

55-CAN-FF-F-RDMRG-F

GENERAL DESCRIPTION

## CLYDE RIVER SALMON SURVEY

By John Dalziel

### ABSTRACT

The water was very low in the river during the summer, and no salmon were caught by anglers up to the time of the survey. The main salmon water in this system is found on the main river between Upper Clyde and the head of tide. No major obstructions were found on the system which interfere to any great extent with the salmon run. Salmon angling catches might be increased on the river by the establishment of water control, if the damping effect of the stillwater areas was not found to be great. Salmon angling is only fair, while speckled trout angling is very good.

## GENERAL DESCRIPTION OF RIVER

Clyde River is a comparatively large stream about 38 miles long and flows into Negro Harbour near Port Clyde. The river was surveyed from Long Lake to the head of tide at Clyde River, including all the large branch streams.

The stream flows mostly through low flat woodland, some of which is swampy, with low swampy meadow lands scattered here and there, and a little cultivated farmland near the mouth. From Long Lake to the head of tide, the gradient is very slight; the flow mostly sluggish and the stream made up of about 75% stillwater and pools to 25% riffles and rapids. The stream bottom down to Middle Clyde is composed of boulders, rocks and rubble in the runs with mud sand and boulders in the stills. Beyond this, a few gravel sections appear particularly near Hemlock Shoals and a section about one mile below Quinn's Falls. The width varies from 30 feet in some of the runs to about 150 feet in the stillwater areas above Quinn's Falls.

The water was very low in the river during the summer, and no salmon were caught by anglers up to the time of the survey.

The writer was assisted in the survey by Fishery Officer Darrow and Warden Atwood.

## TRIBUTARIES

The branch streams are mainly speckled trout waters, and afford little or no salmon spawning or nursery areas.

Bloody Creek is about 20 miles long and enters the main river on the true right bank, about seven miles above Clyde River village. The stream was surveyed from about two miles above Bloody Lake down to the confluence with the main river. Above Bloody Lake, the stream is composed of about 40% runs to 60% stills and pools. Width varies from ten feet in some runs to sixty feet in the stillwater areas. This section is composed of barrens and woodland. Bottom is composed of boulders and rocks in the runs, and mud in the stillwater areas. This section provides a good angling and nursery area for speckled trout.

From the foot of Bloody Lake, down to the foot of Eel Weir Falls, a distance of about four miles, the gradient is quite steep, and there are numerous long runs. From here to the confluence, the stream is composed mostly of wide, deep stillwater areas. Bottom is made up of bedrock, boulders and rocks in the runs and mud and sand in the stillwater areas. This area is composed of barrens, woodland and swampy meadowland. This stream is mainly speckled trout waters, but also serves as a limited nursery area for a few salmon parr.

Hamilton Creek is about 25 miles long and flows in on the true right bank of the river about four miles above Bloody Creek. The stream was surveyed from Mikchick Lakes down to the confluence with the main river. From Mikchick Lake down to the old McGill farm, the stream varies in width from ten feet in some runs to seventy feet in the stills. The water is quite shoal and flows through low woodland, with some swampy meadowland here and there. Bottom is composed of rocks and boulders in the runs; mud in the stills, and some fine gravel in the area near Mikchick Lake. In the spring, this area is heavily fished for speckled trout. From the McGill farm down to the road bridge, the stream is composed almost entirely of stillwater area thirty to forty feet wide. This area is composed of low, flat swampy meadowland. The flow is sluggish, and the bottom is composed of sand, mud, rocks and boulders. Dense aquatic vegetation is found in much of this area, and large numbers of young gaspereaux were observed. From the road bridge down to the main river, the area is wooded; the gradient is steep, and the stream is composed of about 60% runs to 40% pools and stills. Bottom is composed of bedrock, rocks and boulders with some fine gravel and mud down to within one-half mile of the main river. Beyond this, coarse and medium gravel predominate.

This stream is considered to be mainly speckled trout water, but it also provides a nursery area for gaspereaux and salmon parr. The section near the confluence is a potential salmon spawning area.

Davis River is about ten miles long and flows into the main river on the true right bank, about one mile above the old saw mill at Upper Clyde. From the main river up to Rory Lake, the gradient is steep and the stream is composed of about 50% pools to 50% riffles. Bottom is composed mostly of boulders and rocks, and the area is wooded. From the head of Rory Lake to about two miles beyond Engineering Lake outlet, the stream is composed mainly of stillwater areas.

#### SPAWNING AREAS

The important spawning areas are all found on the main river between Middle Clyde and Clyde River, with only two small areas found on the branch streams. These areas are outlined on the map and numbered S-1, S-2, etc.

Just below the confluence of Hemlock Creek with the main river, there is a section about 1/8 of a mile long of possible limited spawning area. The bottom here is composed of a mixture of rocks, rubble, boulders and gravel. Salmon pools are present, and there is a good holding pool about one mile below this area at the mouth of Salmon Creek. This section is shown on the map as S-1.

Immediately above Middle Clyde road bridge, there is a short run with a pool below. There is a small amount of gravel at the foot of this pool where a limited number of salmon might spawn. This area is shown as S-2.

Area S-3 begins about  $1\frac{1}{2}$  miles below Middle Clyde road bridge and continues for about two miles to the holding pool at the mouth of Harper Creek. The stream is composed of about 60% riffles to 40% pools, and the bottom is composed of about 80% medium gravel. This appears to be one of the main spawning grounds in the river.

On the main river, about one-half mile above the confluence of the Hamilton Branch, there is a run which is locally known as the "Hamilton Brook Run". This run is about one-half mile long and 30 to 40 feet wide. The bottom is studded with boulders and rocks with patches of gravel scattered between. Small salmon pools are present and a good holding pool is found in the main river at the mouth of Hamilton Creek. This is a possible limited spawning area, and is shown on the map as S-4.

From the mouth of Hamilton Creek down to Sisters Brook, a distance of about one-half mile, there are limited salmon spawning facilities. The stream bottom is composed of gravel, rocks and rubble. Small salmon pools are present and one holding pool is found at the mouth of the Hamilton Branch. This area is shown on the map as S-5.

At Hemlock Shoals, about one mile above the mouth of Bloody Creek, there is about one-quarter mile of possible salmon spawning grounds. This area is about 60 feet wide; bottom composed mostly of gravel with some rocks and boulders, and the stream composed of 60% riffles to 40% pools. There is a good holding pool at the mouth of Bloody Creek which could be used by fish in this area. This area is shown as S-6.

From Deep Hole down to the head of tide, a distance of about one mile, there is an excellent salmon spawning area. The bottom is composed of about 90% gravel to 10% boulders, while the stream is composed of about 50% riffles to 50% pools. Several salmon pools and holding pools were found along this section of the river. This area is shown on the map as S-7.

Near the mouth of the Hamilton Branch, there is about one-half mile of possible spawning area. This section lacks good salmon pools as most of the area is shallow, open and exposed. However, it is felt that, because  
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of the good holding pool in the main river at the mouth of this branch, salmon might spawn in this area and fall back into the holding pool for shelter when necessary. This area is shown on the map as S-8.

#### NURSERY AREAS

The main nursery areas are shown on the map, and numbered N-1, N-2, etc.

That section of stream from the foot of Barclay Lake down to the confluence of the Davis River, a distance of about seven miles, has all appearances of being a good nursery area for salmon. The stream is composed of a series of runs, pools and stillwater areas. Banks are mostly low and flat and the area is wooded. Bottom fauna seems quite abundant and salmon parr are caught all along this section. This area is shown on the map as N-1.

Area N-2 extends from the saw mill site at Middle Clyde down to about one-eighth mile below Hamilton Creek, a distance of about three miles. This area is composed of a series of short runs and stillwaters; bottom is made up of mud, rocks, boulders and gravel, and fish food seems quite abundant.

The area from Middle Clyde road bridge down to Harper Creek, a distance of about  $3\frac{1}{2}$  miles, serves as a nursery area for salmon. The stream bed is composed of boulders, rocks and gravel affording good shelter for small fish. Natural fish food is quite abundant. Salmon parr are caught by trout fishermen all along this section of stream. This area is designated on the map as N-3.

Area N-4 extends from "Trout Pool Falls" down to "Seven Sisters", a distance of about  $2\frac{1}{2}$  miles. The stream bed is composed of boulders, rocks and gravel affording good shelter and an abundance of food for small fish. Salmon parr are caught here by trout fishermen.

That section of stream from "Hemlock Shoals" to the mouth of Bloody Creek serves as a nursery area for salmon. This area extends for about  $1\frac{1}{2}$  miles. Bottom is composed of gravel, rocks, boulders and mud; flow is sluggish to rapid, and fish food seems quite abundant. This area is designated as N-5.

The area from Quinn's Falls to the head of tide, a distance of about  $2\frac{1}{2}$  miles, serves as a nursery area for salmon. The bottom is composed mostly of gravel, rocks and boulders; flow is sluggish to rapid, and fish food seems abundant. A few salmon parr, speckled trout, suckers and fundulus minnows were seined in this area. This area is shown as N-6.

## ANGLING REPORT

Atlantic Salmon Angling Catch 1949 to 1955:

<u>Year</u>	<u>No. of Fish</u>	<u>Estimated Weight</u>
1949	7	36 Lbs.
1950	12	94 "
1951	10	83 "
1952	17	109 "
1953	91	715 "
1954	17	134 "
1955	-	--

Speckled Trout Angling Catch 1949 to 1955:

<u>Year</u>	<u>No. of Fish</u>	<u>Estimated Weight</u>
1949	2,137	1,310
1950	1,047	625
1951	7,215	3,730
1952	5,850	3,190
1953	5,515	3,525
1954	3,610	1,955
1955	4,930	2,855

The above tables show that on an average year approximately twenty-two salmon (no distinction made between grilse and salmon) are taken by anglers. The weight of these fish average about  $7\frac{1}{2}$  pounds. The catch varied from 91 fish in 1953 to 0 fish in 1955, the latter being a very dry season.

Speckled trout made up the bulk of the angling catch with an average weight of slightly over one-half pound.

## BARRIERS

(1) The saw mill dam on the canal at Clyde River village is forming a partial barrier, as salmon can bypass this canal by using the main river channel. It was reported that in former years salmon came up this channel and held up under the dam for long periods. This spring a fence was built across this canal near its confluence with the main river and, as a result, all ascending fish have been diverted up the main channel.

(2) At the outlet of Long Lake, there is the remains of an old driving dam, about 170 feet long and 10 feet high. At the time of the survey, the gates in this dam were closed but there were holes in the dam near the gates, which allow fish to move back and forth. It is suggested that the gates be left open, so that the gaspereaux will have free access to the lake in the spring.

(3) At the foot of Bloody Lake, there is the remains of an old driving dam. The beavers now have built a dam across this site and at present the area is serving as a catchment basin for all the old debris that drifts down the lake. This dam does not interfere with the salmon fishery as there is no worthwhile salmon spawning or nursery area above this point. It is suggested, however, that this dam be removed to allow gaspereaux and speckled trout free access to the lake.

(4) About two and one-half miles below Mikchick Lake, the beaver have the river completely shut off with a two-foot dam. This dam forms a complete barrier during low-water periods, but it would be useless to remove it as the beaver would only replace it in a short time.

None of these barriers interferes to any extent with the salmon fishery as there is little of salmon spawning or nursery areas above them. However, gaspereaux use these lakes during the spawning run, and they must be greatly hindered, if not completely stopped, from reaching their spawning and nursery areas by these barriers.

## PREDATION

Mergansers were observed in very large numbers in the area above Upper Clyde. Other predators, such as, osprey, kingfishers, great blue heron, loons, catfish, suckers and perch, were observed in lesser numbers scattered throughout the whole system.

## POLLUTION

No pollution was observed in the system.

## CONCLUSIONS

A few years ago, a request was received at this office from Mr. M. P. Smith, M.P., Queens-Shelburne, regarding the establishment of water control on the Clyde River. A survey of the proposed dam sites was made by F. W. Rudge in 1951. If information is required on this, it may be obtained from his 1951 field book. There appear to be ample storage facilities for water control on this system if the damping effect of the long stillwater areas would not nullify the effect. If water control is contemplated, another engineering survey should be made to determine the amount of water that could be stored and whether the results would be great enough to warrant the expenditure. From a fish culture point of view, it is not necessary because, under normal conditions, the salmon have no trouble ascending the river and spawning grounds, and nursery areas would not be improved sufficiently to warrant the expenditure.

There seemed to be a lack of salmon parr and fingerlings in the system, which would indicate the possibility of heavy predation both by fish and birds. The long, deep stillwater areas of the river provide a very suitable habitat for coarse fish.

From observations made during the survey, it would appear, with the possible exception of the lower section of the river, the system is primarily speckled trout water and little can be done to alter this situation.

It is suggested that, if summer fishing is requested at some future date, the stream be stocked with brown trout as they should do very well in this system.

## RECOMMENDATIONS

Because of the large number of predators in the area, it is suggested that stocking be made with yearling salmon if at all possible.

Clyde River



Near head of tide.



Stillwater area near confluence  
with Bloody Creek.



At Upper Clyde road bridge.



Stillwater area above old saw  
mill at Upper Clyde.



About one mile above Upper Clyde,



Near confluence with Davis River.

GENERAL DESCRIPTION 55-CAN-FF-F-RDMR6-B

## SALMON RIVER SALMON SURVEY

(Digby Co., N. S.)

By John Dalziel

## ABSTRACT

The main salmon water of this system extends from Harrington's Mill to the head of tide, a distance of about eight miles. The remainder of the system is primarily speckled trout waters. There are several dams on the system, none of which are interfering to any great extent with the salmon run.

Salmon angling is quite heavy, as it is about the only river in the area that carries a run of salmon.

## GENERAL DESCRIPTION OF RIVER

Salmon River is a comparatively small stream about 22 miles long, and flows into the Atlantic Ocean at Salmon River village. The river was surveyed from Pinetree Lake down to the head of tide, including all the branch streams.

From its source, down to Harrington's Mill, the stream flows mostly through low flat woodland, some of which is quite swampy, the gradient is very slight with the result that long stillwater areas and lakes predominate. Width varies from 12 to 15 feet in the runs to about 150 feet in the stills. The bottom is composed mostly of mud, silt and rocks in the stillwaters, while boulders, rocks and rubble predominate in the runs. This section presently serves as an angling and nursery area for speckled trout and as a nursery area for hatchery stocked salmon parr.

From Harrington's Mill to the head of tide, the stream flows through a mixture of woodland and farmland with some swampy area near Muse's Bridge. The gradient varies from moderate to steep with the result that there is a mixture of about 60% pools, stills and lakes to 40% runs and riffles. The width varies from about 18 feet below Indian Mound to about 50 feet in the stills near Muse's Bridge. Bottom is composed mostly of rocks, rubble, gravel and bedrock in the runs, while rocks, mud and a considerable amount of sawdust predominate in the pools. Natural fish food seems quite abundant and this area serves as the main salmon spawning and nursery area for the system. There are several good holding pools along this section of stream; the most important of which are Mill Pool, Barn Pool, The Narrows, Muse's Bridge, Indian Mound and a small unnamed one a short distance below Harrington's Mill.

During time of survey, July 19th to 30th, the water was very dark brown and turbid, and the temperatures ranged from 20°C (68°F) to 23°C (73.4°F).

Salmon parr (*Salmo salar*) were observed or reported from the foot of Salmon River Lake down to the head of tide, with the greatest concentration below Harrington's Mill. Speckled trout (*Salvelinus fontinalis*) were found throughout most of the system, while catfish (*Amurios nebulosus*), yellow perch (*Perca flavescens*), eels (*Anguilla bostoniensis*), killifish (*Fundulus diaphanus*), suckers and other minnows were also very abundant, particularly in the lakes. There is also quite a large spawning run of gaspereaux entering this system in the spring of the year.

## TRIBUTARIES

The branch streams are mainly speckled trout waters, but there are small sections scattered here and there which might serve as limited salmon spawning areas.

Gaspereaux Brook is a small stream about three miles long which flows out of Gaspereau Lake and empties into the Salmon River on the true right bank about one-quarter mile below Lake Doucette bridge. The stream is about 12 to 15 feet wide in the runs, and 20 to 25 feet in the stillwater areas. Depth varies from 6 inches in some of the runs to over 3 feet in the pools. The stream flows through a low flat wooded area, some of which is swampy, and is made up of about 75% pools and stills to 25% riffles and rapids. Bottom is composed of boulders, rocks and some gravel in the runs with mud silt and rocks in the stillwater areas. Fish food appears abundant, while fish fauna consists mainly of speckled trout. There are no salmon spawning grounds in this area, but the brook could serve as a nursery area for hatchery stocked salmon. At the foot of Gaspereau Lake there is the remains of an old mill, locally known as Felix's Mill, which has fallen into the stream and the old lumber from this is forming partial barriers on the upper end of Gaspereau Brook. It is suggested that this rubbish be cleaned out of the stream to allow the free passage of fish up and down the brook.

Corning Brook is a small brook about  $3\frac{1}{2}$  miles long, which flows out of Lower Corning Lake and empties into the Salmon River on the true left bank about one-half mile below Mayflower Road bridge. The stream varies in width from about ten feet in some of the runs to 40 feet in the stillwater areas, and in depth from one foot in the runs to  $3\frac{1}{2}$  feet in the pools, and to unknown depths in the stillwater areas. The area through which the stream flows is mostly woodland with quite a large swampy area near the center. Bottom is composed of boulders, rocks and gravel in the runs, with some silt in the pools and silt, mud and detritus in the beaver pond and stillwater area. The gradient is quite steep for the first  $1\frac{1}{2}$  miles below Lower Corning Lake. The flow is rapid, and the stream is composed of 50% pools to 50% riffles. Limited salmon spawning grounds are present in this area. Below this, there is a long stillwater and beaver pond about  $1\frac{1}{2}$  miles long with three beaver dams at the lower end, which at present are forming complete barriers to the ascent of fish. Two beaver houses were seen in this area, but no beaver or fresh beaver cuttings were observed. It is suggested that these beaver dams be removed to allow salmon free access to the spawning grounds above and that any beaver in the area be removed. Below this, the gradient is quite steep; the bottom is composed of boulders, rocks, silt and a little gravel, and the stream is composed of 75% riffles to 25% pools. Bottom fauna seemed quite abundant, while fish fauna consisted mainly of hatchery stocked salmon parr, speckled trout and fundulus minnows.

