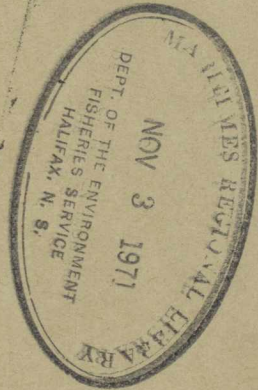


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RESOURCE DEVELOPMENT BRANCH

MANUSCRIPT REPORT

No. 56-8



KESWICK RIVER SALMON SURVEY

by

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**FISHERIES SERVICE
DEPARTMENT OF FISHERIES AND FORESTRY OF CANADA
HALIFAX, N.S.**

KESWICK RIVER SALMON SURVEY

ABSTRACT

Suitable salmon spawning areas in this system appeared most extensive along the ten-mile section between Zealand Station and Barton. Smaller, more scattered spawning areas were also found along the upper and lower sections of the main river, and in the lower sections of a few tributaries. Also, Suitable salmon nursery appeared quite abundant throughout most of the system.

Numerous large pools were located along most parts of the river below Barton. Above Barton, the pools were fewer in number and mostly smaller. A few small pools are also found in the larger tributaries.

No serious sources of pollution or predation were observed on this ~~system~~ system.

KESWICK RIVER SALMON SURVEY

LOCATION

The Keswick River is located in York Co., N.B. The river flows generally from northwest to southeast, and empties into the Saint John River on the true left bank, about 18 miles above Fredericton.

TIME AND EXTENT OF SURVEY

A general salmon survey was carried out on the Keswick River system during the period of September 17th - 27th, 1956. A salmon spawning survey was also carried out during the period of October 25th - 30th, 1956. In these surveys all of the main river and all tributaries of importance to salmon were covered.

GENERAL DESCRIPTION

The main Keswick River is approximately 36 miles long, and drains an area of about 176 sq.miles. This river has a gentle to medium gradient throughout most of its length.

Along the lower 25 miles of the main river, much of the shoreline consists of pasture land and cultivated fields. Above this, most of the shoreline is wooded and bush covered. During the survey, the air temperatures ranged from 9°C (48.2°F) to 15°C (59°F), and the water temperatures from 7°C (44.6°F) to 11°C (51.8°F). The pH readings were all in the vicinity of 6.5 - 7. These temperatures and pH readings were recorded during the September, 1956, survey.

MAIN KESWICK RIVER

From the river mouth to Zealand Station, a distance of about 14 miles, the gradient is mostly very gentle. Numerous deep pools, and quiet areas, 1 - 3 feet deep, are found in this section. In these quiet areas, the bottom is composed predominantly of sand and very fine gravel. Several short, gentle riffles alternate with the quiet areas. The river bottom in the riffles is composed mostly of

mixed gravel and sand, with little coarse material present. The river meanders greatly throughout this section, and numerous deep pools are found on the bends.

From Zealand Station to Barton, about 10 miles, the river has a steeper gradient. Approximately 50 percent of this section consists of gentle to medium riffles. The bottom in the riffles is composed mostly of mixed gravel, in some places very coarse. Several shallow quiet areas and a number of deep pools are also found along this section. Numerous large rocks, boulders and ledges are present in many of the steeper riffles and in the bottoms of several pools. Small percentages of sand are found in some pool bottoms and gentle riffles.

From Barton to the head of the main river, a distance of about 12 miles, the river bottom is very coarse, with little suitable spawning area. In most places, the bottom is composed of coarse gravel, boulders and numerous ledges. Only a few scattered areas of finer gravel and sand are interspersed. The river, along this section, consists mostly of gentle to quite swift rapids. A few pools and shallow quiet areas alternate with the riffles. These areas are mostly located along the upper 2 - 3 miles, and much sand is found on the bottom of some quiet areas.

The head of the main river is made up of two branches, which will be discussed under the heading "Tributaries." The upper end of the main river is about 25 - 30 feet in width and averages nearly 1 foot in depth.

