RESERVOIRS IN THE CYPRESS HILLS DISTRICT*

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WHENEVER one studies the stream run-off of any of these streams in this district one main fact stands out clearly, namely, that in nearly every year about 75 per cent. of the total annual flow runs off in March and April, which is long before the time that the water is most needed on the fields, or will do most good if applied. When we consider this and also note that, periodically, there are wet years with floods in the water, even if it was spread evenly over the season and that, periodically, there are wet years with floods in the spring that do very great damage, we see immediately that there is only one cure for all these troubles, and that is reservoirs. The Cypress Hills water users are having the same experience as all other irrigation developers on streams on the prairie not fed by mountain snows. In fact, it may be said of all streams that the greatest question concerning water supply is always reservoirs.

Water in a reservoir is like money in your pocket—you have it to spend when you want it. Without a reservoir, water is like money some one has promised to pay you—you do not know when you will get it. The question here is, fortunately, not so much one of lack of quantity—there is enough water—it is just a question of reservoiring it so that it is available during the dry summer months when your fields need it. I want to make the point that at present most of the farmers who actually use water apply it on hay lands and one good soaking in the spring does a lot of good, but when the holdings are smaller, or when competition in future makes it necessary to work the land to its full capacity, you will want to have water for other crops in the later dry months. Further, reservoirs will store water and make it available for more land and thus benefit the whole district.

Before I start on facts and figures, you must realize that the building of reservoirs will be a big work, it will cost much money, but it is no bigger job now or in a few years than the building of the ditches was in the old days, when you were not so well established. Because it is a big job we must tackle it early so as to make haste slowly but surely. We must study the question from all angles, collect all data possible, get cost figures, etc., so that when the right time comes everything will be properly lined up.

You must also realize that this is a very complicated engineering question, to decide just how big the reservoirs should be, just how much water we can rely on saving, and so on. I do not present this paper as the final word in the matter, but rather have tried to put the matter before you in a general but true light, anticipating that as time goes on our records will be more complete, and that when active agitation for the building of any reservoir takes place, that will be the proper time to make the final study of each case.

Cypress Lake reservoir was completely surveyed in 1913 and all the necessary data for estimating capacity and cost is available. In the report of the Irrigation Branch, published in 1914, the capacity and cost was figured for a dam 22 ft. high at the east end. The cost per acre-foot stored is very reasonable, $3.80, but when we reckon on the cost per acre of land which can be irrigated and which land must pay for the reservoir, it runs into the higher figure of $16 per acre, based on irrigating 31,000 acres.

At the present time we are able to estimate on the matter of water supply a little more closely because we now have more records available and the more recent survey of the Fifty Mile reservoir also affects the question.

In the irrigation report referred to above it was assumed in considering water supply that two or three wet years like 1912 might follow each other and that water would be stored for successive dry years like 1910 and 1914. This method of study led to the adoption of a reservoir capacity of 126,000 acre-feet which is no doubt amply large and would give complete storage for all water available under any conditions which might arise. Making a more recent study of supply and demand based on stream flow records for 1911 to 1916 it is found that under these conditions a reservoir with a capacity of about 90,000 acre-feet would be large enough based on storing all the water available, absorption losses of 3 feet in the reservoir and a gross duty at the reservoir of 1.5 acre-feet.

The study showed that the water supply available was sufficient to irrigate 21,531 acres only. The cost of the reservoir would, however, be reduced to about $340,000, making the cost per acre-foot stored about 3.77 and the cost per irrigable acre the same as before, about $16. This is just the same cost per irrigable acre as that originally figured, so that we may consider this price not far wrong.

In connection with this reservoir, the only engineering point about which there is any question, arises in connection with diverting the early spring run-off into the reservoir through the made canals. Those of you who were interested enough to read the report published in connection with the survey made will remember that it is planned to divert Battle Creek, Belanger Creek and Davis Creek into the reservoir through made diversion canals. This spring run-off, which produces practically all the water for storage, takes place in March and April and there may be very considerable difficulty in operating the diversion canals at this season of the year due to snow and ice conditions. Another point which should be noted is that in each year there is a certain quantity of water flowing into the streams below the reservoir which cannot be controlled. We have estimated that whatever quantity is available from this source will be used as it comes, in satisfying the water rights on all the irrigable land below the reservoir, up to the limit of getting 50 per cent. of the required water in this way. In four out of the six years studied the irrigators would have had to take less than 20 per cent. of their supply as it came uncontrolled, mostly in the early spring and in two of the years they would have had to take 50 per cent., the remainder being figured as wasted. This feature is not very desirable, but was adopted so as to store and save as much water as possible for the driest years when it is most needed.

To complete the storage problem for the Frenchman River we will take up the Fifty Mile reservoir. Surveys have been made of this site by the Irrigation Branch so that details as to capacity, cost and water supply are available. Studying this reservoir in the same manner as Cypress Lake we have adopted a dam height of 55 feet, giving a reservoir capacity of 52,000 acre-feet. This works out at $6.84 per acre-foot stored and nearly $21 per acre of irrigable land to be served. This is based on serving an irrigable area of 17,000 acres. It has been estimated that there are 24,000 new acres which can be

*Abstract of paper read before the Western Canada Irrigation Association, Maple Creek, Sask.