/Dean's Brook

Dean's Brook is a comparatively large branch, about 8 miles long, which flows out of Ticken's Lake and empties in on the true left bank of the river near Harrington's Mill. About  $1\frac{1}{2}$  miles from Ticken's Lake, and continuing to about  $1/4$  mile below the outlet of Longboat Lake, the stream flows through a wooded area; is about 20 feet wide, 6 inches deep in the runs, and up to 2 feet deep in the pools. The stream here is composed of about 50% pools to 50% riffles. Bottom is made up of boulders, rocks, fine gravel and mud. Fish food seems abundant, but fish fauna is scarce. From here to the railroad bridge, near Hectanooga, the stream is composed of a long stillwater area about 30 feet wide and in places over 5 feet deep. The bottom is composed mostly of mud with some rocks and gravel scattered here and there. The area here is wooded and the banks are low and flat. This is an excellent speckled trout angling and nursery area. From the railroad bridge to Harrington's Mill, the stream is composed of about 90% stillwater and pools to 10% riffles. Bottom is composed of mud, silt and rocks in the pools and stills and boulders, rocks, rubble, sand and gravel in the runs. The area here is wooded with a little swampy meadow land about  $1/2$  mile below the railroad bridge. There are no spawning facilities for salmon along this brook. The width varies from about 25 feet in the stills to 3 feet in the runs. The velocity was very sluggish, the water dark brown in colour, and the temperature was  $18^{\circ}\text{C}$  ( $64.4^{\circ}\text{F}$ ). This is an excellent speckled trout angling and nursery area.

There are several places along the stream where old trees, logs and sticks have piled up to such an extent as to form at least partial barriers which should be removed. About half-way between Harrington's Mill and the railroad bridge, there is a beaver dam about 3 feet high, which forms a complete barrier across the stream.

#### SPAWNING AREAS

The important spawning areas are all found on the main river below Harrington's Mill, with the exception of a small section on Corning Brook. These areas are outlined on the map, and numbered S-1, S-2, etc.

From about 400 yards below Lake Doucette Road bridge down to the Mill pool, a distance of about  $1\frac{1}{2}$  miles, the stream serves as a limited spawning area for salmon. The stream here is about 30 feet wide, up to 4 feet deep in the salmon pools, and is composed of about 75% riffles to 25% pools. The bottom is composed of boulders, rocks, rubble, bedrock, gravel and sand. The stream flows through a mixture of farmland and woodland, and there is a large number of salmon parr in the area. Salmon pools are present and the Mill pool is a good holding pool for the area. This section is shown on the map as S-1.

Just below the confluence of Corning Brook with the main river, there is a section of limited spawning grounds about  $3/4$  of a mile long. The stream here flows through a mixture of farmland and woodland; is 25 to 30 feet wide, and the bottom is composed of gravel, rocks and boulders. There are several salmon pools present, and two good holding pools at Muse's Bridge. This area is shown as S-2.

Immediately below Mayflower Road bridge, there is about 100 yards of possible spawning area. The stream here flows through farmland; is about 20 feet wide, and the bottom is composed of gravel. There is a good holding pool about 200 yards above the road bridge. This area is shown on the map as S-3.

Area S-4 extends from the confluence with Black's Brook down to the old logging bridge above Indian Mound, a distance of about  $1/2$  mile. The stream here is composed of a series of slow runs and small pools. This section is about 40 feet wide; the bottom is composed of rocks with patches of gravel between, and serves as a possible spawning area.

That section of Corning Brook from about  $1/2$  mile below Lower Corning Lake down for about  $1\frac{1}{2}$  miles, could serve as a limited spawning area for salmon. This section varies in width from 10 to 25 feet and the velocity is quite rapid. The stream is composed of about 50% pools to 50% riffles, and the depth varies from 1 to 3 feet. The pools are not very large, but they could serve as salmon pools. It is reported that, before the beaver took over this brook, salmon used this area to spawn. This area is shown on the map as S-5.

#### NURSERY AREAS

That section of stream between Salmon River Lake and Harrington's Mill, a distance of about 6 miles, serves as an angling and nursery area for speckled trout and as a nursery area for hatchery stocked salmon. From local reports, salmon parr are caught all along this area by trout fishermen. Near the foot of Salmon River Lake, there is about  $1/4$  mile of rapids and pools, but beyond this there is a long stillwater for about 4 miles down to Fitz Rapids. This stillwater is 75 to 100 feet wide and, in places, over 6 feet deep. Fitz Rapids is a short run about  $1/2$  miles long. This is followed by another stillwater, which extends to Harrington's Mill, with the exception of one small rapid about  $1/8$  of a mile long. The stream here flows through low woodland with some swampy meadow land below the rapids. The water is very dark brown in colour, sluggish except in the rapids, with a temperature of about  $23^{\circ}\text{C}$  ( $73.3^{\circ}\text{F}$ ). The bottom is composed of mud silt and boulders in the stillwater areas while rocks, boulders and rubble predominate in the runs. Fish food seems quite abundant all along this area. This area is shown on the map as N-1.

Area N-2 is that section of stream from Harrington's Mill to the Mill pool, a distance of about 8 miles. The stream here flows through a mixture of woodland, farmland, /and

and swampland. Width varies from 15 feet in the runs to about 40 feet in the stillwater areas. Bottom is composed of boulders, rocks, gravel and rubble in the runs and mud, rocks and sawdust in the pools. Fish food appears quite abundant, and salmon parr are very numerous. This section is the main nursery area for salmon parr in the system.

That section of Gaspereau Brook from the foot of Gaspereau Lake down to the main river, a distance of three miles, could serve as a nursery area for hatchery stocked salmon parr, if the brook was cleaned of debris on the upper end near Gaspereau Lake. This stream flows through a wooded area; is 12 to 15 feet wide in the runs, and about 25 feet wide in the stills. The stream is composed of about 75% stillwater to 25% runs. Bottom is composed of boulders, rocks and some gravel in the runs with mud and silt predominating in the stillwater areas. Natural fish food seems abundant. The stream at present serves as an angling and nursery area for speckled trout. This area is shown on the map as N-3.

Corning Brook, from the foot of Lower Corning Lake to the confluence with the main river, a distance of about 2½ miles, serves as a nursery area for speckled trout and hatchery stocked salmon parr. For 1½ miles below Lower Corning Lake, the stream is composed of about 50% pools to 50% rapids. The area is wooded, and the bottom is composed of boulders, rocks, gravel and some silt. The stream varies in width from about 10 feet in the runs to about 25 feet in some of the pools. The water is dark brown in colour; the flow is rapid, and the temperature was 20.5°C (68.9°F). For the next mile, the stream forms a wide stillwater area at the foot of which is a series of three beaver dams. For the next half mile, the velocity is quite rapid, and the stream is made up of about 60% rapids to 40% pools. This area is shown on the map as N-4.

Dean's Brook, from Ticken's Lake to the main river, a distance of 8 miles, could serve as a nursery area for salmon. This stream varies in width from about 6 feet below Ticken's Lake to about 30 feet in the stillwater areas near Hectanooga. The stream flows through a low wooded area, and the bottom is composed of boulders, rocks, rubble and sand in the rapids, and mud and rocks in the stills. Fish food seems quite abundant, and there is a large number of speckled trout in the area. It is suggested that this brook be stocked with salmon at the foot of Ticken's Lake, and below the railroad tracks, near Hectanooga on the Balogni road.

#### BARRIERS

Barriers, both partial and complete, were found throughout the whole system, and are shown on the map as B-1, B-2, etc.

B-1: At the outlet of Pinetree Lake, there

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is a storage dam about 7 feet high and 200 feet long. This dam is constructed of rocks and boulders, and has no sluiceway or gates of any kind. The water from Pinetree Lake flows down through the rocks and into the lake outlet. This dam was built a number of years ago to back the water from Pinetree Lake into Little Pine, Rocky and Loonhaunt Lakes, so that logs could be floated down through this system into Rocky Lake, where they were transported across to Ticken's Lake and driven out to Hectanooga. This dam forms a complete barrier.

B-2: There is a beaver dam on the outlet of Moosehorn Lake about 1/8 of a mile below the lake. This dam is about 3 feet high and, at present, is forming a complete barrier.

B-3: A short distance below the beaver dam on Moosehorn Lake outlet, there is the remains of an old storage dam. This dam is 56 feet long, and about 3 feet 8 inches high. It is constructed of rocks and cement; situated on the Robichaud property. The gate has been removed from this dam and there is a large section 6 feet long broken out of the true right side. This dam does not obstruct the stream at present. This site was surveyed a number of years ago by Mr. Lynch for a possible water storage dam. It is the writer's opinion that this dam site is too far from the lake to raise the water appreciably. The findings of Mr. Lynch would give the engineering stand on the subject.

B-4: At the outlet of Salmon River Lake, there is a storage dam on the Robichaud property. This dam is 150 feet long, and 4½ feet high. It is constructed of stones and cement. The dam was used to store water in the lake to operate the saw mill on English Lake, owned by Robichaud. The water is supplied to this mill by a canal, which is dug between the two lakes. This dam forms a barrier when the stop logs are in place. The saw mill on English Lake has not been used for the last few years.

B-5: The A.J. Harrington dam at Mayflower is used to store water for operation of the saw mill on the site. The dam is 106 feet long, and 12 feet high. It is constructed of cement. There is a wooden fish ladder over the dam, which was dry during the survey. There is a considerable amount of water lost here through a large hole in the sluice gate. If repairs were made in the sluice gate, there should be almost enough water saved to operate the fish ladder.

There is a natural run-around leading from the pond above the dam to the river below. This is dry at present but, according to the Fishery Officer, gaspereaux come up this way, as well as the fish ladder, during the spring run.

This dam, at present, is forming a complete barrier. From local reports, only one salmon is known to

have been caught above this dam by angling.

B-6: There is the remains of an old dam at the foot of Gaspereau Lake, which is locally known as "Felix's Mill". At one time there was a sawmill on this site, but it has decayed and toppled into the stream. The debris from this sawmill forms partial barriers at several places, and along the upper section of this brook. This dam was about 175 feet long, and 8 feet high. It is constructed of clay, rocks and wood. From information gathered from D.P.O. Thibault, this dam site and water rights have been offered to the Department free of charge, to be used for water control on the river.

B-7: There is a sawmill dam on the inlet of Lower Corning Lake, owned by James Reed, South Ohio. The dam is 118 feet long, and 7 feet high. It is constructed of wood and rocks. This dam has no fish ladder, and is forming a complete barrier. The dam itself, although still in use, is in very poor repair, probably due to the fact that the owner is a very old man.

B-8: About one mile above this sawmill dam, at the outlet of Three-Island Lake, there is the remains of an old storage dam, owned by James Reed. This dam is about 90 feet long, and  $5\frac{1}{2}$  feet high. It is constructed of clay, rocks and wood. There is a large hole in the center of this dam, which allows fish to pass back and forth.

B-9: The hatchery storage dam at the outlet of Lake George forms a complete barrier.

B-10: There is a series of three beaver dams on Corning Brook, about one mile above the confluence with the main river. These dams form at least partial barriers, but it is useless to remove them unless the beaver are removed also.

B-11: On Dean's Brook, about half-way between the Harrington dam and the wooden railroad bridge near Hectanooga, there is a beaver dam about 3 feet high, which forms a complete barrier.

#### POLLUTION

There were reports of two possible areas of pollution: one at the mouth of the river near the fish plant owned by Charles Deveau, and the other below Harrington's Mill.

The pollution at the mouth of the river is supposedly caused by fish offals, which are dumped into the river from the fish plant. It is the writer's opinion that no pollution exists here, as the hundreds of sea gulls eat the offals as fast as they are dumped into the stream. These offals are dumped when the tide is going out and the

waste products which escape the fish, gulls, etc., are mostly carried out to sea.

Some of the pools below Harrington's Mill have quite large deposits of old sawdust on the bottom. The majority of these pools provide salmon angling when the water is high enough to allow the fish to pass up the river this far. It is, therefore, suggested that pollution, if it exists here at all, is not great enough to bother with.

#### PREDATION

Predators seemed quite abundant throughout most of the system and included king-fishers, loons, great blue heron, mink and dragon fly nymphs. From local reports, large numbers of coarse fish are present in the lakes and in the stillwater areas. The most abundant of these are white perch, black bullheads and eels.

#### ANGLING REPORT

##### Atlantic Salmon Angling Catch 1949 to 1955:

<u>Year</u>	<u>No. of Fish</u>	<u>Estimated Weight</u>
1949	45	394 Lbs.
1950	49	455 "
1951	28	286 "
1952	45	417 "
1953	43	388 "
1954	46	481 "
1955	19	164 "

##### Speckled Trout Angling Catch 1949 to 1955:

<u>Year</u>	<u>No. of Fish</u>	<u>Estimated Weight</u>
1949	2,770	1,630 Lbs.
1950	1,587	984 "
1951	1,608	988 "
1952	1,369	895 "
1953	1,188	765 "
1954	1,137	742 "
1955	1,112	722 "

The above tables show that in an average year approximately forty salmon (no distinction made between salmon and grilse) are taken by anglers. The weight of these fish average about  $9\frac{1}{2}$  pounds.

Speckled trout make up the bulk of the angling catch with an average weight of slightly over  $1\frac{1}{2}$  pound.

## CONCLUSIONS

The main salmon waters of this river extend from Harrington's Mill to the head of tide, a distance of about 8 miles. The remainder of the system is primarily speckled trout waters, but much of it could be used as nursery area for hatchery stocked salmon parr.

There is a very large number of eel weirs strung across this river, particularly in the area between Harrington's Mill and the head of tide. After examining a number of these weirs, the writer concluded that possibly more than eels are caught in some of them. It is suggested that all of these weirs, from Harrington's Mill to the head of tide, be checked sometime after the weir season opens, to insure that the regulations regarding them are not being abused.

This is quite a small salmon river, but it supplies practically the only salmon angling in this particular district of Nova Scotia. As a result, the salmon anglers are very interested in the river and feel that something should be done to try to improve the fishery. During seasons when there is plenty of water, salmon are caught in most of the pools up as far as Harrington's Mill. On the other hand, during low water periods, such as occurred during the summer of 1955, the salmon move up as far as Lake Doucette and remain in the lake all summer. It is very frustrating for the fishermen to drive past the lake on a summer evening and see salmon jumping in the lake where they are not easily caught. To help improve this condition, it is suggested that water control be established and splash dams built on Gaspereau, Three-island and Salmon River Lakes.

## RECOMMENDATIONS

1. That a close check be made on the eel weirs in the fall of the year to make sure that regulations covering them are being adhered to by the fishermen.
2. That it be suggested to the proper authorities that water control be established and splash dams built on Gaspereau, Three-island and Salmon River Lakes, to help improve salmon angling during low-water periods.
3. That the warden or guardian be issued with a permit to shoot predator birds, particularly the great blue heron, and that a gun and ammunition be supplied for this purpose.
4. That salmon stockings be made with yearling fish, if at all possible, to try to cut down the numbers which must be lost by predation.

Salmon River



Shoal section at head of tide



Showing one of many eel weirs found on the system.



Harrington's dam showing exit from fish ladder.



Harrington's dam showing water lost by leak in gate.



Fish ladder at Harrington's dam.



Stillwater about two miles below Salmon River Lake.

Salmon River



Storage dam on outlet of Salmon River Lake.



About one mile above Salmon River Lake.



Remains of storage dam on outlet of Moosehorn Lake.



Rock storage dam at outlet of Pinetree Lake.



Remains of Felix's Mill on Gaspereau Lake.



Proposed flowage site on Gaspereau Lake.

Salmon River



Remains of Filix's dam on  
Gaspereau Lake.



Jim Ried's dam at the inlet of  
Lower Corning Lake.



Remains of Jim Ried's storage dam  
on outlet of Three-island Lake.



## MUSQUODOBOIT RIVER SALMON SURVEY

By H. Edwards and G. Wilson

## ABSTRACT

The Musquodoboit River presently supports a very good trout fishery and a declining salmon fishery.

Salmon spawning and nursery areas, although not extensive, should support a larger population than apparently now exists. In general, spawning areas are limited to areas around Dollar Brook, Middle Musquodoboit and Upper Musquodoboit on the main river, and to short or scattered areas of the tributaries. The main river, except near Reid, is not considered a good nursery but the tributaries appear quite suitable.

Pollution, barriers and predatory birds are not serious problems. Competition and predation from trout and coarse fish could be great, as a considerable portion of the system provides suitable habitat for them. Illegal fishing, from all reports, is excessive; and a strong recommendation for increased protection is advised, along with a continued stocking program for the accessible tributaries.

In any general management program, it is recommended that considerable priority be given the Musquodoboit, because of its close location to large population centers and its valuable recreational fisheries.

The Musquodoboit River, Halifax Co., enters the Atlantic Ocean via Musquodoboit Harbour. The latter is located approximately 30 miles east of Dartmouth on the southeastern shore of Nova Scotia.

#### GENERAL DESCRIPTION

The river was surveyed from July 7th to July 20th, inclusive, 1955. The Musquodoboit River flows south for approximately 70 miles from its headwaters to its mouth at Musquodoboit Harbour. The river branches just a few miles above Upper Musquodoboit and these branches are known as the North Musquodoboit River and South Musquodoboit River.

From the confluence of these two branches, the main river flows through relatively flat, gently sloping country for about 12 miles to the village of Middle Musquodoboit. Some stillwater areas exist in the upper part, with smooth riffle water prevailing as one proceeds down stream towards Middle Musquodoboit. The river banks are low with heavily wooded areas the rule on the left bank and cultivated land predominant on the right bank.

