A SURVEY OF THE TROUT (*SALVELINUS FONTINALIS*) AND SALMON (*SALMO SALAR*) HABITAT ON SEVERAL STREAMS OF CAPE BRETON ISLAND

R. SWEENEY AND R. DUNFIELD

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DEPARTMENT OF THE ENVIRONMENT

HALIFAX, NOVA SCOTIA

CONTENTS

ABSTRACT

During August, 1975, a physical survey was carried out on Indian Brook, Ingonish River, Cheticamp River, Wreck Cove Brook and McLeod Brook on Cape Breton Island, in order to determine the quantity of rearing area on these streams for salmon (*Salmo salar*) and speckled trout (*Salvelinus fontinalis*). A total of 104 kilometers of stream length was surveyed, comprising 1,547,611 square meters of freshwater environment, or approximately 80 percent of the total lotic habitat. In the surveyed area, 1,163,533 square meters of good to fair salmon nursery, and 1,233,389 square meters of excellent to fair trout nursery area were recorded. Salmon spawning ground comprised 12,632 square meters of fair quality material, which was generally poorly situated, widely scattered, and limited in local coverage. Well distributed trout spawning ground of good quality covered 38,180 square meters of stream bed. From the data obtained on the surveyed sections, it is estimated that good to fair nursery areas for salmon and trout respectively comprise 65 percent and 80 percent of the total lotic environment of the streams. Trout were observed in all of the surveyed areas, but juvenile salmon were not observed above the barrier falls on Indian Brook (km 2.5) and Cheticamp River (km 18.5), nor on the headwaters of the other three streams.

INTRODUCTION

Between August 11 and 28, 1975, a survey was carried out on the Cheticamp and Ingonish rivers, and on McLeod, Wreck Cove and Indian brooks on Cape Breton Island, in order to classify and evaluate the physical habitat for speckled trout and Atlantic salmon. Basically, information was collected on the quantative and qualitative value of spawning, nursery and holding areas for both species, on the presence of barriers and obstructions to migrating fish and on the quality of the water for fish occupation.

METHODS

Two survey teams collected information by walking the streams and directly observing and recording the data. Stream widths and lengths were measured by using surveyor's tapes and an optical range finder. Lengths were correlated with planimeter readings from 1:50,000 topographic maps and by references to grid intercepts at known locations. Total water area was calculated from these readings.

Areas of trout- and salmon-rearing habitat were estimated at continuous observation points along the stream and reported as a percentage of the total water area. Simularly, aquatic vegetation and bottom composition of the stream was also recorded as a percentage of the total stream bed. Periodic recordings of air and water temperature, pH, and dissolved oxygen were also made; and general comments on the quality of the habitat, fish abundance, environmental shade and cover, fish food abundance, evidence of predation, and abnormal influence were made.

REPORTING FORMAT

Each river system surveyed is reported separately - each stream being divided into several survey sections, which are numbered consecutively from the mouth of the river. A map accompanies each section, along with a series of photographs, a table which provides the estimates of fish rearing area, and a written general description of the stream section. Following these sectional presentations, tables are provided which summarize the pertinent quantative data for all streams.

TERMS

The following interpretation of terms is intended:

section - a surveyed unit of the stream.

segment - portion of a stream section.

bottom composition - material comprising the stream bed.

a sand - coarse salt size and below.
b gravel - coarse salt size to fist size.
c cobble - fist size to pail size.
d boulder - pail size and larger.
e ledge - unbroken bedrock outcrop.

nursery area - area suited for the production of fish after emergence from spawning gravel.

spawning area - area suited to fish for spawning.

rearing area - spawning and nursery areas.

length and area measurements - metric

grid references - 1000 metre universal transverse mercator grid, zone 20

temperature - degrees celsius.

dissolved oxygen - (O_2) parts per million.

water width - width of the water surface.

bank width - width between opposing banks.

fall - a perpendicular or nearly perpendicular fall of water.

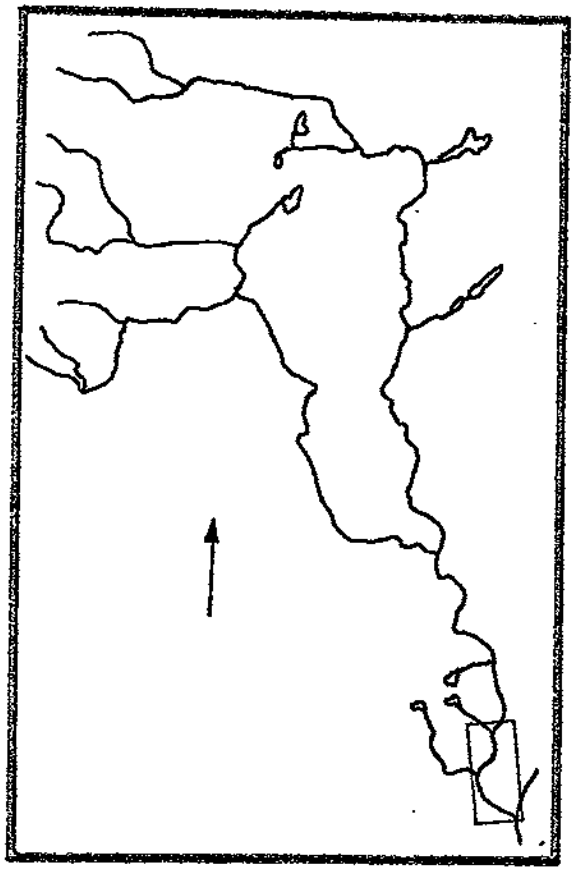
chute - a fall of water over a sharp incline.

rapid - a dissipated and turbulent flow of water over a moderate incline.

riffle - a light to moderate flow of water over a gentle incline.

INDIAN BROOK

Indian Brook, with a main stream length of 43 km, flows southerly from an elevation of 457 km on the Cape Breton plateau into St. Ann's Bay. It drains 270 km^2 of area, and for the most part is a turbulent and rocky stream. Anadromous fish access is limited to the lower 2.5 km of stream; but speckled trout are present throughout, and in apparent increased numbers at higher elevations. The surveyed sections of Indian Brook included the main stream, West Indian Brook and the lower section of McMillan Brook.



INDIAN BROOK
Section 1

898380 - 896404

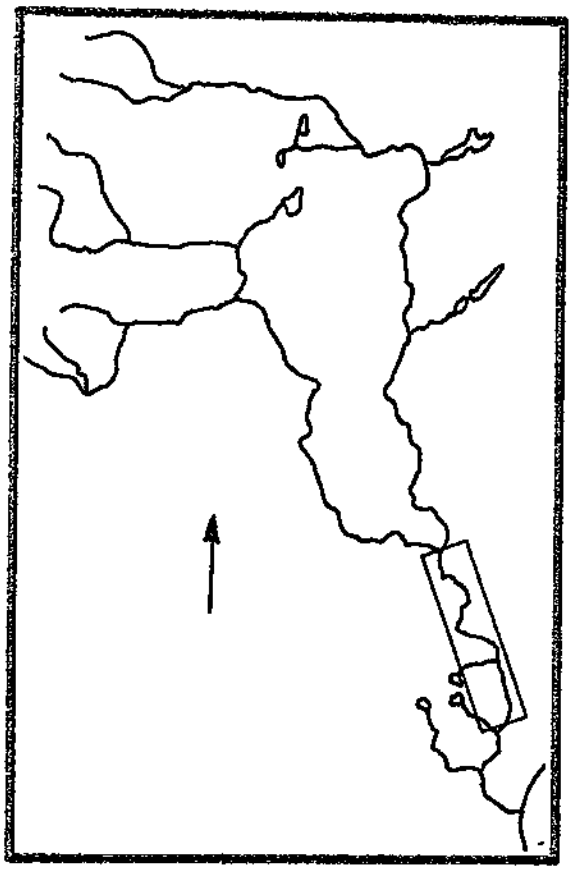
SECTION LENGTH		3,340	m
AVERAGE WATER WIDTH		24.4	m
TOTAL WATER AREA		81,733	m^2
SALMON	REARING AREA	58,809	m^2
	SPAWNING AREA	235	m^2
TROUT	REARING AREA	55,186	m^2
	SPAWNING AREA	897	m^2

STATION	DATE	TIME	pH	O_2	WATER TEMP. (°C)
898380	Aug 21	1030	7.5	10	17.5

Although the overall gradient of this seaward section of Indian Brook is calculated at 1:70, the gradient of the lower two-thirds of the section is more moderate at approximately 1:100. The steeper gradient calculation is the result of the inclusion of a 10.6-m perpendicular fall, which exists 2.5 km from the mouth of the river and effectively bars fish from passing upstream. This "Great Falls" is near the base of a pronounced gorge, which begins at the top of the surveyed section and is surrounded by immediate land elevations in excess of 250 m. Within the gorge, the river forms a continuous series of rapids and pools.


Rapids
Rapids
Rapids
Indian
Brook

Below the Great Falls, bank widths sometimes reach 20 m, and the flow is through a series of riffles and large pools. Eleven major pools are recorded, the largest of which covers a surface area of 670 m^2. The depths of many of these pools exceeds 3m. Bottom composition varies greatly; with sand, gravel, cobble, boulders and ledge all apparent. Major gravel deposits occur at the base of several of the pools and provide some of the best salmon spawning ground encountered on the entire river in terms of quantity, quality and location. Rearing area for trout and salmon comprises 70% of the stream area, with the trout area more extensive in the upper segment of the survey. Some sedimentation and a small amount of algae growth is evident in the limited still areas.



INDIAN BROOK
Section 2

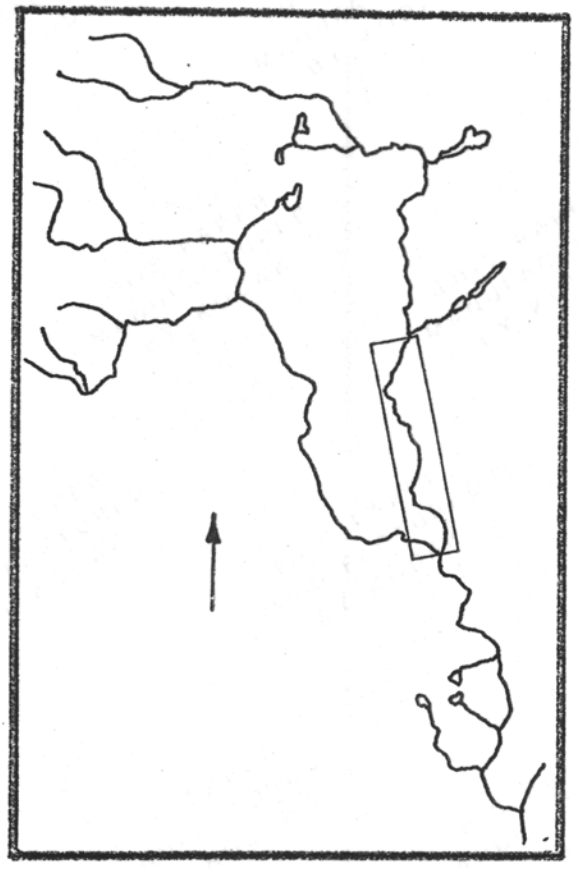
896404 - 876460

SECTION LENGTH		7,734	m
AVERAGE WATER WIDTH		22.9	m
TOTAL WATER AREA		177,067	m^2
SALMON	REARING AREA	154,409	m^2
	SPAWNING AREA	286	m^2
TROUT	REARING AREA	132,855	m^2
	SPAWNING AREA	619	m^2

STATION	DATE	TIME	pH	O_2	WATER TEMP. (°C)
876460	Aug 15	1050	6.5	-	20.5
897404	Aug 15	1030	7.5	10.0	20.0

The gradient of this section of Indian Brook is calculated at 1:85. The river valley doubles in width from the upper to the lower end of the section (800 m vs 1600 m at the 300 m contour), and water flows are more moderate in the lower region. In the upper half of the section the bottom composition ranges from 70% to 80% boulder and from 10% to 30% cobble, but at the base of the section the composition is reversed. Some ledge outcrop occurs, and only patches of streambed gravel are evident. Water widths average 23 m, but the distance between floodbanks occasionally exceeds 40 m. Gravel deposits are found high on many of the slip banks, 2 - 3 m above the level of the water; this situation would suggest that the stream is subject to extensive, rapid and turbulent flooding during maximum flow periods. There are 16 large pools in the section, several of which cover an area of 600 m^2 and possess a maximum depth of 3 m. Numerous small pools are also evident. Aquatic vegetation is scarce or absent in most segments. Excellent salmon and trout nursery area, estimated at 90% - 100% of the water environment, is found throughout, but salmon spawning ground is extremely limited.

