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RESOURCE DEVELOPMENT BRANCH

MANUSCRIPT REPORT

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Preliminary Report

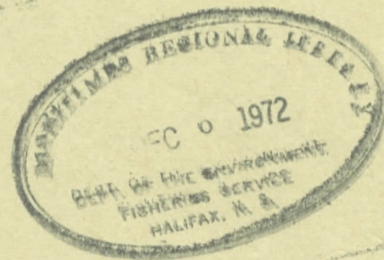
Sissiboo River, Digby County

Nova Scotia

Effects of Proposed Power Development on Fisheries

by

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

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PRELIMINARY REPORT

SISSIBOO RIVER, DIGBY COUNTY,
NOVA SCOTIA

EFFECTS OF PROPOSED POWER DEVELOPMENT ON FISHERIES

DEPARTMENT OF FISHERIES
MAY 1958

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I N D E X

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Introduction:

A letter dated February 27, 1958 has been received by this Department from the Nova Scotia Power Commission mentioning their plans to develop the Sissiboo River for hydro-electric purposes, and requesting our confirmation that fishways will not be required in any of their proposed river structures.

The purpose of this report is to collect and present information on the proposed development, and its probable impact on the fisheries of the area, for the basis of a decision on such a requirement.

Description of the Sissiboo River System:

The Sissiboo River (figs. 1 & 2) is about 40 miles long and drains into St. Mary's Bay at Weymouth Harbour. It starts at Ninth Lake, flowing through Eighth, Seventh, etc. and Sissiboo (Sometimes called "Grand") lakes. The river drains a total of approximately 230 square miles, with principal tributaries being McDonald Brook from Andrews Lake, Mistake River and Lake, Provest Lake, Wallace River and Lake, Unioke Lake, Chub Brook and Lakes, Sporting Lake Stream and Lake, and White Sand Stream and Lake.

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In addition to several stretches of rapids there are two SISSIBOO RIVER, DIGBY COUNTY, Nova Scotia. Both have existing power in NOVA SCOTIA. The lower is Weymouth Falls at Weymouth Mills. This is but little above tidewater

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and about 5 miles from the mouth of Weymouth Harbour. There is a timber dam built on a natural rock falls with combined height approximately 60 feet. The power plant

Introduction:

was built around 1900. It contains a Francis-type turbine developing about 320 K.V.A. (for firm and off-peak power). A letter dated February 27, 1958 has been received by this Department from the Nova Scotia Power Commission mentioning their plans to develop the Sissiboo River for hydro-electric purposes, and requesting our confirmation that fishways will not be required in any of their proposed river structures.

The purpose of this report is to collect and present information on the proposed development, and its probable impact on the fisheries of the largely flat and boggy, with many stillwaters and swamps, area, for the basis of a decision on such a requirement. There is extensive flowage. Dams have been built on

Description of the Sissiboo River System: Lake (12'),

and other lakes. The Sissiboo River (figs. 1 & 2) is about 40 miles long and drains into St. Mary's Bay at Weymouth Harbour. It starts at Ninth Lake, flowing through Eighth, Seventh, etc. and Sissiboo (Sometimes called "Grand") Lakes. The river drains a total of approximately 230 square miles, with principal tributaries being McDonald Brook from Andrews Lake, Mistake River and Lake, Provost Lake, Wallace River and Lake, Unioke Lake, Chub Brook and Lakes, Sporting Lake Stream and Lake, and White Sand Stream and Lake.

In addition to several stretches of rapids there are two major obstructions on the lower river. Both have existing power installations. The lower is Weymouth Falls at Weymouth Mills. This is but little above tidewater and about 5½ miles from the mouth of Weymouth Harbour. There is a timber dam built on a natural rock falls with combined height approximately 60 feet. The power plant was built around 1900. It contains a Francis-type turbine developing about 520 K.V.A. ^{(reportedly used} for firm and off-peak power.)

