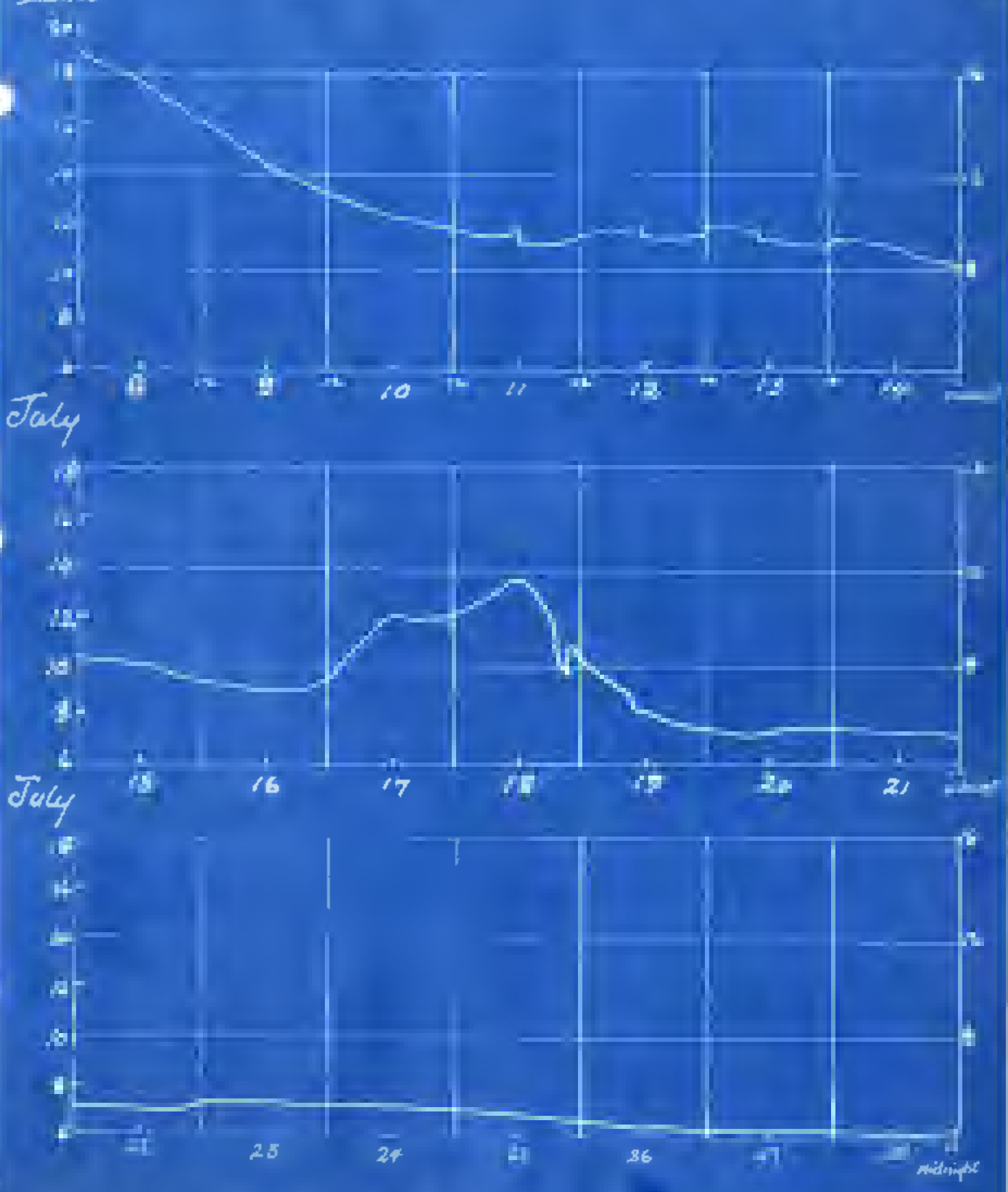



1940
Water Heights
Bridge
Moser River
Shore Road
1940
24
25
26
30


1
2
3
4
5
6
7

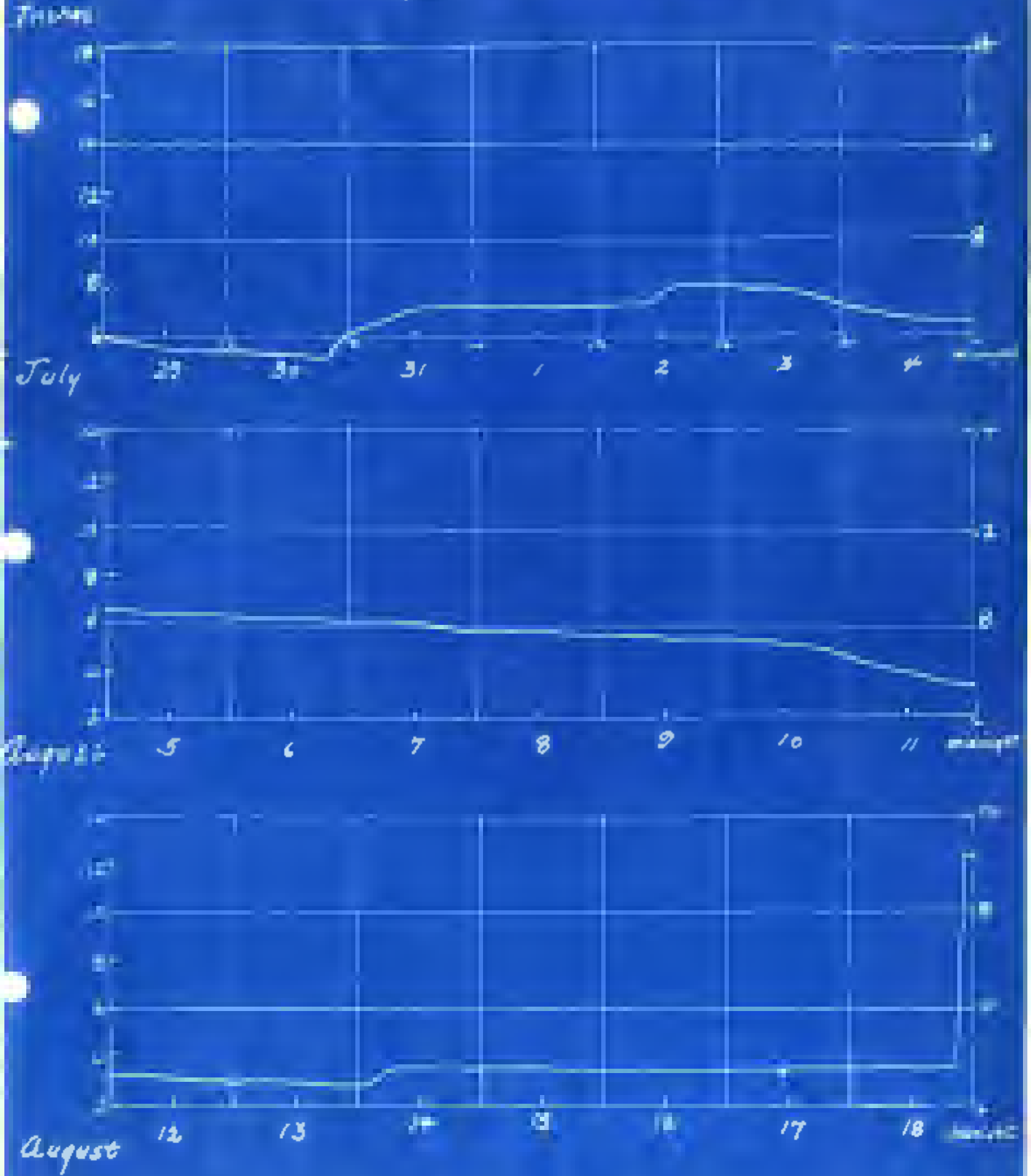
Water Height - Deer River, Minn.