From Middle Musquodoboit south to Elderbank, approximately 7 - 8 miles, the river gradient is sharper with subsequent increased velocity of flow, accompanied by an increase in the proportion of pools to riffles; i.e., 40% - 60%. The river is surrounded for the most part by open country, which is fairly well populated and the land adjacent to the river is farmed quite extensively.

Proceeding south from Elderbank to Crawford Bridge, the river changes abruptly into a long, deep stillwater, which has an average depth approaching eight feet. The stillwater portion extends throughout 75% of the area with only about 25% of the section having relatively shallow riffle areas. The banks are quite high, approaching an average of about  $4\frac{1}{2}$  - 5 feet, and the surrounding terrain is rolling in nature with intermittent stretches of wooded and cultivated land. The bottom is made up mainly of mud, clay and sand except in the Dollar Lake area, which has a higher percentage of spawning gravel.

Following the river south for about a mile below Crawford Bridge, the river is rocky and rough water separates some of the nicest pools on the river. This area is surrounded by dense woods which afford fair shade. The stream banks are low, 1 - 2 feet average height, and the stream bed is composed mostly of rocks and boulders in the riffle sections. The pools and riffles approximate a 50 - 50% relationship.

About a mile below Crawford's Bridge and extending downstream for a distance of about 5 miles, there stretches a long, deep stillwater, known to have a depth of 45 feet in at least one area. The average depth would seem to be around 15 - 20 feet. The margins have long stretches of meadow land on the left bank, while the right bank is sparsely settled by summer dwellings. Wooded and marshy areas run to the margin of the stream.

Rapid water characterizes the stream from this stillwater to its mouth at Musquodoboit Harbour. The stream bed contains a high percentage of large and small boulders, a fair proportion of gravel and sand with only a small proportion of silt.

North Branch (North Musquodoboit River) is a small stream descending from the thickly wooded, hilly areas to the northeast of Upper Musquodoboit. The stream, 7 miles long, flows swiftly over a sharp gradient and has a bottom which is made up predominantly of large boulders with some gravel and sand. One stillwater, known locally as Cox's Flowage, situated on the stream near the headwaters, reportedly produces good trout fishing.

South Branch (South Musquodoboit River) is very similar to North Branch. It drains a very precipitous region for  $6\frac{1}{2}$  miles and flows swiftly over rough, rocky terrain. The headwaters of this branch drains a burned-over area of woodland.

#### NURSERY AREAS

Nursery Area N-1 is a small tributary descending rough, rocky terrain from Gibraltar Lake. The stream width approximates a 12 - 15 foot average. The bottom is comprised mainly of large boulders, coarse gravel, mud and silt. Shade is good from overhanging trees and protection is fair. A number of spring seeps enter the stream along its course. Food appeared to be plentiful with the more common types being noted.

Nursery Area N-2, a section of the main stream between the mouth of Ogilvie Brook and the mouth of the Dollar Lake stream, was considered to have fair nursery conditions. The depth averages from 2 - 3 feet, while the width approximates 72 feet. The gradient is sharp and riffle water makes up about 60% of the section. The banks, composed of mud and clay, have an average height of about 3 feet. Aquatic vegetation was quite thick in the downstream part, near Dollar Lake Brook, with moss patches found in various places along the stream. Mayflies (Ephemera), dragon and damselflies (Odonata) were plentiful in the bottom fauna examined.

Nursery Area N-3, a three-quarter mile section of Dollar Lake Brook, starting at the mouth and extending upstream, has both nursery and spawning facilities. The upper half was found suitable for nursery use. Here, the stream narrows to an average of 10 feet, skirted on both margins by high, sheer rock cliffs. The bottom is comprised mainly of heavy moss covered boulders and coarse gravel, with only small patches of sand visible. Bottom fauna appeared more abundant here than in the lower half of the stream where caddisworms, (Trichoptera) were observed. Only a few small pools were present, the stream being almost 90% riffle water in this section.

Nursery Area N-4, Ogilvie Brook, was considered to be good. About a mile from its mouth, the stream branches and the branch streams drain an area about five or six miles in an easterly direction from the main stream. For descriptive purposes, the branches are called the Grand Lake Branch and Ogilvie Brook.

The Grand Lake Branch is a small stream of 20 feet average width, with banks of clay, sand and silt running around

one foot in height. The stream has a gentle gradient and its velocity is slow. Below Lay Lake it is composed largely of fine sand and silt with patches of bedrock and coarse gravel making up the remainder. A typical mile section showed 35% sand, 25% silt, 15% bedrock and 25% coarse gravel. Pools and riffle existed in a relationship of 25% to 75%. Only two springs were noted during the inspection of this branch of the stream.

Above Lay Lake, conditions are modified somewhat by the heavily wooded, hilly nature of the surrounding country. The stream bed gradient is sharper but the water velocity is only slightly faster and the average width of the stream remained about twenty feet. The bottom has an increased proportion of large and small boulders and small amounts of fine gravel and sand. This section of the stream has about 70% riffles to 30% pools.

Ogilvie Brook, from its mouth to Beaver Lake, flows slowly, sloping gently through heavily wooded country. It averages about 25 feet in width with banks approximately two feet in average height. The bottom was composed mainly of fine sand and silt with only a small percentage of coarse gravel. Extensive areas of aquatic plants were present, covering almost half of the stream bed. Shade conditions were only fair around the mouth, but upstream become better as a heavy growth of trees ran to the margins of the stream. Riffle water predominates though some small pools do exist. Relation of pools to riffles is about 25% to 75%.

Above Beaver Lake, stream conditions are very similar to those found on the headwaters portion of the Grand Lake Branch. The width averages 25 feet, banks two to three feet, and the stream bottom continues very rough and rocky with a large percentage of heavy boulders, some slate rock, patches of fine sand, coarse gravel and silt. The stream, near the headwaters, has some nice stillwater pools, though riffle water predominates with a relationship in the neighbourhood of 40% pools to 60% riffles. Good nursery conditions exist right to Rocky Lake. The food supply seemed ample with the more common types, such as, caddisworms (Trichoptera), and mayflies (Ephemera) predominating. Several or more springs were noted in the section between Beaver Lake and Rocky Lakes.

Nursery Area N-5 - Little River, is one of the largest tributaries to the Musquodoboit River. It enters the main stream near the village of Elderbanks, and stretches for about 15 - 20 miles in an easterly direction, draining a number of small lakes along its course. The stream meanders through moderately hilly country and has a heavy marginate growth, with the exceptions of a section near the mouth, and scattered open patches near the headwaters. The stream width approaches an average of 27 feet, and the bottom is composed of 45% coarse gravel, 30% fine gravel, 15% sand, and 10% silt. The banks are from 2 - 3 feet in average height. The gradient is slight and the velocity is about one-half foot/second. Generally, these conditions exist up to the Shaw's Bridge, a distance of roughly eight miles.

From Shaw's Bridge to the headwaters, the stream width averages 12 feet, and the bottom is made up of 50% slate /rock

rock and smaller percentages of gravel, sand and silt. The banks in this area are quite high, probably averaging 4 - 5 feet, and are fairly rocky. Shade is good. The gradient is sharper and the velocity is greater than one-half foot/second. Some stillwater pools are found in the headwaters section but, for the most part, the stream has about 75% riffles to 25% pools.

The food supply along the stream seemed fairly abundant with the following forms being noted: mayflies (Ephemera), stoneflies (Plecoptera), caddisflies (Trichoptera), and whirligig beetles (Gyrinidae).

Nursery Area N-6 - Cook's (Storey) Brook, is a small stream entering the main river near the village of Elderbank. The average width is about 12 - 15 feet and the banks are 1 - 3 feet in height. The gradient is slight and the water velocity is slightly less than one-half foot/second. The bottom is 35% sand, 25% silt, 10% large boulders, 15% fine gravel, 15% coarse gravel. Shade is very good in most places, though some areas exist near the mouth. The stream has about 75% riffles to 25% pools. Food was noted as fairly abundant.

Nursery Area N-7 is located on Lindsay Brook in that section extending from a point about two miles upstream from the mouth to its source. The stream narrows to an average width of five feet in this section, with banks about two feet high. The bottom is composed of mud, sand and silt with a small percentage of small boulders. The brook winds through a succession of open cultivated areas and heavily wooded areas right up to Lindsay Lake. A number of small springs was found and several small pools were scattered along its course; however, the stream was predominantly riffle water.

The bottom fauna examined included mayfly nymphs (Ephemera), whirligig beetles (Gyrinidae), damselfly nymphs (Odonata), and caddisworms (Trichoptera). Shade was good in some places but poor in the open, farm areas.

Nursery Area N-8 on the main river, extends from the village of Reid to a point about 1½ miles below Middle Musquodoboit. An extensive concentration of coarse gravel persists throughout the section, though smaller percentages of boulders, sand and silt were also found. In the extreme upper half of the section, near Reid, the water is deep and slow moving, but most of the area consists of fast riffle water, containing about 60% riffles to about 40% pools. Most of the stream is open and shade is poor. The banks average about two to three feet in height. A number of salmon parr was found in the upper half of this area.

Food fauna observed were snails (Gastropoda), dragon and damselfly nymphs (Odonata), mayflies (Ephemera), and caddisfly larvae (Trichoptera).

Nursery Area N-9, the upper half of Higgins Brook, was noted for its nursery possibilities. Approximately two miles from its mouth, the stream flows through some marshy areas; but from this point to its source, suitable nursery conditions exist. Throughout most of the upper reaches, the brook meanders through rolling country which is heavily wooded and uncultivated. The stream, averaging about five feet in width, has a slight gradient

with water velocity slightly less than one-half foot/second. Here there is mainly riffle water, broken only by a few small pools. Shade is very good.

Mayfly nymphs (Ephemera) seemed to be the most abundant of the bottom fauna, while caddisworms (Trichoptera) and stoneflies (Plecoptera) were also present.

Nursery Area N-10. This nursery area is located on the main river beginning approximately at Upper Musquodoboit and extending to the village of Elmsvale. There are only limited facilities here. The stream flows through considerable open marshy area; the banks are low, about 1 - 2 feet average height, and are composed mainly of clay, sand and silt, small traces of coarse gravel and a few large rocks. Shade is poor generally, though some areas in the centre section have a fair overhanging growth of alders. A number of spring seeps was observed in this section. The stream gradient is very slight and the water velocity was sluggish in most places and fairly deep. Food seemed to be abundant.

Nursery Area N-11, Fraser Brook, a small stream entering the Musquodoboit River near the village of Middle Musquodoboit, descends from rocky, hilly country to flow through fairly flat country for about a mile or so before entering the main river. The water velocity is greater than one-half foot/second. The bottom is made up of 50% large boulders, 30% coarse gravel, 10% fine gravel and 10% sand and silt. The stream bed has an average width of about 12 feet, with banks 2 - 3 feet in average height. The banks consist largely of rock and silt. Shade is very good from overhanging trees, and brush practically obscures the stream in many places. The food supply was very good.

Nursery Area N-12 lies between the confluence of the North and South Branches and Upper Musquodoboit village. The stream width averages 36 feet with banks running from 1 - 3 feet in height. The stream bottom is made up largely of coarse gravel, with only small amounts of fine gravel, sand and silt present. Fast riffle water prevails through most of the section, while the extreme upper half of the section has a few stillwater pools. In the extreme downstream portion, the water becomes deep and sluggish. Shade is good on the upper half, while on the lower half it is poor. Food seemed fairly abundant and a number of salmon parr was found in the upper half.

Nursery Area N-13, Sherlock Brook, joins Mill Lake stream about a mile from the main river. Sherlock Brook proper, is small, comparing favourably in length with South Musquodoboit River (South Branch), though much smaller in width. The width averages ten feet. The stream has a large percentage of boulders, some coarse gravel, fine sand and silt. The banks average about 1½ - 2 feet in height and shade is excellent from a very heavy growth of trees and shrubs. It is possible that some salmon might spawn in the lower reaches of Sherlock Brook but, generally speaking, the spawning possibilities are overshadowed by the nursery potential.

Nursery Area N-14, Mill Lake Stream, is a small rough stream, strewn with rocks, large boulders, etc., in keeping  
/with

with the precipitous nature of the country. The water velocity is greater than one-half foot/second, and white water predominates in the runs. The stream width approaches a 13 foot average; banks are 2 - 3 feet in average height, and good shade is present throughout the length of the stream. Riffle water predominates in the stream and only a small percentage of pools are present. Food appeared to be quite abundant.

Nursery Area N-15, Gleason Brook, is a small stream entering the Musquodoboit River just below the confluence of the headwaters branch streams. The stream width approaches an average of five feet. The gradient changes from slight to sharp as one proceeds upstream, and the water velocity approaches one-half foot/second. The stream is almost 100% riffle water.

The bottom is made up of 40% coarse gravel with smaller percentages of fine gravel, rock, sand and silt. Shade is good in the upper half as heavily wooded areas run right to the stream margins.

A number of trout of the year was found, but no salmon parr were in evidence. Bottom fauna seemed fairly abundant, particularly in the upper half of the stream.

Nursery Area N-16, South Branch Musquodoboit River (South Branch), is roughly six and one-half miles long and flows through very rough hilly country. The velocity is fast, greater than one-half foot/second, and the gradient rather steep. Average width is 23 feet, and the banks made up mostly of rock and clay, have an average height of about two feet. A typical mile section of the South Branch has a bottom made up of 75% large boulders, 10% coarse gravel and 5% silt and mud. Some stillwater pools occur about two miles up from the mouth of the stream but generally the pools make up only about 25% of the area, the remainder being riffle water. Shade is good over most of the stream, although some open patches occur near the headwaters area which has been burned over.

Food present included mayflies (Ephemera), stoneflies (Plecoptera), caddisflies (Trichoptera) and fishflies (Sialidae).

Nursery Area N-17, the Martin Lakes Branch, is a small stream, tributary to South Musquodoboit River, noted for its nursery potential. The stream has an average width of eight feet with banks between 1 - 2 feet in height. The bottom is made up of about equal proportions of coarse gravel, fine gravel, sand and silt. Shade conditions are good with heavy growths of hard and soft wood sheltering the stream as it meanders through very rough hilly country. Considerable moss was noted on the rocks. The stream contains mostly riffle water, which flows at a velocity greater than one-half foot/second. The food supply seemed abundant and included mayflies (Ephemera), dragonflies (Odonata) and caddisflies (Trichoptera).

Nursery Area N-18, North Musquodoboit River (North Branch), is a small stream descending from thickly wooded hilly areas lying to the northeast of Upper Musquodoboit. The average width is 21 feet and banks run from 2 - 10 feet in height. The stream descends a sharply inclined bed of boulders and coarse

/gravel

gravel, and white water is predominant throughout its course. It is estimated that the bottom is made up of 50% large boulders, 25% coarse gravel, 10% fine gravel and 15% silt. Both margins are shaded by dense woods and large mats of moss covered most of the large boulders. A number of small pools were noted on the upper portion of the stream, also one fairly large stillwater pool known locally as Cox's flowage.

Bottom fauna examined included caddisflies (Trichoptera) stoneflies (Plecoptera), mayflies (Ephemera) and whirligig beetles (Gyrinidae).

#### SUMMARY OF NURSERY AREAS

(1) Tributary Nurseries - The larger tributary streams of Ogilvie Brook and Little River appear to have the best nursery conditions available on the system. The smaller tributaries, Cook's, Lindsay and Higgins Brooks, provide moderately good nursery facilities for small parr; and in the latter two instances, these brooks are located adjacent to a sizable spawning area in the main river.

Above Higgins Brook, the tributary streams flow into an area of the main river which lies in open country. The resulting "quick run-off" leaves the river in this section, as well as the tributaries, with very low water during the dry periods. The upper half of the Musquodoboit River system was very low at the time of this survey, and both salmon and trout parr were absent from areas where they had been found some months previous to the survey.

The writer would, therefore, consider the tributaries entering the main river above Higgins Brook to be more suitable for small parr.

(2) Main River Nurseries - The Main Musquodoboit River, between Middle Musquodoboit and Jam Falls, is estimated to be 90% deep, sluggish water (velocity less than one-half foot/second.) In two areas, (1) between the mouths of Dollar Brook and Ogilvie Brook; (2) below Crawford Bridge, some shallow runs exist. Generally speaking, however, this whole area is not credited with having nursery conditions of appreciable value. The area of the main stream between Dollar Brook and Ogilvie Brook may have some nursery value for older parr.

Upstream from Middle Musquodoboit, nursery conditions improve but are by no means optimum. Most of this area, which contains a large portion of the available spawning areas, lies in open country and the unobstructed drainage allows for "quick run-off" of natural freshets. During periods of dry weather, the main river is down in this section and the water velocity is sluggish, particularly in the area between Middle Musquodoboit and Upper Musquodoboit. Nursery conditions are considered only fair for underyearling, but better for older parr.

Spawning Area S-1, is located on the main stream commencing just above Dollar Lake Brook and extending downstream to the mouth of the Ogilvie Brook stream. In this section, which begins about one-half mile above the mouth of Dollar Lake Brook, the river is quite deep with fast water. The gradient is sharp and the flow is generally one-half foot/second or slightly greater. The depth averages two to three feet. Considerable vegetation was present at the time of the survey, though enough of the bottom was visible to see that a typical mile section in this area would approach the following percentage composition: 60% coarse gravel, 20% sand, 20% silt. Pools and riffles are present in a relationship of 40% pools to 60% riffles.

Spawning Area S-2, Dollar Lake Brook. This tributary has fair spawning possibilities on the downstream portion. Good spawning gravel constitutes about 75% of the bottom in a section reaching from the mouth to a point about three-quarters of a mile upstream. The width is about 35 feet on the average. Banks are low near the mouth, changing to high banks as one proceeds upstream. The area is quite open in the lower reaches, but is shaded by heavy marginate growths upstream. Only a few small pools are found in this area with the remainder being fast riffle water.

Spawning Area S-3 is located on the main river in a section extending from Reid downstream to a point roughly about one and one-half miles below Middle Musquodoboit.

An extensive concentration of good spawning bottom was found throughout the entire length of the section and this is considered the best spawning area on the system.