The second obstruction is at Sissiboo Falls, about 5 miles upriver from Weymouth Falls. The Sissiboo Falls power station also uses a timber dam built on a natural falls. It produces about 650 K.V.A. from a head of approximately 36 feet, also using a Francis-type turbine.

The system's catchment is reported to be largely flat and boggy, with many stillwaters and swamps. There is extensive flowage. Dams have been built on Grand Lake (10'), Fourth Lake (11'), Fifth Lake (12'), and other lakes for many years to help maintain dry-season river flows for the existing power stations.

Lumbering is reported to be (in 1949) important in the headwater areas, and it is expected that there may be many small driving dams on the smaller tributaries.

Fisheries of the District:

Local commercial fisheries are important to residents in the area. They include the various

fisheries of St. Mary's Bay and adjacent Bay of Fundy waters.

In 1950 there were reported to be one or two small weirs in the estuary for flounders. Other local fisheries are:-

(a) Clams: Reported in 1950 to occur in about half the tidal river. Annual production for several years before 1950 averaged about 5,000 cwt. Digging is prohibited upstream from approximately the railway bridge. No doubt pollution will generally tend to increase with growth of population or industrial development.

(b) Smelts: Catches in 1945 to 1949 ranged from nil to 175 cwt. They are reported to spawn in the small feeder streams below Weymouth Falls. Fishing is done usually through the ice in a section of the river about 1 mile long, some 2 miles below the falls. The catch, as frequently is the case in the Maritimes, appears to fluctuate more because of variations in ice conditions than size of the run.

(c) Salmon: There do not appear to have been any salmon caught in the river within the last 60 or 70 years. It has been said that salmon sometimes enter the estuary and even come in on the tide to the foot of the falls, and there is a deep pool at Weymouth Falls known as "Salmon Hole" (letter from Weymouth Board of Trade, February 19, 1950). However it appears unlikely that any salmon could ascend Weymouth Falls even before construction of the existing power dam. There does not appear to be any

evidence reported of suitable spawning or rearing grounds amounted to over 20,000 large (74) fingerlings in 1950. Guides are reported (1949) to maintain cabins at Silversand (Whissandv), sporting and winter except perhaps as noted on page (6) under "Previous Lakes for fishing parties. Proposals".

(d) Eels: It is reported (letter from Weymouth Board of Trade, February 19, 1950) that sometimes, especially in dry years, trouble is experienced in the early fall at the existing power stations with eels in the turbines. This would indicate a normal population. The existing obstructions would probably not unduly impede their juveniles' upstream migrations. *and April 28/1958*

(e) Pike: Pike have been reported (1951) present in ^uNorth Lake. It is not known if this report has been confirmed. (Perhaps confusion with Chain Pickerel reported in Spectacle Brook drainage.)

(f) Trout: Most of the lakes and streams of the area carry speckled trout. The lower river between the falls only provides about 6 weeks angling in spring to resident fishermen, but the upper system provides very extensive angling to tourists also with important incidental employment to guides from Bear River and other local districts.

In 1949 it was reported that 1908 trout were caught, weighting about 1097 lb., for 2135 rod days. Nearly all were caught in April, May, June and July. The total annual catch for the system was estimated at about 4,000 lb., equivalent to roughly 7,000 fish.

Hatchery-reared trout have been planted in lakes of the system to help maintain stocks. These

that speckled trout are lost downstream over the numerous

amounted to over 20,000 large (#4) fingerlings in 1956.

Guides are reported (1949) to maintain cabins at Silversand (Whitesand?), Sporting and Ninth Lakes for fishing parties.

(9) Pack?

Previous Proposals Improve Fisheries:

Residents of the area have often suggested that fish ladders should be built at obstructions on the Sissiboo. Recent letters on file from the Weymouth Board of Trade ^{to} concerning their position are dated March 19, 1958 addressed to the Manager of the Nova Scotia Power Commission with a copy to this Department for our information, and dated March 7, 1957 ^{and April 28/1958} to this Department.