Bridge - Shore Road



Water Heights Moser River 1940

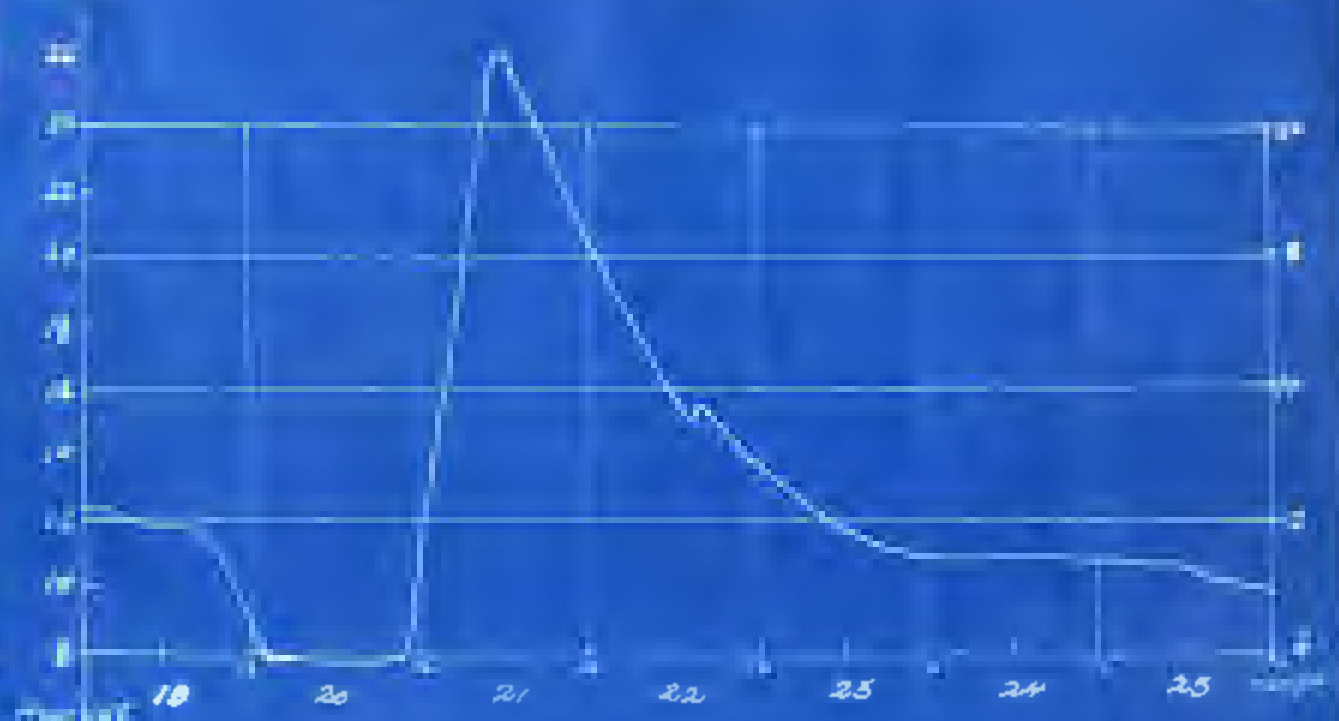
1940 Bridge Shore Road 1939

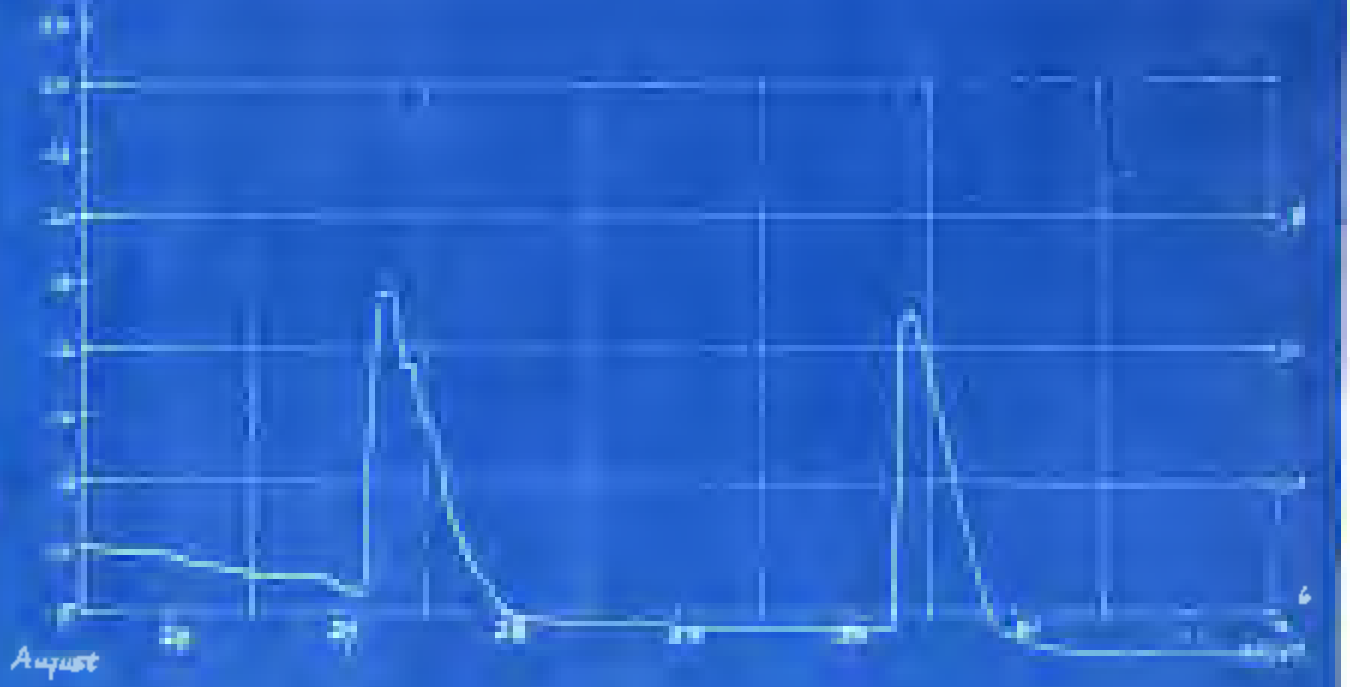


1940 Water Heights Moser River, 1940

Bridge, Shore Road

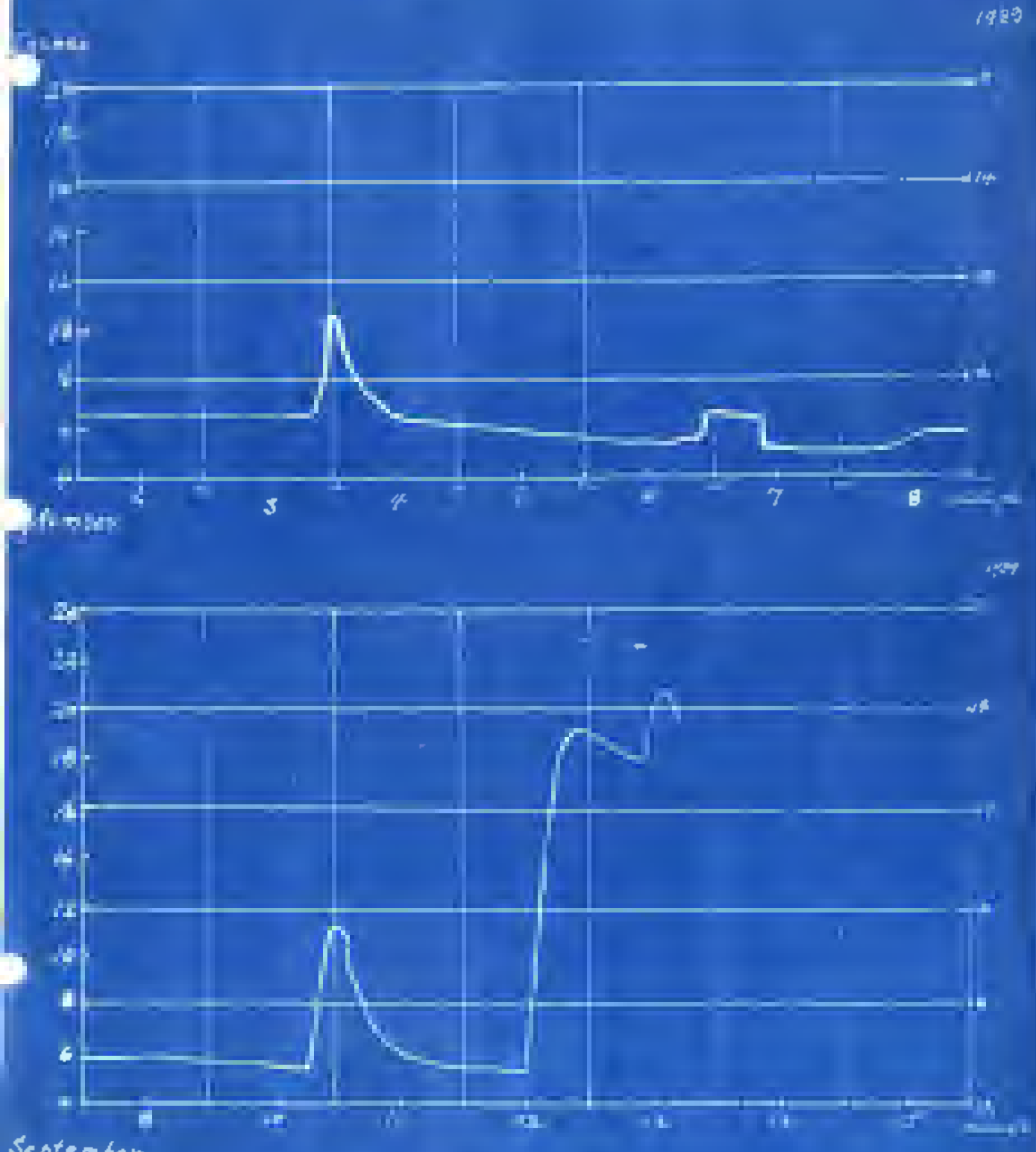