TRIBUTARIES

Jones Forks. This brook flows approximately from north to south, and enters the Keswick River on the true left bank at Burt's Corner. The brook has a gentle to medium gradient. About 75% of the brook consists of riffle areas, with shallow, quiet areas and few small pools, up to 4' in depth, alternating. Coarse gravel and large rocks are abundant in

most riffles. Finer gravel and sand are found in some of the gentler riffles and quiet areas, especially along the lower two miles.

Near the mouth, this brook averages 25 - 30 feet in width and about 1 foot in depth. About $3\frac{1}{2}$ miles upstream, the width is only 10 - 15 feet and the depth, 3 inches to 1 foot in riffles. The pH of this brook was 6.5; water temperature 8°C (46.4°F), and air temperature 11°C (51.8°F).

North Forks. This brook flows generally from north to south, and joins the Keswick River on the true left bank at Stoneridge. The gradient is mostly quite steep. The brook consists mainly of riffle areas, with only a few small pools. Very coarse gravel, large rocks and boulders cover most of the bottom. Along the lower section, this brook averages 20 - 25 feet in width and about 1 foot in depth.

Middle Brook, a small tributary of North Forks, also has a fairly steep gradient and a very coarse bottom. This brook is only 10 - 15 feet wide and about 1 foot deep along the lower part.

On the date of survey, the pH on both these brooks was 7. The water temperatures were 7°C (44.6°F) and the air temperatures were 9°C (48.2°F).

West Branch Keswick River. This branch is the largest tributary of the Keswick River and drains several small lakes. It flows generally from northwest to southeast, and joins the main river on the true right bank at Barton. The gradient is mostly gentle to medium, with a few very swift areas and a small fall (near the upper end).

In most parts of this branch, the bottom is quite coarse, with boulders and ledges quite numerous. However, several sections of mixed gravel provide some good spawning area, mostly along the lower 3 - $3\frac{1}{2}$ miles. More than 75% of the stream consists of riffles, in some spots very steep and rocky. A few shallow quiet areas and small pools, 2 - 4 ft. in depth, alternate.

Near the lower end, this branch varies between 20 and 30 feet in width and 6 inches to 1 foot in depth. The pH of this branch was 6.5; water temperature, 7°C (44.6°F) and the air temperature, 10°C (50.°F).

Howard Brook. This brook flows generally from northwest to southeast, and joins the Keswick River on the true right bank about 5 miles above Barton. The lower 3 miles of this brook has a gentle to medium gradient. This section consists mostly of riffles, with only a few small pools. The width varies in most places from 12 - 18 feet, and the depth from 6 inches to 1 foot. The bottom here consists mostly of mixed gravel and sand.

Above this section for over 1 mile, the brook becomes much steeper, with many swift rapids. The bottom here is composed mostly of large rocks and boulders, with small percentages of sand and gravel interspersed.

From this section upstream 1 - 1½ miles, the brook consists mostly of swampy deadwater areas. The bottom here consists mainly of mud and sand, overlying large rocks and boulders.

The pH readings on this brook were about 6.5; the water temperature 9°C (48.2°F) and the air temperature, 10°C (50.°F).

Left Branch Keswick River. This branch forms part of the headwaters of the Keswick River. Near the lower end, the brook is 12 - 15 ft. wide and 1/2 - 1½ feet deep. The brook has a gentle to medium ~~gradient~~ gradient. Near the lower end, a series of beaver dams exist with short riffles between the flowage areas. Mud and sand are abundant in the quiet areas. In riffles, the bottom is composed mostly of large rocks and boulders, with small percentages of sand and gravel interspersed.

Above this section, the brook consists mostly of gentle riffles, with a few small pools alternating. The

bottom consists mainly of sand and fine gravel, overlying large rocks and boulders. The pH of this branch was 6.5; the water temperature, 8°C (46.4°F) and the air temperature, 11°C (51.8°F).

Right Branch Keswick River. This branch also forms part of the headwaters of the main Keswick River. Several quiet water areas and beaver dam flowages are found near the lower end of this branch. The brook is 20 - 30 ft. wide and up to 4 ft. deep in some quiet areas. Much sand and mud, overlaying large rocks and boulders, are found in the quiet areas. Small amounts of mixed gravel are present in the few riffle areas. The brook has a gentle to medium gradient.