The stream width approaches an average of 60 feet. Banks are between two and three feet average height and are made up mostly of clay, sand and silt. The gradient becomes quite sharp and the water velocity is greater than one-half foot/second. Pools and riffles are present in a relationship of 40% pools to 60% riffles. Shade is only fair in most places and protection is not very good.

Spawning Area S-4, Lindsay Brook, is a small tributary stream entering the main river just above Middle Musquodoboit. The stream lies in flat open country; has a slight gradient, and the water velocity is slightly less than one-half foot/second. The average width is 20 feet and its banks, made up of small rocks and clay, are about 2 - 3 feet average height. The bottom, in the first mile and a half to two miles, is made up of 50% coarse gravel, 25% large rocks, 15% sand and 10% silt. Shade is fair from the overhanging trees and a number of small pools are situated along its course.

The remainder of the stream above this spawning area is suitable as a nursery. The stream is reduced to an average width of about 4 - 5 feet with a bottom made up mainly of sand and silt.

Spawning Area S-5, Higgins Brook, is a small tributary stream entering the main river near Middle Musquodoboit. It is spring fed, receiving drainage from only one or two small intermittent streams.

A one-mile section near the mouth lies in flat, open country and provides suitable spawning area. The bottom is made up of about 50% coarse gravel, 10% fine gravel, 10% silt, 15% mud and 15% large boulders. The average width is about 20 feet and its banks (made up of sand, clay and silt) are between two and three feet average height.

Spawning Area S-6 - main river. Good spawning facilities are found in a two-mile section of the main stream between the confluence of the two branches, North and South Musquodoboit Rivers, and Upper Musquodoboit. A typical mile of bottom consists of 75% coarse gravel, 10% fine gravel, 5% large rock, 5% sand and 5% silt. River width averages 36 feet and the banks average two feet in height. Shade is fair from overhanging alders in the up-stream area, but considerable open areas are found downstream. Pools are scarce, but two or three large pools are found in the upper section and these, together with a few small pools farther downstream, make up a relationship of 25% pools to 75% riffles.

Spawning Area S-7 - Gleason Brook, is a small tributary stream entering the Musquodoboit River just below the confluence of the headwaters branch streams. The stream width approaches five feet, velocity approaches one-half foot/second, and the gradient changes from slight to sharp about three-quarters of a mile upstream. It is almost 100% riffle water. The bottom is made up of 40% coarse gravel, 30% fine gravel, 10% rock, 10% sand and 10% silt. Above the spawning area, the stream is much smaller and is practically obscured by overhanging trees and brush.

#### SPECIES OF FISH AND ANGLING

The following species of fish are found on the Musquodoboit River - salmon (*Salmo salar*), trout (*Salvelinus fontinalis*), eels (*Anguilla bostoniensis*), suckers (*Catostomus commersoni*), perch (*Perca flavescens*), sticklebacks (*Gasterosteus aculeatus*), golden shiner (*Notemigonus crysoleucas*) and notropis minnows. Gaspereau (*Pomolobus pseudoharengus*) and shad (*Alosa sapidissima*) are reported to use the river but the extent of this usage could not be determined during the time of the survey. Notropis minnows were present in noticeable abundance and eels are known to be very plentiful.

Salmon (*Salmo salar*) and speckled trout (*Salvelinus fontinalis*) Angling catch records are as follows:

<u>Year</u>	<u>Salmon</u>	<u>Trout</u>
1951	134	3450
1952	102	3630
1953	83	3225
1954	42	3230
1955	17	1550

It appeared to the writer that most of the salmon angling was carried out on the lower portion of the Musquodoboit River. Most catches are made from pools in a mile stretch of

water extending downstream from Crawford Bridge, while the occasional salmon has been taken in the area between Jam Falls and the head of tidewater. Occasional catches of salmon have also been reported from the Cook's Brook to Dollar Lake Brook area on the main stream and from the area of the main river extending downstream from Middle Musquodoboit about one-half mile. 90

There is evidence to show that most of the angling for sea-run speckled trout is carried on in the area of the main stream extending from the mouth of Gibraltar Lake run downstream to tidewater. A few sea-run trout have been taken from Ogilvie Brook in the area between the mouth and the confluence of the two branch streams.

The writer was able to substantiate reports of very good residual trout angling on the Mill Lakes Branch. Most of these trout were taken from the lakes and a small area of the stream just below the lakes. Good residual trout fishing is reported also from the headwaters of Little River, as well as in the following areas:- The North and South Branches of the main river, Sherlock Brook, Gleason Brook, Lindsay, Higgins and Fraser Brooks.

#### ILLEGAL FISHING AND PREDATORY POPULATIONS

It is the opinion of the writer that illegal fishing is having a detrimental effect on the salmon and, possibly, the trout fisheries of the Musquodoboit River. The main salmon spawning areas and some holding pools are very accessible to poachers. Information received from people living along the river indicates that trout are trapped in the late fall and used as bait by trappers. For example; one informant stated, "I catch maybe 50 - 60 trout every fall for my traps." The residents state also that "some" salmon are taken.

There was also evidence that there are large populations of predator and competitor species of coarse fish. No predatory birds were found on the river during the survey.

#### POLLUTION

There was no significant condition of pollution affecting the river fishery at the time of the survey. It is worth recording, however, that two industrial establishments offer potential sources of pollution; the first, a creamery, is situated at Middle Musquodoboit; the second, a gypsum plant, is at Upper Musquodoboit.

#### BARRIERS

One partial barrier in the form of a mill dam exists on the outlet of Lay Lake. The dam is 50 feet wide, five feet high, and is built on a natural rock falls, 6 - 8 feet high. Near the right bank of the river it has a sluice controlled by stop logs and, immediately downstream, the rock is blown or chipped down to form a rough incline. The mill was not operating at the time of the survey and ownership was not established. *lime crushing*

#### WATER CONTROL AND PRODUCTION OF ARTIFICIAL FRESHETS

This phase was only very lightly investigated. The /Musquodoboit

Musquodoboit is a fast run-off river, having much open land and few large natural reservoirs on its system. Its drainage area, just over 257 square miles, is about half that of the St. Mary's or LaHave Rivers.

The most suitable storage locations are fairly well down the river system; i.e., those lakes on Gibraltar, Dollar and Ogilvie Brooks, but their areas are small (totalling 3 - 4 square miles). The presence of a five-mile stillwater and Bayer's Lake, below Crawford Bridge on the main river, plus several smaller stillwaters above, probably would have a serious buffering effect on the production of artificial freshets.

While freshet production may be virtually impossible, it may be practical to increase the minimum spring and summer flows through the controlled release of stored waters (Hayes 1953) #

Any serious consideration of water control, however, should be preceded by a critical engineering survey and a cost analysis of the project. Water control is not recommended as a necessary conservation measure.

#### SUMMARY

The Musquodoboit system consists of some 70 miles of main river, including its two source branches, and roughly 120 miles of tributaries both large and small. It possesses a very good speckled trout fishery, both residual and sea-run strains, but only a mediocre and currently declining salmon fishery.

Salmon spawning areas, while not extensive for a river system this size, should support a much larger spawning population than it apparently does (as indicated by both angling and estuary netting returns).

##

# Bulletin #99, Fisheries Research Board of Canada. Artificial Freshets and Other Factors Controlling the Ascent and Population of Atlantic Salmon in the LaHave River, N.S.

## reported verbally by P.O. MacDonald as being very low.

Some 3 - 5 miles of spawning area are available to salmon, with the best being located near Middle Musquodoboit on the main river. Below Upper Musquodoboit, with the exception of an area near Reid, the main river is not considered as good salmon nursery. A number of the tributaries, however, do appear quite suitable.

Salmon spawning-nursery areas fall into three general geographical locations as follows:

- (1) Meagher Grant to Elderbank - plus tributaries, Little River, Ogilvie, Dollar and Cook's (Story) Brooks.
- (2) Middle Musquodoboit - plus tributaries, Lindsay and Higgins Brooks.
- (3) Upper Musquodoboit - plus tributaries, Fraser, Sherlock

Barriers, predatory birds and pollution appear to present no serious problems to the salmon fishery. Competition and predation by coarse fish and trout may be great as habitat conditions are suitable for both groups of fishes and both are known to be present in good quantities throughout the system.

Although it is virtually impossible to obtain figures, a good number of reports, considered to be from reliable sources, indicate that illegal fishing (poaching) is excessive and almost uncontrolled. While the sea trout and salmon angling is mainly carried out on the lower seven miles of river, spawning grounds and holding pools are located for the most part above this, in open and very accessible areas. Residents have admitted to the writer that salmon are taken almost at will from the spawning grounds and it appears that the present protection staff is unable to cope with the problem.

The control of this illegal fishing should demand very serious attention, and it is recommended as the most practical management procedure that could be applied to this river in an effort to increase salmon stocks. A concentrated and conscientious effort to apprehend or otherwise discourage the more persistent offenders, seems justified. This might be accomplished by adding a Warden, with canoe, who could be located near Middle Musquodoboit, to the Protection staff and/or if necessary, a flying patrol system of non-resident officers at critical poaching periods.

Because of its location, less than an hour's drive from Halifax and Dartmouth, its good trout fishery, and its potential salmon fishery, the Musquodoboit system must be considered highly valuable for local recreation. With this in mind, it is recommended that the river receive priority consideration in any general management program.

#### RECOMMENDATIONS

- (1) A strong recommendation for additional protection, particularly during spawning season, in that area of the main river between Dollar Lake Brook and the confluence of the two main branches.
- (2) A continuation of stocking on the tributary streams, particularly Little River and Ogilvie Brook.
- (3) A restriction to stocking with yearling salmon in the main river and then only to those areas above Middle Musquodoboit and between Ogilvie and Dollar Brook.

TEMPERATURE AND pH RECORDS

<u>Station</u>	Air °C	Temp. °F	Water °C	Temp. °F	pH	<u>July</u>	<u>Time</u>
Plaster Rock	27	80.6	22	71.6	6.8	7th	10:00 am
North Branch	30	86.0	23	73.4	6.7	8th	12:00 Noon
Martin L. Br.	21	69.8	15	59.0	6.5	9th	9:00 am
South Branch	27	80.6	22	71.6	6.4	9th	4:00 pm
Y Main Stream	24	75.2	18	64.4	6.6	9th	5:00 pm
X Main Stream	25	77.0	22	71.6	6.8	9th	5:30 pm
Main Stream at Reid.	25	77.0	22	71.6	6.5	10th	10:00 am
Main Stream at Middle Musq.	25	77.0	23	73.4	7.4	11th	2:00 pm
At Creamery	Three tests for pH taken at 400 yds. above, near and 400 yds. below the Creamery effluent were the same.						
Main stream at Elderbank	23	73.4	21	69.8	7.2	12th	1:00 pm
Quarry Bk. (Little R.)	25	77.0	22	71.6	7.2	12th	4:00 pm
Dollar L.Bk.	21	69.8	22	71.6	7.0	13th	3:00 pm
Sherlock Bk.	20	68.0	21	69.8	6.8	14th	9:00 am
Fraser Bk.	18	64.4	16	60.8	6.8	15th	9:20 am
Lindsay Bk.	17	62.6	20	68.0	6.8	16th	10:15 am
Main Stream near Gibraltar Lake runs	18	64.4	20	68.0	7.2	17th	3:00 pm

Y These two in the area between Plaster Rock and  
Upper Musquodoboit.



MUSQUODOBOIT RIVER

HALIFAX CO. NS.

LEGEND

▲▲▲ nursery areas

●●● spawning areas

⊥ Barrier B-1

Scale 1 inch = 3.95 miles

55-CAN-FF-F-RDMRG-I

## ST. MARY'S RIVER SALMON SURVEY

By N. MacEachern

## ABSTRACT

Nursery areas were found to be plentiful on the St. Mary's River system. Salmon fry and parr were found on most sections of the river, but they appeared to be more abundant on East River St. Mary. Predatory bird control techniques have been carried out on the river since 1953, and spot seining indicates that salmon fry and parr are more abundant than they were in 1953. Numerous spawning areas were observed and they are well scattered throughout the river. No obstructions to salmon were found on the main branches, but three old wooden dams and several barrier falls were found on the smaller tributary brooks.

## ST. MARY'S RIVER

## GENERAL DESCRIPTION OF RIVER

St. Mary's River, one of the better known salmon angling rivers in Nova Scotia, is situated in Guysborough County, with the headwaters extending into Pictou and Antigonish Counties. The river has a drainage area of 523 square miles, and it empties into the Atlantic Ocean about seven miles below Sherbrooke. The seven-mile section below Sherbrooke is tidal water. The river flows through rolling country, partly wooded and partly cultivated. The gradient of the watershed varies from slight to moderate, and the velocity varies from sluggish to rapid. Accessibility to the river is very good as roads run along the main river and the two main branches. The survey was carried out during June and July, and the water levels were low during this period. A spawning check was carried out during the latter part of October.

The main St. Mary's River extends from Sherbrooke to Glenelg, a distance of 12 miles. At Glenelg, the river divides into two main branches, East River St. Mary and West River St. Mary.

The main St. Mary's River is wide with numerous deep pools, and the water is brown in colour and slightly turbid. The upper five miles of the main river below the confluence of the two branches consist of slow-moving water with gravel, rock and mud bottom. The next two miles are stillwater areas, then changing to rough, fast-flowing water for the remaining three miles to Sherbrooke. The majority of the salmon angling is carried on in the main St. Mary's River.

East River St. Mary, 17 miles in length, is the shorter of the two main branches. The headwaters originate in Antigonish and Pictou Counties, and the river flows southeasterly and enters the main river at Glenelg. The gradient is moderate and the velocity is rapid. The water is colourless with a pH of 7.0. The river bed is composed of rocks, rubble and gravel. Pools are about the average width of the river and deep.

West River St. Mary, 35 miles in length, is the longer of the two main branches. The river is slow-flowing in most sections, and the gradient is slight. The water is brown in colour and slightly turbid. Pools are long about the average width of the river and deep. The river is fed by numerous small brooks, about 4 - 7 miles long, with an average width of 15 - 20 feet.

## NURSERY AREAS

Nursery areas are found in abundance on the St. Mary's River. They are marked on the map and designated as N-1, N-2, etc.

**Main River:** N-1 is the five-mile section between Waternish and Glenelg on the main St. Mary River. The river has an average width of 200 feet and the bottom is composed of rock, gravel and mud. Pools in this area are wide and deep. Shelter is good provided by rock, aquatic vegetation and overhanging banks. Shade is poor in this section. Fish food is abundant.

**East River:** The nursery area N-2 on the East St. Mary River extends from Eden Lake to Aspen, a distance of 14 miles. Salmon parr were observed all along this section. Shelter is very good provided by rocks, pools, overhanging banks, logs and windfalls. Shade conditions are poor on the lower half of the river, but good on the upper half. This area is marked as N-2 on the map. Fish food was abundant and the following were observed in the main branches and the tributary brooks: caddis larvae, (Trichoptera); mayfly nymphs, (Ephemera); chironomids, (Chironomidae); damsel and dragon fly nymphs, (Odonata); stonefly nymphs, (Plecoptera) beetles, (Coleoptera); fish flies, (Sialides).

For description purposes, Area N-2 is divided into five sections, each about three miles long.

From Aspen to the Mitchell Brook outlet, the river has an average width of 75 feet and an average depth of 15 inches. The river bottom is made up of 40% rock, 40% gravel, 15% rubble, and 5% ledge rock. Pools are about the average width of the river, longer than 75 feet and fairly deep. Fish food is fairly abundant and shade conditions are poor. Banks are low, composed of clay, rocks and gravel. The water velocity was fairly sluggish.

For the next three miles, from Newton Bridge to the Denver Bridge, the river has an average depth of 8 inches and the average width is 80 feet. The composition of the bottom is mostly rock, with ledge rock in some areas. There are only four good-sized pools in this section. Fish food is abundant, but shade conditions are poor. Banks are high and made up of rock and ledge rock. The velocity of the water is rapid.

From East River St. Mary's Bridge to the Newton Bridge, the river bottom is composed of 85% gravel, and 15% rocks. The average width of the river is 45 feet. Pools are deep, with good shelter, and are in 50 - 50 relation to the ripple areas. Fish food is found only in fair abundance. Banks are low, composed of clay, rocks and gravel.

The section from the mouth of Campbell's Brook to East River St. Mary's Bridge, has an average width of 40 feet and an average depth of 9 inches. The river bed is composed of 50% rock and 50% coarse gravel. Pools are deep with good shelter, and they occupy about 25% of the river section. Their width and length are similar to the average width of the river. Fish food was found to be abundant. The gradient is moderate, and the water velocity is rapid.

The last section from the mouth of Campbell's Brook to Eden Lake, has an average width of 30 feet, and an average depth of seven inches. The velocity is quite rapid and the river bed has a composition of 60% rock, 30% rubble and 10% gravel. /The

The gradient changes from moderate on the upper part to steep on the last  $1\frac{1}{2}$  mile section. Here, the river is precipitous in nature where it flows through a steep-walled gorge, with cliffs on either bank. Pools are small and occupy less than 25% of the total stream area. Salmon parr were not abundant in this area.

The nine East River brooks described below are tributary to East River St. Mary. They appear to be good nursery areas, and numerous salmon parr were observed in these brooks.

#### TRIBUTARY BROOKS EAST RIVER

N-3. Moose River is in the headwater area of East River St. Mary. The river is a good nursery area for  $5\frac{1}{2}$  miles. The stream has an average width of 20 feet and an average depth of 5 inches. Shade and shelter were good. Fish food was present, and pools occupy about 25% of the total stream area. Numerous fry and parr were observed on the upper section of the stream.

N-4. Barney River enters Moose River just above Eden Lake. The stream bottom is similar to Moose River, composed of about 65% gravel and 35% rock. Shelter is good and shade is fair. Pools are small and occupy less than 50% of the total stream area. Very few salmon fry or parr were observed in this brook, probably due to the presence of a brood of mergansers removed two weeks previous. Nursery area extends upstream for about four miles from the mouth.

N-5. Campbell's Brook is a good nursery area for about three miles. The average width is twenty feet and the average depth, 7 inches. The stream bed is mostly rocky, interspersed in some places with gravel. Pools are small and the water velocity is rapid. Fish food was abundant.