Rapids
Rapids
BROOK
Rapids
Indian
Brook



INDIAN BROOK
Section 3

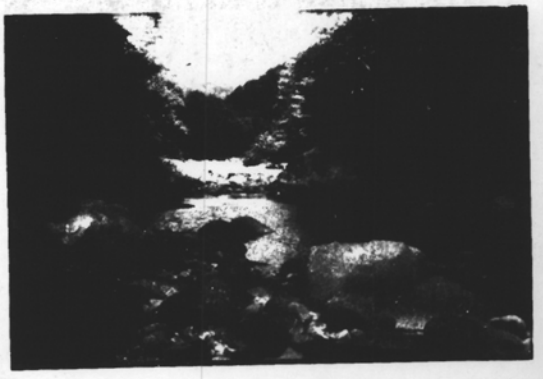
East Indian Brook

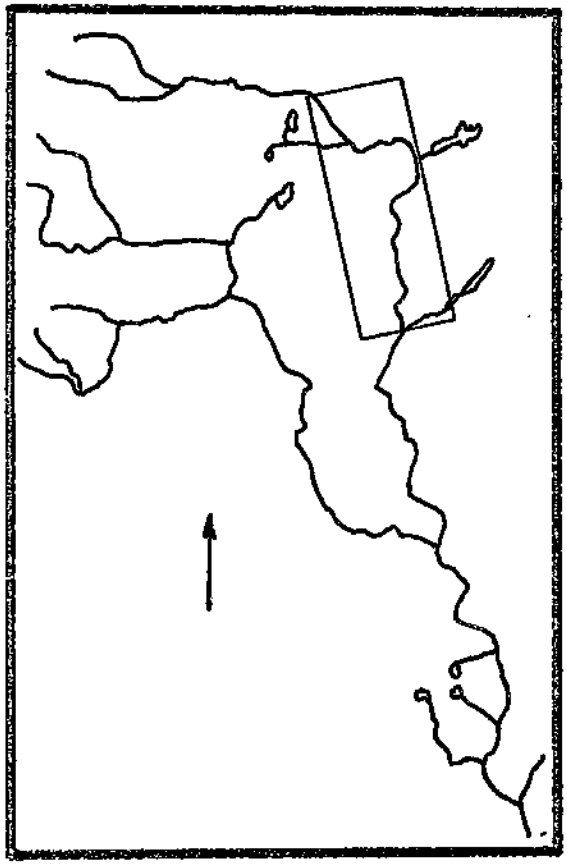
876460 - 862534

SECTION LENGTH		9,394	m
AVERAGE WATER WIDTH		14.3	m
TOTAL WATER AREA		134,546	m^2
SALMON	REARING AREA	94,392	m^2
	SPAWNING AREA	84	m^2
TROUT	REARING AREA	106,748	m^2
	SPAWNING AREA	569	m^2

STATION	DATE	TIME	pH	O_2	WATER TEMP.(°C)
862534	Aug 20	1015	7.2	12	17.0
866495	Aug 20	1400	-	-	17.5
875461	Aug 19	0920	7.5	9.0	22.0

This 9.4 km section of East Indian Brook, the lower end of which terminates at the forks of the east and west branches, can be divided into upper, middle and lower segments. In the upper 3-km segment, the stream transverses the outer edge of the plateau, with a gradient no greater than 1:100. For the next 2 km the stream drops rapidly through a semi-gorge, at a gradient of 1:25; and at the end of this segment, the gradient moderates to 1:50. Outcrops of bedrock are found frequently throughout the section, but the river bed is generally characterized in the middle and lower segments by concentrations of boulders (40 - 60%), among which cobble is distributed. On the plateau area, however, cobble and gravel are more prevalent, in an approximate 60:40 ratio. The river ranges between 2 and 7 m wide in the gorge, while below and above this segment the average width is 20 m. There is a moderate to rapid flow throughout. At one point within the gorge, heavy boulders are distributed naturally in such a manner as to restrict and direct the water flow to several small channels under the bed material, creating what is considered a potential partial barrier to adult salmon, except in periods of high water. Twenty-one pools are recorded in the lower two segments, each covering between 35 m^2 and ranging from 1 m to 1.5 m in depth. Numerous small pools exist in the plateau section, where water depths rarely exceeded 0.5 m. Little or no aquatic vegetation is present. Less than 100 m^2 of poor quality salmon spawning area is present in the section, but approximately 75% of the upper and lower segments is suitable salmon nursery habitat. Trout nursery area comprises about 80% of the stream environment, and adequate patches of trout spawning gravel are well distributed thoughout the survey area.





INDIAN BROOK
Section 4

East Indian Brook

862534 - 832605

SECTION LENGTH		11,416 m
AVERAGE WATER WIDTH		13.9 m
TOTAL WATER AREA		158,163 m^2
SALMON	REARING AREA	85,752 m^2
	SPAWNING AREA	1,512 m^2
TROUT	REARING AREA	107,027 m^2
	SPAWNING AREA	4,684 m^2

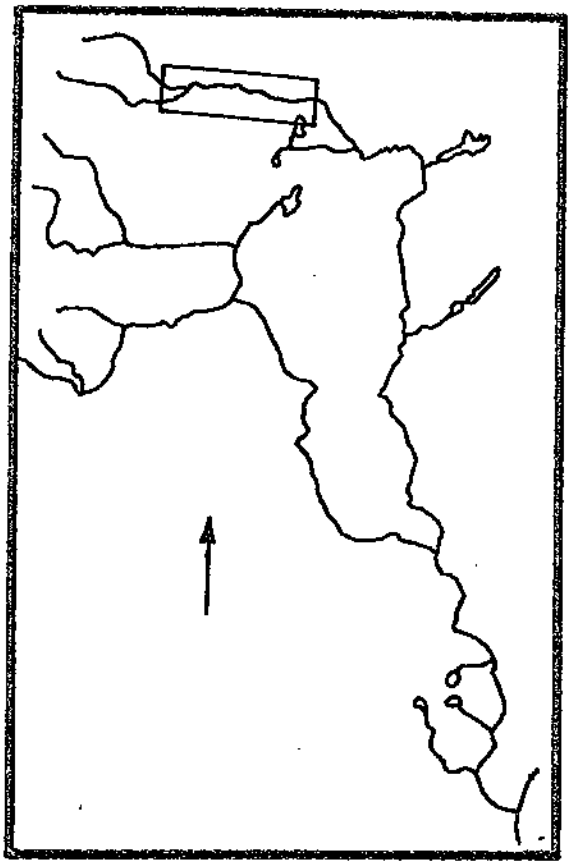
STATION	DATE	TIME	pH	O_2	WATER TEMP. (°C)
833606	Aug 12	1020	7.5	10	19.0
865586	Aug 12	1515	7.5	9	24.5
862534	Aug 14	0910	7.0	-	17.0
862534	Aug 20	1015	7.2	11	17.0

This section of Indian Brook possesses an average width of 14 m, a mean which also describes an actual uniformity of width throughout. The gradient is approximately 1:160, and the flow is uniform over a bottom composition of boulders, cobble and gravel, in a ratio of 20:60:20 in the upper, and 10:60:30 in the lower segments of the survey. Water depths rarely exceed 0.6 m.

Grassy flood banks are prevalent, and although coniferous forest proximates the shore, the zone above the water surface is open and exposed. Aquatic vegetation covers approximately 50% of the stream at the upper survey limit, but is less evident as lower elevations are reached and is not prevalent on the lower 1.4 km of the surveyed length.

Numerous feeder streams of relatively insignificant flow enter the main stream in the section, and shore springs were frequent. At these outflows, schools of trout were observed. Scattered and frequent sightings of trout were also made throughout the main stream. Progressing from the lower end of the section to the upper, trout rearing ground was observed to increase in quality, with pockets of spawning gravel frequent and well distributed in all segments. Salmon nursery ground was observed to be inversely proportionate to that of trout, comprising 75% - 100% of the water habitat in the lower segment, and 25% - 50% in the upper region. Occasional areas of high gravel content were evidenced in some locations, but the location and situation of such deposits limits its usefullness as prime salmon spawning ground.

There is only one major pool within the survey section, located at grid reference 856568, measuring 15 by 18 m and estimated at 3 m in depth. The pool is immediately below a 1.5-m high, 19-m long ledge outcrop, over which the stream flowed in one narrow channel. Another small chute is recorded near the upper limit of the survey, but neither of these two drops is considered a deterrent to fish passage. Approximately one-third of the stream section will be directly affected by the construction of Dam #4.



INDIAN BROOK
Section 5

East Indian Brook

832605 - 776602

SECTION LENGTH		7,031 m
AVERAGE WATER WIDTH		7.9 m
TOTAL WATER AREA		55,855 m^2
SALMON	REARING AREA	15,422 m^2
	SPAWNING AREA	2,676 m^2
TROUT	REARING AREA	48,311 m^2
	SPAWNING AREA	7,179 m^2

STATION	DATE	TIME	pH	O_2	WATER TEMP. (°C)
775605	Aug 11	1010	7.0		14.0
785607	Aug 11	1200	7.2	11	15.5
833606	Aug 11	1655	7.5	9	23.0
833606	Aug 12	1020	7.5	10	19.0

At the upper end of this section the stream is 2.7 m wide, and consists of a continuous series of shallow pools and riffles over a bed of gravel and sand. The brook is completely overgrown with alders. Aquatic vegetation covers an estimated 75% of the stream bed. At the lower end of the surveyed section, the stream possesses an average width of 10.6 m, the bottom composition changes to an estimated 50% cobble, 30% gravel and 20% boulders, and aquatic vegetation covers 50% of the stream bed. Water depths do not generally exceed 0.5 m, and the zone above the stream is open. The overall gradient of the surveyed section is approximately 1:200.

The numerous small pools throughout the section invariably contained schools of from 10 to 30 speckled trout each, most individuals being under 13 cm in length. Spawning area for the species are extensive in the upper segments of the section, and the general trout habitat is excellent.

Suitable salmon habitat is limited to about 50% of the lower half of the surveyed section, with no rearing area of consequence existing in the upper 3 km of stream. Spawning area for the species is limited except for a segment (2600 m^2) of ground which had been disturbed by the recent activity of heavy machinery. Apparently, in the search for suitable gravel for construction work, bulldozers had been used to clear away heavy material and expose stream bed deposits; this action had resulted in the creation of stream profiles and conditions resembling ideal artificial salmon rearing channels.