Inches





Water Height. Moser River, 1340

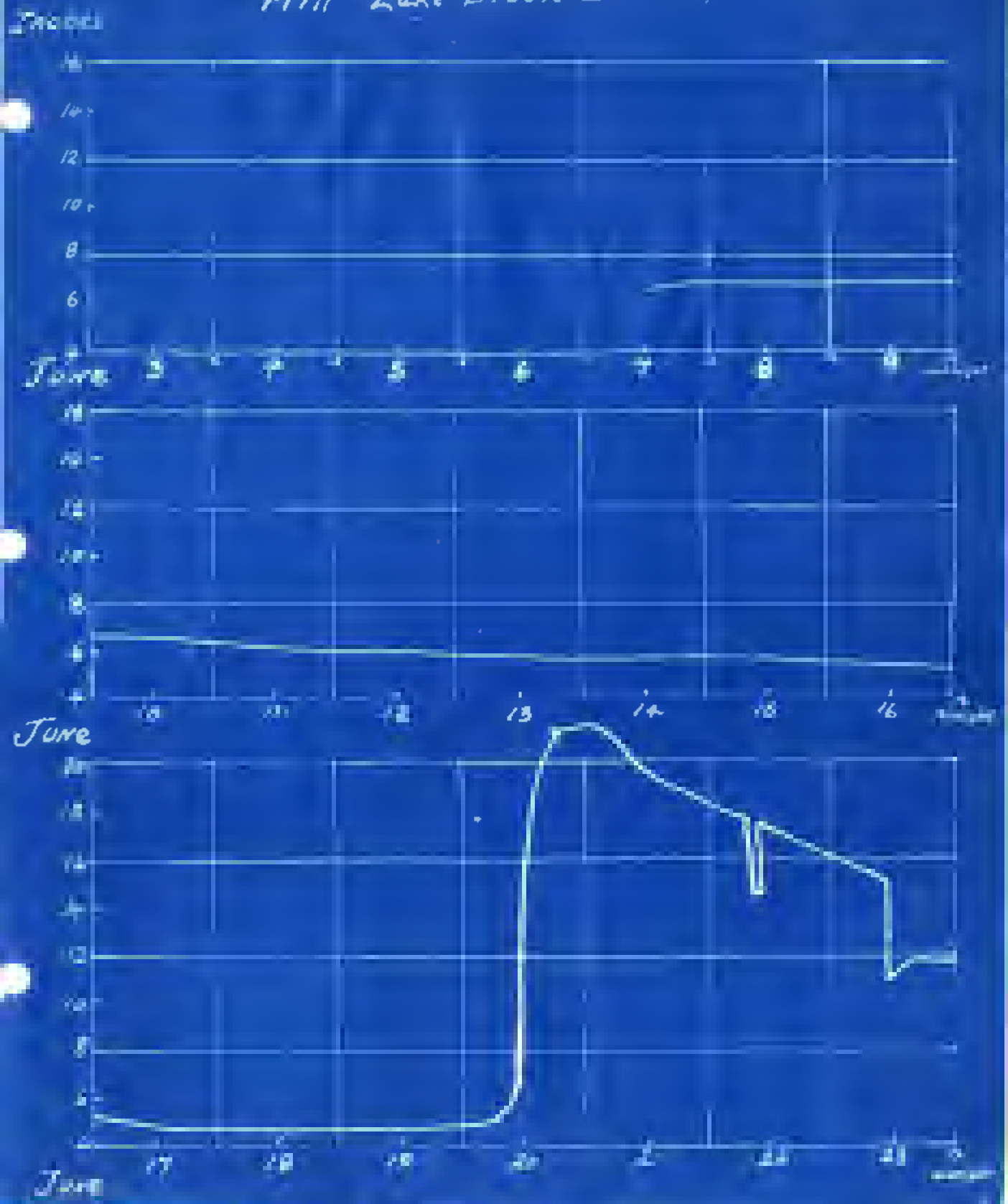
Bridge, Shore Road.



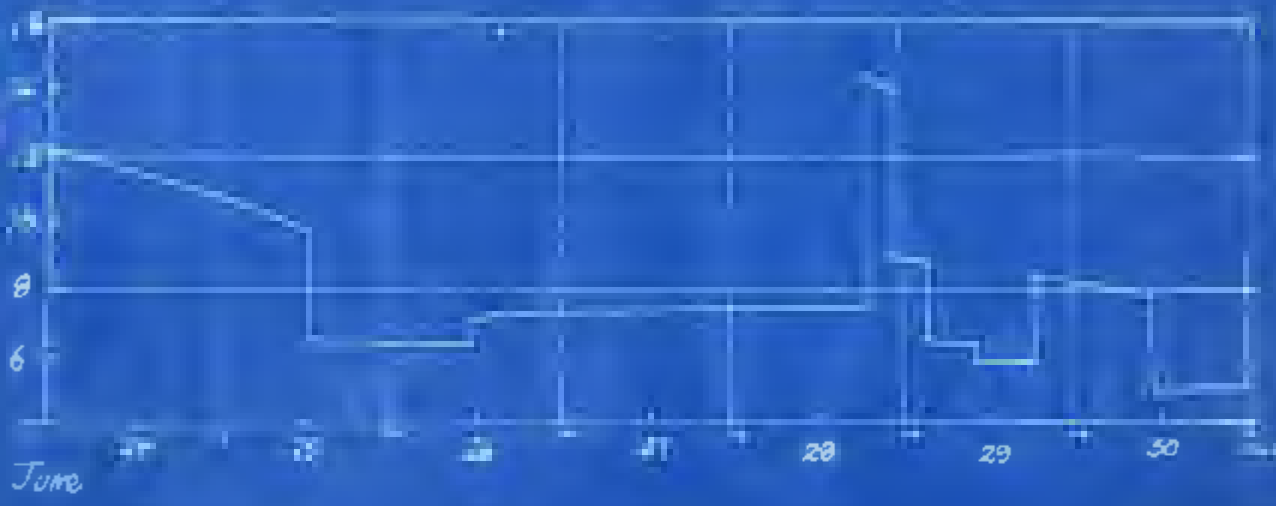
7. Water Heights. Mill Brook at bridge.

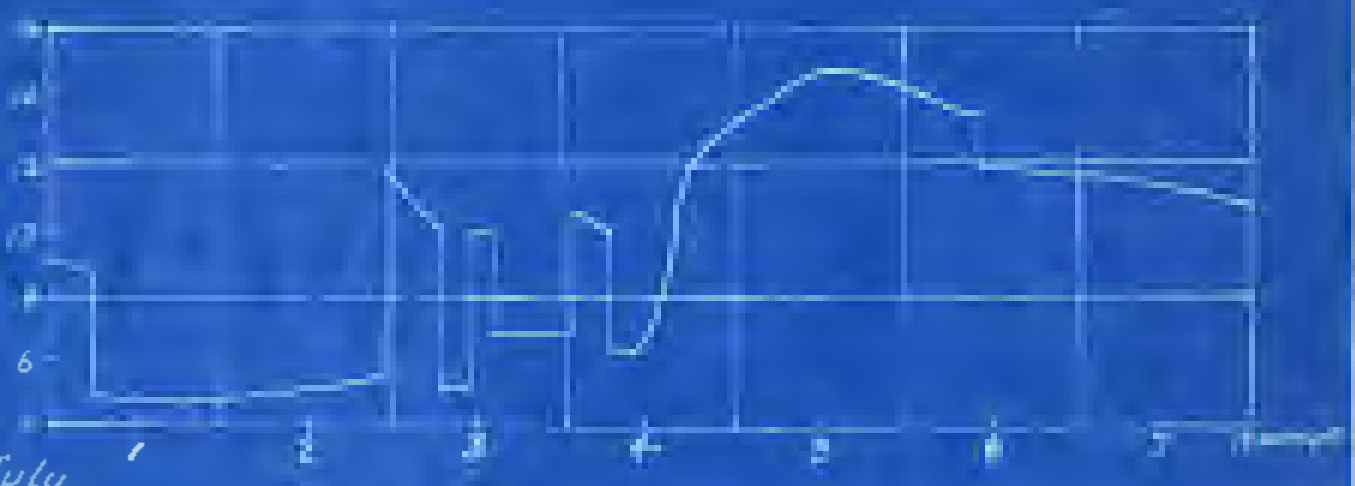
7. Water Heights Moser River, 1940.