The pH of this branch was also 6.5. Air temperature was 11°C (51.8°F) and water temperature, 10°C (50.°F).

Other tributaries to the Keswick River are considered to be too small to be of much importance to salmon, being 10 ft. or less in width at the mouth. These brooks are mostly quite steep and rocky and, at best, would provide only a small amount of suitable nursery.

SPAWNING AREAS

For descriptive purposes, the main river will be divided into sections, and indicated on the accompanying map as S-1, S-3, and the tributaries, S-4, S-5 etc.

MAIN KESWICK RIVER

S-1. This section extends from the river's mouth up to Zealand Station. A very large percentage of the river bottom in this section is composed of sand and very fine gravel. However, a few scattered riffle areas contain suitable spawning gravel. The better possible spawning areas in this section are located in riffles between Upper Keswick and Zealand Station. A few scattered spawning areas were also observed from the vicinity of Burt's Corner, downriver about three miles. In the remainder of this section, suitable spawning areas were very few and scattered.

The total estimated spawning area in this section is 26,000 sq.yds.

S-2. This section extends from Zealand Station to Barton, a distance of about 10 miles. Most of the possible spawning area in this section is found along the lower five miles. Above this, more coarse gravel and rocks are found on the bottom. However, several scattered areas here also provide good spawning conditions. The estimated total of possible spawning area here is 33,000 sq.yds.

S-3. This section extends from Barton upriver about 12 miles to the forks. The better possible spawning areas in this section are located from Barton upstream about 1 mile, and from the entrance of Howard Brook downstream about 1 mile. Along most of the remainder of this section, the bottom is too coarse to provide suitable spawning areas. However, in a few other scattered areas throughout this section, small amounts of possible spawning gravel were found. The total estimated spawning area in this section was 12,000 sq.yds.

TRIBUTARIES

S-4 Jones Forks An estimated total of about 900 sq.yds of possible salmon spawning area was found in this branch. These possible spawning areas are scattered throughout the lower two miles of the brook. Above this, the brook is mostly too small and rocky for salmon spawning.

S-5 North Forks. Possible spawning area in this branch is located mostly along the lower 1 - 1½ miles of the main brook, and possibly for a short distance up Middle Brook. These brooks are quite small and rocky, and the total salmon spawning area is estimated at 700 sq.yds.

S-6 West Branch Keswick River. This is the largest tributary of the Keswick River, and contains an estimated total of about 5,000 sq.yds. of suitable salmon spawning area. Most of this spawning area is located in

the riffles along the lower 3 - 4 miles of the branch. Small, scattered areas, as far as 6 - 7 miles above the mouth, may also be used by spawning salmon.

S-7 Howard Brook. Very little suitable salmon spawning area is found on this brook. The estimated total is only about 400 sq.yds. These areas are scattered along the lower 1 - 1½ miles of the brook.

S-8. Left Branch Keswick River. This branch is very small and little suitable salmon spawning area is found. An estimated 200 sq.yds. of possible spawning area is found in a few riffles along the lower section.

S-9 Right Branch Keswick River. This branch is also small, and only an estimated 200 sq.yds. are considered suitable for salmon spawning. This possible spawning area is located along the lower few hundred yards of the branch.

NURSERY AREAS

For descriptive purposes, the main river will be divided into sections, and designated on the accompanying map as ~~N-1, N-2, N-3~~ N-1 - N-3, and the tributaries as N-4, N-5 etc.

MAIN RIVER

N-1. In this section, extending from the river's mouth to Zealand Station, an estimated total of 176,000 sq.yds. of suitable salmon nursery is found. This nursery is located mainly along the upper half of this section, with smaller scattered areas along the lower half.

Numerous quiet water areas and large pools, especially along the lower half of this section, have little shade and shelter and are considered to be mostly unsuitable as nurseries.

N-2. An estimated total of 222,000 sq.yds. of suitable salmon nursery are found in this section, which extends from Zealand Station to Barton. The nursery area here is fairly well scattered throughout the section. Ample shade and shelter are provided by the

rocks and gravel on the bottom and in some places by marginal vegetation.

N-3. From Barton to the head of the main Keswick River, an estimated total of 246,000 sq.yds. of suitable salmon nursery is found. Very little quiet water area is found here, and the nursery is quite well spread throughout the section. Ample food, shade and shelter are provided along most of this section.