Previous correspondence between 1949 and 1952 led to extensive surveys of the river, and designs and estimates for fishways at Sissiboo and Weymouth Falls. Copies of the plans and photographs are attached (figs. 4 to 8). Estimates of costs at the time totalled \$57,000 for the two main fishways, with an expectation that additional costs might be incurred in developing the rest of the river.

Earlier communications requesting consideration of fish ladder construction included a letter in 1935 and a petition in 1932.

This local interest in construction of ladders is apparently almost entirely concerned with developing a salmon run in the river, although reference (1949) is noted to opinions of guides in the upper area that speckled trout are lost downstream over the numerous

either in feeder streams now used by smolts, or by a smaller dams present, and that their being unable to return again results in a loss to the sport fishery. The writer understands that although screens are sometimes provided at the outlets of lakes, this factor is considered of minor importance in management of speckled trout as few adult trout are believed to attempt a downstream migration for spawning, and younger trout would not normally descend from a lake which provides them with a suitable environment.

to be revised later

The residents appear to feel that there is little worthwhile fishing in Sissiboo River considering its size. Their desire to develop a salmon fishery is probably also influenced by the dearth of such fishing in their vicinity. This is indicated by the map, fig.1, wherein generally the rivers shown with complete or proposed surveys are either present or are considered potential salmon streams.

Only limited salmon fishing exists along the Bay of Fundy coast in Nova Scotia, or for that matter elsewhere in western Nova Scotia. Past lumbering operations and power developments perhaps have eliminated or severely curtailed salmon populations in many rivers which may once have maintained moderate or even large runs.

Encouragement is given local ambitions by the reports that salmon enter the estuary and sometimes ascend with the tide as far as the first falls, and by the name of "Salmon Hole" in the vicinity. It may be that a small run was locally maintained a great many years ago,

either in feeder streams now used by smelts, or by a few spawners surmounting Weymouth Falls. The river between Weymouth and Sissiboo Falls now appears to have no suitable spawning sites but conditions may have been better before construction of the upper dam prevented normal movement of gravel in the river bed, and before headwater lumbering or other extensive interference by man in the catchment.

The speckled trout fishing in the river between Weymouth and Sissiboo Lake is perhaps maintained by losses of adult salmon over the dam, but could more likely be due to a resident stock. The fast water would provide as ample spawning and an ideal nursery area for a similar small salmon population if water temperatures are suitable. However, the productivity is doubtless limited and presence of young salmon would probably result in a corresponding decrease in trout. In addition, salmon parr would undoubtedly suffer heavily at the hands of trout fishermen even if always returned to the water with the utmost care.

It is doubtful if the best of fish ladders at the two lower dams would result in a sufficient natural salmon return to justify their expense even if all other conditions are satisfactory. Perhaps if residents should be agreeable, consideration might be given to a plan of stocking the lower river with fingerling salmon to provide salmon angling below the Weymouth dam. There would be some small loss of smolts at the two existing turbine houses, and it would probably be desirable

to close the river nursery areas to all angling. This suggestion of course could only apply if the present proposals to develop the river are not implemented since raising headpond levels to the proposed heights would inundate this stretch of river.

However, it would appear likely that earth-fill structure in the main river bed with an intake dam containing the intake, bypass and spillway located in a saddle adjacent to the river valley. A short pipeline, approximately 300 feet long will convey their normal migration. Similar sorties into fresh waters of other than their home stream appear to be a cut will lead the discharge to tidewater. Centre-line of proposed dams is approximately 2000 feet upstream appears to be no sound basis for considering such appearances as evidencing suitable or previously used salmon environments.

The Department has thus in the past, in view of the absence of evident suitable salmon spawning or rearing areas, the high estimated cost of suitable facilities at the major obstacles and lack of evidence of the need for fish ladders at the dams at outlets of the major lakes, not required fish passes at these obstructions in the Sissiboo River system.