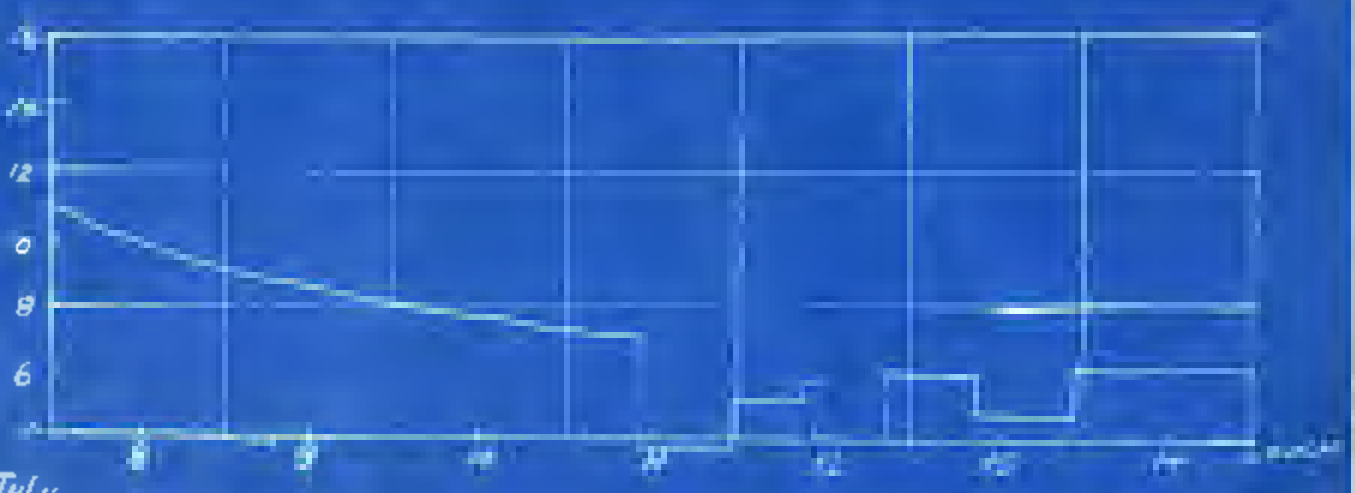
Mill Lake Brook at Bridge



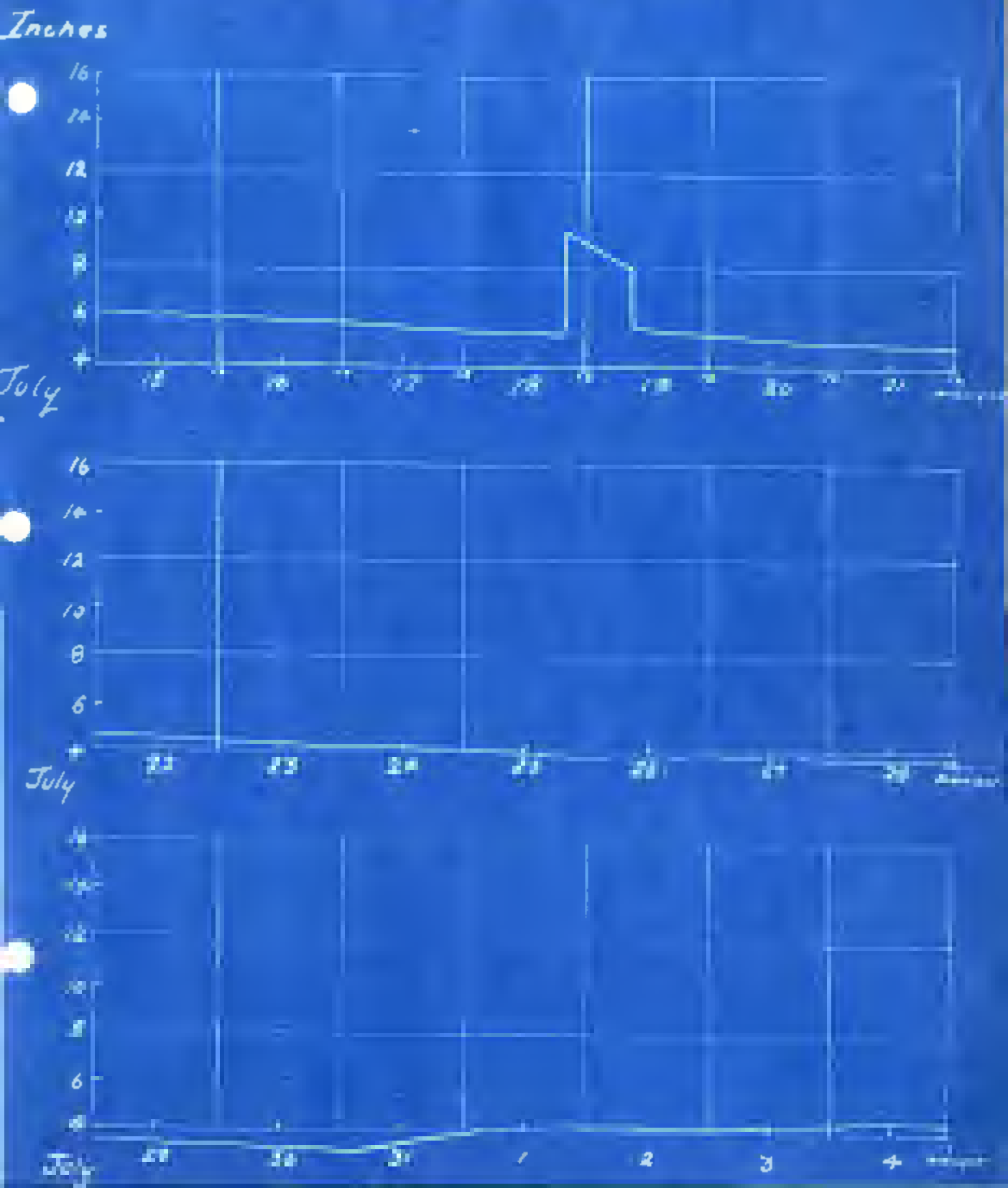
Water Heights Moser River, 1920
Mill Lake Brook

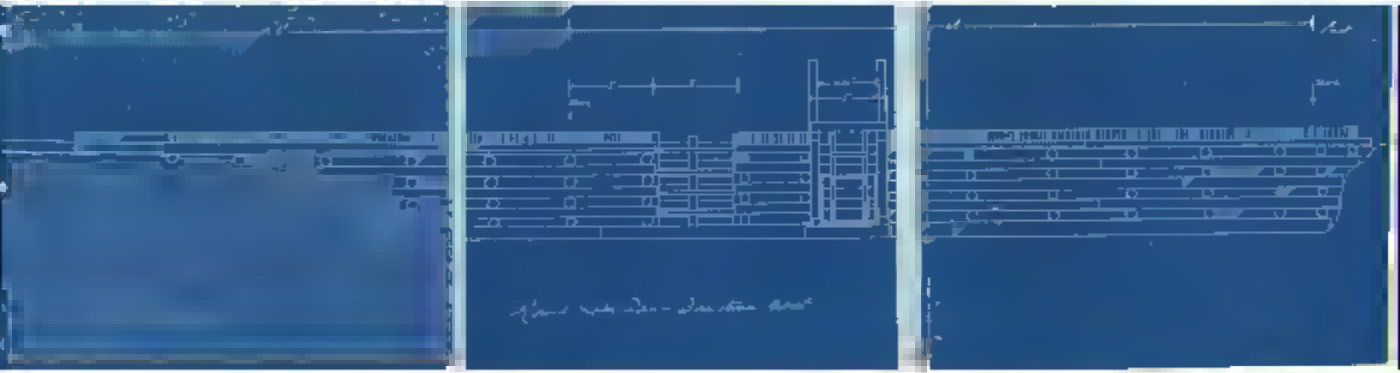


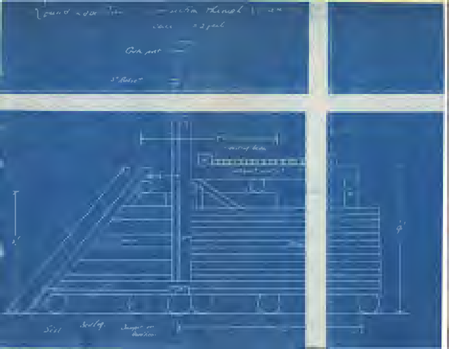




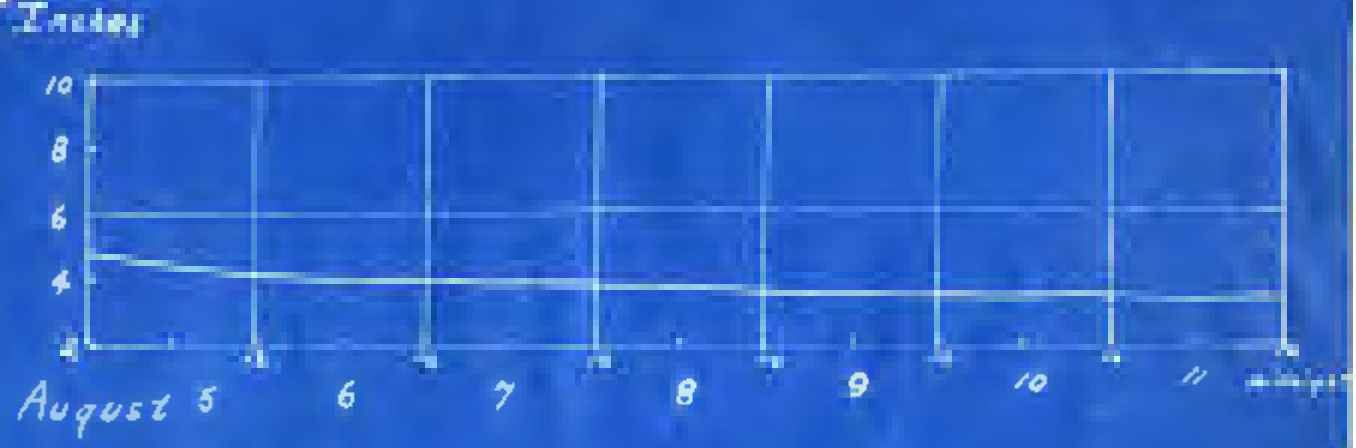
Water Heights, Moser River, 1940
Mill Lake Brook, Bridge