N-6. Black Brook has a good nursery area for  $2\frac{1}{2}$  miles. The average width of the stream is twenty feet and the average depth is 8 inches. The velocity is rapid; fish food is abundant, and the water is light brown in colour. There is a barrier falls about  $2\frac{1}{2}$  miles from the mouth of the stream.

N-7. Jordan Brook has an average width of 18 feet and an average depth of 4 inches. The bottom is composed of 50% rock, 25% gravel and 25% rubble. Large numbers of salmon parr and fry were observed in the stream. Fish food was not too abundant. The brook has about three miles of nursery area.

N-8. Mitchell Lake outlet is a good nursery area. There is a mill dam about one mile from the mouth of the stream. The stream bottom is composed of rocks and rubble. The width of the stream varies between 10 - 18 feet, depending on whether the mill is operating, or shut down.

N-9. Meadow Brook appeared to be a good nursery area on the lower two miles; but, at the time of the survey, the water level in the brook was very low.

N-10. McKean Brook<sup>1</sup> is a good nursery from the mouth /to

to Cameron Lake, a distance of six miles. The average width of the stream on the lower end is forty feet, and the average depth is nine inches. The bottom is composed of 65% gravel, 30% rock and 5% sand. There is a large holding pool at the mouth of the brook. On the lower section of the brook, pools are wide and intermediate in depth. The upper half of the brook has an average width of 25 feet, and rock and rubble bottom. Pools are narrow but deep.

N-11. The North Branch of McKean's Brook appears to be an excellent nursery area for  $1\frac{1}{2}$  miles. The bottom is made up of 65% rubble and 35% rock. Fish food was abundant. Shade and shelter conditions were very good.

#### WEST RIVER ST. MARY

N-12. The West River St. Mary appears suitable as a nursery area throughout most of its length. The nursery area extends, approximately, thirty-one miles from the "Main River Dam" to Glenelg. The bottom is a mixture of rocks, rubble and gravel. Fish food was abundant and the following types were observed: caddis larvae, (Trichoptera); mayfly nymphs, (Ephemera); chironomids, (Chironomidae); damsel and dragon fly nymphs, (Odonata); stonefly nymphs, (Plecoptera); and beetles, (Coleoptera).

For description purposes, Area N-12 is divided into sections with a brief description of each section.

From Lower Caledonia to Glenelg, a distance of 12 miles, the river has an average width of 125 feet and an average depth of 10 inches. The river bottom is composed of 65% rock and boulders and 35% gravel. The velocity varies from sluggish to rapid. Pools are long, about the average width of the river and fairly deep. The banks are low and composed mostly of rock, some ledge, gravel and rubble. Shelter is good, provided by rock and boulders. Shade is poor along this section. Fish food is abundant.

The seven-mile section from Caledonia to Lower Caledonia has an average width of 100 feet, and an average depth of 12 inches. The river velocity is slight and the pools are long and deep, and occupy about 50% of the total river area. The river bed is made up of rock and rubble, interspersed in some places with gravel. The banks are high, composed of rock and rock ledge. Shade is poor and shelter is fair. Fish food is present but not in abundance.

From Bryden Brook to Caledonia, a distance of 7 miles, the river is narrower with an average width of 60 feet and 14 inches in average depth. The banks are low, composed of clay, rocks and some gravel. Pools are deep, wider than the average width of the river, and occupy less than 50% of the total river area. The river bottom has a composition of 50% rock, 30% gravel, and 20% rubble. Fish food is abundant. Shelter and shade are good.

From the Main River Dam to Bryden Brook, a distance of five miles, the river has an average width of 70 feet. The velocity is rapid; the water is dark brown, and the river bottom  
/comprised

comprised mostly of rocks and boulders. Pools are wide and deep but occupy less than 25% of the total river area. Banks are high, made up of rocks and ledge rock. Fish food is abundant and shelter is excellent, provided by rocks and boulders. Shade conditions are good.

#### WEST RIVER TRIBUTARIES

The headwater brooks,- North Nelson River, Nelson River and South Branch, are all slow-flowing meadow brooks with alder-lined shores. They alternate between stretches of still-water with mud and rock bottom to short riffle areas with gravel, sand and rock bottom. Salmon parr appeared to be scarce in these brooks.

N-13. North Nelson River has an average width of 15 feet, and an average depth of five inches. The velocity is sluggish and the bottom is composed of 65% gravel, 25% moss covered rock and 10% sand. Pools are small and shallow, and shelter is fair. Shade is good. The stream has, approximately, six miles of nursery area.

N-14. Nelson River is, approximately, five miles in length. The greater part of the river is composed of still-water area. The ripple areas have an average width of 25 feet. The velocity is sluggish, and the water is light brown in colour. Shelter and shade are good. Fish food is fairly abundant, especially on the lower section. The lower two miles of the brook are suitable as a nursery area.

N-15. South Branch is similar to Nelson River with stillwater areas on the stream. The average width of the ripple areas is 15 feet, and the stillwater areas are 30 - 40 feet wide with mud and rock bottom. The first mile of the stream from Loon Lake is very rocky and suitable as a nursery area. The next mile is composed of coarse gravel and appears to be an excellent spawning area. The remainder of the stream is stillwater area with small gravel areas between the stillwater. Very few salmon parr were found in the South Branch.

N-16. Castley Brook (Black Brook) is, approximately, six miles long and enters the river on the true left bank above the main river dam. It has an average width of twenty feet and an average depth of six inches. The stream bottom is composed of 40% rock, 30% gravel and 30% sand. Pools are small and shelter is fair. Shade conditions are good. The stream appears suitable as a nursery area, and salmon parr were observed in the brook.

N-17,18,19,20. The brooks entering the west side of the river, (Black Brook, Chisholm Brook, McQuarrie Brook and McDonald Mill Brook) have barrier falls about 1 - 1½ miles from the main river. These brooks have an average width of 15 feet and an average depth of three inches. The bottom is composed of rocks and interspersed with gravel on the lower section. Shade is very good, and shelter is excellent provided by rocks, logs and small pools. Fish food is present. These brooks provide good nursery areas up to the falls.

N-21. Upper Bryden Brook has an average width of 15 feet and an average depth of three inches. The velocity is sluggish and the water is light brown in colour. There is a fair nursery area on the lower three miles of the brook. A barrier dam is located about two miles from the mouth of the brook. Salmon parr were not found in abundance.

N-22. Bryden Brook appeared to be an excellent nursery area. Large numbers of salmon parr and fry were observed in the stream. The stream bed is composed of 80% gravel and 20% rock. Pools are small, but numerous. Fish food is fair and shade conditions are good. The nursery area covers four miles.

N-23. Cross Brook, which enters on the true left bank of the river below Caledonia Bridge, has a good nursery area from the Forks to the mouth of the brook, a distance of  $2\frac{1}{2}$  miles. The stream has an average width of 15 feet. Pools are shallow and long occupying about 25% of the total area. Fish food is present but not abundant. An old wooden dam, located about a mile from the mouth, is a partial barrier to salmon during low-water conditions. The West Branch has a mile of good nursery area, and the East Branch has a fair nursery area.

N-24. Ross Brook has an average width of 13 feet and an average depth of three inches. The velocity is sluggish to rapid. Good nursery area extends from the mouth to the forks, a distance of four miles. The bottom is composed of rock, rubble and gravel, with gravel predominant on the lower end. Pools are wide, long and fairly shallow.

N-25. Barren Brook appears suitable as a nursery area on the lower two-mile section. The brook has an average width of 12 feet and an average depth of 2 - 3 inches. The bottom is composed of rock and rubble. The upper section of the brook is stillwater area.

N-26. Sutherland Brook is about five miles in length, and appears to be a good nursery area. The average width of the brook is 20 feet. The bottom is composed mostly of rock and rubble, interspersed with gravel in some areas. Shade and shelter are good, and fish food is found in abundance.

N-27. Fraser's Brook (MacDonald Brook) has an average width of 18 feet. The brook has about six miles of nursery area, and the stream bed is composed of rock and rubble except for two gravel sections extending for about  $1\frac{1}{2}$  miles. The water is brown in colour and the water velocity is sluggish.

N-28. On Indian Man Brook, salmon parr were observed only on the lower mile of the stream. The bottom is composed of rock and rubble with scattered gravel sections. The upper section of the brook flows through barren country with alder-lined shores.

N-29. Clarke's Brook has an average width of 13 feet and an average depth of 4 inches. There is a good nursery area from the mouth of the brook to the forks, a distance of two miles. The bottom is composed of rock and gravel, with gravel predominating

on the lower end. Shade and shelter are good and fish food is abundant.

N-30. Glencross Brook has an average width of 12 feet and an average depth of two inches. The stream bottom is composed of rock and rubble and has a good supply of fish food. Shade and shelter are good, and the velocity of the water is rapid. The nursery area extends for about four miles.

#### SPAWNING AREAS

Good spawning facilities were observed throughout the St. Mary River and its tributaries. The areas are marked on the map as S-1, S-2, etc., and the location and size of each area are listed below.

#### MAIN RIVER

S-1. This area is located opposite Waternish on the main river, about five miles above Sherbrook. The area extends for 500 yards, and the river bottom is composed of gravel. The average width of the river is 200 feet, and the stillwater section below provides a good holding pool for salmon.

S-2. From Glenelg for a distance of one mile down river, it appears suitable as a spawning area. There are good salmon pools in this section and the river has an average width of 200 feet.

#### EAST RIVER ST. MARY

S-3. The area from Aspen Bridge down to the mouth of McKeen's Brook, appears suitable as a spawning area. The river bottom is composed of gravel, and the average width is 60 feet. Scattered spawning areas extend for about a mile, and there are several good salmon pools in this area.

Areas S-4, S-5 and S-6 are located on the river between the Denver Bridge and Aspen Bridge. Area S-4 is situated on the main river above the outlet of Two-Mile Lake. The area is about 400 - 500 yards in length. Area S-5 is in the vicinity of "Gunn's Pool", and extends for about 400 yards. Area S-6 is found about 1/4 mile below Denver Bridge, and is about 300 yards long. These areas are composed of coarse gravel. The average width of the river is 75 feet and the average depth is 1 1/2 feet. The water velocity is fairly rapid, and salmon pools are found near the spawning areas.

S-7. The section between East River St. Mary's Bridge and the Newton Bridge was found to be one of the best spawning areas on the river. This section is about three miles long. The river bed is composed of 85% gravel and 15% rock, and the average width is about 45 feet. Pools are deep and occupy about 50% of the total river area.

S-8. Scattered spawning areas were observed on the three-mile section between the mouth of Campbell's Brook and the /mouth

mouth of Black Brook. The river bottom is composed of 50% coarse gravel and 50% rock. The average width of the river is 40 feet. The spawning area is limited to about  $1\frac{1}{2}$  miles over the  $3\frac{1}{2}$  mile section.

S-9. A small spawning area was observed at the outlet of Eden Lake. The river bed is composed of gravel. The average width is 50 feet and the average depth is 6 inches. The area extends for about 500 feet.

#### TRIBUTARIES - EAST RIVER

Limited spawning areas were observed on the tributary brooks flowing into the East St. Mary River. Pools on these brooks are small, so they are only used by salmon during high water.

S-10. The lower  $1\frac{1}{2}$  miles of Moose River are suitable as a spawning area. Pools on this brook are fairly deep. The river at this section has an average depth of 25 feet. Scattered spawning areas were observed on the upper section of the brook, but these are limited.

S-11. Barney River has a spawning area about one mile above the mouth of the stream. The area extends up river for about two miles. The average width of the brook is 18 feet, and the pools are small.

S-12. From the mouth of Black Brook to about one mile upstream, appears suitable as a spawning area.

S-13. Jordan Brook has scattered spawning areas on the lower two-mile section.

S-14. Meadow Brook has a small spawning area near the mouth of the brook for a distance of  $\frac{1}{4}$  mile.

S-15. McKeen Brook has a good spawning area on the lower section of the brook. The area is about one mile in length and the average width of the stream is forty feet. There is a good holding pool at the mouth of the brook.

S-16. Goshen Brook has a stream bed of 85% gravel, and 15% rock on the lower  $1\frac{1}{2}$  mile section. The stream has an average width of ten feet. Numerous fry were observed in this area.

#### WEST RIVER ST. MARY

The spawning areas on the West River St. Mary are marked on the map as S-17, S-18, etc., and the areas are described below.

Area S-17 extends from the confluence of the East and West branches for about two miles, and the river bed is made up of 70% coarse gravel and 30% rock. Holding pools are available for salmon.

Area S-18 is located about  $\frac{1}{4}$  mile below the outlet of McLeod's Brook. The section extends for about  $\frac{1}{2}$  mile. The river bottom is made up of 50% gravel, 30% rock and 20% rubble. Pools in this area are long and intermediate in depth.

Area S-19 is located about  $\frac{1}{2}$  mile upstream from the mouth of Churn Brook. The area is about 300 feet long and the river has an average width of 125 feet.

Area S-20 is located about  $\frac{1}{2}$  mile below the mouth of Glencross Brook. The spawning area is limited to about 150 yards.

S-21. The river for about  $\frac{1}{2}$  mile on either side of the mouth of Clarke's Brook appears suitable as a spawning area. The river has an average width of 125 feet. Pools in this area are long and fairly shallow. The river bed is composed of 60% coarse gravel and 40% rock. The velocity of the water is rapid.

S-22. At the mouth of Indian Man Brook, there is a large holding pool. The river for 500 feet on each end of the pool appears suitable for spawning purposes.

S-23. From the mouth of Barren Brook to the mouth of Sutherland Brook, the characteristics of a good spawning area are presented. The section extends for about three miles. The river bottom is made up of gravel interspersed with rocks. Pools are present in this area.

S-24. In the vicinity of Black Brook, the river appears suitable as a spawning area for a distance of about  $\frac{1}{2}$  mile. The river is about 115 feet wide and is made up of 75% gravel and 25% rock. The velocity of the water is rapid.

S-25. A small spawning area was observed at the mouth of Ross Brook. The area is about 300 yards long.

S-26. From Caledonia Bridge to the mouth of Cross Brook, the river has a bottom of gravel suitable for spawning purposes. The section is about a  $\frac{1}{2}$  mile in length. Pools are scarce.

From Caledonia Bridge up to the mouth of Doggett Brook, a distance of nine miles, the river bottom is a mixture of rock, rubble and gravel. The river has an average width of between sixty and seventy feet, and an average depth of one foot. The velocity of the water is rapid. Pools are long and deep in this section, and provide good resting areas for salmon. Spawning areas are scattered along this area but are not localized in one place. They are marked on the map and their approximate lengths and positions are listed below.

S-27. Near the mouth of Chisholm Brook, the area extends about  $\frac{1}{4}$  of a mile.

S-28. Area about halfway between the mouth of Beaver Brook and Chisholm Brook extends about 300 yards.

S-29. Vicinity near the mouth of Beaver Brook extends about 1/2 mile.

S-30. Scattered areas between the mouth of Black Brook and the mouth of Lower Bryden Brook, available area covers about 1/2 mile (800 yards).

S-31. A small area, about 500 feet long, near the mouth of Doggett Brook.

The tributary brooks on the West River St. Mary have small spawning areas situated on the lower sections of the streams. The pools on these brooks are small and fairly shallow. These areas are listed below with their approximate lengths of available spawning areas.

S-32. North Nelson River has about one mile of spawning area. This spawning area is scattered throughout the stream and is not confined to any one area of the brook. The average width of the brook is 15 feet.

S-33. Nelson River is similar to North Nelson River and has, approximately, 1/2 mile of spawning area scattered throughout the stream. The average width of the stream is 20 feet.

S-34. The South Branch has about one mile of good spawning area situated about a mile below Loon Lake.

S-35. Upper Bryden Brook has about one mile of spawning area on the lower half of the brook. The brook has an average width of 15 feet.

S-36. Spawning on Bryden Brook extends for about three miles on the main branch, and 1 1/2 miles on the East Branch. The stream has an average width of 15 feet and the pools are small.

S-37. McQuarrie Brook has about one mile of spawning area on the lower section of the brook. The average width of the stream is 15 feet.

S-38. Cross Brook has a good spawning area from the mouth to the forks, a distance of two miles. The average width of the stream is 15 feet.

S-39. Ross Brook has good spawning area on the first mile of the brook. The average width is 13 feet.

S-40. Sutherland Brook has a good spawning area for the 3/4 mile area about the mouth of the brook.

S-41. The 3/4 mile section of Fraser Brook above the mouth is suitable for spawning purposes. Two miles from the mouth, there is another spawning area extending for about 1/2 mile. The average width of the brook is 20 feet.

S-42. The first two miles of Clarke's Brook provide  
Pools are numerous in this area but are

fairly narrow. The average width of the stream is 13 feet.

S-43. The spawning area on Glencross Brook is located above Glencross Lake. The area extends about 1/4 mile. The average width of the stream is 12 feet. The lake provides a good holding pool for salmon.

#### POLLUTION

No pollution was found on the St. Mary's River.

#### BARRIERS

No barriers or obstructions were found on the East River St. Mary, or on the West River St. Mary, but barriers were found on the tributary brooks entering the East and West branches.

Upper Bryden Brook, a tributary to the West River St. Mary, has a wooden dam located about two miles from the mouth of the brook. The dam is about 60 feet wide and 7 - 9 feet high. There is a gate in the centre of the dam. The dam is unused and in poor state of repair. This barrier is marked on the map as B-1.

The remnants of an old dam were found on Cross Brook about two miles from the mouth of the brook. The dam was of wood construction but, at the present time, it is covered with dirt, mud and debris. The dam is about 50 feet wide and about 5 feet high. There is a hole in the dam near the true left bank through which the water runs, instead of pouring over the dam. This dam is marked as B-2 on the map.

The remains of an old wooden dam were found on Glencross Brook. The dam is located at the foot of Archibald Lake about 1 1/2 miles from the mouth of the brook. The dam is about 50 feet wide and 6 feet high. The dam is unable to retain a head of water, because of the rotted condition of the logs in the dam. This barrier is referred to as B-3 on the map. The owner of the dam is Clarence Cook, whose present address is unknown.

