A STREAM SURVEY REPORT
of
BLACK AND NORTH HARBOUR RIVERS

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by
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Resource Development Service

Department of Fisheries of Canada

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INTRODUCTION

In November, 1965, a field party surveyed the two rivers involved in the water supply scheme for the proposed paper mill (Fig. 1). The scheme utilizes the headwaters of Black River, which are to be pumped into Come by Chance River through pressure pipeline. The mill site is to be located at tidewater, near the settlement of Come by Chance. A third river, North Harbour, will not be affected by the water scheme. However, the Department wished to examine the feasibility of this river for salmon to offset any damage to fish stocks that may occur in the aforementioned rivers.

Mercer (1963) completed a preliminary study of North Harbour and Come by Chance Rivers. The report provides general information on stream characteristics, terrain, vegetation and fish populations.

The current survey was planned to begin in early November, so that redd counts could be made on spawning beds. Since Come by Chance River had been surveyed previously, only known spawning areas were visited. No spawning redds were observed. Black River was studied in a reconnaissance fashion to determine accessibility, spawning and rearing areas, and related basic information. Time did not permit any analysis of fish stocks, except by questionnaire. More detailed analyses on stream bottom types, river width, depth, temperatures, etc., were completed on North Harbour River.

On November 11, all three rivers were investigated by helicopter. Excessive rains curtailed any further ground examination and the party returned to headquarters on November 13, 1965.

Proposed Development and River Implication

The proposed mill is planned to have an operational capacity of 100,000 tons of newsprint and 75,000 tons of bleached kraft pulp annually, or a total of 400 - 500 tons daily, with the output expected to double in the next ten years. The major portion of the wood required to feed the mill will come from southern and eastern Labrador. The mill is expected to be completed in 1967 - 68.

During the summer of 1965 a study to select a feasible water supply scheme was completed (Shaw Eng., 1965). The report shows that it is possible to provide the required flow of 25 million USgpd or 38 cfs. to operate at the announced production level. It is also possible to provide 50 million USgpd or 76 cfs. when the mill expands to its full operation.

In order to supply the required 25 million USgpd, 12,000 acre ft. of water is necessary to supplement flow into Come by Chance River.

The recommended scheme utilizes the natural storage of Black River Pond (Fig. 2). This scheme requires a control structure at the pond outlet and a diversion works consisting of a pumphouse, pressure pipeline and a canal to transfer the storage water into Come by Chance River. The supply system to the mill consists of a control weir and intake structure at Goobies Pond with gravity pipeline to the mill. Storage can be provided in Black River Pond to supply a mill demand of 50 million USgpd.

The route selected will utilize a pressure pipeline and canal, but takes advantage of favourable topography to facilitate flow.