Present Development Proposal:

The plans of the Nova Scotia Power Commission have been outlined in their letter of April 3, 1958 to our Chief Supervisor at Halifax, and in their plan 68-31-5 dated November 1957, scale 1"=1320' with 10 foot contours and flowage areas indicated.

The following description, plan (fig.2), and digram-
etic section (fig.3) have been prepared from their letter
and plan.

(a) Weymouth Falls Development

This development will consist of an
earth-fill structure in the main river bed with an
intake dam containing the intake, bypass and spillway
located in a saddle adjacent to the river valley. A
short pipeline, approximately 300 feet long will convey
the water to the powerhouse. A 1600 foot tailrace

cut will lead the discharge to tidewater. Centre-line
of proposed dams is approximately 2000 feet upstream
from existing dam. General data on development:

- Installed capacity - approximately 11,500 HP
- Storage in Headpond - Nil
- Tailwater Elevation 8.0 to 12.0
- Headwater Elevation 128.0 at spillway crest
- Head (average) 118.0 feet
- Reservoir level fluctuations: Negligible as far as operating of plant is concerned, but maximum flood conditions expected, would raise level to elevation 130.5.
- Storage in Headpond -
- Discharges from turbine: 392 C.F.S. min. continuous
- Head, maximum 980 C.F.S. Max. with installation at 40% L.F.
- Reservoir level fluctuat
- Drainage Area: 240 square miles

(b) Sissiboo Falls Development

A concrete gravity dam, with earth-fill
wings will be constructed on the site of the existing
concrete spillway of the present Sissiboo Falls Plant
to be purchased by the Commission from the Digby County
Power Board. The powerhouse and spillway will be
incorporated in the gravity section.

or Grand Lake is at approximately 184.0. An earth-fill

Installed capacity - approximately 8400 HP
 Storage in Headpond - Nil
 Tailwater Elevation 128.0
 Headwater at elevation 215.0 at spillway crest
 Head 87.0 feet
 Reservoir level fluctuations: Negligible as far as operating of plant is concerned, but max. flood conditions expected would raise level to elevation 217.5.
 Discharge from turbine: 378 C.F.S. min. continuous or 950 C.F.S. max. flow with turbine installation at 40% load factor.
 Storage in Headpond - 47,000 acre feet with a maximum drawdown of 22 feet effective 40% of the time.
 Drainage Area: Approximately 220 square miles.
 Headwater Elevation 215.0 at spillway crest
 Head, maximum 85 feet
 Reservoir level fluctuations: Under normal operating conditions this level will be maintained about spillway level of 210.0 or 207.0 as the case may be. Allowance has been made for a maximum drawdown of 30 feet in lean water years.

(c) Riverdale Development

This development is located at the elbow in the river bed adjacent to Provost Lake and will consist of an earth-fill main dam with two wing dams. The spillway will be located in a wing dam and will spill into the headpond of the Sissiboo Falls Development. The powerhouse will be situated at the toe of the main dam.

Installed capacity - approximately 8200 HP
 Storage in Headpond - 28,000 acre feet with drawdown of 30 feet effective approx. 8% of the time.
 Tailwater Elevation 215.0
 Headwater Elevation Max. 307.0 to 310.0 (not finally decided on as yet)
 Head, maximum 95.0 feet
 Reservoir level fluctuations: During normal operations will be maintained about spillway level of 310.0 or 307.0 as the case may be. Allowance has been made for a maximum drawdown of 30 feet in lean water years.
 Discharge from turbine: 342.0 min. continuous or 860 C.F.S. maximum flow based on 40% load factor installation.
 Drainage Area: 187 square miles.