Free movement is available to fish throughout the section and excellent bottom cover is available amongst the heavy stream bed material.

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Brook
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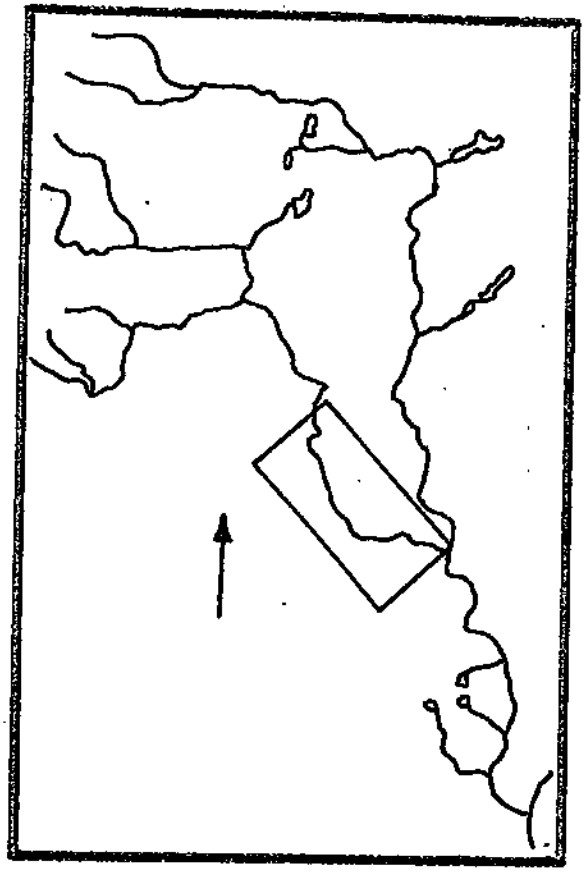
I n d i a n
W e s t I n d i a n
McMillan
Brook



INDIAN BROOK
Section 6

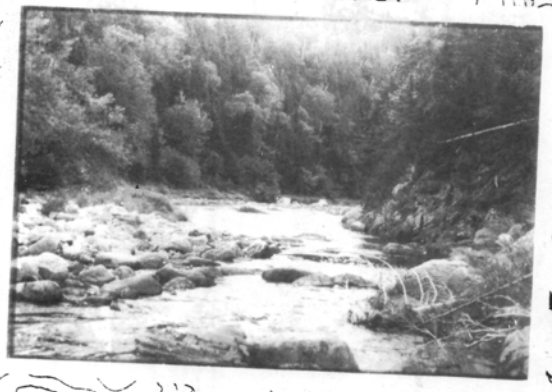
West Indian Brook

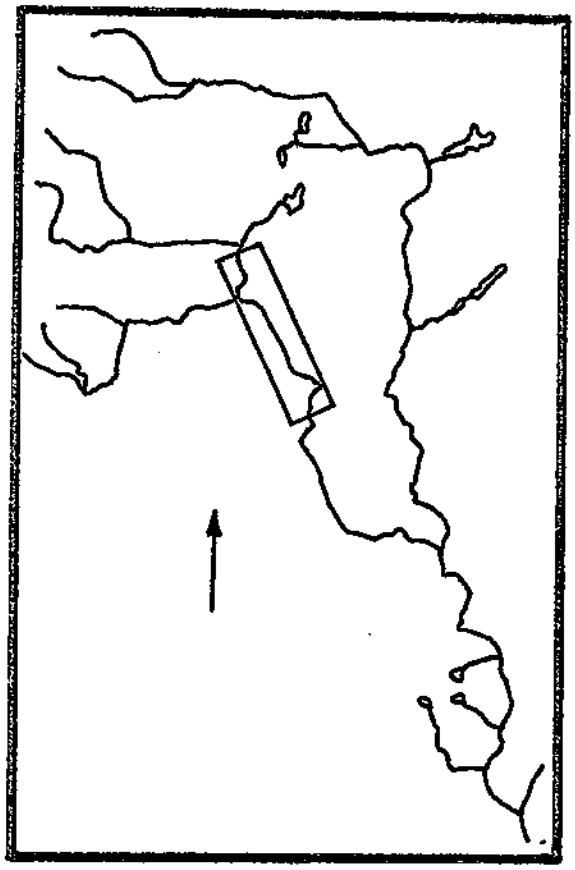
876461 - 828505

SECTION LENGTH		8,692 m
AVERAGE WATER WIDTH		16.0 m
TOTAL WATER AREA		146,531 m^2
SALMON	REARING AREA	105,355 m^2
	SPAWNING AREA	92 m^2
TROUT	REARING AREA	116,674 m^2
	SPAWNING AREA	1,175 m^2

STATION	DATE	TIME	pH	O_2	WATER TEMP. (°C)
828505	Aug 14	0915	7.5	10	16.5
828505	Aug 18	1300	7.5	-	16.5
843466	Aug 18	0910	7.5	10	16.5
843466	Aug 19	0930	7.5	9	19.0
874461	Aug 19	1530	7.0	9	21.0

This lower 8.7-km section of West Indian Brook has an overall gradient of 1:55 and incises a steep valley with a rapid flow. The average bank width is 21.7 m, with an average water width of 16.9 m. The stream bed composition is 60% to 70% boulders with scattered depositions of cobble and gravel. There are 32 pools in the section, each exceeding 1 m in depth. Aquatic vegetation is in evidence. Trout and salmon nursery areas are estimated to compose 80% and 70% of the water area respectively. Salmon spawning area, however, is negligable.





INDIAN BROOK
Section 7

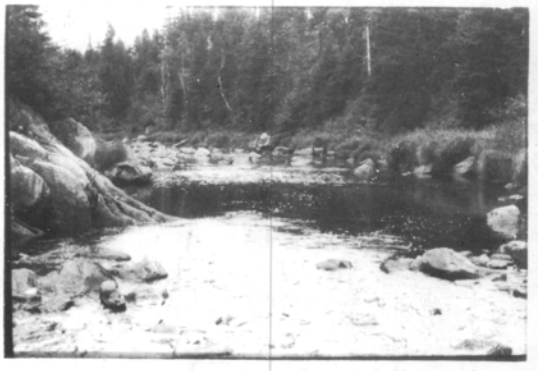
West Indian Brook

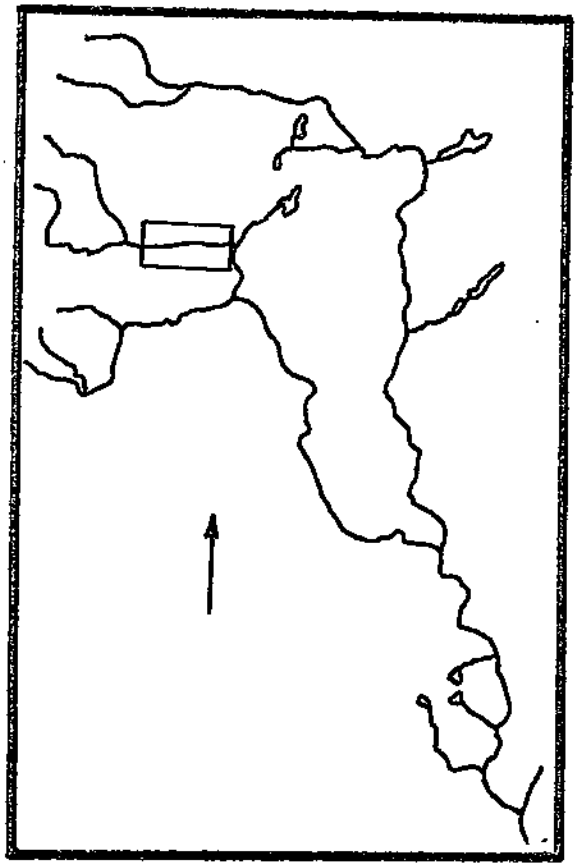
828505 - 804558

SECTION LENGTH		8,102 m
AVERAGE WATER WIDTH		15.3 m
TOTAL WATER AREA		123,684 m^2
SALMON	REARING AREA	98.753 m^2
	SPAWNING AREA	176 m^2
TROUT	REARING AREA	113,967 m^2
	SPAWNING AREA	1,134 m^2

STATION	DATE	TIME	pH	O_2	WATER TEMP. (°C)
804558	Aug 13	1000	8.0	9	17.0
828505	Aug 14	0915	7.5	10	16.5
828505	Aug 18	1300	7.5		16.5

This 8.1-km section of West Indian Brook below the outlet of Beaver Lake Brook possesses an overall gradient of 1:130, and has average bank and water widths of 19.8 m and 15.3 m respectively. The immediate shores are generally composed of grasses which give way after some distance to alders and coniferous trees. The stream bottom is a mixture of cobble and boulders with small amounts of scattered gravel. Aquatic vegetation is less evident in this section than in the area immediately above the outflow of Beaver Lake Brook. Approximately 80% of the stream environment is suitable as salmon nursery area, but spawning ground is extremely limited. Trout inhabit virtually the entire area. Sixteen pools are enumerated, all exceeding 1 m in depth.





INDIAN BROOK
Section 8

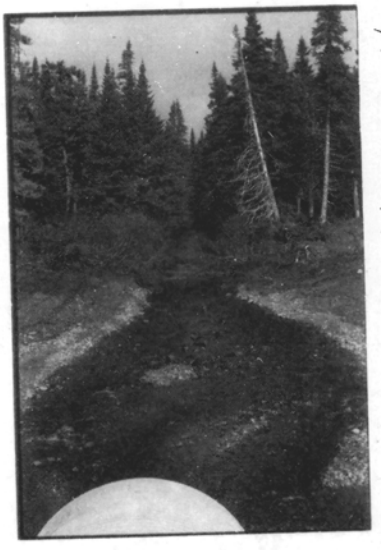
West Indian Brook

804558 - 782557

SECTION LENGTH		2,625	m
AVERAGE WATER WIDTH		13.2	m
TOTAL WATER AREA		34,663	m^2
SALMON	REARING AREA	20,255	m^2
	SPAWNING AREA	2,403	m^2
TROUT	REARING AREA	25,762	m^2
	SPAWNING AREA	3,761	m^2

STATION	DATE	TIME	pH	O_2	WATER TEMP. (°C)
765558	Aug 11	1000	7.2	10	15.5
788558	Aug 11	1130	7.5	-	15.5
804558	Aug 13	1000	8.0	9	17.0

This 2.6-km section of West Indian Brook immediately above the confluence of Beaver Lake Brook possesses a gradient of 1:85. Bank and water widths average 14.9 m and 12.4 m respectively, and a cobble and gravel bottom with scattered boulders typifies the stream bed. Aquatic mosses and green algae are common along the stream bottom. Scattered and numerous small pools exist throughout the section. Stream banks are low and covered with a thick growth of fir, intermixed with alder at the stream's perimeter. A cursory survey was conducted beyond the upper limit of the section, where the stream was found to be narrow and overgrown with alders. This upper area is little suited for salmon. Trout of small size were found to be numerous in all areas.