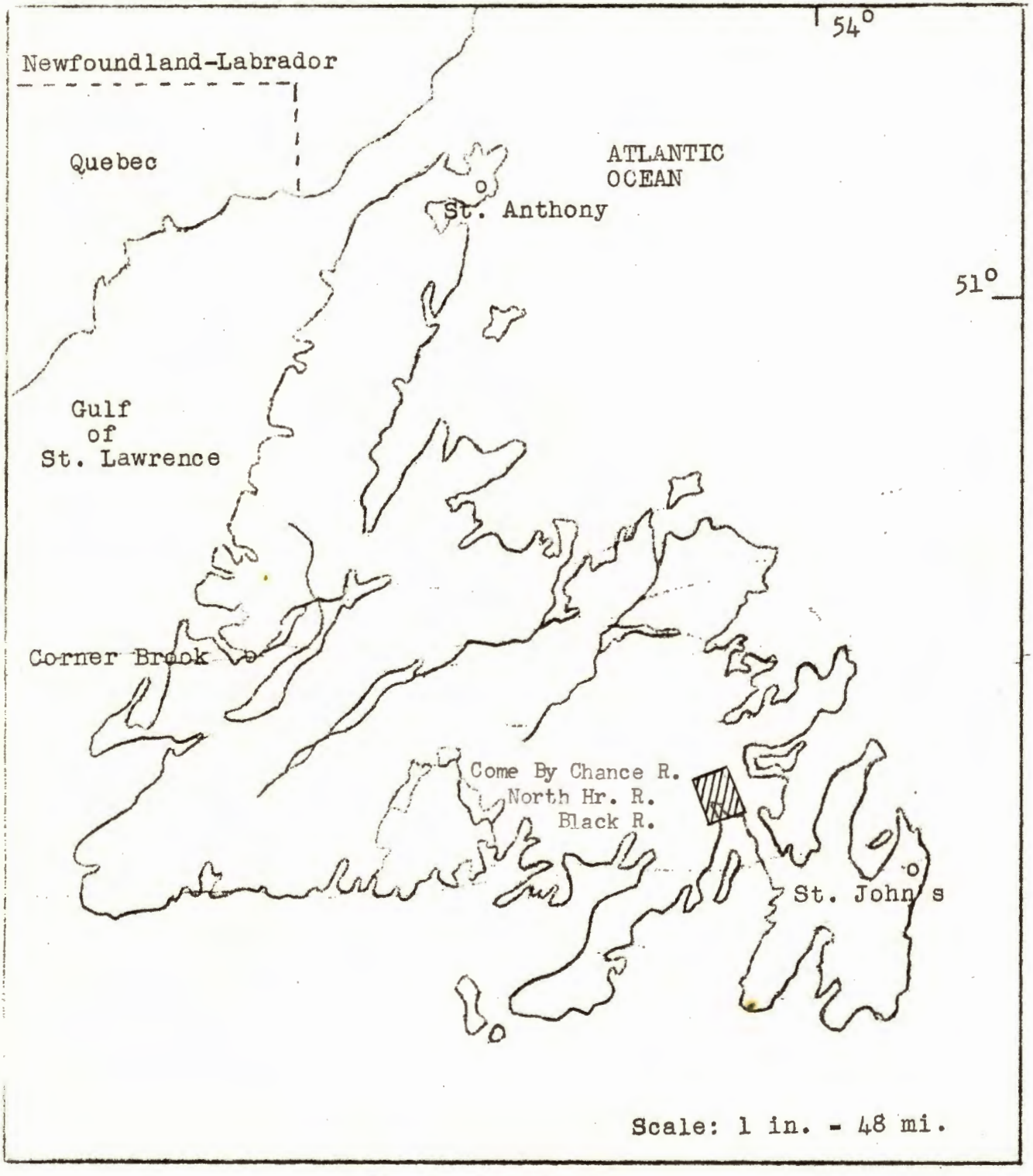

Fig. 1. Location Map

Logging dams and booms will not represent any problem on the rivers in question, since the wood will be trucked or shipped directly to the mill.

BLACK RIVER

Located in the Northeast bottom of Placentia Bay, Black River and its tributaries drain an area of approximately 85 square miles (Fig. 2). The settlements of Black River and Swift Current are located near the mouth, with the Burin Peninsula Highroad intersecting the river 1/2 mile above tidewater.

General Description

Black River Pond, with a surface area of 3.9 square miles, forms a natural reservoir for flow into Black River. It is considered to be the headwaters. Most streams flowing into the pond are little more than spring-fed brooks, and these contribute very little to the total drainage. Arising at an elevation of about 650 ft. above sea level, the river flows 10.5 miles in a general Southwesterly direction into Placentia Bay.

In the upper seven miles the river valley is wide, with bordering glacial drift hills which slope gently to the river. A falls is located approximately 3 miles upstream from the mouth. Below this, the river flows more swiftly through fairly steep hills which drop almost vertically into the main channel. Twenty-three miles of primary and secondary streams are tributary to the main stream as well as some 16.9 linear miles of standing water.

FIG. 2: PROPOSED WATER SUPPLY SCHEME
FOR COME BY CHANCE MILL.

Along most of the stream there is a margin of thick brush consisting of alders, birch, fir and spruce. The stream banks are typically earth in the upper section; boulder and ledge-rock outcrop in the lower drainage. Above the river valley the scant brush gives way to barren and swampy areas nestled among the pronounced glacial drumlins. Glacial drift and glacial erratics are also evident.

The lower section is generally described as a fast stream with short falls and scattered rapids. The channel width ranges from 40' to 150' with an average of about 100'. Depths range from 1 - 3 feet throughout the year over a predominate boulder-rubble bottom. Only trace amounts of bedrock and gravel were observed in this section.

Three primary streams judged as having the potential to support Atlantic salmon (Salmo salar) flow into the main channel below the falls. Several others are of such limited dimensions that they are of no apparent use as potential salmon producers. Tributaries 1, 2 and 3 (Fig. 2) are 8.4, 7.2 and 3.2 linear miles respectively. Time permitted a brief look only at tributary No. 3 which was indicated to be the most probable spawning stream. Its flow and bottom composition were ideal up to one-half mile from the mouth. A falls terminates salmon passage beyond this point. Several redds were observed in this tributary below the falls, however, upon excavation, no eggs were found, and the redds were presumed false.