TRIBUTARIES

N-4 Jones Forks. Suitable salmon nursery is quite abundant throughout most of this brook and the lower sections of its larger branches. It is estimated at a total of 49,000 sq.yds. Food, shade and shelter are abundant in most parts of the brook.

N-5 North Forks This brook also contains abundant suitable salmon nursery on the main branch and the lower 2 - 3 miles of Middle Brook. Food, shade and shelter are quite abundant throughout. The total possible nursery is estimated at about 42,000 sq.yds.

N-6 West Branch Keswick River. An estimated total of about 106,000 sq.yds of suitable salmon nursery is found on this branch. This suitable nursery is mostly located along the lower 7 - 8 miles of the West Branch and the lower sections of its tributaries. The natural food supply seemed abundant. Shade and shelter are also amply provided throughout most of the branch.

N-7 Howard Brook. Suitable salmon nursery is quite abundant along the lower 2 - 3 miles of this brook. It is estimated to total about 14,000 sq.yds. Food, shade and shelter are abundant in most places. However, a swampy, deadwater area, near the upper end of the brook, is considered unsuitable as a nursery.

N-8 Left Branch Keswick River Small scattered areas along the lower part of this brook provide only a small

amount of suitable salmon nursery. Food, shade and shelter are abundant, and the total nursery area is estimated at 5,000 sq.yds.

N-9 Right Branch Keswick River. This branch is also very small, and the total of suitable nursery area is estimated at 5,000 sq.yds. This nursery is located mainly along the lower two miles of the brook. Here, also, food, shade and shelter are quite abundant.

A small amount of possible salmon nursery area is also found in the lower sections of a few other minor tributaries. These are relatively unimportant and are not listed separately.

OBSTRUCTIONS

No obstructions to Atlantic salmon were found on the Keswick River system.

POLLUTION

The Keswick River system was also found to be free of any serious pollution sources. At most, there may be a small amount of domestic pollution from the very scattered settlements along the lower half of the river.

PREDATION.

Only a few merganser ducks were observed during the survey.

FISH FAUNA

Other than Atlantic salmon (*Salmo salar*), fish observed in this system included Speckled trout (*Salvelinus fontinalis*), suckers (*Catostomus commersonii*), lampreys (*Petromyzon marinus*) and *Notropis* minnows.

865,000 sq yds.

DISCUSSION

According to the local Fisheries Protection Officers, there is no official record of salmon being taken legally on the Keswick River in the past six years. Salmon and grilse have been observed in the river by the Fisheries Officers, but mostly after the close of the angling season. The reason salmon ascend the river so late may be partially due to the general low-water conditions along the lower part of the river. During the earlier part of the season, it is quite possible that the salmon hold in the well known Hartt Pool, which is located on the St. John River about four miles below the mouth of the Keswick River.

The better spawning areas on this river appear to be more concentrated in the ten mile section between Zealand Station and Barton. Less extensive spawning areas are also scattered along the remainder of the main river and in the lower sections of a few tributaries. Suitable salmon nursery is quite abundant throughout most of the system.

Possible angling and holding pools are also quite numerous from Barton, downriver. Above Barton, the pools are more scattered and ^{usually} ~~usually~~ smaller.

No serious sources of pollution or predation were found and there were no serious obstructions to the movements of salmon.