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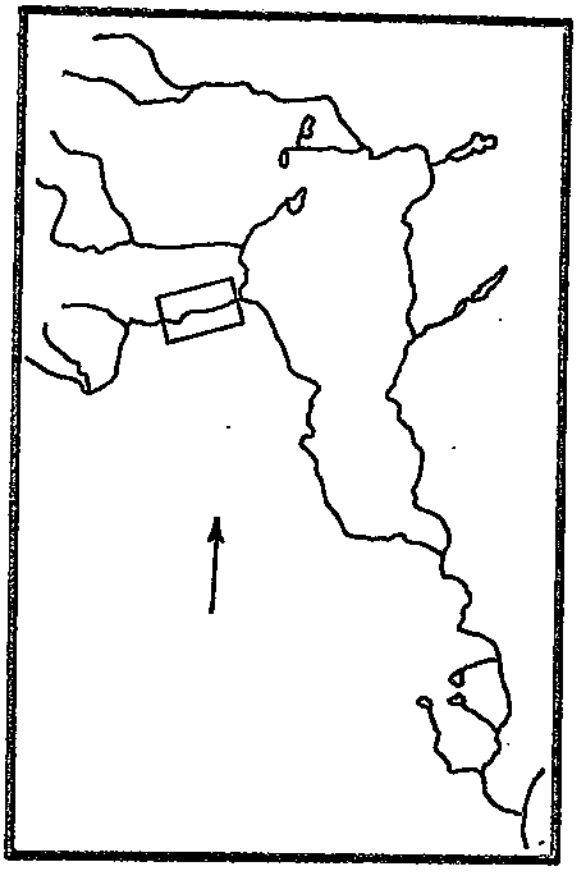


INDIAN BROOK
Section 9

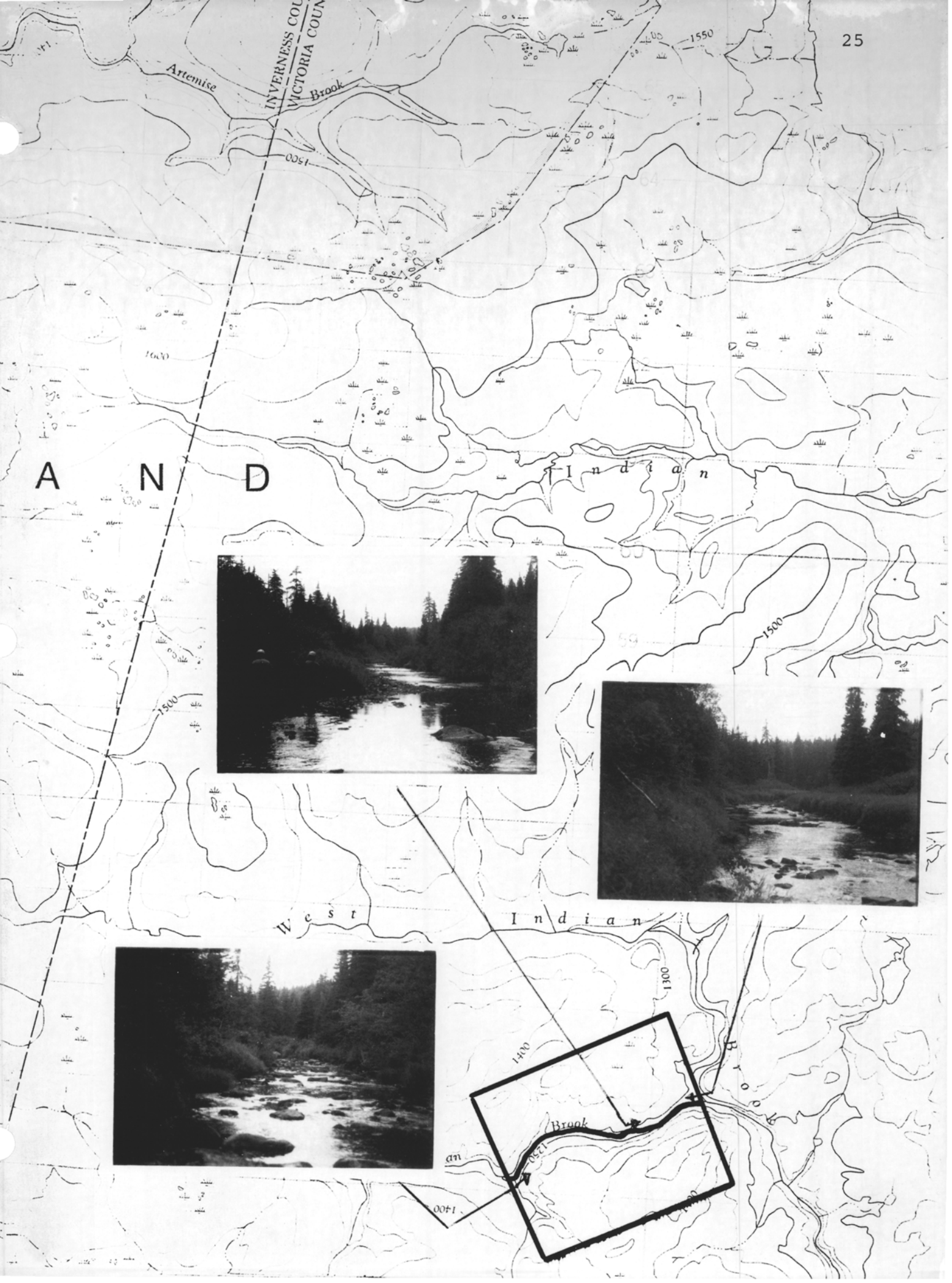
McMillan Brook

805541 - 785533

SECTION LENGTH		2,492	m
AVERAGE WATER WIDTH		9.7	m
TOTAL WATER AREA		24,088	m^2
SALMON	REARING AREA	18,014	m^2
	SPAWNING AREA	319	m^2
TROUT	REARING AREA	18,481	m^2
	SPAWNING AREA	176	m^2

STATION	DATE	TIME	pH	O_2	WATER TEMP. (°C)
785533	Aug 13	1430	7.5	-	19.5
804541	Aug 13	1300	8.0	9.0	20.0

This tributary to West Indian Brook is approximately 10 km long and possesses an overall gradient of 1:150. The survey segment comprised only the lower 2.5 km of stream, which possesses a gradient equivalent to the overall average. Stream-bank width averages 11.5 m in the surveyed area, and water width averages 9.7 m. Cobble, scattered boulders and gravel comprise the stream bed, with aquatic mosses and algae prevalent. The shoreline is predominately grassy, with clumps of alders and fir. Only three pools are recorded with depths exceeding 1 m. Nursery areas for salmon and trout are provided over 75% of the stream, but spawning material, particularly for salmon, is lacking.


Artemise
Brook
1500
1550
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A N D
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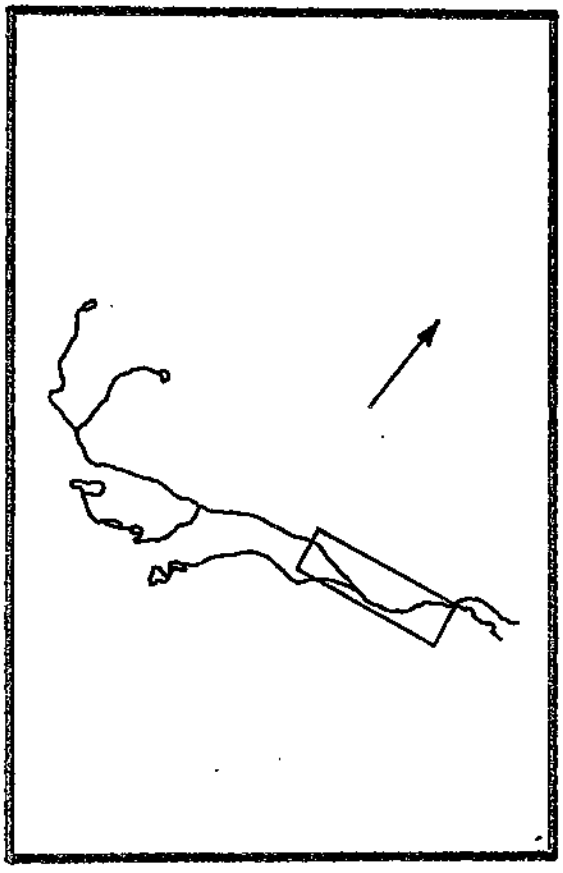
Brook
1400

INGONISH RIVER

The Ingonish River originates on the Cape Breton plateau and flows easterly to enter the Atlantic Ocean at Ingonish Beach, Victoria County.

It is approximately 19.9 km long with an overall gradient of 1:40. The stream drains a flat barren near Cheticamp Lake before cutting a steep sided valley through the escarpment.



INGONISH RIVER
Section 1

964667 - 900650

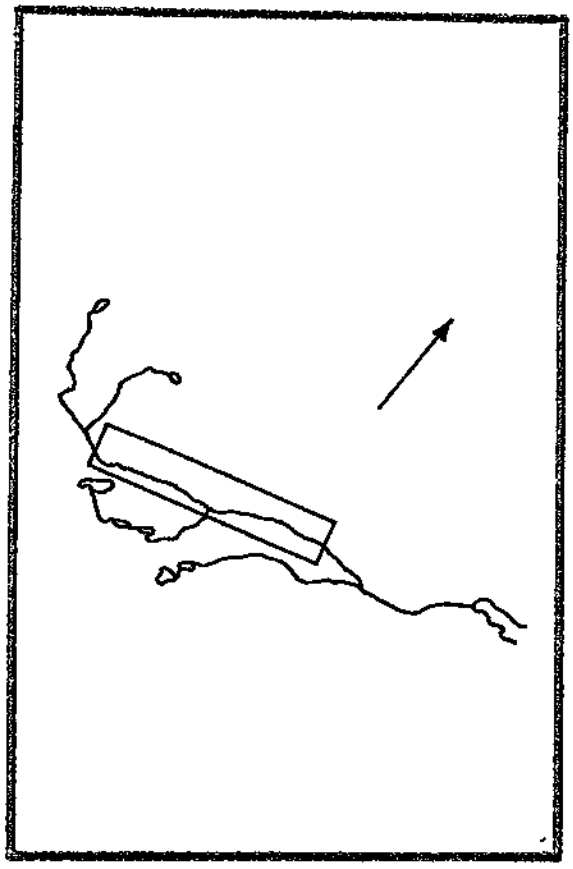
SECTION LENGTH		7,084 m
AVERAGE WATER WIDTH		12.3 m
TOTAL WATER AREA		87,080 m^2
SALMON	REARING AREA	75,811 m^2
	SPAWNING AREA	1,381 m^2
TROUT	REARING AREA	74,417 m^2
	SPAWNING AREA	417 m^2

STATION	DATE	TIME	pH	O_2	WATER TEMP. (°C)
956665	Aug 12	0900	7.2	10	19.5
921655	Aug 12	1500	7.5	9	21.0
903652	Aug 25	1000	7.0	10	13.5

This lower section of the Ingonish River comprises 7 km of stream, over which an average gradient of 1:50 is calculated. On the upper segment of the section - the 3 km above the confluence of McKinnon Brook - the stream possesses relatively rapid flows over a gradient of approximately 1:30. The stream ranges between 7 and 17 m in the water width, and the bottom is composed primarily of boulders and scattered cobble. On the lower 4 km below McKinnon Brook, the stream ranges between 7 and 27 m in width and has a gradient of 1:130. In progressing downstream, the bottom composition changes from boulders to


South Ingonish
Harbour
Ingonish
River
McKinnon
River

cobble, and finally to 100% gravel at the river's mouth. Some sedimentation occurs in this lower area. The total section contains 23 pools in excess of 1 m in depth. Nursery areas for both salmon and trout are estimated to comprise approximately 90% of the stream habitat, with spawning ground generally scarce for salmon except near the river's mouth. Both trout and juvenile salmon were sighted throughout the section, but considerably fewer salmon were observed than trout.