The upper section of the main river differs considerably from the lower course below the falls. Here the channel is wider, the waters run more slowly and a boulder-rubble and gravel bottom typify the river bed. Channel widths range from 75 - 300 ft. with an average of approximately 200 ft. Velocities are slow to medium and depths range between 1 - 2'

throughout the year. Because of its slow velocity, many long steadies and ponds are located in the main channel, especially near headwaters.

Water temperatures ranged from 39°F to 41°F during the survey period.

Black River Falls represents a total barrier to upstream fish migrations. At the falls the river drops a total of 60 ft. in 76 ft., with one vertical drop 40 ft. The torrent of water, approximately 20 ft. wide at the crest, drops into a large round basin. No Atlantic salmon have been reported above the falls.

Fish Populations

Black River was the site of the first pulp mill in Newfoundland. Built in 1897, with an operational capacity of 20 tons per day, the mill ceased production in 1903. A 30 foot high dam was constructed at the mouth of Black River to provide water for mill operations. Blair (1946) removed a small section of the dam permitting fish to enter for the first time since 1897. Following its removal, a portable counting fence was put in operation during 1946 and 47; 37 and 49 salmon respectively were recorded through the trap. Local residents report a moderate run of fish enter the river each Spring. However, the river is not "scheduled"* and accurate angling statistics are not available. The local Fishery Warden reports a run of several hundred salmon.

Similarly, accurate records of brook trout (Salvelinus fontinalis), both resident or sea run, are not available. Estimates of the population of this river are not forthcoming until further study.

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* Scheduled means "restricted" to holders of a salmon fishing license.

Summary

Since tributaries 1 and 2 of the lower drainage were not surveyed, accurate conclusions on salmon potential cannot be drawn. However, from what has been observed through ground and aerial surveys, the river does not appear to have a large potential due to the lack of suitable spawning areas. The only observed spawning beds were on tributary No. 3 which itself is not extensive enough to support any large numbers of fish. Moreover, the channel width and depth in tributary No. 3 is such that any periods of drought or excessive flooding could limit salmon and trout production or stop spawning, if they co-incide with spawning.

Recommendations

The following recommendations are made as a result of the survey:

1. The dam at the mouth be completely removed to provide increased flow into the bay and attract anadromous species.
2. That adequate fish-passage facilities be provided at Black River Falls, improving the status of Atlantic salmon and other anadromous species.
3. That the river be "scheduled".

The above recommendations are to be followed provided the present stream flow is not altered. If the aforementioned supply scheme is adhered to, then the above recommendations would not serve their purpose of increasing the stocks of anadromous fish in the river.

COME BY CHANCE RIVER

Since a more detailed ground survey was completed on this river (Mercer, 1963), only a brief summary from that report will be given here. The sections of the river known to have suitable spawning characteristics

were visited during the recent survey. No evidence of spawned or spawning salmon was observed.

The river has a total length of 18 miles, with tributary streams accounting for eight miles. The complete watershed is accessible to migrating fish. Extensive spawning facilities are present in the system; however, the hardpacked gravel probably reduces the extent to which it could be utilized. Mercer (1963) estimates an escapement of 100 salmon, and 1000 - 2000 sea run brook trout.

Based on a helicopter survey completed on November 11, in which the complete watershed was flown, the bottom composition was observed to be as follows: 40% gravel, 25% rubble, 20% boulder, 10% sand and 5% mud. Only trace amounts of bedrock were observed.

NORTH HARBOUR RIVER

North Harbour River flows in a Southwesterly direction into North Harbour, Placentia Bay. The watershed covers an area of 34 square miles. Its stream mileage totals approximately 29 linear miles, 16 of which are tributary streams (Fig. 2).

Mercer (1963) writes a general description of the watershed. This report will give a little more detail on stream bottom composition of the section between Gull Pond Brook and one mile of the main channel above 2nd. Pond. Time did not permit detail above or below this section, however, some figures based on helicopter work and Mercer's report are given.

Physical Characteristics of the Main River

The section between the mouth to Gull Pond Brook represents 2.4 linear miles of the drainage system and is characterized by steep banks of unconsolidated drift material which rise to 100' above the river bed. The immediate river shoreline is composed of boulders and bedrock. Only

where the land slopes gently into the river bed is there any mud bank exposure. This is particularly evident at the mouth of Gull Pond Brook and near tidewater. The river has an average width of 75' with a range from 25 - 150'.

The stream bottom classification (Lagler, 1956) is described as Bedrock 10%, Boulder 45%, Rubble 40%, with gravel, sand and mud making up the remaining 5%.