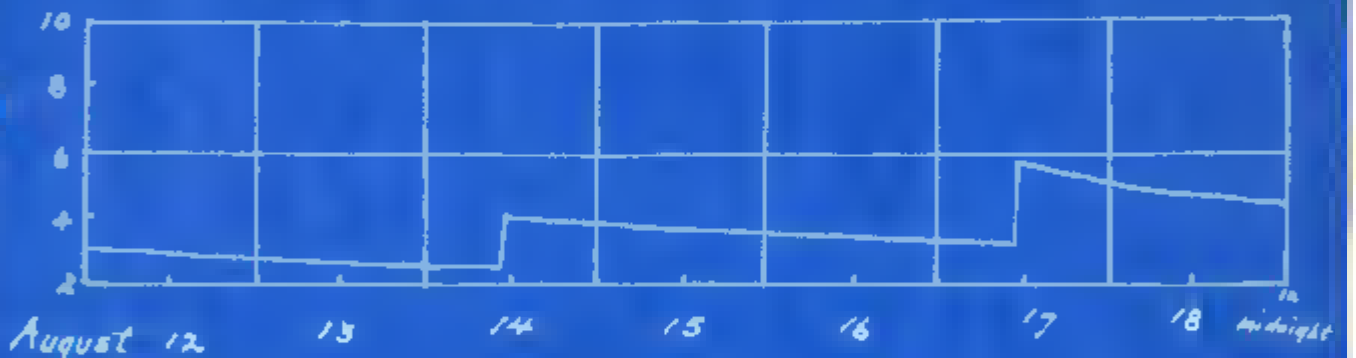




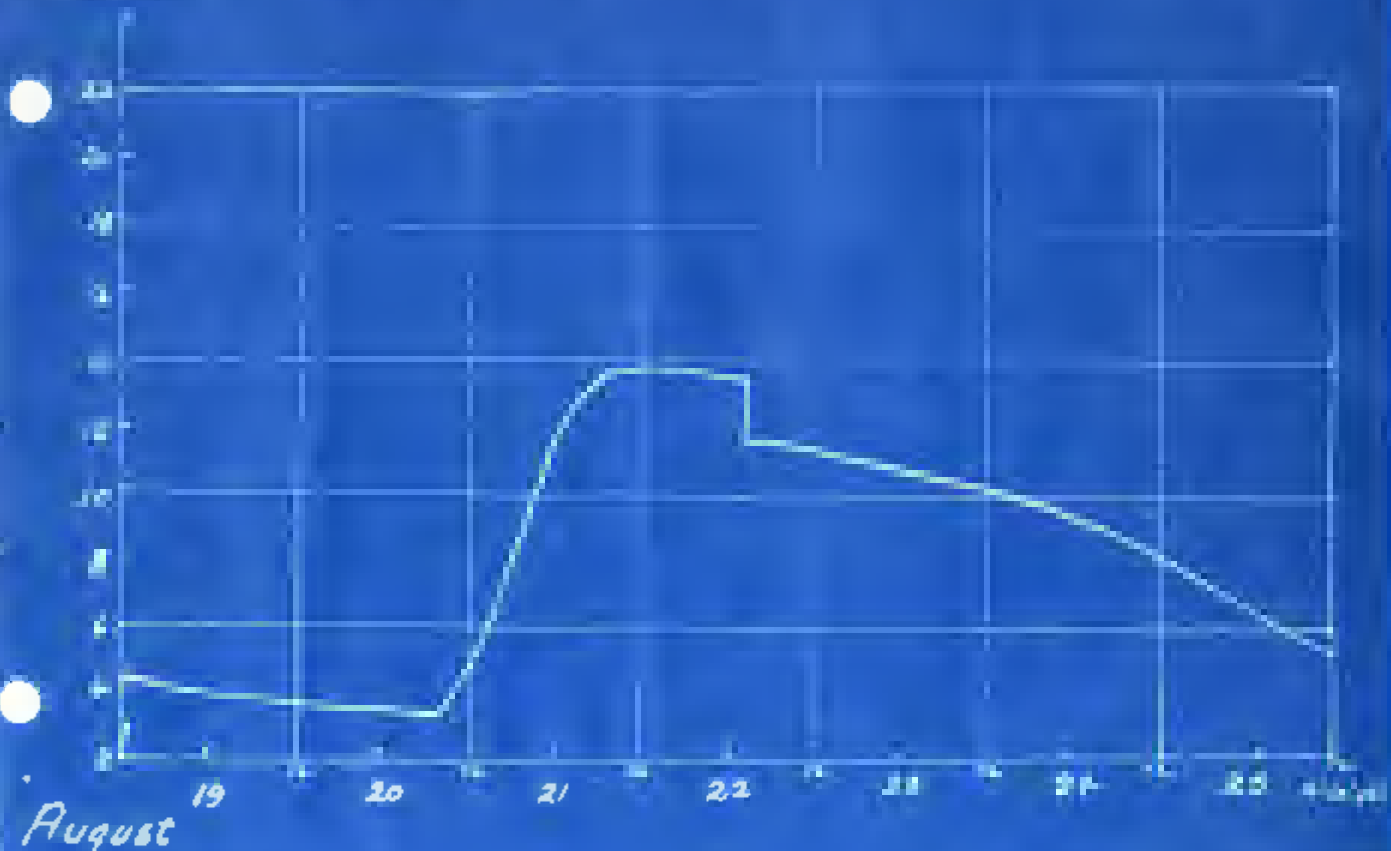

Gate post
Sill
4'

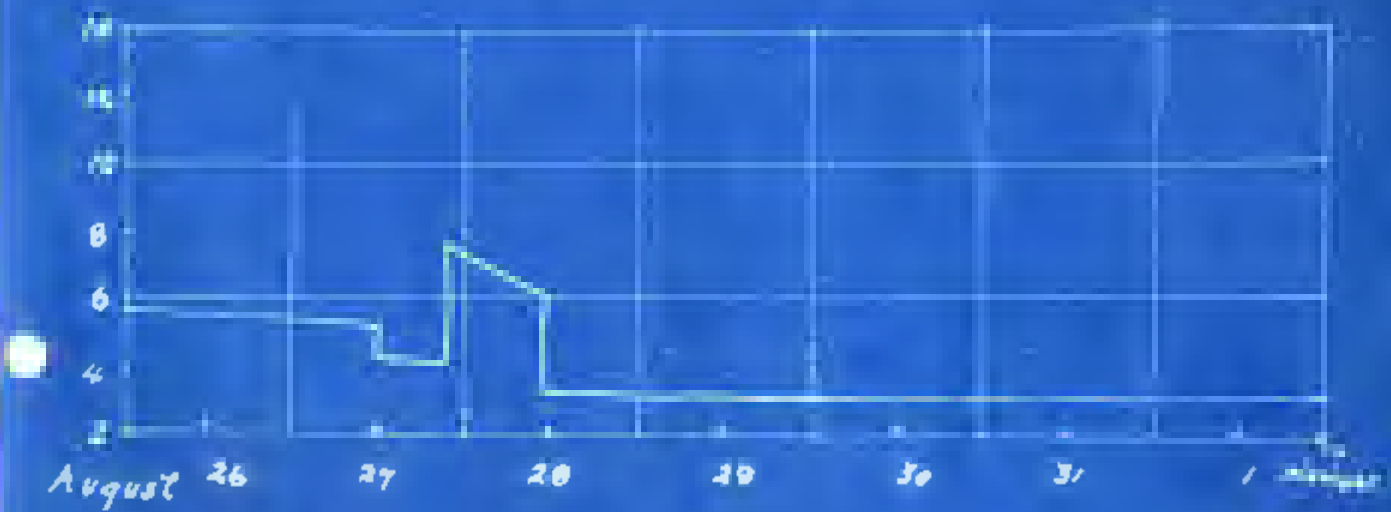
Water Heights, Moser River, 1940
Mill Lake Brook, Bridge