(d) Grand Lake Development

Existing water surface level of Sissiboo or Grand Lake is at approximately 384.0. An earth-fill

dam at the outlet of the lake will raise the surface to spillway level at elevation 415.0. A powerhouse will be situated at the toe of the main dam. The spillway will be located in a wing dam and discharge from this spillway will be into Tuskett Lake.

Installed capacity - approximately 4200 HP
Storage in Headpond - 47,000 acre feet with drawdown of 35 feet effective approximately 20% of the time.

Tailwater Elevation 350.0
Headwater Elevation 415.0 max. at spillway crest
Head, maximum 65 feet
Reservoir level fluctuations: Under normal operating conditions this level will be held at just under spillway crest by discharge from Fourth Lake Storage. Maximum high water at flood will be elevation 417.5. Minimum water level can be as low as elevation 380.0 depending on water required from storage to maintain minimum, continuous flows downstream.

Drainage Area:

Discharge from Turbine: 254 C.F.S. min. continuous or 640 C.F.S. maximum flow.
Drainage Area: 136 square miles.

(f) General Remarks by Chief Engineer

During normal operations at Weymouth Falls

(e) Fourth Lake Development

An earth-fill dam at the outlet of Fourth Lake, whose present water level elevation is 448.5 will raise the water to spillway crest elevation 470.0. This water will be backed up into Fifth Lake, presently at elevation 466.0 to form one basin. A generating station will be installed at the toe of the main dam and the spillway, in a wing dam, will discharge into the watershed of the Tuskett River.

Installed capacity - approximately 2300 HP
Storage in Reservoir - 57,600 acre feet with a maximum drawdown of 22 feet effective 40% of the time.

will possibly be cut back. Flow down the Wallace and Mistake Rivers and MacDonald Brook will be uncontrolled.

Tailwater Elevation 415.0
Headwater Elevation 470.0 maximum at spillway crest.
Maximum Head 55.0 feet
Reservoir Level Fluctuations: Maximum water level will be at elevation 472.5 in cases of maximum flood. For sixty per cent of the time the water level will be maintained at at least 470.0 but will be drawn down below this during the dry season to a minimum of elevation 448.0 in order to maintain minimum continuous flow downstream. Other storage as required will come from Grand Lake and Riverdale reservoirs. Drawdown time on this storage is estimated to be required approx. 40% of the time.
Discharge from turbine: 167 C.F.S. minimum continuous flow with a maximum flow of 420 C.F.S. with proposed installation at 40% load factor.
Drainage Area: 101 square miles.

(f) General Remarks by Chief Engineer G. D. Mader of N.S.P.C.

All plants will have an installation of one turbine only and bypasses are to be provided at each development to pass water during shutdowns.

During normal operations at Weymouth Falls and Sissiboo Falls at all times and the other three plants during periods of full storage, excepting times of flood condition, the headwater levels of each forebay can be expected to remain at or near a point just below their respective spillway crests, withstanding a possible variation downward of, at most, one foot. This will allow for normal operating conditions with possible alternating of generation from the various plants during times of low demand. No sustained break in the flow of water from Fourth Lake to tidewater need be anticipated except during wet seasons when the flow from Grand Lake and Fourth Lake will possibly be cut back. Flow down the Wallace and Mistake Rivers and MacDonald Brook will be uncontrolled.

It is estimated, from studies of the mass curve, based on the overmachining of the plants, that no appreciable spill will be experienced in approximately 60% of the years of operation. At other times the spill will be somewhat flashy during very wet years. It is hoped that most of what would normally be spilled, over and above the calculated minimum continuous flow, will be generated in the form of secondary energy. The average run-off taken from Bear River records is estimated to be approximately 2.37 C.F.S. per square mile or 570 C.F.S. at Weymouth Falls. This figure is appreciably lower than the capacity of the turbines.