The bedrock in the lower section of the stream channel is similar to that found throughout the remainder of the system. It is soft and easily eroded, causing many rapids and small falls.

This section represents the least productive portion of the river with its fast water and bedrock-boulder bottom.

Table 1. Stream Bottom Types from Mouth to Gull Pond Brook, North Harbour River, Sq. Yd.

Sand-Mud Gravel	Rubble	Boulder	Bedrock
2,200	17,600	19,800	4,400

It must be borne in mind that these figures (Table 1) are derived from a brief helicopter survey. Mercer (1963) reports, between Gull Pond Brook and the mouth the river is a fast moving stream flowing over a boulder-bedrock bottom. However, it is recommended that more detailed ground work be carried out on this section during the coming season.

Gull Pond Brook

This tributary enters the main channel 2.4 miles from tidewater. The main brook is 2.5 linear miles long with an additional 1.6 miles in

secondary tributary streams. Mercer (1963) surveyed the first 1/4 mile up to the falls. He describes it as "swift over boulder and bedrock", with "no gravel or sand beds being evident". The falls are 25' wide and 60' long, and drop an estimated 15 - 20'. The falls are considered passable but difficult at low water levels.

Beyond the falls the river is described as a narrow 25' wide channel flowing slowly over a predominately boulder-rubble bottom. The river meanders through a low lying area of marshes and muskeg: tree growth is restricted to the river shoreline. Only one small patch of gravel was observed, and that was located immediately above the falls. Near the headwaters the river becomes a series of small ponds and steadies. The headwaters extend north of the highroad to Gull Pond (Fig. 2).

Table 11. % Bottom Composition Gull Pond Brook

Sand - Mud	Gravel	Rubble	Boulder	Bedrock
-	5	45	45	5

Tables III, IV and V give a resume of the gravel and rearing area between Gull Pond Brook and one mile above 2nd. Pond. This was obtained by using four personnel, walking in the river bed and recording bottom composition at 500 - 600 ft. intervals.

Table III. Gravel and Rearing Area Between Consolation Pool and Cull Pond Brook.

Mile Pt*	Width in ft.	Average depth in ft.	Gravel Area in sq. yd.		Rearing Area in sq. yd.	Flow
			Good	Med.		
0.1	30	1.5	1020	-	1700	Med.
0.2	35	1.0	1632	-	2000	Med.
0.3	30	1.0	1275	-	1700	Med.
0.4	30	1.0	1275	-	1700	Med.
0.5	30	1.5	850	-	1700	Med.
0.6	30	1.5	850	-	1700	Med.
0.7	30	1.5	425	-	1700	Med.
0.8	30	1.5	-	-	800	Med. - Fast
0.9	30	1.5	-	-	800	Med. - Fast
1.0	30	1.5	-	-	800	Med. - Fast
1.1	50	1.5	-	-	600	Med. - Fast
1.2	50	1.5	-	-	600	Med. - Fast
1.3	60	2.0	-	-	700	Med. - Fast
1.4	60	2.0	-	-	700	Fast
7000'	35'	1.5'	7000 sq yd		17200 sq yd	

The bottom classification used is that of Lagler (1956).

Rearing area is described as habitat suitable for the fry, parr or smolt

* Stream sheets were completed for every 500' interval, i.e. 0.1 - 0.2 = 500 ft.

of Atlantic salmon. Only sections which have very fast water over bedrock and boulder bottom were considered unsuitable.

Table IV. Gravel and Rearing Area Between Duck Pond and Consolation Pool.

Mile to*	Width in ft.	Average depth in ft.	Gravel Area in sq. yd.		Rearing Area in sq. yd.	Flow
			Good	Med.		
0.1	30	2.0	-	125	2500	Med.
0.2	30	1.5	625	-	1200	Med-Fast
0.3	35	1.0	2100	-	3000	Med.
0.4	30	1.5	500	-	1200	Slow-Med
0.5	30	1.5	625	-	1200	Med.
0.6	30	1.5	2000	-	2500	Med.
0.7	40	1.5	325	-	1600	Med-Fast
0.8	30	1.5	2250	-	2500	Med.
0.9	30	2.0	2250	-	2500	Med.
1.0	30	1.5	1250	-	2500	Med.
1.1	35	1.5	1950	-	3200	Med.
1.2	30	1.5	1250	-	2500	Med.
9000'	30'	1.5	15000	125	24400 sq yd	Med.

* 0.1 - 0.2 = 750'

Table V. Gravel and Rearing Area in 1st. Mile Above 2nd. Pond.

