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REPORT ON INVESTIGATIONS OF ST. CROIX RIVER, SEPTEMBER, 1936.

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by

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Interest in the development of the St. Croix river as a salmon stream has continued since the original report on conditions in this stream, in 1930. The local branch of the New Brunswick Fish and Game Association desired to know what could be done to develop this stream for this species, since an exceptionally large number of salmon appeared in the stream this summer, but were prevented from proceeding up the stream by numerous dams which exist on it, and which have no fish-ways, or else are provided with inadequate or inefficient ways.

Prior to making any move regarding the fish-ways, it was desired to know whether the unfavourable conditions observed in 1930 have disappeared or improved in any degree, in the interim. Accordingly, on September 17, 1936, in company with the president of the Schoodic branch of the New Brunswick Fish and Game Association, each of the stations visited in 1930 was again visited, and an entirely comparable set of examinations was made at each station. In this study, sub-surface water samples were taken at all but one of the stations. For the location of these stations, reference should be made to the previous report, figure II of which shews the precise location of each of these, and the points examined.

The plan of the 1930 report is being followed in the preparation of this report, for ease of comparison between the two years.

HYDROGRAPHIC AND METEOROLOGICAL CONDITIONS.

This season has not been so warm, and there has been more rain,

than in 1930. There were deviations of the maximum temperature of the waters above the normal in the week of the investigation in 1930, of 6.0°C., whereas during the current week (1936) the deviation of the maximum temperature from its mean has been negative, -2°C.

INVESTIGATION.

The various stations, as already described were visited in turn, beginning at the dam above the cotton mill at Milltown, N. B., about 3:00 p.m., on the afternoon of September 17th. It was a clear, warm day, with a strong breeze from the north-west.

Samples were taken for oxygen determination, from the surface at each station, and sub-station samples also, except at Upper Mills (Baring). Temperatures were determined, and the hydrogen-ion concentration or acidity (pH) was also ascertained. In two stations, namely that at the cotton mill, and also at Princeton (the two extremes of the area under investigation) samples were secured to find the phosphate concentration, which furnishes under some circumstances an excellent measure of pollution.

RESULTS.

The results secured from the various tests are given herewith in Table I.

TABLE I

Station	Location		Acidity pH	Oxygen c.c.per litre	% sat'n	Temp. °C.	Phosphate P ₂ O ₅ mgms.per cu.m.
1	Milltown - above cotton mill dam	(S)	6.6	5.95	89.5	18	12.2
		(B)		6.15	92.5	18	
2	Milltown - above upper dam, above bridge.	(S)	6.5	5.34	80.0	18	
		(B)		5.37	80.8	18	
3	Mohanas creek - below bridge.	(S)	7.0	6.48	102.6	20.5	
		(B)		6.50	102.8	20.5	

Station	Location		Acidity pH	Oxygen cc.per litre	% sat'n	Temp. °C.	Phosphate P ₂ O ₅ mgms.per cu.m.
4	Below Baring bridge -above dam*	(S)	6.7	6.10	92.7	18.5	
5	Woodland Jct. - above dam;above sorting slip.	(S)	6.8	6.14	92.0	18	
		(B)		6.08	90.5	17.5	
6	Princeton, Me., below highway bridge	(S)	7.0	6.53	97.4	17.5	Sample badly contaminated by organic matter.
		(B)		6.56	97.6	17.5	

*Dam no longer in existence. (S) signifies surface sample.
(B) signifies sub-surface sample.

DISCUSSION.

In order to facilitate comparison of the findings of the two investigations the following table (Table II) has been prepared comparing the pH values of the two studies, and also the oxygen concentrations. It is to be remembered in making this comparison that the concentration of dissolved oxygen in water varies inversely as the temperature. Since the temperatures in this last investigation were higher (study made in September, whereas the 1930 investigation was made in October) the amount of dissolved oxygen should be lower under normal conditions. In order to make comparisons of waters under such different conditions of temperature, the percent saturation is determined, using the saturation value for distilled water at the given temperature as the standard.

Due to the failure to secure temperatures in the 1930 investigation, it is not possible to get the actual saturation values. However, an approximation can be secured by making the value secured at Station 6 (Princeton) the same for 1930 as that determined in the present investigation, and then using this as a basis or standard for the proportional estimation of the probable values

for the other stations of the 1930 investigation. On doing this, the indicated temperature for 1930 is 16.8°C., that is, to give the estimated percent saturation values appearing in the following table.

It is justifiable to make this estimation as Princeton is above the probability of pollution, and it is most likely that the water was as pure then as now, so that in 1930, 98% saturation seems just as probable as in 1936; and so for the other stations.

TABLE II

Station	Acidity		Oxygen Content				Differences for Oxygen Content % saturation.
	pH		cc. per l.		% sat'n.		
	1930	1936	1930	1936	1930	1936	
1	6.2	6.6	5.32	5.96	78	90	-12
2	6.2	6.5	4.90	5.34	72	80	- 8
3	7.0	7.0	7.06	6.48	104	103	+ 1
4	6.2	6.7	5.40	6.10	79	93	-14
5	6.8	6.8	6.37	6.14	94	92	+ 2
6	6.8	7.0	6.66	6.53	98	98	0

It was shewn in 1930, in the report on the investigation (page 5) that there was "a significant change in the water condition between station 5 (mile 11.5) and station 4, at Baring dam (mile 6), in which station 3 does not participate". It will be noted that this difference is much reduced, and so far as Baring goes, has disappeared entirely. The last column shews the degree of change which has occurred at all these stations - only those in the St. Croix below the Woodland mill have been altered - those above being practically the same as in 1930. It will be noted also that the same holds true for the pH values. With respect to the pH values for Princeton, the difference recorded there may be due to the difficulty of making the readings, since it was the last station, and the light had begun to fail considerably in

ably in 1930, and was not so bright in 1936. The striking similarity for the Mohanas stream for the two investigations affords further support of the comparability of the two studies, and strengthens any conclusions which may be drawn from them.

CONCLUSIONS.

It may be fairly concluded that the unfavourable conditions observed in 1930 no longer exist. From surface water samples, the improvement in the oxygen values amounts to about 12%. The acidity is also improved by 0.3-0.4 pH units. Both of these facts indicate that pollution from the Woodland mill no longer exists.

Further proof of this opinion is furnished by observation of the river bed, in which large amounts of wood fibre were previously visible (report 1930, page 6), but which now seems to be quite clean.

It seems necessary however, to direct attention to the lowest value for oxygen secured in the present study, namely at the Customs bridge at Milltown. This place also had the lowest value for the study in 1930. It is possible that pollution still exists there, but probably from other sources than the Woodland mill, but there does not seem to be any likelihood that this pollution is dangerous, certainly not if the run-off does not fall to lower levels than the existing ones.