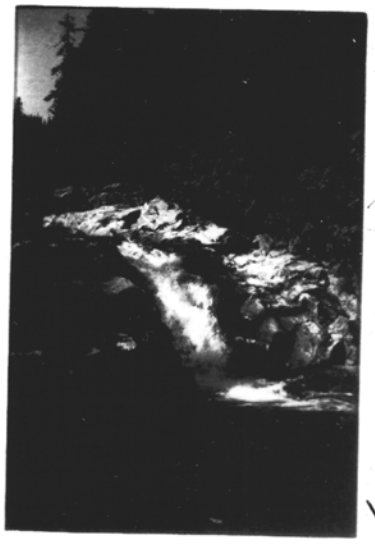
INGONISH RIVER
Section 2

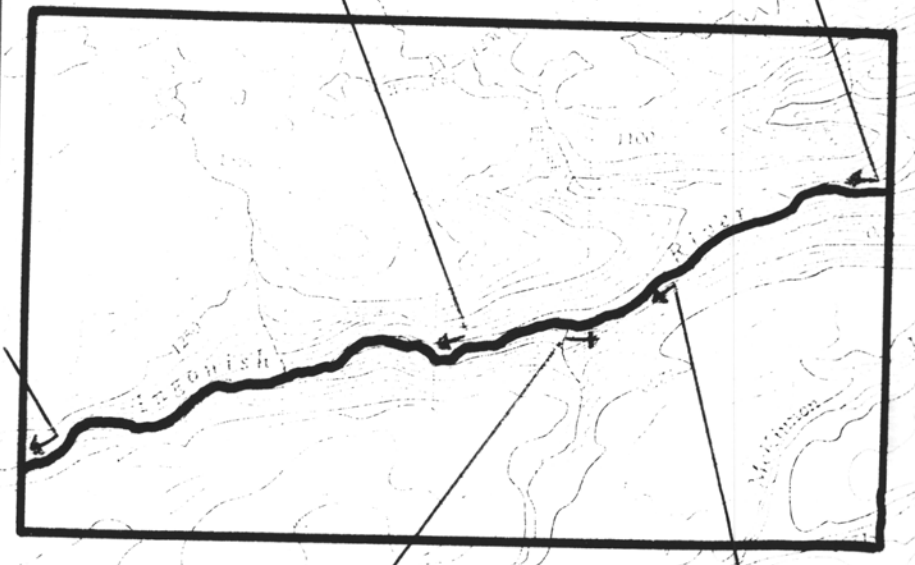
900650 - 842629

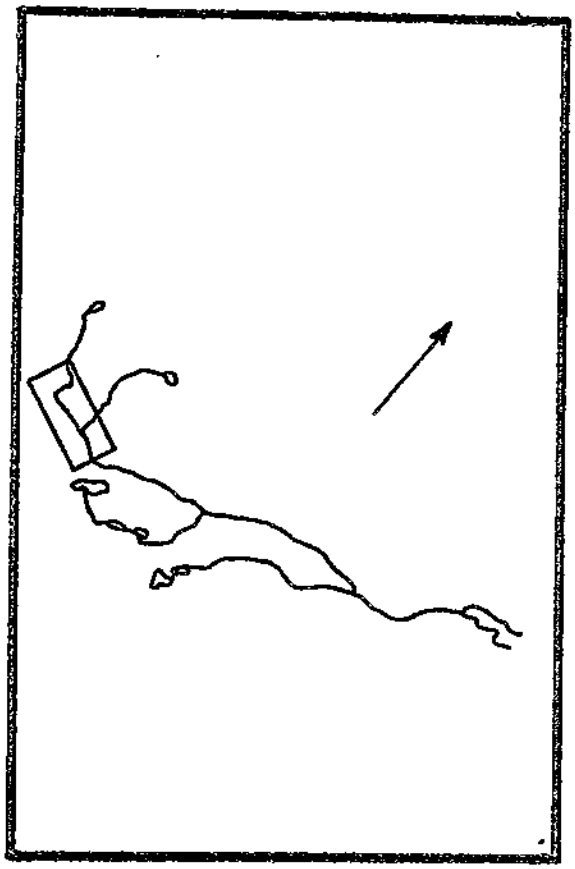
SECTION LENGTH		6,682 m
AVERAGE WATER WIDTH		9.5 m
TOTAL WATER AREA		63,438 m^2
SALMON	REARING AREA	48,589 m^2
	SPAWNING AREA	69 m^2
TROUT	REARING AREA	55,279 m^2
	SPAWNING AREA	578 m^2

STATION	DATE	TIME	pH	O_2	WATER TEMP. (°C)
879641	Aug 25	1310			14.5

This 6.7-km, middle section of the Ingonish River is basically a gorge and semi-gorge type of topography, characterized by falls, chutes, rapid riffle areas and pools. Boulders and ledge rocks predominate the stream profiles throughout, with occasional small pockets of gravel. Thirty large, and numerous small pools are recorded, ranging between 1 and 2 m in depth. Six falls, two of which approximate 3 m in height, are considered partial obstructions to upstream migrants, particularly during low water conditions. In the various segments of the stream, salmon habitat is estimated at between 25% and 50% of the water area, and trout habitat between 50% and 75%. Trout were present in all areas but no positive identification of juvenile salmon was made.







INGONISH RIVER
Section 3

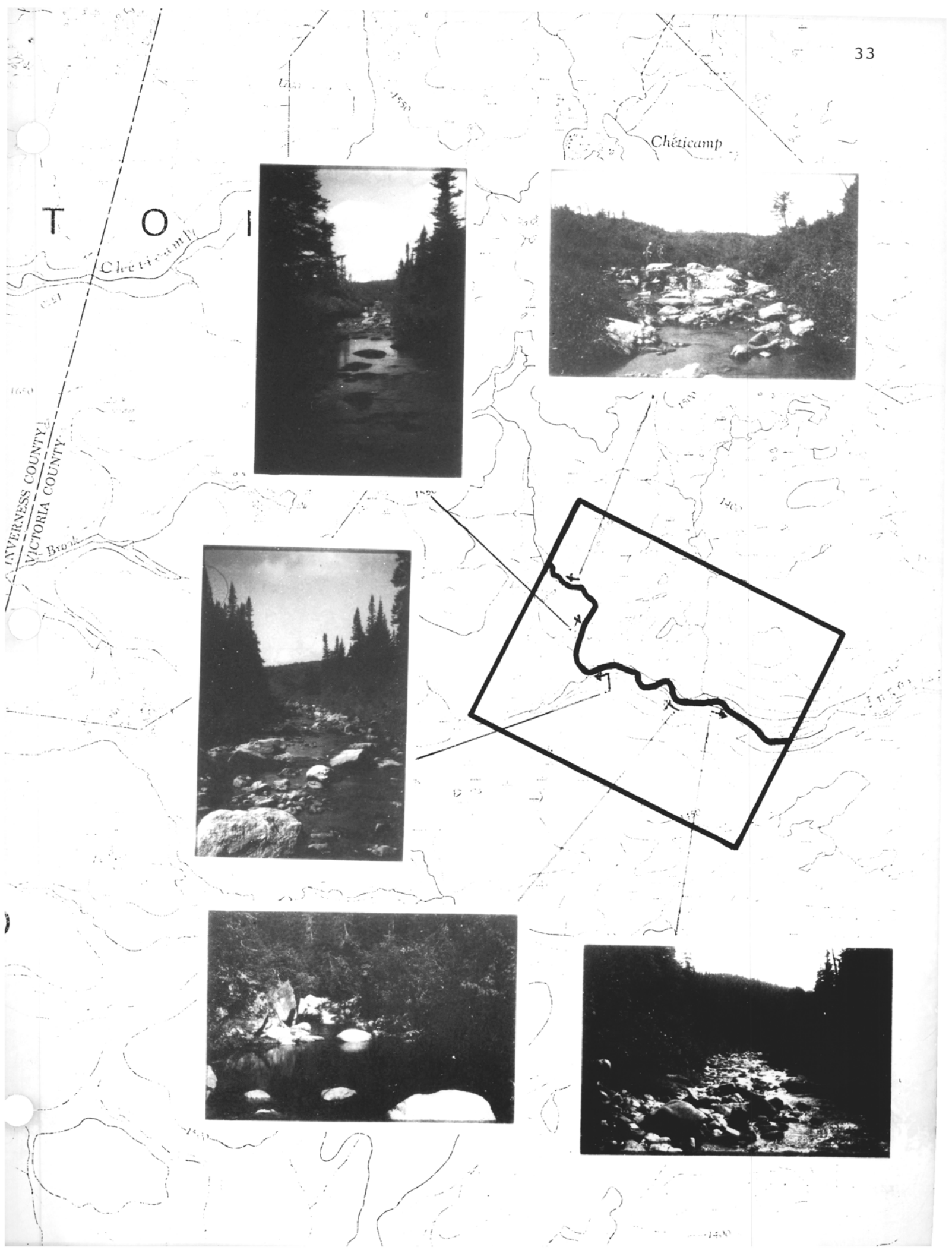
842629 - 814648

SECTION LENGTH		4,434 m
AVERAGE WATER WIDTH		7.8 m
TOTAL WATER AREA		34,696 m^2
SALMON	REARING AREA	27,128 m^2
	SPAWNING AREA	26 m^2
TROUT	REARING AREA	29,823 m^2
	SPAWNING AREA	298 m^2

STATION	DATE	TIME	pH	O_2	WATER TEMP. (°C)
833634	Aug 25	0955	7.0	12	9.5
833634	Aug 28	1045	7.0	11	16.0

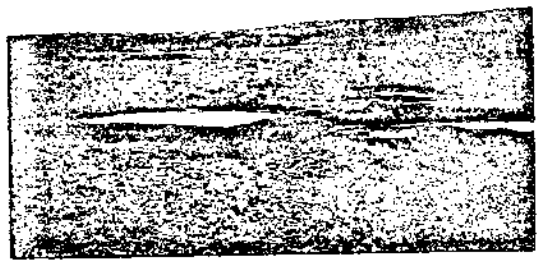
This section of the Ingonish comprises the lower 4.4 km of the main stream flowage on the highland plateau. Its gradient is 1:50 and widths range from 4 to 11 m, with an average width of 7.9 m. Bottom material consists of 25% boulders, 50% cobble and 25% gravel in a random and mixed arrangement throughout the section. On the lower 2 km of the section, shade from coniferous forest cover is prevalent; but, on the upper segment of the survey, a tundra-like environment prevails, with only alders and scattered spruce existing along the watercourse. At the top of this latter segment, aquatic vegetation covers 50% of the stream bottom, but this percentage gradually decreases until little or no aquatic vegetation appears at the lower end of the survey. Considerable sedimentation is evident below the proposed Dam #2 as a result of bulldozing at the site, and slight amounts of sediment and organic material exist in the less turbulent areas. Small pools and stillwater areas, covering a surface of between 15 and 50 m^2 and up to 1.5 m deep, are numerous, but the entire stream course is predominantly lotic.

Trout were observed singularly and in schools of 20 - 30 throughout the section; they were generally of small size, but occasional individuals of 17 - 18 cm were observed. Pockets of trout spawning gravel are distributed frequently, and the entire section is excellent trout habitat. The only evidence of predation is that affected by a species of the heron family. At the lower end of the survey area, salmon rearing habitat comprises between 75% and 100% of the stream environment; but


Chéticamp
INVERNESS COUNTY
VICTORIA COUNTY

quality salmon habitat decreases to only a nominal amount near the upper end of the survey area. Spawning ground for salmon is lacking throughout the segment. No American eels were observed during the survey and, although juvenile salmon were occasionally suspected to have been sighted, such observations were not substantiated by a positive identification.