Mile Pt*	Width in ft.	Average depth in ft.	Gravel Area in sq. yd.		Rearing Area in sq. yd.	Flow
			Good	Med.		
0.1	25	1.0	170	170	1700	Med.
0.2	20	1.5	126	-	1000	Med.
0.3	30	1.5	420	-	2100	Med.
0.4	30	1.5	840	-	2100	Med.
0.5	20	1.5	-	-	1300	Med.
0.6	20	1.5	-	-	1300	Med.
0.7	20	1.5	-	-	1300	Med.
0.8	20	1.5	756	-	1300	Slow
5000	25'	1.5	2500	170	12000 sq yd	Med.

Table VI. % Bottom Composition From Consolation Pool to 1st. mile above 2nd. Pond.

Location	Sand-Mud	Gravel	Rubble	Boulder	Bedrock
From Gull Pond Brook to Consolation Pool	10	27	21	39	3
Consolation to Duck Pond	8	48	19	25	-
From 2nd. Pond to One Mile above	4	20	40	32	4

* 0.1 - 0.2 = 625'

The Section between 3 rd. Pond to Headwaters

This section of the river is generally described as a narrow channel with medium velocity over a predominate boulder-rubble bottom. The river flows through a well wooded area of gentle slope. Overhanging alders and balsam fir provide excellent shade. The surrounding land is equally well forested with only the occasional bog and barren hill observed.

The bottom types are based on observations from a helicopter survey and are as follows: bedrock 5%, boulder 35%, rubble 50% and gravel 10%. The boulder and rubble is of a hard granite nature, and are found well mixed together on the stream bottom.

Gravel areas are spread throughout this upper section, however, they are not extensive. Near the headwaters the river gives way to a series of ponds and steady areas forming a natural reservoir.

Practically the entire 4.5 miles of this upper section is classed as suitable rearing area for immature salmon.

Fish Populations

Atlantic Salmon

Table VII. Salmon Angling Statistics, North Harbour River, 1955 - 65.

Year	Under 6 lbs.	6 lbs. and over
1955	19	-
1956	4	-
1957	16	-
1958	37	-
1959	57	-
1960	2	-
1961	6	-
1962	26	-
1963	41	-
1964	105	2
1965	12	1

Angling figures, (Table VII), show that the catch statistics over the period 1955 - 1965 ranged from a low of 2 fish in 1960 to a high of 105 in 1964, with a predominately grilse population. Mercer estimates the escapement of salmon to be 250 - 500 fish. The writer is inclined to agree with this figure. However, it would seem that this river could support a larger number of spawning salmon, and also there would appear to be reasonable amounts of rearing area available (Tables III, IV and V). The river is subject to a wide range of water levels which could act as a limiting factor. Adjustments in stream flow to minimize fluctuations could help to increase the population of salmon in this river.

Brook Trout

This stream has been generally acknowledged to support a sizeable sea trout population. In 1962, 1,350 fish were angled. Mercer estimates a population of 4,500 fish, based on 30% angler catch.

No accurate catch figures of resident brook trout are available, however, it is reported that anglers have catches comparable to those of sea run brook trout.

Summary

Based on the amounts of available spawning and rearing area, North Harbour River possesses an excellent potential for Atlantic salmon. Its size, however, limits it being a great producer, but streams such as this, in the aggregate, contribute immensely to our overall Atlantic salmon resource. Mercer (1963) ponders why this stream is not now supporting a larger run and attributes it to fluctuating water levels. He estimates that a run of 1,500 Atlantic salmon could be supported in the stream.

This example of a river supporting well below its potential is not uncommon for Newfoundland streams, which have suffered a steady decline over the years. No clear cut answer to this problem is imminent, however, the increased commercial and sport fishery could be one of the reasons.

North Harbour River with its large amounts of spawning gravel and ideal rearing areas could possibly be developed to produce a larger run of fish. Locations for such management tools as control flow dams, spawning channels, hatcheries, river improvement, etc. are available and built at economic costs.

Recommendations

1. Since only a small section of the total watershed was covered by foot, it is recommended that the remaining portion be covered next season.
2. That accurate stream flow records be collected for several years.
3. That a study in productivity be carried out.
4. The best management technique be investigated to build up the existing stock to the river's carrying capacity or to compensate for any loss of fish in Come by Chance River and Black River, should this occur.
5. Investigate the Pipers Hole River as an alternative to developing the smaller North Harbour River.

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Fig. 3. Looking up Black River from highroad below the falls.

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Fig. 4. Black River Falls.

Fig. 5. Black River Above the Falls.

Fig. 6. North Harbour River Below 1st. Pond.

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Fig. 7. North Harbour River above 2nd. Pond.