KESWICK RIVER SYSTEM

Temperature and pH Record

Station	Date, Time	Air Temperature	Water Temperature	pH
<u>Main Keswick River</u>				
Just below forks at head of river	9/18/56 11:30 A.M.	11°C. 51.8°F.	9°C. 48.2°F.	6.5
2 mi. above en- trance of Howard Brook	9/18/56 12:30 P.M.	11°C. 51.8°F.	9°C. 48.2°F.	7.
Zealand Station, above highway bridge	9/27/56 3:00 P.M.	15°C. 59°F.	8°C. 46.4°F.	6.5
<u>Tributaries</u>				
Jones Forks, (3 mi. above mouth)	9/21/56 4:00 P.M.	11°C. 51.8°F.	8°C. 46.4°F.	6.5
North Forks, (½ mi. above mouth)	9/21/56 10:00 A.M.	9°C. 48.2°F.	7°C. 44.6°F.	7.
West Branch, Keswick River (near mouth)	9/26/56 5:30 P.M.	10°C. 50°F.	7°C. 44.6°F.	6.5
Howard Brook (4 mi. above mouth)	9/18/56 4:30 P.M.	10°C. 50°F.	9°C. 48.2°F.	6.5
Left Branch, Keswick River, (near mouth)	9/18/56 11:30 A.M.	11°C. 51.8°F.	8°C. 46.4°F.	6.5
Right Branch, Keswick River, (near mouth)	9/18/56 11:30 A.M.	11°C. 51.8°F.	10°C. 50°F.	6.5

Volume of flow in main Keswick River at Zealand Station, on September
27, 1956 (3:00 P.M.) = 180. c.f.s.

KESWICK RIVER SYSTEM

Atlantic Salmon - Stocking Record (1947 - 1956)

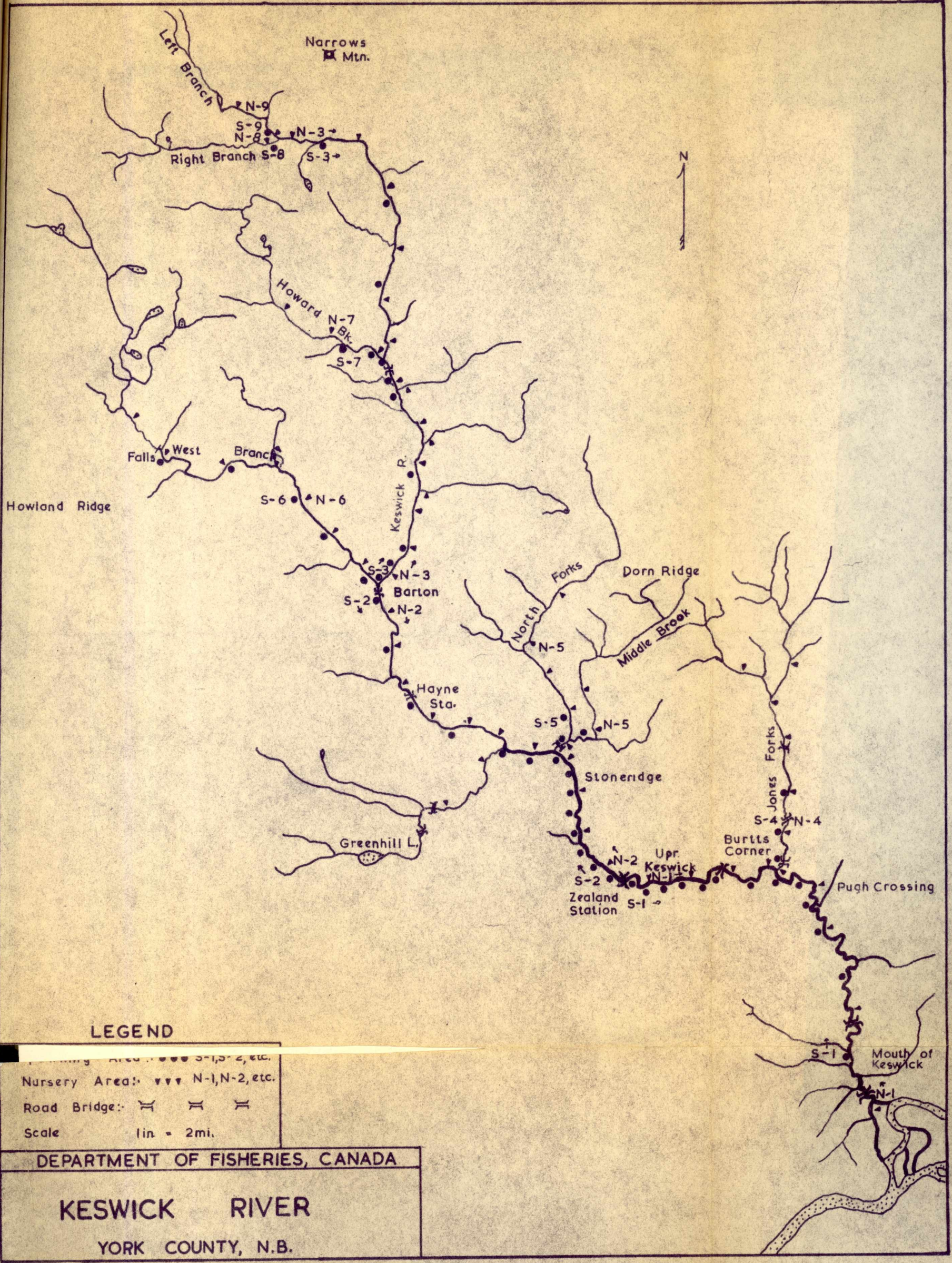
<u>Year</u>	<u>No. Fry</u>	<u>No. Fingerlings</u>
1947		25,000
1948	25,000	25,000
1949	60,000	40,000
1950	25,000	10,000
1951	60,000	10,000
1952	60,000	80,000
1953	40,000	80,000
1954	50,000	70,000
1955	85,000	45,000
1956	<u>68,750</u>	<u>24,000</u>
TOTALS	473,750	409,000