Effects of Development on the parts of the system:

(Note: Most measurements given here are only approximate, for guidance in biological assessments)

(A) <u>Fifth Lake</u>	<u>Present</u>	<u>Proposed</u>
Level, high		470' 00 acres
low	466 +	? (460 +) acres
Area, high		1600 acres acre-ft.
low	1100 acres	1100-acres
Volume, high	? V	V+3500 acre-ft.
low	? ?	? ?
Depth, high	? d	d + 4'
low	? ?	? ?

It is assumed that the drawdown level in this area probably would be about 5 feet below the present lake level and approximate the original minimum lake level. It is noted that impounding an additional 4' of water would increase the lake area by roughly 50%. Much of the inundated area is now indicated as marshy.

The increase in surface area could

be expected to result in increased summer water temperatures, especially in surface water discharges to the next storage area, but it is perhaps likely the levels in warm weather will usually be drawn down to approximately the present level so the effect on temperature should be small in the overall picture.

The small rise in surface level proposed should result in relatively little effect on higher surface temperatures and more or less compensating greater depths. feeder streams.

The present outlet dam would become a barrier only at low water levels.

(B) Fourth Lake

	<u>Present</u>	<u>Proposed</u>
Level, high		470'
low	448.5'	448'
Area, high		3000 acres
low	1000 acres	1000 acres
Volume, high	? V	V + 30,000 acreft.
low		2 (V)
Depth, high	? d	d + 22'
low	?	?

Minimum storage level proposed is approximately the present level. Full storage level would be 22' higher and provide probably about 35,000 acre-ft. of water in conjunction with Fifth lake which will become part of it at levels over about 466'. This volume could maintain the average estimated runoff from the catchment above Fourth Lake dam for roughly 50 days, or the average estimated flow of 570 cfs at Weymouth for about 28 days.

From examination of the topographic map (fig.2), no important tributaries exist which would be affected by a rise in storage level, except perhaps for Beavertail Lake which would become completely absorbed as water levels rise above about 460'.

Total lake area would become as much as 3 times present area, with the probable result of again higher surface temperatures and more or less compensating greater depths.

It is expected that drawdown will be required about 40% of the time and no doubt would usually occur during most of the period June to November. The large drawdown possible (22 ft.) makes it perhaps unlikely that heavy permanent aquatic plant beds could survive along shore shallows to provide a good environment for warm-water sports fish. Any vegetative growth during summer low-water periods along exposed shallows will tend to increase the winter oxygen demand. This would perhaps be unimportant because of the relatively large capacity proposed.

It is assumed a suitable environment for speckled trout would be maintained, perhaps requiring stocking if no suitable spawning grounds exist or remain.

There is a spillway provided which may occasionally be used to send surplus water into Tusknet Lake, at the head of the Silver River, tributary to Tusknet River.

The outlet structure proposed would include a powerhouse using an available head of about 55' maximum. Damage may result to a fraction of trout or other

Again, the surface would be roughly fish which may descend through the turbine. The number tripled, with increased surface heating compensated by so damaged might not warrant any special screening. greater depths. Inflows from Fourth Lake would perhaps

There would appear to be no reason be surface waters and perhaps be warmer than at present, to provide for migration upstream. but as now would be drawn off at the same end of the lake

(C) Sissiboo Lake (Grand Lake) general lake water temperatures.

	<u>Present</u>	<u>Proposed</u>
Level, high	The proposed high water level w 415'	415'
low	384'	380'
Area, high	Third Chubb Lake. There do not 2600 acres	2600 acres
low	900 acres	900-acres
Volume, high		V + 35,000 acre ft.
low	? V	V - 2,000 acre ft.
Depth, high	This has an area of about 50 d + 31'	d + 31'
low	? d	d - 4

Again, minimum storage level proposed is approximately the present low level, with a 35' drawdown from full level giving an approximate storage about equal to the total in Fourth and Fifth Lakes. However, this drawdown would not normally be used to maintain flows until upstream reserves are exhausted. No estimate is given of the expected frequency or extent of probable drawdown. It is assumed it would probably not occur every year, would seldom be fully used, and would not often be of long duration. There would probably therefore be an opportunity for more normal vegetative growth along the shores and in the shallow flowage areas than in Fourth Lake. area if spawning areas are available in the vicinity of Deadwater Lake or elsewhere or if supplied with hatchery stock.