These dams on the brooks are only partial barriers during low-water periods, and the spawning area above them are limited. During the fall, Mr. Manson, Fishery Officer for the district, and his wardens, intend to remove sections from these dams to allow salmon to pass.

Mitchell Lake Brook has a dam situated about a mile from the mouth of the brook. The dam is of wooden construction and there is a saw mill located on top of the dam. The dam is about 75 feet long and about 12 feet high. The section of the stream between the dam and Mitchell Lake is about one mile and is suitable only as a nursery area. This obstruction is marked as B-4.

There is a barrier falls located on Black Brook, a tributary to East River St. Mary. The falls is located about

2½ miles from the mouth of the brook.

Similar barrier falls were found on four brooks entering on the true right bank of West River St. Mary. Black Brook, Chisholm Brook, McQuarrie Brook and MacDonald Mill Brook have barrier falls located about 1 - 1½ miles from the mouth of the brook. These falls vary in height from 20 - 30 feet.

#### PREDATORS

Predator Bird Control has been carried out on the St. Mary's River for the last three years. The two-man crew consists of Mr. M. M. Manson, Fishery Officer, and Mr. Lawrence Demmons, Assistant. The crew is doing an excellent job in removing predatory birds from the river, and it rendered valuable ~~and-it-rendered-valuable~~ assistance during the river survey.

The number of mergansers removed from the river during the last three years is listed below:

<u>Year</u>	<u>Number of Mergansers destroyed</u>
1953	187
1954	344
1955	247

#### CONCLUSIONS

From the results of the survey carried out on the St. Mary's River system, nursery areas were found in abundance throughout the river. Salmon parr were found on most sections of the East River St. Mary and the West River St. Mary, and in the numerous brooks entering these branches. Salmon parr were found to be more abundant in the brooks than in the main river, but this is due to the fact that seining was much easier, and observation much better in the smaller brooks than in the larger branches. Also, parr seemed to be more abundant in the East River St. Mary than in the West River St. Mary.

Predator bird control has been carried out on the river since 1953. Predatory birds, particularly mergansers, have been kept to a minimum and, from visual observation, parr seemed to be more abundant in the river than in 1953, when the writer worked in the area. Anglers also report seeing more parr and of catching more parr while angling for salmon.

Spawning facilities on the St. Mary's River are fairly abundant. They are not localized in any one area, but are well scattered throughout the river system. Spawning area on the East River occupies about 30% of the total river area; while on the West River, the spawning area occupies about 20% of the total river area. Most of the tributary brooks entering the main branches have 1 - 1½ miles of spawning area located near the lower end of the stream. These brooks vary from 15 - 25 feet in width with an average depth of 3 - 5 inches. Water conditions would have to be fairly high during the spawning season to allow salmon to enter these brooks for spawning purposes.

Barriers are very few on the St. Mary's River. Three dams were found on the brooks and these were in such a poor state of repair that they could be only considered as partial barriers during normal water conditions. The removal of these dams would allow salmon to reach scattered spawning areas farther up the brooks, and these areas are very limited. Barrier falls were found on five of the tributary brooks, and the area above the falls is suitable only as a nursery area. The average width of these brooks above the falls is 15 feet.

Stocking figures show that the same number of fish have been stocked in both the East and West Branches. West River is about twice the size of East River, so stocking should be heavier in the West River.

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## STOCKING RECORD

Listed below is the number of salmon stocked in the St. Mary's River for the last three years:-

1953West River St. Mary

60,525 #2f  
80,000 #1f

East River St. Mary

130,000 #1f

1954West River St. Mary

25,000 #3f  
40,000 #2f  
190,000 #1f

East River St. Mary

20,000 #2f  
190,000 #1f

1955West River St. Mary

35,000 #2f  
75,000 #1f

East River St. Mary

35,000 #2f  
75,000 #1f

## TEMPERATURE RECORD

Date	Air Temp.		Water Temp.		Time	Place
	C°	F°	C°	F°		
May 30	18.0	64.4	10.0	50.0	10.00 am	East River
" 31	18.0	64.4	15.0	59.0	10.30 am	East River
June 1	18.2	64.7	11.0	51.8	1.20 pm	Campbell Brook
" 1	19.0	66.2	12.0	53.6	2.45 pm	Black Brook
" 1	22.0	71.6	15.2	59.4	6.00 pm	Jordan Brook
" 2	18.0	64.8	15.0	59.0	10.30 am	East River
" 4	12.0	53.6	14.0	57.2	10.30 am	Mitchell Lake Brook
" 6	15.0	59.0	14.0	57.2	6.00 pm	South Branch
" 6	8.5	47.3	10.0	50.0	12.10 pm	West River
" 9	12.0	53.6	11.5	52.7	10.00 am	West River
" 10	14.0	57.2	14.0	57.2	11.30 am	West River
" 15	20.0	68.0	17.5	63.5	3.00 pm	East River
" 17	15.0	59.0	17.8	64.0	11.15 am	Nr. Br. McKeen Br.
" 17	20.0	68.0	19.0	66.2	3.00 pm	McKeen Brook
" 18	19.0	66.2	15.5	59.9	10.30 am	Glencross Brook
" 18	21.0	69.8	19.8	67.6	2.15 pm	Glencross Brook
" 20	21.5	70.7	21.5	70.7	3.15 pm	Loon Lake outlet
" 21	23.0	73.4	21.0	69.8	1.15 pm	Castley Brook
" 22	18.0	64.4	19.0	66.2	2.15 pm	Nelson River
" 23	24.0	75.2	19.5	67.1	2.00 pm	North Nelson River
" 24	23.0	73.4	18.0	64.4	11.15 am	East Bryden Brook
" 24	26.0	78.8	22.0	71.6	3.30 pm	Bryden Brook
" 26	25.0	77.0	19.0	66.2	2.30 pm	Indian Man Brook
" 26	21.0	69.8	19.0	66.2	4.30 pm	Indian Man Brook
July 8	33.0	91.4	23.0	73.4	11.30 am	East Cross Brook
" 8	27.0	80.6	22.0	71.6	2.30 pm	Cross Brook
" 8	29.0	84.2	30.0	86.0	3.00 pm	West River
" 9	29.5	85.1	27.0	80.6	3.00 pm	Barren Brook
" 9	29.5	85.1	30.0	86.0	3.15 pm	West River
" 12	20.5	68.9	19.0	66.2	1.00 pm	East Ross Brook
" 12	25.0	77.0	19.0	66.2	2.30 pm	Ross Brook
" 12	25.0	77.0	23.0	73.4	2.45 pm	West River
" 13	25.5	77.9	22.0	71.6	3.30 pm	McQuarrie Brook
" 13	25.5	77.9	26.5	79.7	3.30 pm	West River
" 15	28.5	83.3	26.0	78.8	4.15 pm	West River (Caledonia)
" 20	21.5	70.7	16.0	60.8	1.45 pm	Black Brook
" 22	23.0	73.4	22.0	71.6	2.40 pm	Bent Brook
" 25	22.0	71.6	20.5	68.9	3.40 pm	Fraser Brook
" 26	31.0	87.8	27.0	80.6	3.45 pm	West River
" 28	31.0	87.8	28.5	83.3	4.30 pm	(Clarke Brook). West River (Demmons)
" 18	23.5	74.3	21.5	70.7	2.45 pm	Barney River

## SALMON ANGLING CATCH

The majority of the salmon angling on the St. Mary's River is carried out on the main river between Glenelg and Sherbrooke. Listed below is the number of salmon caught on the St. Mary's River since 1928:-

<u>Year</u>	<u>No. of Fish</u>	<u>Year</u>	<u>No. of Fish</u>
1928	189	1942	208
1929	444	1943	1005
1930	245	1944	651
1931	305	1945	806
1932	140	1946	207
1933	127	1947	237
1934	64	1948	1063
1935	241	1949	336
1936	930	1950	264
1937	365	1951	1070
1938	441	1952	831
1939	262	1953	1164
1940	617	1954	415
1941	301	1955	253

ST. MARYS RIVER



B-1 Dam on Upper Bryden Brook



B-2 Dam on Cross Brook



B-3 Dam on Glencross Brook



Waterfall on Black Brook



Waterfall on Chisholm Brook



Waterfall on Mac Donald Brook

ST. MARYS RIVER



Waterfalls on Black Brook  
(West River)



Storage dam on McKean Brook



Cross Brook



Campbell Brook



Barney Brook



Castley Brook

ST. MARYS RIVER



Nelson River



Upper section West River St. Mary



West River St. Mary at  
Cameron Settlement



West River St. Mary at  
Upper Smithfield



West River St. Mary at  
Smithfield



Confluence of East and West  
St. Mary River (Silver's Pool)

ST. MARYS RIVER



East River St. Mary



Glenelg Lake



Main St. Marys River below Stillwater

## GENERAL DESCRIPTION OF RIVER

55-CAN. FF-E-RDMR6-15

## MARGAREE RIVER SALMON SURVEY

By N. MacEachern

## ABSTRACT

The survey of the Margaree River system showed the presence of ample nursery area for salmon parr. Spot seining indicated a paucity of salmon parr, but results were not conclusive because high water and the rocky nature of the river bed made accurate seining difficult. Spawning areas were found to be concentrated on the lower half of the Northeast Margaree, with scattered spawning areas observed on the main Margaree, the Southwest Margaree, and on the upper half of the Northeast Margaree. No major obstructions to salmon were found on the main branches. Large numbers of mergansers were observed on the river. It is recommended that predatory bird control techniques be applied on the Margaree River.

The lower half of the Northeast Margaree gradually changes from mountainous, wooded country to low, cultivated country. In this area, the water velocity is less rapid than above; pools are wider and longer than the average width of the river, and 6 - 10 feet in depth. The bottom is composed of coarse gravel and rocks. The water is light in colour and clear. Accessibility to this lower section is very good.

## NURSERY AREAS

Nursery areas on the Margaree River system to be plentiful, and three areas are described below and marked on the map as No. 1, No. 2, etc. Seining was carried out on different sections of the river, but, because of the rocky nature of the bottom and the high water, these attempts did not prove very successful.

Main River

## GENERAL DESCRIPTION OF RIVER

The Margaree River is situated in Inverness County, Nova Scotia, and is tributary to the Gulf of St. Lawrence. About eight miles from the mouth, the river divides into two main branches: the Southwest Margaree River and the Northeast Margaree River.

A salmon survey, to determine the extent of the nursery and spawning areas, was carried out on the river from August 26th to September 19th. The area covered included the Southwest Margaree River and its tributary brooks; the Northeast Margaree River (up to the mouth of Campbell's Brook), and the main brooks entering this section of the Margaree River. Water levels were above normal during the first two weeks of the survey.

The Southwest Margaree River, 14 miles in length, is the shorter of the two branches. Lake Ainslie forms the headwater area of the river and it flows northerly to join the main river at Margaree Forks. The nature of the land through which the river flows is flat and cultivated. The gradient of the river is moderate, and the velocity varies from slight to rapid. Pools on the river are wide and 3 - 7 feet in depth, and they occupy about 25% of the total river area. Accessibility to the river is good.

The Northeast Margaree River is approximately 27 miles long from the Forks up to the mouth of Campbell's Brook. The upper half of the watershed is mountainous and wooded country, gradually changing on the lower section to flat cultivated country. The upper section of the river is fast, rough water, with a river bed composed of rocks and emergent boulders with small amounts of gravel. Pools have a width and length similar to the average width of the river and are 4 - 8 feet in depth. Accessibility to the section above the Big Interval is poor, reached only by trails along the river bank.

The lower half of the Northeast Margaree gradually changes from mountainous, wooded country to low, cultivated country. In this area, the water velocity is less rapid than above; pools are wider and longer than the average width of the river, and 4 - 10 feet in depth. The bottom is composed of coarse gravel and rocks. The water is light in colour and clear. Accessibility to this lower section is very good.

## NURSERY AREAS

Nursery areas on the Margaree River appear to be plentiful, and these areas are described below and marked on the map as N-1, N-2, etc. Seining was carried out on different sections of the river; but, because of the rocky nature of the bottom and the high water, these attempts did not prove very successful.

/Main River

## MAIN RIVER

N-1 area on the main river extends from the mouth of Gallant Brook up to Margaree Forks, a distance of four miles. The river has an average width of 175 feet, and the depth varies from 1 - 5 feet. The gradient is slight, and the velocity is sluggish. Pools are long and deep and occupy less than 50% of the area. The river bed is composed of rock, rubble and gravel, with mud and rock in some stillwater areas. The banks are low in this section, and they vary from 1 - 5 feet in height. Shelter is provided by pools, overhanging banks and rocks, but shade conditions are poor. Fish food was fairly abundant, including stonefly nymphs, (Plecoptera); mayfly nymphs, (Ephemera); caddis larvae, (Trichoptera), and dragon fly nymphs, (Odonata).

N-2 extends from the Margaree Forks up river to Portee Bridge, a distance of approximately 11 miles. This area comprises a fifty-fifty relationship of pools and rapids. The average width of the river is 100 feet, and the average depth of the river is 14 inches. Pools are close to the average width of the river, longer than 100 feet, and 4 - 8 feet deep. The banks along this section are low, composed of clay, coarse gravel and rocks. Pools, undercut banks and rocks provide good shelter, but shade conditions are poor. The water velocity is moderate to rapid. Fish food was abundant, including caddis larvae, (Trichoptera); mayfly nymphs, (Ephemera), and stonefly nymphs, (Plecoptera).

Area N-3 is an extension of Area N-2, and continues from Portee Bridge up river to the mouth of Campbell's Brook, a distance of 16 miles. The area changes from a moderate to a fast rough river on this section above the Big Interval. Most of this section flows through mountainous, wooded country. The width varies from 40 feet on the upper part to 100 feet near the Portee Bridge. The velocity of the water is fast, and the gradient varies from steep to moderate. The river bottom is composed mostly of rocks and emergent boulders, with small amounts of gravel located near the pools. Pools are from 4 - 8 feet in depth, and are limited to 1 - 2 pools for every mile of river. Shelter is excellent and shade conditions are good. Fish food was abundant, and the following types were observed: Caddis larvae, (Trichoptera); mayfly nymphs, (Ephemera); stone fly nymphs, (Plecoptera), and chironomids and black flies, (Diptera).

N-4. Gallant River is approximately 11 miles long, and enters the main river on the true right bank about four miles above Margaree Harbour. The stream appears to be an excellent nursery area throughout its length. The average width is 40 feet, and the average depth is seven inches. The bottom is composed of approximately 70% rock, 25% gravel, 10% ledge rock, with rocks predominating on the lower end. The velocity is rapid, and the gradient is steep. Pools are numerous on the upper section, but scarce on the lower three miles. Banks are high, varying from 4 - 20 feet, and made up of rock and ledge rock. Shade and shelter were very good. /Fish

Fish food is abundant and similar to that found in the Northeast Margaree River.

N-5. Big Brook enters the Northeast Margaree River on the true left bank, about three miles above Margaree Forks. The brook has, approximately, six miles of nursery area. The average width is 20 feet, while the average depth is 6 inches. The velocity of the water is rapid, and the gradient varies from steep on the upper half to moderate on the lower section. The bottom is mostly rock interspersed with coarse gravel in some places, except on the lower mile, which is mostly gravel. Shade and shelter are very good, and fish food is abundant. Pools are small and fairly shallow.

N-6. Tomkins Brook enters Big Brook about 1/4 mile from the mouth of the brook. Tomkins Brook is about five miles long, and has approximately 3 1/2 miles of good nursery area. The average width is 15 feet, and the average depth is four inches. The upper 2 1/2 miles of the brook is rocky, changing to gravel on the lower 2 1/2 miles. Fish food was present but not in abundance. Shade and shelter were good on the upper half, but poor on the lower section. Salmon parr were observed on the upper half of the brook, but only two parr were found on the lower end.

N-7. Lake O'Law Brook enters the Northeast Margaree on the true left bank, about 1/2 mile above the mouth of Big Brook. The brook is approximately 5 1/2 miles long from Lake O'Law to the main river. The average width of the brook is 35 feet, and the average depth is 8 inches.

The bottom is composed of gravel and rock, with rocks predominating on the lower part of the brook. The gradient is moderate, and the velocity is rapid. The stream is a good nursery throughout its length. Shade conditions were good and shelter was excellent provided by rocks, overhanging banks, old logs and windfalls. Fish food was abundant, including: caddis fly larvae, (Trichoptera); stone fly nymphs, (Plecoptera), and may fly nymphs, (Ephemera).

Because of construction and relocation of Highway 19, a 600 foot section of Lake O'Law Brook was dammed, and a new channel bulldozed around the area. The local Fishery Officer, the Margaree Hatchery Superintendent, three hatchery employees, and the writer, attempted to remove the trapped salmon fry, parr and trout from the area before the channel was filled in by the bulldozer. A total of 490 salmon parr and fry, and 121 trout, were removed from the 600 foot area and transferred to the new channel.

N-8. Nile Brook appears to be a good nursery area for salmon parr for approximately 4 1/2 miles. The brook is tributary to the Northeast Margaree River. The average width of the brook is 18 feet, and the average depth is 6 1/2 inches. The stream bed is made up of rocks, changing to coarse gravel and rocks on the lower 1 1/2 miles of the brook.

/The

The upper section of the stream is very precipitous, flowing over rough rocky bottom with banks of ledge rock varying from 10 - 50 feet high. Shade was good on the upper section of the stream but poor on the lower section. Fish food was present but not in abundance.

N-9. Ingram Brook appears to be an excellent nursery area for salmon parr. The brook has an average width of 30 feet, and an average depth of eight inches. The brook has approximately eight miles of nursery area. The brook bed is composed of moss covered rocks, gravel and small amounts of sand. Large, deep pools are limited but small pools are numerous. The upper section of the brook is precipitous and very rocky. Shelter is good; shade is good on the upper section, but only fair on the lower areas. Fish food was abundant, including: Mayfly and stone fly nymphs, (Ephemera), (Plecoptera); caddis larvae, (Trichoptera); chironomids and black flies, (Diptera). The gradient on the upper section is steep, and the velocity of the water is rapid.