During this same period, (1947 - 1956) there were also a number of speckled trout distributed in the Keswick River system. These totaled 42,300 fingerlings, 900 yearlings, and 300 three year olds.

KESWICK RIVER SYSTEM

Summary of Spawning and Nursery Areas. -

Location	Length of section in miles	Average width, in yds.	Approx length of nursery in mi.	Nursery area, in square yards	Spawning area in sq. yds
Keswick River					
Mouth to Zealand Station	14	25	5	176,000	26,000
Zealand Station to Barton	10	18	7	222,000	33,000
Barton to head of river	12	14	10	246,000	12,000
	<u>36</u>		<u>22</u>	<u>644,000</u>	<u>71,000</u>
<u>Tributaries</u>	<u>Length of Brook</u>				
Jones Forks	12	4	7	49,000	900
North Forks	10	4	6	42,000	700
West Branch, Keswick River	20	6	10	106,000	5,000
Howard Brook	5	4	2	14,000	400
Left Branch, Keswick River	4	3	1	5,000	200
Right Branch, Keswick River	4	3	1	5,000	200
	<u>55</u>		<u>27</u>	<u>221,000</u>	<u>7,400</u>
<u>Grand Total</u>	<u>91</u>		<u>49</u>	<u>865,000</u>	<u>78,400</u>



LEGEND

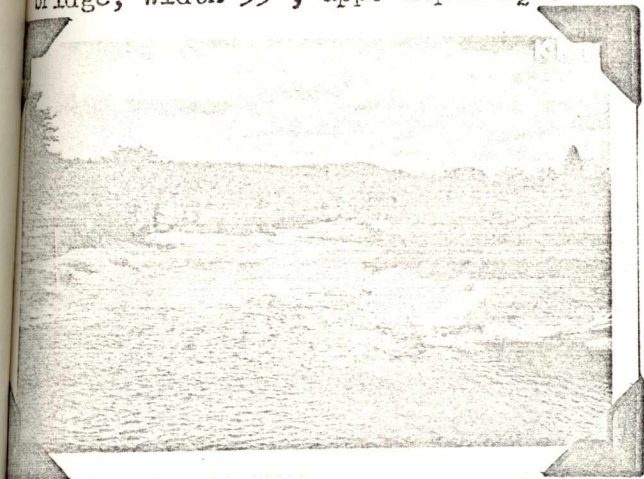
- Sampling Area: ●●● S-1, S-2, etc.
- Nursery Area: ▼▼▼ N-1, N-2, etc.
- Road Bridge: ≡ ≡ ≡
- Scale 1 in = 2 mi.

DEPARTMENT OF FISHERIES, CANADA

KESWICK RIVER
YORK COUNTY, N.B.