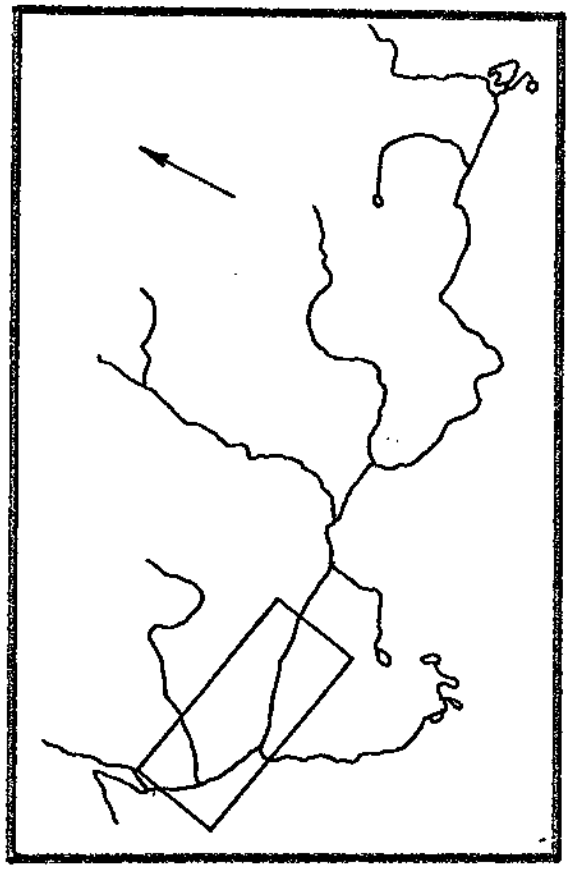
There are no obstructions to fish migration in the segment.



CHETICAMP RIVER

The Cheticamp River originates in a barren, swampy area around Cheticamp Lake on the central portion of the Cape Breton plateau and flows westerly into the Gulf of St. Lawrence at Petit Etang. It is approximately 40.2 km long with an overall gradient of 1:80.

The river is accessable to anadromous species in the lower 18.5 km above which there are insurmountable destructions.



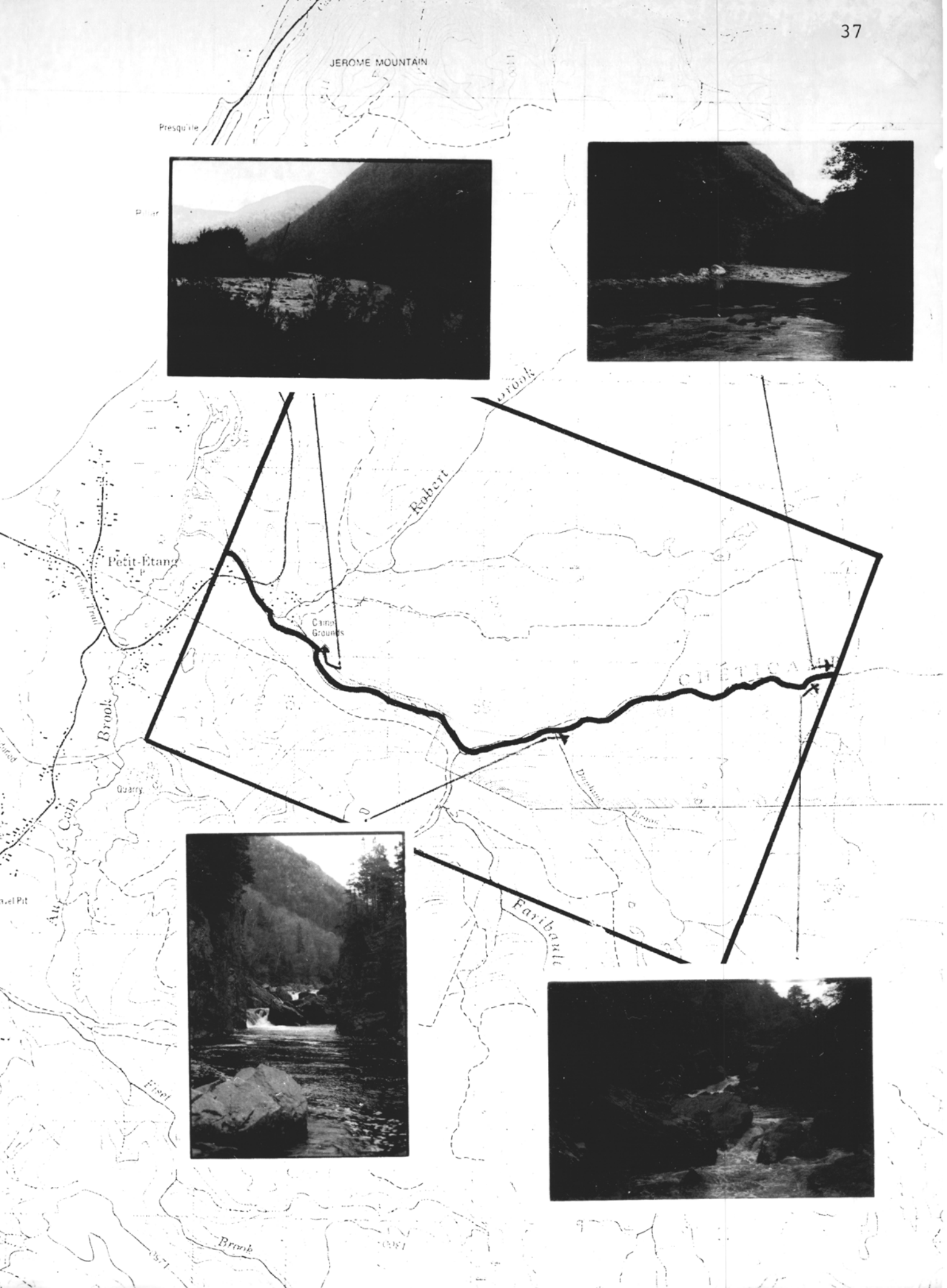
CHETICAMP RIVER
Section 1

564680 - 629669

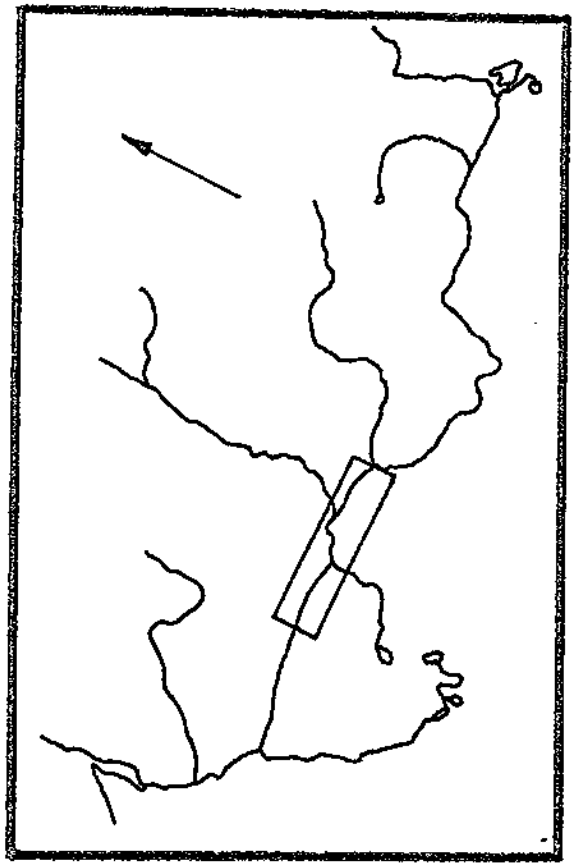
SECTION LENGTH		8,154 m
AVERAGE WATER WIDTH		30.0 m
TOTAL WATER AREA		236,434 m^2
SALMON	REARING AREA	227,804 m^2
	SPAWNING AREA	212 m^2
TROUT	REARING AREA	188,040 m^2
	SPAWNING AREA	1,862 m^2

STATION	DATE	TIME	pH	O_2	WATER TEMP. (°C)
623668	Aug 26	1115	7.0	12	14.0
597664	Aug 26	1100	7.0	10	14.0
568674	Aug 26	1400	7.2		17

This section of the Cheticamp River comprises the lower 10.8 km of stream. For the first 2.7 km from its mouth, the river consists of a large barachois pond and several wide, deep channels. From the National Park campground to the vicinity of Daphine Brook, a distance of 4.4 km, the gradient is approximately 1:150 and the average stream width is 35 m. The stream bed in this segment is principally composed of cobble with a scattering of boulders. Virtually all the area is excellent salmon nursery, although it is of lesser value for trout. Spawning ground for


JEROME MOUNTAIN
Presqu'île
Petit-Etang
Robert
Brook
Camp Grounds
Cain Brook
Quarry
Faribault
Brook

salmon, however, is extremely limited. Four large pools are present, with depths in excess of 1 m. From Daphine Brook to the upper termination of the survey section, a distance of approximately 3 km, the river possesses an average gradient of 1:50, or three times that of the lower segment. The average width of the upper segment is 18 m, and the bottom material is composed of ledge, boulders and cobble, along with small amounts of gravel. The stream flows rapidly through a series of riffles, rapids, falls and deep pools; and, of the latter, 13 were recorded, the largest of which covers more than 1,500 m^2 and exceeds 3 m in depth. None of the falls or rapids are considered barriers to fish; coincident electrofishing, in fact, established the presence of juvenile salmon well above this section. There is slight evidence of aquatic vegetation along the banks. Salmon rearing area comprises at least 80% of the stream environment, but spawning ground is lacking. There is a greater proportion of better quality trout rearing area in this segment than in the lower reaches of the river.



CHETICAMP RIVER
Section 2

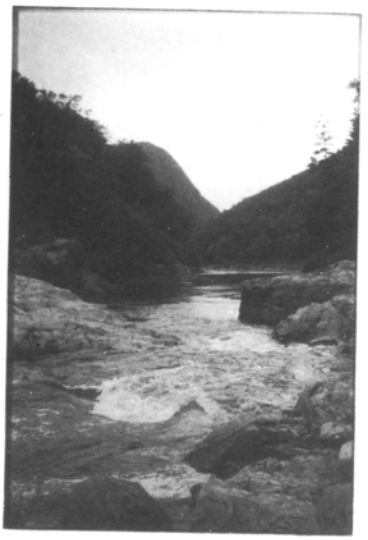
629669 - 686673

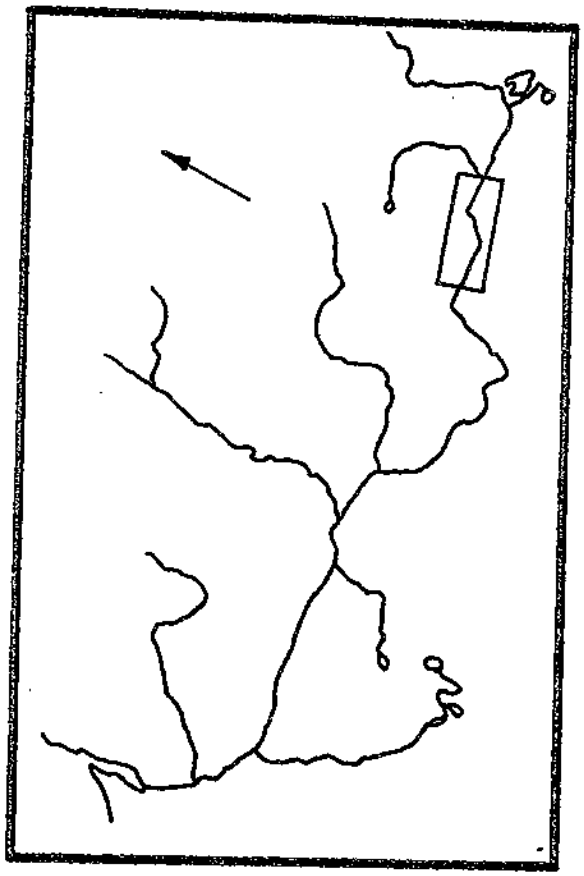
SECTION LENGTH		6,116	m
AVERAGE WATER WIDTH		17.1	m
TOTAL WATER AREA		104,493	m^2
SALMON	REARING AREA	66,520	m^2
	SPAWNING AREA	60	m^2
TROUT	REARING AREA	90,397	m^2
	SPAWNING AREA	901	m^2