N-10. Forest Glen Brook enters on the true left bank of the Northeast Margaree River, about  $1\frac{1}{2}$  miles above the Big Interval Bridge. The average width of the brook is 27 feet and the average depth is 6 inches. The stream appears to be an excellent nursery area for a distance of five miles. The bottom is made up of rocks and coarse gravel. The gradient is steep, and the water velocity is rapid. Pools are small, over two feet in depth, and occupy less than 25% of the total stream area. Fish food was found to be abundant.

N-11. Second Forks Brook, tributary to the Northeast Margaree River, has a good nursery area on the first  $1\frac{1}{2}$  miles of the brook. A barrier falls about 40 feet high is located  $1\frac{1}{2}$  miles from the mouth of the brook. The average width of the stream is 25 feet and the average depth is four inches. The stream bottom is composed of rock and rubble. Shade and shelter were good. Fish food was abundant.

N-12. Coinneach Brook appears suitable as a nursery area on the lower mile section examined. The average width is 23 feet and the average depth is 5 inches. The stream bed is composed of 90% rocks and 10% gravel. The gradient is quite steep, and the velocity of the water is rapid. Shade conditions and shelter were good. The banks are made up of rock and ledge, and vary from 10 - 50 feet in height.

N-13. Calumruadh Brook is similar to Coinneach Brook. Only the lower section was examined and it appeared suitable as a nursery area.

N-14. The Southwest Margaree River appears to be a suitable nursery area throughout the 14 miles from Lake Ainslie to Margaree Forks. The width of the river varies from 50 - 80 feet. The first mile below Lake Ainslie is stillwater area, gradually changing to a riffle section for the next eight miles and then to a slow-moving section for /the

the remaining five miles. The bottom varies from mud and rock in the stillwater area to rocks, gravel and rubble in the riffle areas. The water is brown in colour and slightly turbid. Pools are similar to the average width of the river, longer than the average width, and from 3 - 7 feet in depth. Banks are low, composed of clay and rocks. Shade conditions on the river are fair. Fish food was fairly abundant, including: Caddis larvae, (Trichoptera); mayfly nymphs, (Ephemera); stone fly nymphs, (Plecoptera); dragon fly nymphs, (Odonata), and chironomids, (Diptera).

N-15. Matherson Glen Brook enters the Southwest Margaree River on the true right bank, about two miles below Lake Ainslie. The brook has an average width of 30 feet and an average depth of  $3\frac{1}{2}$  inches. There is a barrier falls located about  $1\frac{1}{2}$  miles from the mouth of the brook. The stream bed is composed of 75% moss covered rocks, and 25% gravel. Fish food is abundant, and shade and shelter are good.

N-16. Mount Pleasant Brook, a tributary to the Southwest Margaree, appears to be a good nursery area for a distance of  $3\frac{1}{2}$  miles. The bottom is composed of rock, rubble and gravel. The gradient is slight on the lower  $2\frac{1}{2}$  miles, but it becomes quite steep on the upper section.

N-17. Trout Brook is a tributary to Lake Ainslie. Nursery areas extend for a distance of five miles. The brook has an average width of 25 feet and an average depth of 5 inches. The gradient of the brook is moderate, and the velocity is rapid. The lower two miles of the brook is made up of rocks and coarse gravel with wide, deep pools. Above this, the brook is narrower and very rocky. The gradient is steeper with greater velocity. Shelter was good and fish food was abundant. Very few salmon parr and fry were observed in the brook. The lower  $1\frac{1}{2}$  miles of the stream bed appeared to have been bulldozed, moving the large rocks out of the stream bed to provide a road for trucks.

#### SPAWNING AREAS

Spawning areas found on the Margaree River system are marked on the map as S-1, S-2, etc., and each area is described below.

Three small spawning areas were observed on the main river below Margaree Forks. Most of this section is slow moving water with a river bed of rock, rubble, gravel and mud, but these areas (three) appear suitable as spawning areas. Area S-1 extends for about 300 feet, and is located about  $\frac{3}{4}$  of a mile above the mouth of Gallant Brook. Area S-2 is situated  $1\frac{1}{2}$  miles above the mouth of Gallant Brook and the area extends for approximately 800 feet. Area S-3 is located about a mile below Margaree Forks and extends for 500 feet. The average width of the river in this section is 175 feet.

Area S-4 is located on the Northeast Margaree River and extends from the Margaree Forks bridge up river for  $1\frac{1}{2}$

1½ miles. The average width of the river is 100 feet, and the bottom is composed of coarse gravel and rocks.

Area S-5 extends from the mouth of Big Brook up the Northeast Margaree for 5½ miles to Ingram Brook. The average width of the river is 100 feet, and the bottom is composed of 75% coarse gravel and 25% rocks. The pools are long and deep and are in fifty-fifty relationship to the riffle areas.

The four areas, (S-6 to S-9, inclusive) listed below, are found on the three-mile section of the Northeast Margaree from Ingram Brook to Portee Bridge. The river has an average width of 100 feet, and salmon pools are located near the spawning area. In these areas, the river bottom is composed of 75% coarse gravel and 25% rock.

Area S-6 is located about ½ a mile above the mouth of Ingram Brook, and the area extends for about 500 feet.

Area S-7 is situated near the mouth of Marsh Brook, and is 400 to 500 feet in length.

Area S-8 is located about ½ a mile above the mouth of Coady Brook, and the area extends for approximately 1,000 feet.

Area S-9 was found just above the Portee Bridge, and is approximately 500 feet in length.

Area S-10 extends on the Northeast Margaree from the mouth of McLean's Brook up river for a distance of ½ a mile. In this section, the river bed is composed of 50% coarse gravel and 50% rock.

Area S-11 is located between the mouth of Stewart Brook and the mouth of Forest Glen Brook. The area is scattered along a ¼ mile section of the river, and the bottom is composed of 50% coarse gravel and 50% rock.

The ten-mile section of the Northeast Margaree from the Big Interval up to the mouth of Campbell Brook has a river bed of rocks and boulders. The only suitable spawning gravel observed was in the vicinity of the larger pools. These spawning areas are small, extending for about 50 - 100 feet. Pools are limited to one or two for every mile along this section. This is marked on the map as Area S-12.

#### TRIBUTARY BROOKS

Area S-13 is located on Gallant River about four miles above the mouth. For a distance of two miles, there are scattered spawning areas, where the composition of the river bed is 50% rock and 50% coarse gravel.

/Area S-14

Area S-14 is found on the lower two miles of Big Brook. The bottom is made up of 65% coarse gravel and 35% rock. The average width of the river is 20 feet. Pools are small and vary from 2 - 4 feet in depth.

Area S-15 is located on Tomkins Brook. It is situated about  $\frac{1}{4}$  of a mile from the mouth of the brook, and extends upstream for approximately two miles. The brook has an average width of 15 feet, and the bottom is made up of gravel.

Area S-16 extends from the mouth of Lake O'Law Brook upstream for about two miles. The river has an average width of 35 feet, and the bottom is composed of 75% gravel and 25% rock. Pools are equal in width and length to the average width of the river, varying from 2 - 5 feet in depth, and they occupy less than 25% of the total area.

Area S-17 is located on Lake O'Law Brook from the mouth of Ryan Brook upstream for a distance of  $1\frac{1}{2}$  miles. Conditions are similar to those on the lower section.

The lower  $\frac{1}{4}$  mile section of Nile Brook, near the mouth, appears suitable as a spawning area. The brook has an average width of 18 feet, and the bottom is composed of 60% coarse gravel and 40% rock. This area is referred to as S-18 on the map.

Two good spawning areas were found on Ingram Brook. Area S-19 starts about one mile above the mouth of the brook, and extends up river for about  $\frac{3}{4}$  of a mile. The brook has an average width of 30 feet, and the bottom is composed of gravel. Pools in this area are wider than 35 feet and are 3 - 7 feet in depth. Area S-20 commences at the second highway bridge and extends up river for about  $1\frac{1}{2}$  miles. The bottom is composed of gravel, and the velocity is sluggish.

Area S-21 is located on Forest Glen Brook near the mouth of the stream. The average width of the stream is 27 feet, and the bottom is composed of 50% coarse gravel and 50% rock. The area is approximately 300 - 400 yards in length.

The second spawning area on Forest Glen Brook is found about three miles from the mouth of the river. It extends for about  $\frac{1}{4}$  of a mile. At this section, the river has an average width of 20 feet, and the bottom is composed of gravel. The area is referred to as S-22 on the map.

A small area at the mouth of Second Forks Brook appears suitable as a spawning area. The bottom is composed of gravel and rubble, and has an average width of 25 feet. The area is approximately 500 feet long, and is referred to as S-23 on the map.

## SOUTHWEST MARGAREE

The river bed of the Southwest Margaree is composed mostly of rock, rubble and some gravel, so that spawning areas are scattered along the river. The width of the river varies from 50 - 80 feet. Pools on the river are located near the spawning areas and vary in depth from 3 - 7 feet.

Area S-24 is located about  $\frac{1}{2}$  a mile from the confluence of the two main branches. The area extends for about 600 feet.

Area S-25 is situated about one mile above Area S-25, and the section is approximately 300 feet long.

Area S-26 is located about three miles from the Forks, and the gravel area is about 300 yards in length.

Area S-27 commences at the mouth of Captain Allan Brook and extends down river for a mile, with scattered spawning areas on the section.

Area S-28 is located near the mouth of Mount Pleasant Brook on the main river, and the area extends for  $\frac{1}{4}$  of a mile.

Area S-29 is situated near the mouth of Matherson Glen Brook, and has scattered spawning areas for a distance of  $\frac{1}{2}$  a mile.

Area S-30 is found on Mount Pleasant Brook, and the spawning area extends from the mouth upstream for approximately two miles. The average width of the brook is 25 feet, and the bottom is composed of rock, rubble and gravel. Pools are small and fairly shallow.

Area S-31 is located on Trout Brook. There are scattered spawning areas from the mouth of the brook extending upstream for approximately two miles. The brook has an average width of 28 feet, and the bottom is composed of 70% coarse gravel and 30% rock. Pools in this section are wide and deep, and occupy less than 25% of the total area.

## BARRIERS

No barriers were found on the main Margaree River, the Northeast Margaree River, or the Southwest Margaree River.

On Big Brook, a tributary to the Northeast Margaree River, there are the remnants of a dam. The dam is located three miles from the mouth of the brook. It is a wooden dam, 80 feet long and 7 - 8 feet high. The spillway of the dam extends about three feet from the face of the dam. The section of the brook above the dam is mostly rocky bottom and suitable only as nursery area for salmon. The obstruction is shown as B-1 on the attached map.

On Second Forks Brook, about  $1\frac{1}{2}$  miles from the mouth, there is a barrier falls approximately 40 feet high. This obstruction is shown on the map as B-2. The area above the falls appears suitable as a nursery area.

Matherson Glen Brook has a barrier falls located about  $1\frac{1}{2}$  miles from the mouth of the brook, 35 - 40 feet high. The section above the falls is rocky, and no spawning areas were observed. The barrier is marked on the map as B-3.

The remnants of an old mill dam were found on Mount Pleasant Brook, about three miles from the mouth. This old dam appeared to be only a partial barrier in low water, but it was collecting old logs and debris floating downstream, and in time it may become a complete barrier. The area above the dam appears suitable as a nursery area, and no spawning grounds were observed.

#### PREDATORS

Mergansers were observed in large numbers on the Margaree River system during the time of the survey. Forty-one mergansers were observed on a 12 mile section of the Margaree River. This section, from the mouth of Ingram Brook to the Margaree Bridge, was covered by canoe on August 27th. On August 31st, forty-four mergansers were observed on a fourteen-mile section of the Southwest Margaree River. On September 8th, while camped on the upper section of the Northeast Margaree near the mouth of Goinneach Brook, a flock of eighteen mergansers lighted on the pool in front of the camp. On September 9th, a flock of five mergansers were observed farther up river.

During the salmon spawning survey in early November, a flock of thirty mergansers were observed on the Northeast Margaree, and five on the Southwest Margaree.

## DISCUSSION

The survey of the Margaree River system showed an abundance of nursery areas available for salmon parr. The two main branches and the tributary brooks entering these branches are all suitable as nursery areas for salmon. Fish food is fairly abundant in all sections; shelter is good; and, at the time of the survey, the water temperatures varied from 7.5°C (46.8°F) to 17.0°C (64.4°F).

From spot seining along the lower section of the Northeast Margaree and the Southwest Margaree, salmon parr were found to be very scarce. No accurate conclusions can be drawn from these seinings, because of the conditions under which they were carried out. Water levels were above normal; water velocity was rapid, and the rocky nature of the bottom allowed seining to be carried out only in the shallow gravel sections of the main branches. Seining in the tributary brooks showed better results, because the net could be handled much more efficiently on the smaller brooks.

Although seining results were not conclusive, they gave a good indication that salmon parr were not abundant on the Margaree River system. Similar results were shown by a seining survey carried out on the Northeast Margaree by K. Smith and J. Ingram of this Branch during September, 1954.

The large number of mergansers observed on the Margaree River might be one of the main reasons for the depletion of salmon parr on the river. The number of mergansers could be reduced considerably by carrying out brood drives in late June and early July.

Spawning areas on the river system were found to be concentrated on the lower half of the Northeast Margaree River. Spawning areas were found on the main Margaree and on the Southwest Margaree, but they were scattered along the river and not as extensive as those found on Northeast Margaree. On the upper half of the Northeast Margaree, as far as the mouth of Campbell Brook, spawning areas are limited - found only near the larger pools, which are about  $\frac{1}{2}$  a mile apart.

No barriers were found on the main river, or the two main branches. Old log dams were found on Big Brook and Mount Pleasant Brook, and barrier falls on Second Forks Brook and Matherson Glen Brook. The areas above these obstructions are small and confined to nursery areas.

## RECOMMENDATIONS

It is recommended that predatory bird control methods be applied on the Margaree River.

It is also recommended that the river be stocked as soon as salmon stocks are available.

## ANGLING

The statistics on the commercial and angling of salmon on the Margaree River are listed below:-

	<u>Commercial Catch</u>	<u>Angling Catch</u>
1948	1212 cwts	836 Salmon
1949	629 "	425 "
1950	826 "	462 "
1951	541 "	553 "
1952	388 "	325 "
1953	576 "	385 "
1954	424 "	440 "
1955	226 "	345 "

## TEMPERATURE RECORD

	Air Temp.		Water Temp.		Date	Time
	C <sup>o</sup>	F <sup>o</sup>	C <sup>o</sup>	F <sup>o</sup>		
N.E. Margaree	18.5	65.3	14.0	57.2	Aug. 26	10.00AM
Lake O'Law Brook	23.0	73.4	17.0	62.6	Sept. 1	12.30PM
Big Brook	18.5	65.3	14.5	58.1	Sept. 6	1.30PM
Forest Glen Brook	17.8	64.0	13.5	56.3	Sept. 7	2.10PM
Coinneach Brook	12.0	53.6	10.0	50.0	Sept. 8	5.10PM
Second Forks Brook	18.0	64.4	7.5	45.5	Sept. 9	1.30PM
Tomkins Brook	15.0	59.0	12.5	54.5	Sept. 10	1.30PM
Gallant Brook	15.0	59.0	14.0	57.2	Sept. 12	11.45AM
Matherson Brook	14.5	58.1	12.0	53.6	Sept. 13	12.15PM
Mount Pleasant Brook.	16.8	62.2	14.0	57.2	Sept. 13	3.45PM
Capt. Allan Brook	17.8	64.0	15.0	59.0	Sept. 16	2.30PM
Trout Brook	13.0	55.4	10.0	50.0	Sept. 17	1.00PM

MARGAREE RIVER



B-1 Dam on Big Brook



B-2 Falls on Second Forks Brook



Waterfall on Big Brook



Ingram Brook



Gallant River



N.E. Margaree River

MARGAREE RIVER



N.E. Margaree River  
below mouth of Big Brook



N.E. Margaree River  
at mouth of Nile Brook



N.E. Margaree River  
below Cranton Bridge



N.E. Margaree River  
below Ingram Bridge



N.E. Margaree River  
above the Big Interval



Southwest Margaree River

GENERAL DESCRIPTION 55-CAN-FF-F-RDMR 6-15

## GRAND RIVER SALMON SURVEY

By N. MacEachern

### ABSTRACT

The eight miles of main river from Loch Lomond Lake to the estuary appears suitable as a nursery area for salmon. Spot seining indicated a fair population of salmon fry, but very few salmon parr were found. Good spawning areas were observed scattered along a five-mile section of the river, but there is a limited number of pools on the river. Low water conditions during a dry summer period may prevent salmon from entering the river from the tidal waters. Because of the limited number of holding pools on the river, salmon tend to move up river to Loch Lomond Lakes when a spate occurs.

Black Brook enters the main river on the west bank, just above Grand River village. The brook is about two miles long and drains from Loch Lomond Lake. The brook has an average width of 15 feet and an average depth of 12 inches. The brook bottom is composed of gravel on the lower part, and rocks and rubble on the upper part. Sheds and shelter were found to be very good. Bottom fauna were abundant and similar to that found on the main river. This section is marked as W-1 on the map.

Several small spring brooks entering the main river and Loch Lomond Lake area provide limited nursery areas for salmon parr. Most of these brooks are 1 - 1 1/2 miles long, and are from 5 - 10 feet wide. Shelter and shade conditions were good and fish food was abundant.

Spot seining along the river with a hand seine indicated a fair population of salmon fry, but very few salmon

## GENERAL DESCRIPTION OF RIVER

Grand River, situated in Richmond County, Nova Scotia, flows southerly from Loch Lomond Lake, and is tributary to the Atlantic Ocean. The river is approximately eight miles in length from Loch Lomond Lake to the estuary. The river flows through rolling, wooded country. The gradient of the river is moderate, and the velocity varies from slight to rapid. The river bed is composed of gravel, rubble and rocks with gravel predominating, and covered with aquatic vegetation on some sections. The banks of the river are low in most sections and composed of rocks, rubble and gravel and ledge rocks in some sections. Pools on the river are small, intermediate in depth, and they occupy less than 25% of the total river area.