KESWICK RIVER

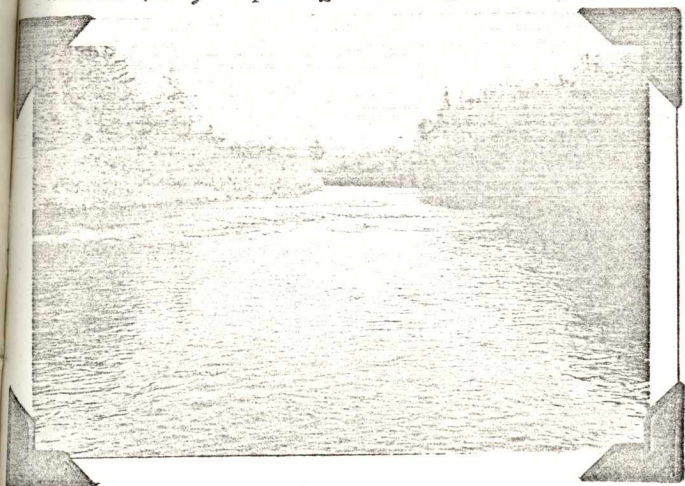
KESWICK RIVER - just above Zealand bridge; width 55', app. depth 1½'.



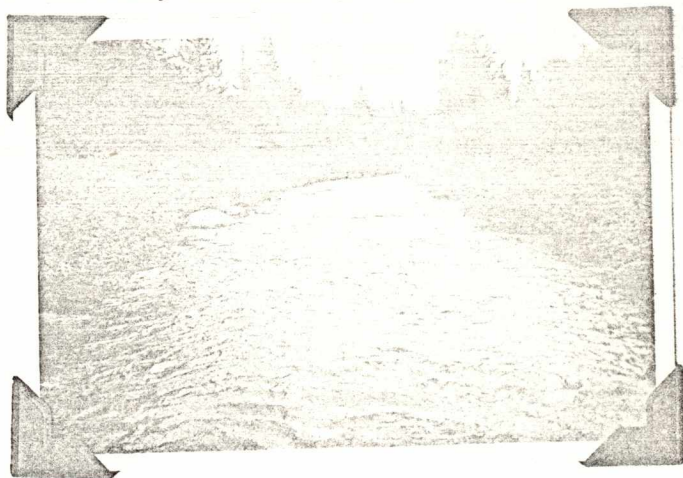
KESWICK RIVER - app. 3 mi. above Barton; app. width 30', app. depth 1½'.



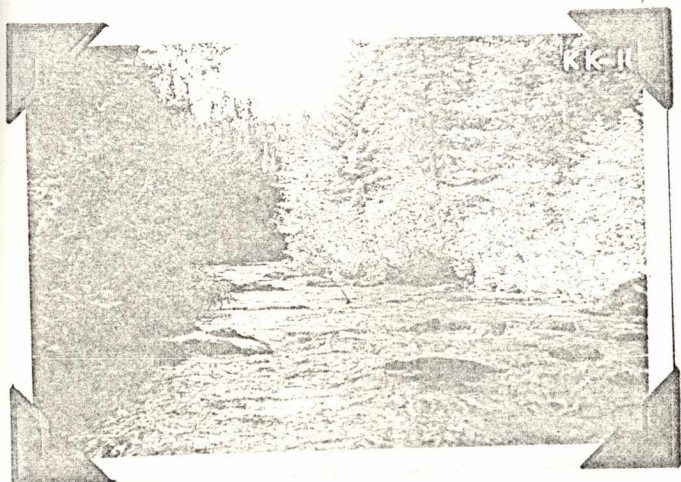
KESWICK RIVER - 4 mi. above Barton; width 70', depth ½' in rips.



KESWICK RIVER - 2¼ mi. above Howard Brook; width 35', depth 14".



KESWICK RIVER - app. 1 mi. below forks of Right and Left branches; width 20'.



KESWICK RIVER - remnants of old wood Dam app. ¼ mi. below Right & Left branches.