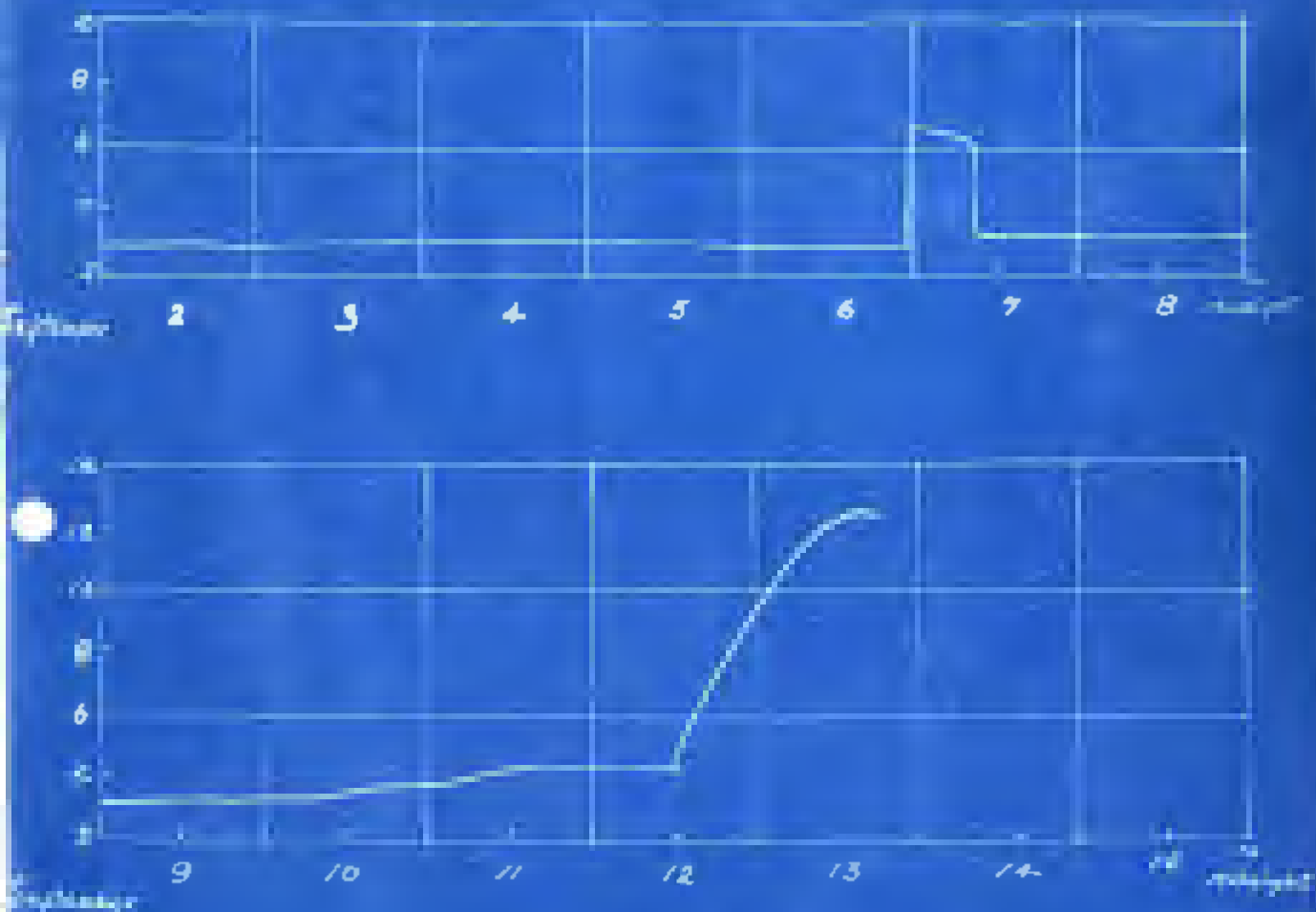


Water Heights, Moser River, 1940
Mill Lake Brook Bridge





Water Heights Moser River, 1940
Mill Lake Brook Bridge

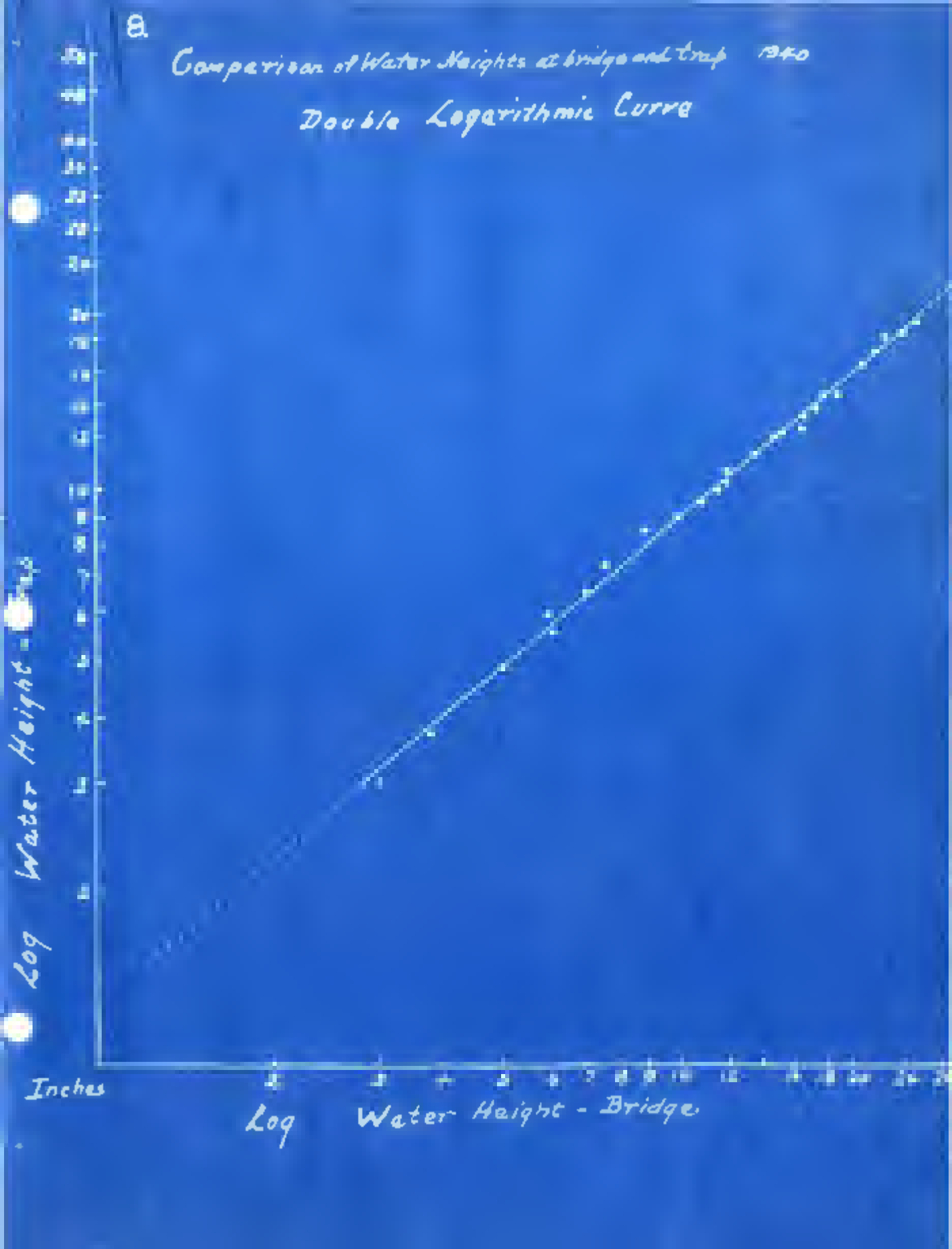


Double logarithmic curve constructed to compare water heights at the hydrographs located at the bridge and trap on Moser river proper. This was necessitated by the fact that the continuity of records at the trap hydrograph was destroyed by the freshet of June 20 and permits water levels obtained prior and subsequent to that event to be related by comparing them to levels obtaining at the shore bridge.

The curve shows that water level rises relatively faster at the bridge than at the trap, e.g.:

River height at bridge,	at trap
5"	4 7/8"
10	9
15	14 1/8
20	19 3/4
40	39

The influence of Mill lake brook may be neglected since it may be presumed that increase in its volume will be proportional to increase in river volume in most instances and, in any case, its outflow only constitutes 1/10th of that of the main river (river height, 14"; discharge of river at bridge, 275 ft. ^{3}/sec.; discharge of Mill lake brook, 25 ft. ^{3}/sec.).


8.
Comparison of Water Heights at bridge and trap 1940
Double Logarithmic Curve
Log Water Height - Trap
Inches
Log Water Height - Bridge

9. Construction of Round Lake Dam.

Object.

For the purpose of storing water to create experimental freshets and to study the effects of such freshets on the movement of anadromous fish, a dam was constructed one half mile below Round Lake on the Moser river. At this point the river is relatively narrow and flows over bed rock of vertical shale. On either bank the shore ascends rapidly to shale out cropping eight to ten feet above water level. Ripe and cascades lie below the dam while above is a half mile stretch of still water to the outlet of Round lake and the Maloposketch river. The fall is level from Round lake to the dam is less than six inches.

The advantages of a dam at this point may be summarized as follows:

1. It permits a closer control over the magnitude and duration of a freshet in the estuary than may be obtained from the more distant dam at Buggy Lake.

2. It permits storage of water from both the Moser river system proper / and the Maloposketch branch. Stored water from dams at Middle lake and the relatively large Buggy lake may be used be they Round lake filled.

3. The small fall in level between Round Lake and the dam utilizes to full advantage the height of the dam in water storage.

4. The extensive area of swamp in the lower portion of the Maloposketch river and between Round Lake and the dam is made available for water storage.

The original plan submitted called for a dam ninety-nine feet in length, eleven feet in height above the stream bed, sixteen feet wide at the base and with a 45° slope on the upstream facing (vide diagram). Construction was started on this basis but, in order to finish it within the allotted time, the crib-work was not built higher than eight feet above the stream bed. The dam, when finished, measured one hundred and eighteen feet in length, sixteen feet in width, nine feet, eight inches in height above the stream bed and is capable of holding an eight foot head of water.

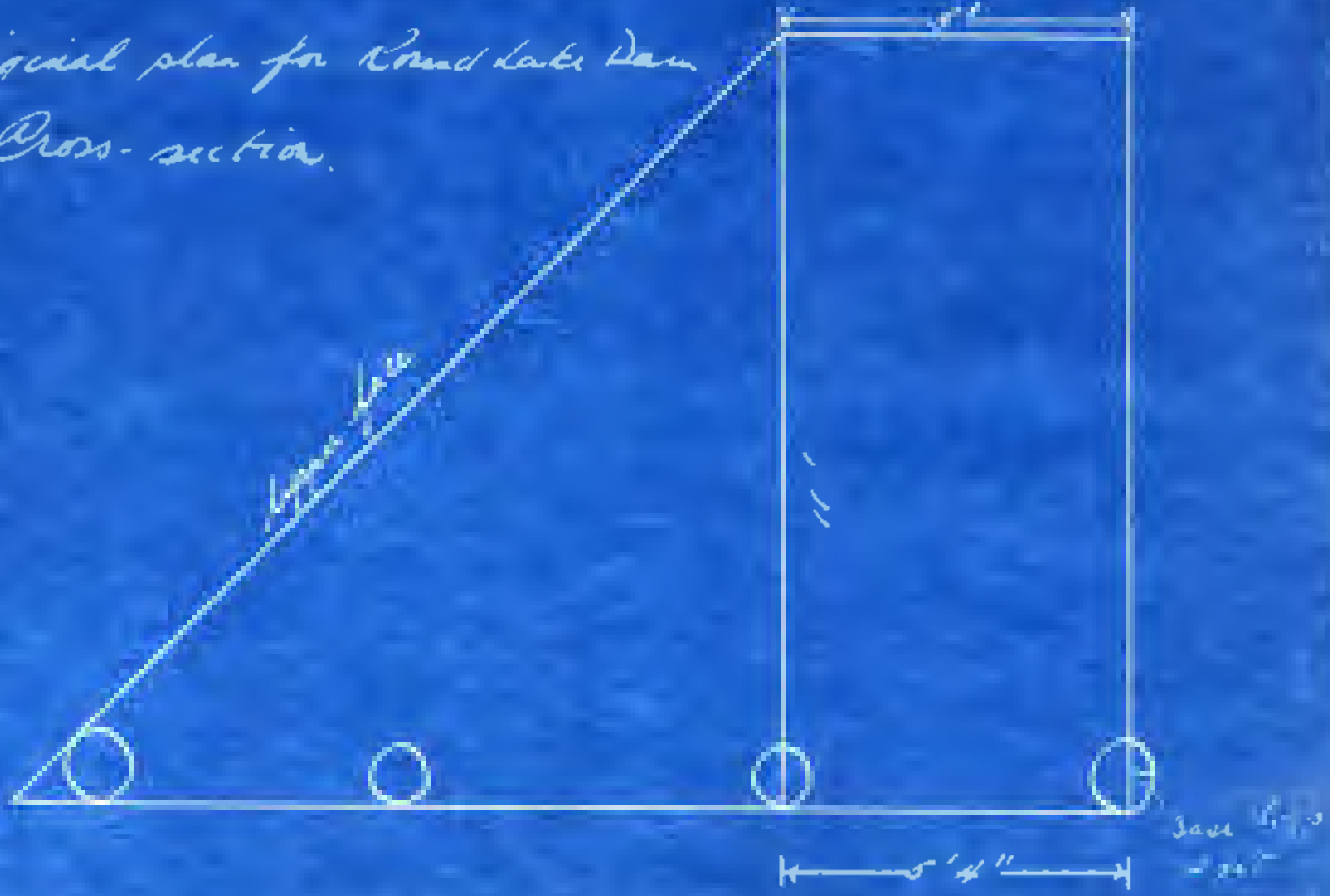
Cribwork.

