

the stream flow potential? Is it expected that the reservoir will be empty once, or perhaps twice in the next fifty years? What size of spillway should be provided for the dam to ensure that the structure will not fail under a severe flood and cause damage and loss of life? These are but a few of the questions for which adequate stream flow records would provide the answers. In addition the efficiency of the regulation reservoir is dependent upon knowledge of the duration of low flows. In other words in most streams in Canada there are periods of low flow and periods of high flow. The periods of high flow really are not too serious in the case of water supply provided the structures are adequate to pass any high water which may occur. But the periods of low flow may be very significant in determining just how much use can be made of the water supply available in the reservoir.

Now Mr. Chairman, I think in a very sketchy manner I have covered sufficient of the organization of the branch. I attempted to define, at least in some fashion, some of the reasons for carrying out hydrometric survey operations. With that I would suggest at this moment I close. If there are any questions I will attempt to answer them.

The CHAIRMAN: Thank you very much.

Mr. SLOGAN: I was wondering if you had knowledge of any difference in the volume of water crossing the border at Emerson since the United States undertook to construct some reservoirs of their own on the Roseau river.

Mr. McLEOD: I could not say there has been any significant difference. However that answer I have just given you is in a sense based on ignorance, because I have not scrutinized in detail recent records of the Red river.

Mr. SLOGAN: I have one more question. Over the years have you noticed any significant difference in the levels of flow of water in various streams due to the melting of the polar ice cap, and the difference in the earth's tilt?

Mr. McLEOD: I do not think there is any significant difference covering the period for which we have records. I might add that as one of the side-lines, if you like, in connection with the hydrometric survey operations, the branch does do a limited amount of glacier survey investigation in the rockies, the coastal range, in Alberta, and in British Columbia for the particular purpose you have just mentioned.

The general pattern at the present time in these glaciers seems to be one of recession. But the differences in the stream flows do not appear to be particularly significant.

Also in connection with your question I would like to point out that the stream flow and water level conditions appear to travel or conform to some sort of cycles; that is, there will be periods of perhaps several years when flows are higher than normal, and then a period of several years when they are lower than normal.

As you know even better than I do, the period of the 1930's was particularly obviously a low flow period virtually over the whole of the prairie provinces, in contrast to the period of the 1950's which was probably a period of high supply or high water period, as was evidenced in the Red River floods of 1950, and the Saskatchewan river floods of 1953 and, with better than average supply of water on the whole throughout those years.

Mr. AIKEN: My question was very much along the same lines, Mr. McLeod, but I was going to ask you if, from the records available, patterns have been established on water flows, and if so, during what length of cycle? That is, per 20 year cycle and so on? Are there any records in that regard?

Mr. McLEOD: I do not think we have enough information to estimate the length of cycle in any particular area. It is only that we have recognized, as I say, in the 1930's, and in central Canada, and right before this, a very low