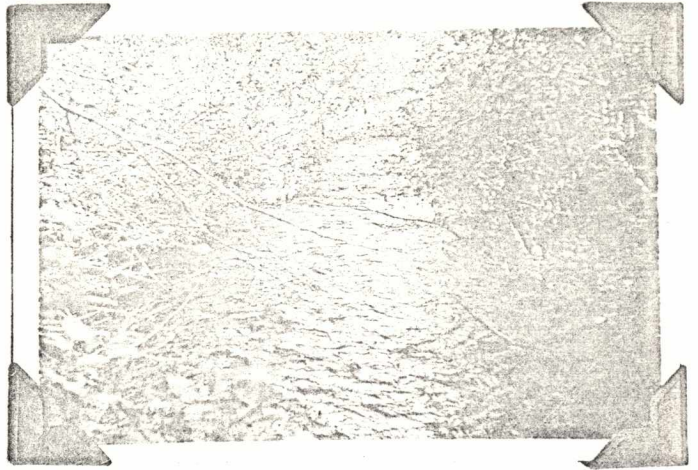


KESWICK RIVER - TRIBUTARIES

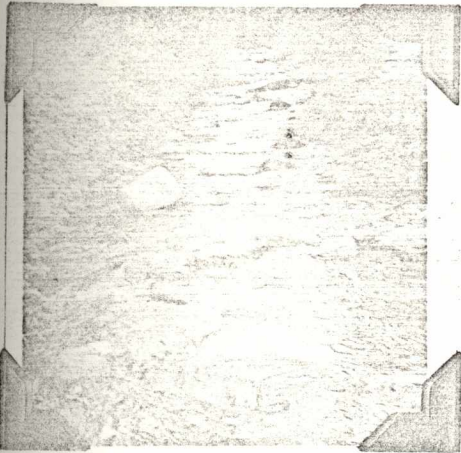
HOWARD BROOK - app. 3 mi. above mouth; width 12', depth 1'.



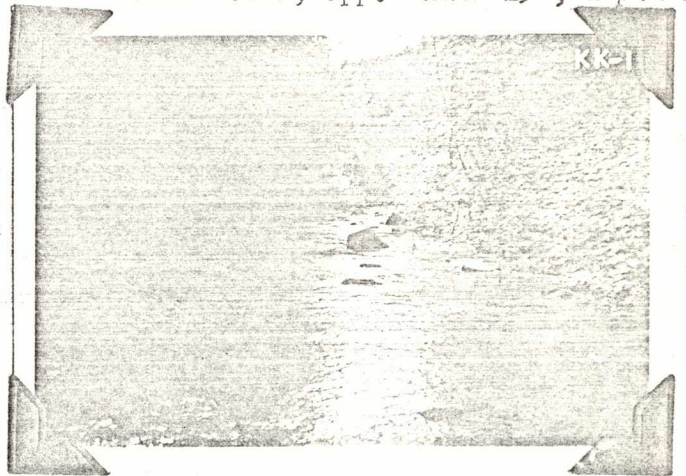
HOWARD BROOK - $\frac{1}{4}$ mi. above mouth; width 18', depth $\frac{1}{2}$ ' to 1'.



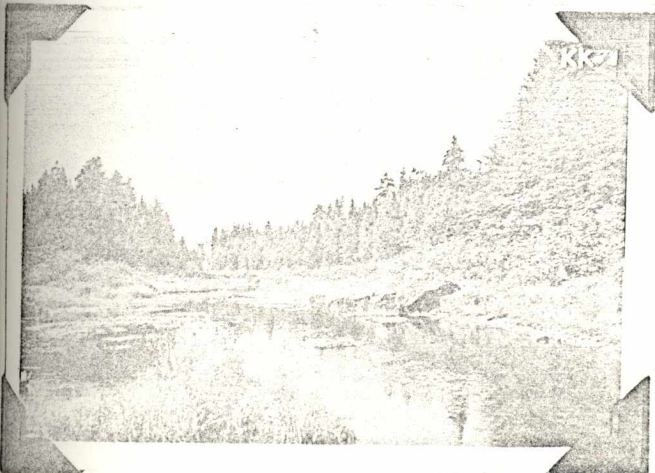
NORTH FORKS - just above entrance of Middle Brook; width 20', depth 1'.



MIDDLE BROOK - $\frac{1}{4}$ mi. above entrance to North Forks; app. width 15', depth 1'.



KESWICK RIVER - at forks of Right and Left Branches.



LEFT BRANCH - app. $\frac{3}{4}$ mi. above entrance to Keswick R. width 12', depth $\frac{1}{2}$ ' to 1'.