The dam is of a crib- or cobwork structure in which the logs are laid criss-cross at right angles to one another and is of a type commonly built along the eastern shore of Nova Scotia for log driving. Logs used in its construction were red spruce and Jack pine, 15, 20, 25 and 30 feet in length and varying in diameter from 8 to 16 inches at the top. Four sets of bed logs were laid across the stream from bank to bank on bed rock bottom and, on the west side, the logs were carried 12 feet in to the bank and the ground trenched to bed rock to receive them. In order to keep the dam level and to compensate for the difference in height between the shore and the stream bottom, the bed logs and two sets of stringer logs were laid with butts toward the channel. Care was taken to break all lower joints but bed and stringer logs were laid butt to butt and not halted together.

Four tiers of the logs, alternating with three tiers of stringers, were laid on the bed logs. The logs were placed at right angles to the stringers and about 6 feet apart, where necessary, to maintain level, the logs were notched to receive the stringers. Ties and stringers were bolted together with three-quarter inch iron bolts

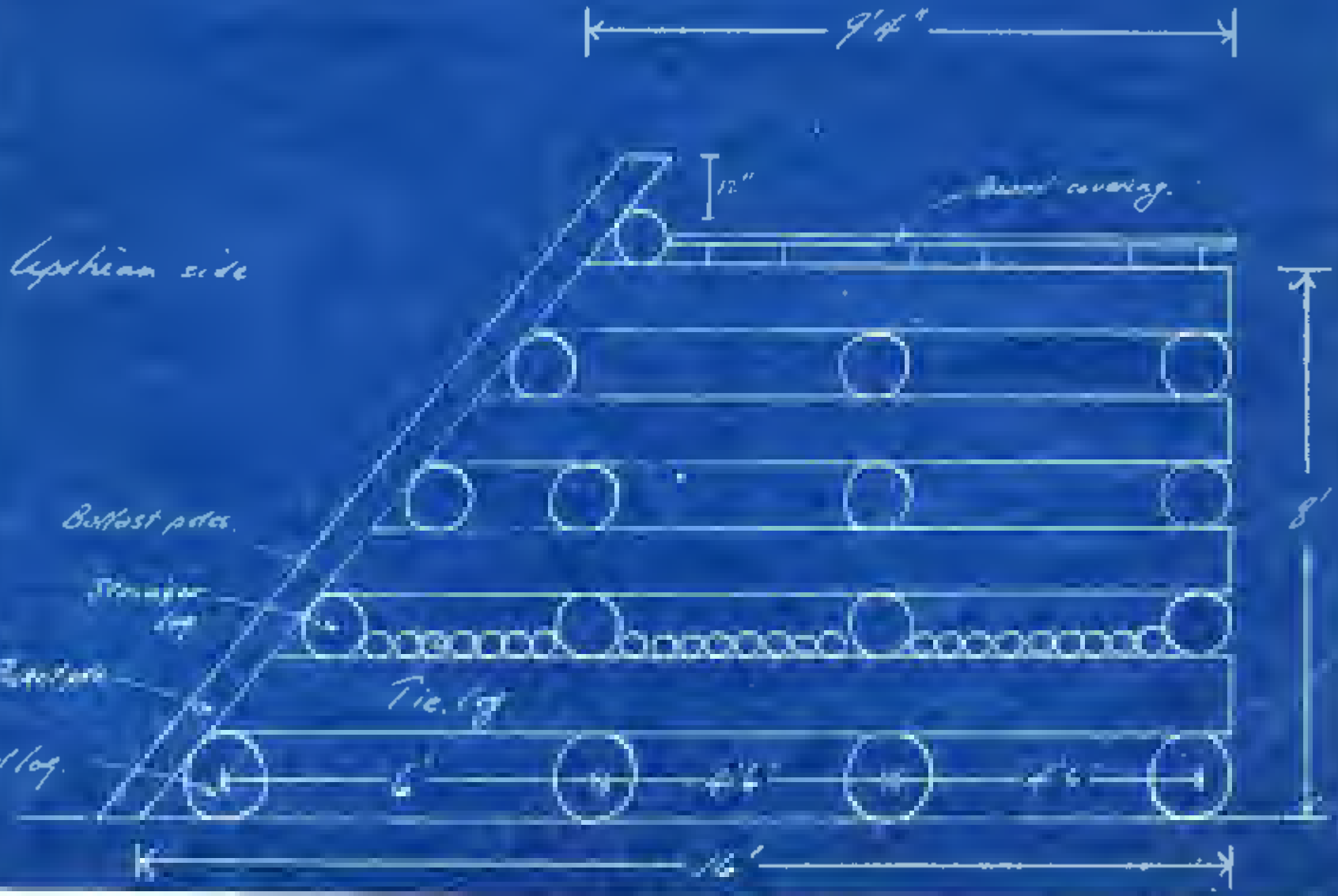
Original plan for Round Lake Dam

Cross-section

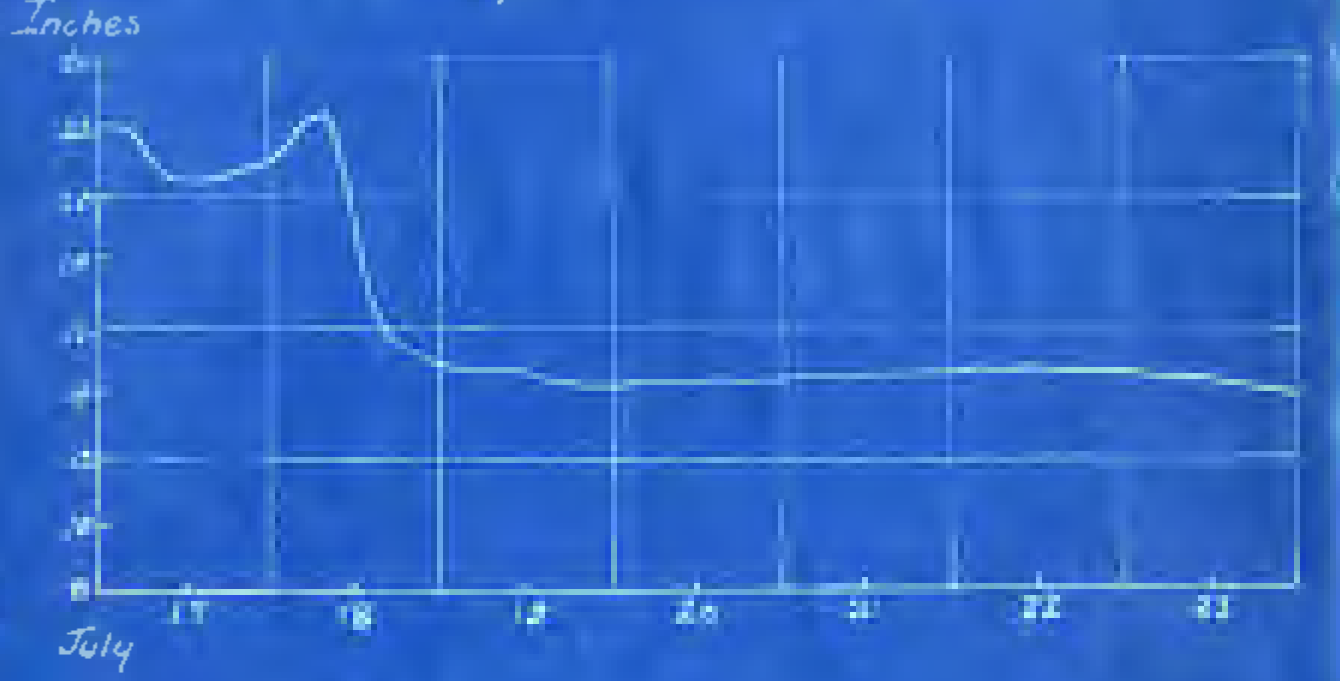


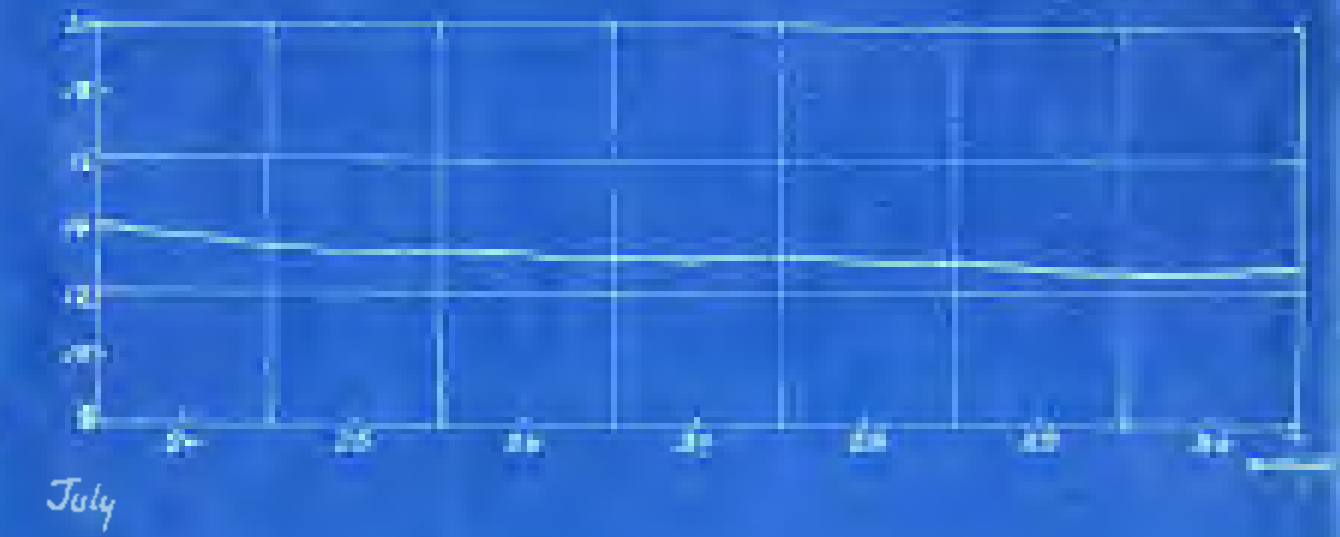
Round side Dam - Cross section.

Scale. 1" = 2 feet



Water Height, Moser River 1940
Bridge at Round Lake Camp





and the logs were partially bored to receive the bolts with a three-quarter inch auger.

To maintain a 45° slope on the upstream facing each successive tier of the logs was cut one foot shorter than the immediately lower tier and the upstream ends were cut 45° obliquely. Upstream stringers were moved downstream in a similarly graded manner until, in the third tier, only three were set. The top stringer only was laid on the fourth row of ties to afford support for the tops of the pickets.

On the west bank successive tiers of ties and stringers were dropped as the bank ascended. The bed logs and three tiers of stringers on either bank butted on solid rock, adding to the stability of the structure.

Facing.

The upstream side of the dam was faced with vertically set picket poles, 14 feet in length, and with 5 to 7 inch butts. These were all soft wood, red and black spruce and fir and were laid with bark on. Butts and tops were alternated to keep the pickets plumb. Pickets were nailed in position with eight inch spikes, and chinks and crevices between the pickets were caulked with wood moss, driven firm with wooden caulking irons.

As previously described, the cribwork was constructed so as to give a 45° slope to the facing. Pressure of water lying on this facing adds to the weight holding the dam in position and maintains it against the downstream directed force of the head of water.

Ballast

A layer of ballast poles with 6 inch butts was placed on the first tier of ties and ballast rock-shale (wind rock) slate and quartz - was dumped in all cribs. Centre cribs were more heavily ballasted, and all cribs bounding the gates were filled to the top with stone.

Gravel