STATION	DATE	TIME	pH	O_2	WATER TEMP. (°C)
654669	Aug 27	1040	7.0	11.0	15.5

The gradient of this middle section of the Cheticamp River is 1:50. At the lower end of the section the river is 18 m wide, but at the upper end it contracts abruptly to 9 m; the overall average width, however, is 17 m. The stream generally flows rapidly through a steep walled valley with ledge and rock sides, and the stream bottom is comprised of ledge rock (20% - 50%), large boulders (20% - 50%) and cobble (20% - 70%). Gravel deposits are extremely limited. Numerous rapids are encountered, but are not considered barriers to upstream migrants. Sixteen large pools exist in the section, each ranging from 2 to 3 m in depth and covering a surface area of between 350 and 1,600 m^2. Trout rearing area is plentiful and of good quality, and salmon nursery area is calculated to comprise approximately 60% of the stream environment. Some aquatic vegetation is located along the banks of the stream where protection is afforded by large boulders.

The stream course from the upper level of the surveyed section to the Inverness-Victoria Co. line, (approx 12 km), was surveyed in 1974. Its overall gradient is 1:60. It flows swiftly through a steep-walled valley with rock and boulder sides. There is a total of thirteen waterfalls in the section, ranging in height from 1 to 15 m; at least four of these falls are total obstructions to anadromous fish. Deep pools are common and speckled trout were observed in them. No specific calculations of rearing area for trout and salmon were made; but spawning area is believed to be extremely limited, and nursery area for salmon limited to a small proportion of the extreme upper and lower segments.





CHETICAMP RIVER
Section 3

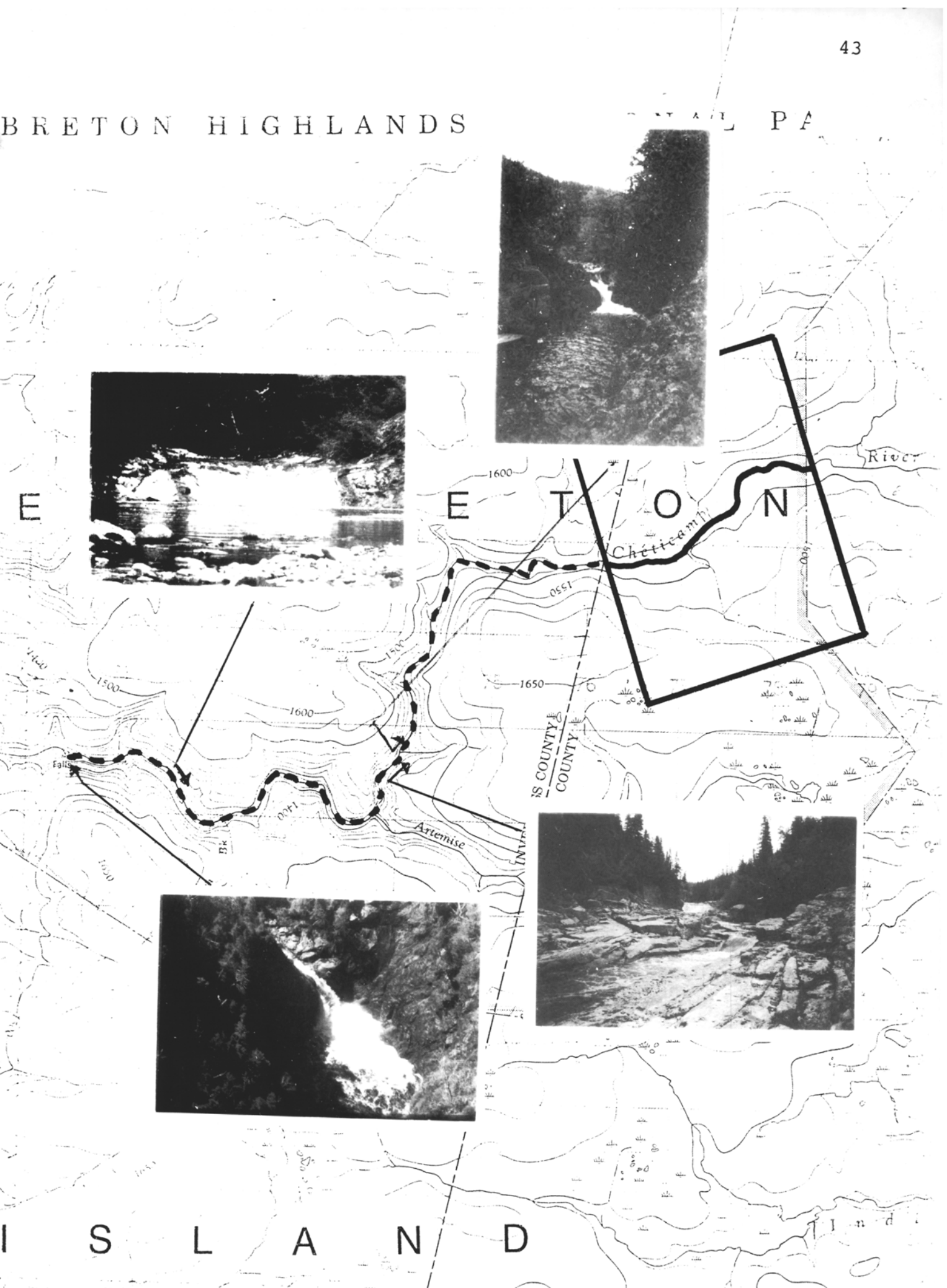
762678 - 786689

SECTION LENGTH		3,305	m
AVERAGE WATER WIDTH		12.8	m
TOTAL WATER AREA		42,412	m^2
SALMON	REARING AREA	32,331	m^2
	SPAWNING AREA	2,788	m^2
TROUT	REARING AREA	35,211	m^2
	SPAWNING AREA	13,760	m^2

STATION	DATE	TIME	pH	O_2	WATER TEMP. (°C)
786689	Aug 28	1050	6.5	10	16.5

This 3.3-km upper section of the Cheticamp River, which lies immediately east of the Inverness-Victoria County boundary, has a gradient of less than 1:400. It flows gently through a land of alder and spruce, surrounded by barrens and a bog-like terrain. The stream averages 13 m in width and the bottom is composed largely of gravel with some cobble mixture. The region is classified as excellent salmon and trout rearing area, with both nursery and spawning ground in good supply and proportionately compatable for optimum production. Numerous trout were sighted during the survey. Aquatic vegetation, however, is common in areas of minimum current. Pools are lacking, but long stretches of flats and stills exist.

Although areas immediately upstream of the section were not surveyed during the current season, observations from the previous year show that similar stream conditions exist from the upper end of the present survey to Cheticamp Lake.


BRETON HIGHLANDS
E
E T O N
Chéticamp
River
1600
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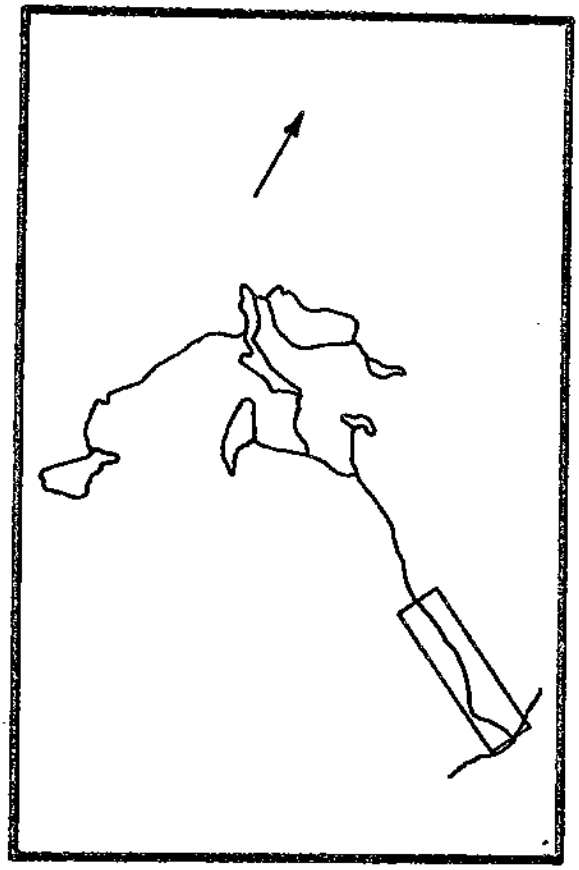
Artemise
I S L A N D



WRECK COVE BROOK
Section 1

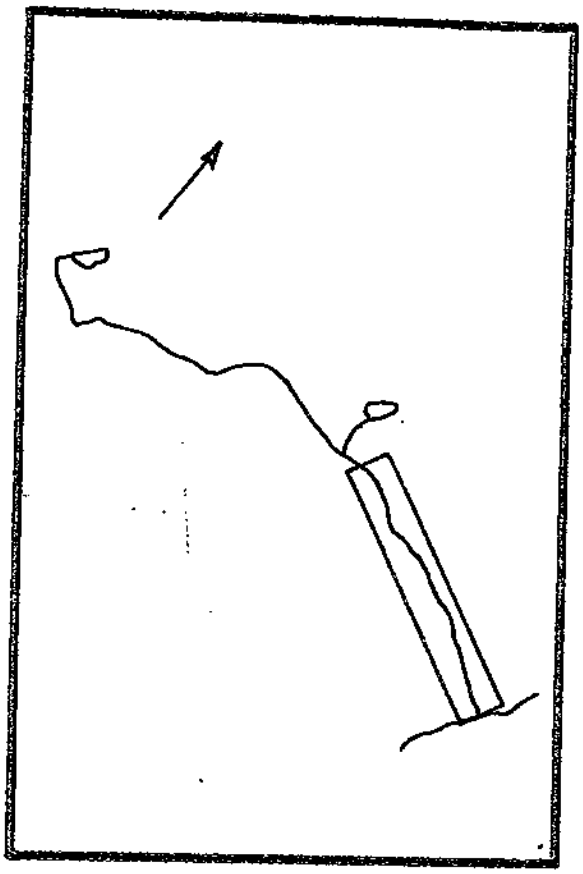
981552 - 956563

SECTION LENGTH		2,775 m
AVERAGE WATER WIDTH		5.1 m
TOTAL WATER AREA		14,170 m^2
SALMON	REARING AREA	10,591 m^2
	SPAWNING AREA	271 m^2
TROUT	REARING AREA	11,149 m^2
	SPAWNING AREA	49 m^2

STATION	DATE	TIME	pH	O_2	WATER TEMP. (°C)
976552	Aug 22	0830	7.5	11	11.0
960562	Aug 22	1000	-	-	14.0

Wreck Cove Brook flows from the northwest into the Atlantic Ocean at Wreck Cove, Victoria County. It is approximately 12 km long, with a watershed area comprising 28 km^2 and a gradient of 1:30. The lower 4 km of stream flows through a wide, predominately hardwood valley, and a cobble bottom with boulders and scattered gravel typifies the stream bed. Bank width averages 10 m on the lower 3 km of stream. After 4 km, the stream exhibits a turbulent flow through huge boulders, creating a series of cascades; waterfalls are numerous, the largest single drop being 9 m. Falls of 3 - 4.5 m are frequent from the Wreck Cove lakes to 4 km. The streams interconnecting the Wreck Cove lakes possess a gentle gradient, a cobble and boulder bottom, and stream banks which are generally overgrown with scrub birch and alders.

