ample water for the largest ocean ships for about twenty miles.

Oromocto Shoals

There is but one serious obstruction preventing a 15′ channel all the way to Fredericton. This is the Oromocto Shoals situated just above the mouth of the Oromocto River and extending over several miles of channel. The low water depth over the shoals is 9 feet, which limits the draft of vessels going to Fredericton. During the past 45 years the Provincial and Dominion Governments have spent large sums in an effort to open a channel through these shoals, mainly by dredging. The early records, in so far as the writer has had access to them, are very non-committal regarding costs, but it appears safe to say that not less than $200,000 has been spent on channel improvements at this place. To this might fairly be added a large part of the $80,000 paid for Dept. of Public Works Dredge No. 12, which was built and placed on the river mainly for the purpose of dealing with the sands at Oromocto. However, in spite of all this expenditure of time and money, no improvement has been effected. Surveys made before any work was undertaken at the shoals show practically the same conditions as exist today in so far as navigation is concerned.

An analysis of the conditions obtaining at Oromocto Shoals will make the reason for this clear. (See Fig. 1). About 25 miles above Oromocto the grade of the river bed suddenly flattens and the valley widens. From this point to Fredericton the river channel is wide and contains numerous islands and bars of sand and gravel. The coarse material carried down by the swift currents of the upper river has all been deposited by the time the water reaches Fredericton. Between that city and Oromocto the river channel is narrower and the flood currents strong and very uniform. No silt is deposited and during rising floods a great deal of fine material is carried over this part of the river. At the head of Oromocto Shoals the river has a cross section of 59,000 square feet when passing a 16-foot flood, while two miles farther down stream the section is 86,700 square feet for the same flood stage. Due to this enlargement of the channel the average velocity is reduced by approximately 30%. The silt carrying power of a river is said to vary as $v^{2.56}$.

Dredging Increases Silt Deposit

Assuming this to be so, it follows that the average silt transporting power of the St. John is reduced by over 60% in passing over the shoals and consequentially a very large part of the fine material brought down from up river is deposited at this place as the current slackens. Obviously any dredging that is done will cause a reduction of velocity and increase the tendency to deposit silt. This is amply borne out by experience, as any channel excavated is filled up very rapidly. Generally the succeeding flood entirely obliterates it.

There is another condition affecting the situation at Oromocto Normally a river carries most silt while rising and deposits this wherever the current slackens sufficiently. This raises the bed, reduces the section and therefore increases the velocity. Thus the amount of silting up is limited automatically. After the crest of the flood has passed the newly formed bar acts as a submerged dam and the increased current over its crest rapidly wears it away and the river bed is left approximately as it was before the flood.

At Oromocto Shoals the river is divided by Oromocto Island, and Oromocto River enters the navigable or western channel at the lower end of the shoals. (See Fig. 1). This river has an extensive flood plain near its mouth into which the waters of the St. John flow as the latter stream rises. This creates a lake estimated at 30 to 40 square miles in area which is drained out as the water level in the main river falls. This water discharging into the lower end of the navigable channel, diminishes the amount of water that can be drawn over the shoals from up river and so reduces the amount of scouring that can take place.

Some years ago the district engineer in charge of the river for the Dept. of Public Works prepared plans for improving the river by constructing jetties along Thatch Island. This method seems objectionable in that it would affect only the lower portion of the shoals and would do this by congesting the flow in this part of the river thus slackening the current over the upper shoals and making matters worse there. In any case to remove part of the shoal without arranging for a channel through the rest of it is of no use.

Deeper Channel to Fredericton

To the writer it seems that the only means of permanently improving the channel at this place is to close the eastern channel by a long permeable dike, as shown on the plan. By building this up to an elevation of 4 feet above low water the velocity of current in the navigable channel will be about doubled when the crest of the dike is just awash. The idea in making it permeable is to encourage silting below the dike so that if possible the eastern channel may be permanently closed by the time the life of the proposed dike has expired. After the river has had a couple of seasons to adjust itself to the changed conditions created by the dike it may be necessary to raise its crest by flash boards or otherwise, and it should be designed with this in mind.

The estimated cost of this structure is $25,000 and with Oromocto Shoals removed such information as is available goes to show that it would not be very difficult to secure a 15-foot channel all the way to Fredericton. The only complete information on the subject is a survey made by the British Admiralty in 1844-46 and in the absence of new surveys it is not possible to give an estimate of the cost of the 15-foot waterway, but apparently a sum not greater than half that already spent at Oromocto would be ample.

When Grand Falls and the other powers are developed it will be necessary to regulate the flow of the river as fully as possible. A very small amount of regulation would raise the lower water flow by two or three feet, so that ultimately a depth of 18 feet or more below Fredericton is quite possible. The development of the water powers of the river will increase manufacturing and this, together with the lumber which at present is shipped by rail or scow to St. John, should provide traffic for the improved waterway.

Economic Conditions

Economically the basin of the St. John may be divided roughly into four districts. First, the upper or forest area, extending from the head of the river to near Grand Falls and including the basin of the Tobique. Much of this division is occupied by the low mountains of the Appalachian range and it constitutes the chief remaining lumber district of the St. John River. Settlements are extending and no doubt will continue to extend for some time as there is much fertile land here, but any colonization schemes for this district should be given very careful consideration before being adopted. The mistakes made in the older parts of the country should not be repeated here.