It is the usual custom in a dam of this type to cover the toes of the pickets with two to three feet of mixed gravel and clay. Six inches of gravel was placed upon the toes of the pickets, enough to hold the water during the period of 1940 when the dam was in use, but which soon washed out with a 6 foot head, causing the dam to blow beneath the pickets.

Gateways

Room was left for two gates, eight feet in width in the river channel and one gate was constructed.

East gateway. Two gate posts, 10^{x} x 10^{x} x 14^{1} were erected two feet behind the top stringer and were fitted on the upstream side with a three inch rabbet. The gate itself was made of seven 2 inch planks, seven feet in length, and, with all planks in position, stood seven feet, six inches high. Two upright beams, 6 x 6 inches were fastened on the gate behind with spikes and 9 inch bolts provided with thread and nuts and three hoisting pieces were mortised on these beams.

The gate planks were secured as follows in order from top to bottom:

1. Loose
2. Loose
3. Spiked
4. Bolted
5. Spiked
6. Bolted
7. Bolted

Two gate sills, 10" x 10" x 22', were laid on either side of the gate way on the bed logs. These sills extended from the front facing to 7 feet below the dam and rested on a toe log on the downstream side.

On the floor of the gateway between the gate posts was placed a bumper or dead head 8" x 6" x 6'6" to receive the impact of the gate, when dropped.

The sluice in front of the gate was boarded with 2 inch plank on the bottom and east side and with poles on the west side.

The gate sills, carried 7 feet below the dam, rested on a toe log and on this basis a short flume was constructed to carry the water a short distance below the dam and to prevent undermining of the bedlogs. The scaffolding was built 9 feet above the stream bed. The floor of the flume was covered with poles and the sides to a height of five feet. Joints on the beams of the scaffolding were mortised with mortise and tenon and bound by wooden pegs. A hoisting beam, 8"x8"x18' was straddled behind the gate on the scaffolding to afford leverage for the pryn in hoisting the gate and the whole scaffold was covered with poles to form a platform.

East gateway. The front of this gateway was covered with eleven 2 inch planks and these were inserted into an inclined rebbet. The top four planks were left loose, the bottom seven were spiked in position, covered with a layer of tar paper and faced with one inch board to prevent leakage.

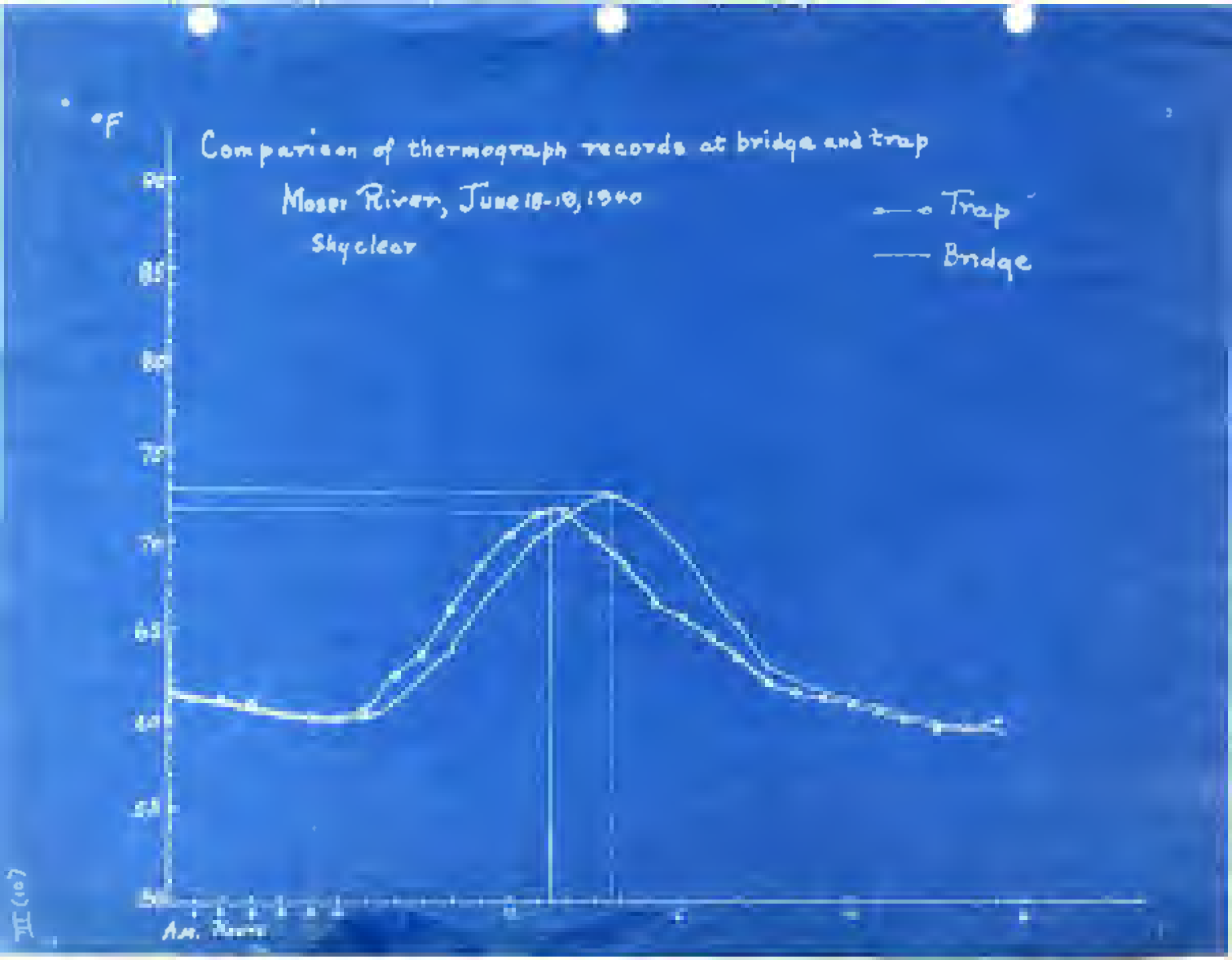
The plank facing of this gateway was reinforced by stringing 4 poles across the gateway to support a centre plank on which the two inch boards rested. Such an arrangement, while not making full use of this gateway, permits an added flow by removal of the top 3 or 4 planks when there is a full head.

Covering.

The east wing of the dam was covered with an inch board supported by two inch plank. The west wing was covered with poles. No covering was placed on the centre crib between the two gateways.

10. Comparison of thermograph records at bridge and trap.

Beaver River, June 18-19, 1940.


°F
Comparison of thermograph records at bridge and trap
Moser River, June 18-19, 1940
Sky clear
Trap
Bridge
85
80
75
70
65
60
55
50
A.M.