Wreck Co
Wreck Pt
Birch Plain
Gravel Pit



McLEOD BROOK
Section 1

993952 - 953612

SECTION LENGTH		4,606 m
AVERAGE WATER WIDTH		6.2 m
TOTAL WATER AREA		28,558 m^2
SALMON	REARING AREA	23,598 m^2
	SPAWNING AREA	42 m^2
TROUT	REARING AREA	24,062 m^2
	SPAWNING AREA	121 m^2

STATION	DATE	TIME	pH	O_2	WATER TEMP. (°C)
992593	Aug 22	0840	7.5	13	12.0

McLeod Brook, approximately 13 km in total length, drains the highland area in the immediate vicinity of Wreck Cove. Its overall gradient is 1:35 and its valley is steeply cut between elevations in excess of 300 m. The surveyed segment of the stream comprised the lower 4.6 km of principal flow, over which a gradient of 1:35 was calculated; the average width of the water section was 6.2 m, with a maximum width of 11 m. Cobble, boulders, and gravel typify the lower segment of the surveyed section in an estimated ratio of 80:10:10. This composition generally changes to ledge-rock, boulders and cobble at the upper end of the section, where a semi-gorge type of stream profile is evident.

At the mouth of the brook, the stream is completely barred to fish passage by a mass of beach stone deposited by the action of the sea. Behind this dyke is created a small fresh-water pool, the surface of which if 1 - 2 m below the crest of the dyke; the brook water diffuses through this deposit to the sea. About 2 km upstream from this barrier, the stream also divides and diffuses through several shallow channels over a wide floodplain for a distance of approximately 275 m. Fish passage through this area was considered questionable at the time of the survey, and passage may only be facilitated during periods of high water.

Aquatic vegetation is sparce to absent throughout the surveyed area, and the water is transparent and clear. Although a bulldozed road parallels the section at a distance of between 5 and 100 m from the banks, no evidence of abnormal settling action was observed except at a ford, approximately 3 km from the river's mouth. A belt of forest cover exists along the stream despite the devistation of a large segment of the watershed

Roads: Routes:

hard surface, all weather	pavée, toute saison	dual highway, 2 chaussées séparées	more than 2 lanes, plus de 2 voies
hard surface, all weather	pavée, toute saison	2 lanes, 2 voies	less than 2 lanes, moins de 2 voies
loose or stabilized surface, all weather	gravier aggloméré, toute saison	2 lanes or more, 2 voies ou plus	less than 2 lanes, moins de 2 voies
loose surface, dry weather and unclassified streets	de gravier, temps sec et rues hors classe		
cart track	de terre		
trail or portage	sentier ou portage		

ING
VICTOR
NOVA

Scale 1:

Miles 1 0

Metres 1000 0 1000

Yards 1000 0 1000

during the conflagration of 1967.

Good to fair salmon rearing ground comprises 75% - 100% of the stream habitat in the lower segments of the streams, but salmon habitat decreases to low proportions at the upper end of the survey area; small amounts of salmon spawning gravel are available at scattered locations. Trout spawning areas are confined to numerous pockets of ground throughout the area, and an excellent overall rearing habitat for the species was observed. One American eel and numerous speckled trout sightings were made. Salmon parr were also observed, but salmon fry of the year were not identified; this may suggest the effectiveness of the barrier at the mouth of the river in barring access to the stream since the autumn of 1974.

Several pools with a maximum depth of 1.5 m are found in the upper segment of the stream, and several of 1 m on the lower segment; in most areas of the survey, however, water depths were generally shallow, rarely exceeding 0.4 m.

TABLE 1. QUANTATIVE DATA RELATING TO FISH HABITAT IN SURVEYED AREAS.

SECTION	SECTION LENGTH (m)	AVERAGE WATER WIDTH (m)	TOTAL WATER AREA (m^2)	SALMON AREA		TROUT AREA	
				NURSERY (m^2)	SPAWNING (m^2)	NURSERY (m^2)	SPAWNING (m^2)
INDIAN BROOK							
1	3,340	24.4	81,733	58,809	235	55,186	897
2	7,734	22.9	177,067	154,409	286	132,855	619
3	9,394	14.3	134,546	94,392	84	106,748	569
4	11,416	13.9	158,163	85,752	1,512	107,027	4,684
5	7,031	7.9	55,855	15,422	2,676	48,311	7,179
6	8,692	16.9	146,531	105,355	92	116,674	1,175
7	8,102	15.3	123,684	98,753	176	113,967	1,134
8	2,625	13.2	34,663	20,255	2,403	25,762	3,761
9	2,492	9.7	24,088	18,014	319	18,481	176
TOTALS	60,826		936,330	651,161	7,783	725,011	20,194
INGONISH RIVER							
1	7,084	12.3	87,080	75,811	1,381	74,417	417
2	6,682	9.5	63,438	48,589	69	55,279	578
3	4,434	7.8	34,696	27,128	26	29,823	298
TOTALS	18,200		185,214	151,528	1,476	159,519	1,293
CHETICAMP RIVER							
1	8,154	30.0	236,434	227,804	212	188,040	1,862
2	6,116	17.1	104,493	66,520	60	90,397	901
3	3,305	12.8	42,412	32,331	2,788	35,211	13,760
TOTALS	17,575		383,339	326,655	3,060	313,648	16,523
WRECK COVE BROOK							
1	2,775	5.1	14,170	10,591	271	11,149	49
McLEOD BROOK							
1	4,606	6.2	28,558	23,598	42	24,062	121
GRAND TOTALS	103,982		1,547,611	1,163,533	12,632	1,233,389	38,180

TABLE 2. QUANTATIVE DATA RELATING TO FISH HABITAT IN UNSURVEYED AREAS (EXCLUDING LAKES)

STREAM	UNSURVEYED WATER AREA (m^2)	ESTIMATED AMOUNT OF SALMON NURSERY (m^2)	SALMON SPAWNING (m^2)	TROUT NURSERY (m^2)	TROUT SPAWNING (m^2)
INDIAN BROOK	83,000	33,000	300	78,000	2,500
INGONISH RIVER	28,000	3,000	-	26,000	900
CHETICAMP RIVER	262,000	108,000	1,000	210,000	10,000
WRECK COVE BROOK	20,000	2,000	-	17,000	200
McLEOD BROOK	13,000	1,000	-	10,000	100
TOTALS	406,000	147,000	1,300	341,000	13,700

TABLE 3. WATER QUALITY DATA AT VARIOUS STATIONS IN SURVEYED AREAS.

RIVER	STATION GRID. REF.	DATE (AUGUST)	TIME	AIR TEMP (^{o}C)	H_2O TEMP (^{o}C)	pH	O_2 (ppm)
INDIAN BROOK	898380	21	1030	15.5	17.5	7.5	10
	897404	15	1030	21.0	20.0	7.5	10
(Tributary)	897417	15	1130	23.5	21.0	7.0	-
	876460	15	1050	22.5	20.5	6.5	-
	875461	19	1530	23.5	22.0	7.5	9
	875461	20	0920	19.5	15.5	7.0	-
	866495	20	1400	20.0	17.7	-	-
(Tributary)	857518	20	1130	-	14.0	7.0	-
	857518	20	1130	-	17.0	7.0	-
	862534	20	1015	20.0	17.0	7.2	11
	862534	14	0910	24.0	17.0	7.0	-
SPRING	859539	14	0940	-	11.0	6.5	-
	865586	14	1600	20.5	-	7.5	-
(Tributary)	865586	14	1600	20.5	22.0	-	-
(Tributary)	865586	12	1515	25.0	23.0	7.0	9
	865586	12	1515	25.0	24.5	7.5	9
(Tributary)	859594	12	1450	21.5	19.5	6.3	-
	859594	12	1450	21.5	23.5	-	-
(Tributary)	843593	12	1255	26.0	21.0	6.5	-
	843593	12	1255	20.0	21.5	-	-
	833606	12	1020	19.5	19.0	7.5	10
	833606	11	1650	23.0	23.0	7.5	9
	785607	11	1200	21.0	15.5	7.2	11
	775605	11	1010	-	14.0	7.0	-
WEST INDIAN BROOK	874461	19	1530	23.5	21.0	7.0	9
	843466	19	0930	22.0	19.0	7.5	9
	843466	18	0910	16.5	16.5	7.5	10
(Tributary)	826495	18	1100	17.5	14.5	7.5	-
(Tributary)	828505	18	1300	20.0	12.0	7.0	-
	828505	18	1300	20.0	16.5	7.5	-
	828505	14	0915	16.5	16.5	7.5	10
(Tributary)	785533	13	1430	19.0	15.5	7.5	-
	785533	13	1430	19.0	19.5	7.5	-
	804541	13	1300	20.0	20.0	8.0	9
(Tributary)	804558	13	1000	20.0	15.5	7.5	10
	804558	13	1000	20.0	17.0	8.0	9
	788558	11	1130	19.5	15.5	7.5	-
(Tributary)	788558	11	1130	19.5	-	-	-
	765558	11	1000	19.5	15.5	7.2	10

TABLE 3. (CONT'D)

RIVER	STATION GRID. REF.	DATE (AUGUST)	TIME	AIR TEMP (^{o}C)	H_2O TEMP (^{o}C)	pH	O_2 (ppm)
INGONISH RIVER	956665	12	0900	19.5	19.5	7.2	10
(Tributary)	951656	12	0930	19.5	16.5	6.5	-
(Tributary)	946654	12	1130	23.0	16.5	7.0	-
(Tributary)	936652	12	1315	21.0	18.5	7.5	-
	921655	12	1500	24.0	21.0	7.5	9
	903652	25	1000	16.5	13.5	7.0	10
(Tributary)	879641	25	1310	16.5	14.5	-	-
	879641	25	1310	16.5	14.5	6.2	-
(Tributary)	833634	25	0955	19.5	9.5	7.0	12
	833634	25	0955	19.5	12.0	7.0	12
	833634	28	1045	21.0	16.0	7.0	11
(Tributary)	819636	28	1200	-	17.0	-	-
	819636	28	1200	-	15.5	7.0	-
CHETICAMP RIVER	568674	26	1400	19.5	17.0	7.2	-
(Tributary)	568674	26	1400	19.5	15.5	7.0	-
(Tributary)	588660	26	1230	18.0	14.5	7.0	-
	597664	26	1100	18.0	14.0	7.0	10
	623668	26	1115	23.0	14.0	7.0	12
	654669	27	1040	20.0	15.5	7.0	11
	786689	28	1050	15.5	16.5	6.5	10
WRECK COVE BROOK	976552	22	0830	14.5	11.0	7.5	11
	960562	22	1000	16.0	14.0	-	-
(Tributary)	960562	22	1000	16.0	14.0	6.2	-
McLEOD BROOK	992593	22	0840	18.0	12.0	7.5	13