A salmon survey was carried out on the river during the latter part of August, to determine the extent of the nursery areas and spawning grounds on the river. Water levels were low during the time of the survey.

## NURSERY AREAS

Nursery areas on the main river extend for eight miles from Loch Lomond Lake to the estuary. The width of the river varies from 35 feet on the upper part to 60 feet on the lower section. The bottom is composed of gravel, rock and rubble. Woodland areas give partial shade to most sections of the river, and fair shelter is afforded by rocks, small pockets, pools, and aquatic vegetation. Bottom fauna are fairly abundant and include mayfly nymphs, (Ephemerdia); stonefly nymphs, (Plecoptera); dragonfly nymphs, (Odonata); caddis fly larvae, (Trichoptera); chiromonids and black flies, (Diptera). This area is referred to as N-1 on the map.

Black Brook enters the main river on the true right bank, just above Grand River village. The brook is about two miles long and drains from McRae Lake. The brook has an average width of 15 feet and an average depth of  $3\frac{1}{2}$  inches. The brook bottom is composed of gravel on the lower part, and rocks and rubble on the upper part. Shade and shelter were found to be very good. Bottom fauna were abundant and similar to that found on the main river. This section is marked as N-2 on the map.

Several small spring brooks entering the main river and Loch Lomond Lake area provide limited nursery area for salmon parr. Most of these brooks are 1 -  $1\frac{1}{2}$  miles long, and are from 5 - 10 feet wide. Shelter and shade conditions were good and fish food was abundant.

Spot seining along the river with a hand seine indicated a fair population of salmon fry, but very few salmon

parr were found.

### SPAWNING AREAS

From the mouth of Murchison Brook, scattered spawning areas extended up river for a distance of two miles. On this section, the river is composed of a mixture of rocks, rubble and gravel. The average width of the river is 60 feet. Pools in this area are limited and fairly shallow. This area is marked as S-1 on the map.

The second spawning area was observed below Grand River Falls and extended down river for, approximately,  $1\frac{1}{2}$  miles. The river has an average width of 50 feet, and the velocity is rapid. The bottom is composed of 75% gravel and 25% rocks and rubble. Pools in this section are limited - narrower than the average width of the river, and deeper than two feet. The pool below the falls is wider and longer than the others, and provides a good holding pool for salmon. This area is referred to as S-2 on the map.

The third spawning area on the river was observed below the outlet of Loch Lomond Lake. The area extended down river for about  $1\frac{1}{2}$  miles. The bottom is made up of gravel. The average width is 50 feet, and the velocity is sluggish. Pools in this area are long still-water type. The lake above this section provides an excellent holding pool for salmon. This area is marked on the map as S-3.

A small spawning area was observed on Black Brook. The area extends for about a mile from the mouth. The brook has an average width of 15 feet. The velocity is sluggish, and the bottom is made up of gravel. The area is indicated as S-4 on the map.

No mergansers were observed on the main part of the river, but a brood of 12 were seen at the mouth of Black Brook. A large flock of mergansers was observed in the estuary, about 25 in number. Local residents claim that mergansers inhabit the main river.

### BARRIERS

No barriers to the ascent of salmon were found on the river. About three miles below the lake, there are a series of steps or falls but this section is supplied with a fishway.

### CONCLUSIONS

The eight miles of main river from Loch Lomond Lake to the estuary appear to be suitable nursery area for salmon parr. Good spawning areas were also observed along this section, but there is a limited number of pools on the river. Most of the pools are narrow and not very deep. Spot  
/seining

seining on the river indicated a fair population of salmon fry, but very few salmon parr were found.

Low-water conditions during a dry summer period prevent salmon from leaving the tidal water and entering the river. Because of the limited number of holding areas on the river, salmon tend to keep moving up river to Loch Lomond Lake when a spate occurs. Anglers have reported catching grilse in Loch Lomond Lake while angling for trout.

A storage dam on Loch Lomond Lake might supply artificial freshets to attract salmon into the river, but it is doubtful if enough water could be stored to give a sustained flow during low-water periods to improve angling. Construction of a storage dam on Loch Lomond might flood considerable farm land, and adjacent to the lake.

Predation of salmon parr by mergansers might be reduced by supplying the fishery warden with a shot gun and shells. The area to be covered is small and could be handled by one man.

fm

GRAND RIVER



Upper section of Grand River



Lower section of Grand River



Grand River Falls



Fishway at Grand River Falls

55-CAN-FFF-ADMIR 64107

GENERAL DESCRIPTION OF RIVER  
MUSHAMUSH RIVER SALMON SURVEY

By Neil MacEachern

## ABSTRACT

The result of the survey of the seven-mile section of the Mushamush River and its tributaries showed five miles of nursery areas, and approximately  $\frac{3}{8}$  of a mile of spawning areas available to salmon. Six barriers were found on the main river, and one on the tributary brook. Only the first barrier was supplied with a fishway. A salmon counting fence, installed at the mouth of the river, passed two salmon during the year. The river does not seem to warrant the expense of reclaiming it for salmon, because of the numerous barriers, the small run of salmon entering the river, and the limited spawning and nursery area available to salmon.

## GENERAL DESCRIPTION OF RIVER

The Mushamush River is situated in Lunenburg County, Nova Scotia, and flows south easterly and empties into Mahone Bay. A salmon survey was carried out on the river from the mouth up to Little Mushamush Lake, a distance of seven miles. The survey was carried out during the first part of April.

The river flows through rolling country, partly wooded and partly cultivated. The gradient is moderate, and the velocity is rapid throughout most of its length. The water is colourless, and the river bed is composed of rocks and gravel, with rocks predominating. Pools are infrequent with long stretches of swift water between them.

Fish fauna in the system included speckled trout (*Salvelinus fontinalis*), yellow perch (*Perca flavescens*), suckers (*Catostomus commersonii*), and *Notropus* minnows. Alewives (*Pomolobus pseudo-harengus*) were observed below the first dam on the river. White perch (*Morone americana*) were reported to inhabit the area, but none were found while seining.

## NURSERY AREAS

The first nursery area was observed on the lower section of the river from the mouth up to the first dam. This area is about one-half mile long and marked as N-1 on the map. The average width of the river is 75 feet, and the bottom is composed of boulders, rocks and small amounts of gravel. Food is present, and the following types were found: Caddis larvae, (*Trichoptera*); mayfly nymphs, (*Ephemera*); stone fly nymphs, (*Plecoptera*). Shelter is good, but shade conditions are only fair.

The second nursery area extends from below Harley Ernest mill dam downstream for, approximately, one-half mile. On this section, the average width of the river is 70 feet, while the average depth is 12 inches. The river bed is made up of coarse gravel, with some rocks interspersed among the gravel. Fish food was present and similar to that found on the lower section. This area is marked as N-2 on the map.

The section marked as N-3 on the map commences above the mill pond of Ernest Harley dam, and extends up river for a distance of 2½ miles. The average width of the river is 60 feet, and the average depth is 12 inches. The river bottom is composed of 80% rocks and 20% gravel. Shelter is provided by rocks, small pools and windfalls and old logs found in the river. The velocity of the river is rapid. Fish food is abundant and includes caddis larvae, mayfly nymphs, and stonefly nymphs. Banks are low on this section of the river, and composed of rocks, rubble and clay. Trees extend to the river banks on this section, and provide good shade conditions.

Of the three brooks entering this section of the river, Blockhouse Mill Brook is the only one suitable as a nursery area. This brook drains Langille Lake and enters the main river on the true right bank about three miles from the estuary. The stream is approximately  $1\frac{1}{2}$  miles in length, and has an average width of 25 feet, with an average depth of 10 inches. The stream bed is mostly rock, interspersed with gravel. The velocity is rapid. There are very few pools, and these are small and shallow. The stream is well shaded on the upper and lower section, but open in the middle section. Fish food was found in abundance, and similar to that found in the main river. This area is marked on the map as N-4.

#### SPAWNING AREAS

The first potential spawning area was observed below Harley Ernest mill dam, (B2), and the area extends for about 400 yards down stream. The river has an average width of 70 feet, with an average depth of 12 inches. The river bed is composed of coarse gravel, and some rocks interspersed among the gravel. There are two good salmon pools in this section and a long stillwater below, which would serve as a holding pool. This area is marked as S-1 on the map.

The second spawning area, indicated as S-2 on the map, is located about  $1\frac{1}{2}$  miles below the third dam, (B4), on the river. On this section, the river is about 60 feet wide, with an average depth of 12 inches. The river bottom is made up of coarse gravel, interspersed with rocks. The area extends from 300 - 400 yards down stream. The pools in this section are limited and intermediate in depth.

#### POLLUTION

The section of the river below Natham Joudrey dam for a distance of  $1\frac{1}{2}$  miles is considered a polluted area. In this section, the river bed is completely covered with sawdust that has been dumped in the river for the last 50 years. Steps have been taken recently by the mill owner to prevent the sawdust from entering the river. Most of this section is stillwater area about 60 feet wide and from two to five feet in depth.

#### PREDATORS

Two mergansers and two kingfishers were observed on the river.

#### OBSTRUCTIONS

Seven barriers were found on the section of the river surveyed. They are referred to on the map as B-1, B-2, etc.

The first one is located about one-half mile above tidewater. It is a wooden dam, 200 feet long and 15 feet high, owned by the Nova Scotia Power Commission. There is a run-around type of fishway located on the true left bank of the river. The entrance to the fishway is located on the true left bank, while the tailrace from the power plant is on the true right bank, so salmon have difficulty locating the entrance. During the summer months, the power plant is operated during the daytime. This barrier is marked as B-1 on the map.

The next obstruction is located about one-half mile above the power dam. This is a wooden dam, owned by Mr. Harley Ernest, Mahone Bay, and it is used to hold water to run his saw-mill. The dam is 234 feet long and 9 feet high. There is an old fishway on the west side of the pond, but it has disintegrated and a new fishway will be required. This barrier is marked as B-2 on the map.

The third obstruction (B-3) is located just below the mouth of Blackhouse Mill Brook. It is an old mill dam, which is partly washed away, but the remainder of it should be removed to allow free passage of fish, and to prevent debris from collecting and forming a complete barrier.

The fourth obstruction (B-4) is an old sawmill that has disintegrated and fallen into the river, forming an obstruction. The mill is owned by Messrs. Norman Spidle, Harvey Spidle, Exram Spidle, Clayton Spidle of Lower Cornwall, and Wedden Joudrey of Blockhouse.

The fifth obstruction (B-5) is a mill dam located just above B-4. The dam is 143 feet long and 8 feet high, but forms only a partial barrier as a small section has been removed. This dam is owned by Mr. Nathan Joudrey, Blockhouse.

A holding dam, owned by the Nova Scotia Power Commission, is located on the outlet of Little Mashamish Lake. The dam is supplied with a fishway of cement construction, L-shaped, 2½ feet wide and 45 feet long. One section of the fishway has fallen away, and the upper section is plugged with debris. This barrier is marked as B-6 on the map.

On Blockhouse Mill brook, there is an old mill dam referred to on the map as B-7. The dam is rotting away and is no longer used as a mill dam. The dam is owned by Messrs. Willis Aulenback, Enoch Aulenback, Freeman Aulenback of Framville, and Mrs. Wilfred Ernest of Blockhouse.

## CONCLUSIONS

The results of the survey of the seven-mile section of the Mushamush River and its tributaries showed five miles of nursery area and, approximately, 3/8 of a mile of spawning area available to salmon. Six barriers were found on the main river, and one on the tributary brook. Only the first dam was supplied with an operating fishway, and this was not working efficiently at the time of the survey.

The fishway on the power dam is a run-around type, located on the true left bank of the river. It is narrow and contains only two rest pools. The entrance is located on the true left bank of the river, while the tailrace from the power house is situated on the true right bank of the river. During the summer months, the power house is operated only during the day, and it is shut off at night to store water. At night when the Power Company is storing water, the only water in the river below the dam comes from leakage from the dam and from the fishway if it is open.

The possibility of the river as a salmon angling water was also investigated. Pools on the middle section of the river are infrequent, narrower than the average width of the river, and two to four feet in depth. The best pools were observed on the upper and lower sections of the river. Local residents claim that: "Before the power dam was installed on the river, it was one of the best salmon angling rivers along the coast."

Yellow perch were found in the system and white perch were reported to inhabit the area. These coarse fish would be predaceous on salmon fry and parr.

A salmon counting trap was installed near the mouth of the river in April. The total count of salmon passing through the trap for the year was two salmon.

Because of the very small run of salmon entering the river; the numerous barriers on the river, and the limited amount of nursery and spawning area available, the river does not seem to warrant the expense of reclaiming the river for salmon.

At the time of the survey, gaspereaux were observed attempting to use the fishway at the power dam. Improvements of the fishway at the power dam, and rebuilding of the fishway at Barrier No.2 (Harley Ernest dam), would open up limited nursery areas for gaspereaux on the ponds behind these dams. To allow gaspereaux to reach one of the larger nursery areas on the river, (Little Mushamush Lake),

Barriers Nos.3 and 4 would have to be removed; a fishway built on Barrier No.5, and repairs made to the fishway on Barrier No.6.

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MUSHAMUSH RIVER



B-1 N.S. Power Commission Dam



Entrance to fishway on B-1



Run-a-round fishway at B-1



B-2 Harley Ernest Dam



B-3 Remnants of old dam



B-3 Remnants of old dam

MUSHAMUSH RIVER



B-4 Dam and old sawmill in river



Old sawmill blocking the river



B-5 Nathan Jourdrej Dam



B-7 Dam on Blockhouse Mill  
Brook



B-6 Dam on Little Mushamush  
Lake



Remains of fishway on B-6

MUSHAMUSH RIVER



Main river below B-1



Main river below B-2



Main river above B-2



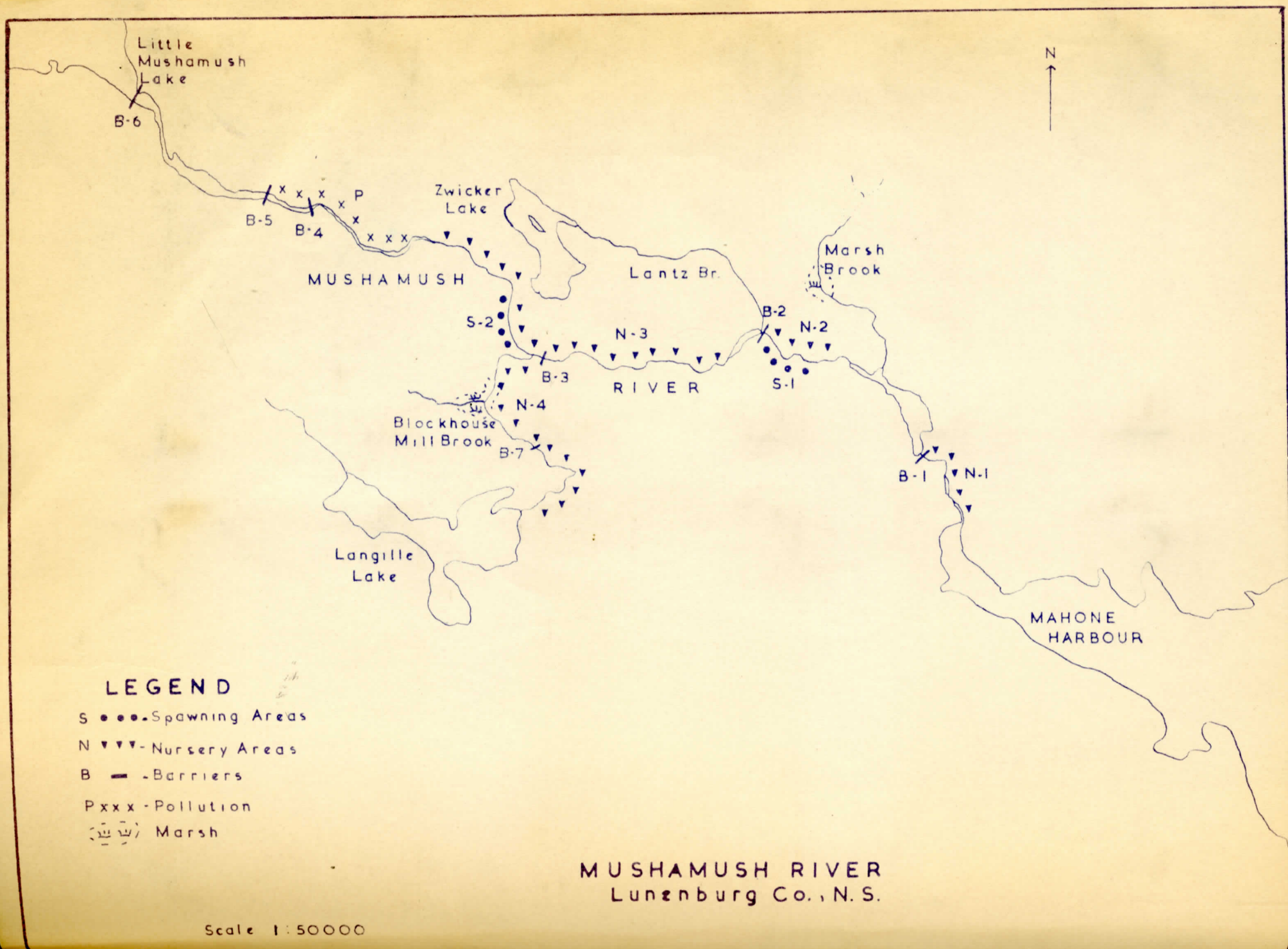
Main river above B-3



Sawdust pollution below B-5



Sawdust pollution below B-5



**LEGEND**

- S ●●● - Spawning Areas
- N ▼▼▼ - Nursery Areas
- B — - Barriers
- P xxx - Pollution
- ⌞⌞⌞ Marsh

**MUSHAMUSH RIVER  
Lunenburg Co., N.S.**

Scale 1:50000