(F) Riverdale Again, the surface would be roughly tripled, with increased surface heating compensated by greater depths. Inflows from Fourth Lake would perhaps be surface waters and perhaps be warmer than at present, but as now would be drawn off at the same end of the lake and might have little effect on general lake water temperatures.

The proposed high water level would envelope Third Lake and Chubb Brook, but would not affect Uniake Lake, or Third Chubb Lake. There do not appear to be any other important tributaries.

(D) Deadwater Lake

This has an area of about 50 acres, and would not be affected by proposed development except that more water would be available, *with a steadier flow through* and the quality may alter slightly.

(E) #1 Development

	<u>Present</u>	<u>Proposed</u>
Level	310' +	350'
Area	30 acres	300 acres

It is noted this project is not included in present plans but may apparently be developed in the future. It would offer little storage. The flowage would include Hackmatack Lake and several widened sections of the present river, with several acres probably less than 5' deep near the upstream end.

It would perhaps provide a valuable speckled trout area if spawning areas are available in the vicinity of Deadwater Lake or elsewhere or if supplied with hatchery stock.

or similar purposes.

(F) Riverdale (#2) Development

	<u>Present</u>	<u>Proposed</u>
Level	215' to 310'	310'
Width	generally 100' ±	-
Area	75 acres	1600 acres
Volume, 280' to 310'	-	20,000 acre ft.
Depth	-	0 to 95'

This development would inundate approximately 5 1/2 miles of main river channel, plus the lower two miles or so of Wallace River, and would include Provost Lake which has a present surface level shown as 306.9'.

It might, like the #1 Development, produce speckled trout well if spawning areas are available or hatchery stock supplied. It is not known what potential areas exist. Any upstream from the development would be cut off by the #1 Development if built.

If maximum water temperatures become too high and no cool springs or holes below a summer thermocline exist, trout might not be able to survive.

Except for small local areas near the mouth of the Wallace River and Provost Lake the contours indicate generally steep banks within 10 feet or so of fall storage level.

It is noted provision is made for a draw-down of 30 feet to enable use to be made of the substantial available storage capacity in very dry years. It is assumed this would not normally be used until all water stored at Sissiboo Lake should be used, and therefore would not be expected in occasional years unless ~~required~~ for maintenance or similar purposes.

(G) Sissiboo Falls

Present

Proposed

Length of Pond	about	<u>Present</u>	about	<u>Proposed</u>
Head Level of Headpond	about	165'		87' 215'
Width of river		generally about	100'	generally about 500'

from Length of ponds, with a 1 1/10 miles excavated 5 miles

in the Head bed from the new power 36 1/2' to approximately 87' the

existing dam site, losing part of the present headpond area.

Probably any fish moving upstream from tidewater would have

access as far as the powerhouse draft tubes. A by-pass

ing about 5 miles of the present river channel and present

spillway is provided near the powerhouse but it is expected

gravel beds if such exist. It would also include approx-

imately 1 mile of the Mistake River. The turbines proposed could

use several times the quantity passed by the present turbines.

Normal turbine flows will be 392 to 980 c.f.s. with average

is roughly four times that of the present wheels, so the ~~be~~

would be little spill expected. A normal fishway collection system for the

site would probably require about 10 c.f.s., or 2% of average

flow, from one entrance above the draft tube. To surmount

approximately 10 c.f.s., equivalent to about 2% of the

estimated average annual flow, and would probably, if of normal

gallery probably at least 1200' long, costing roughly \$100,000.

plus water consumption. A fish pass based on the lock

plans for the structures. It appears a fishway would serve

no useful purpose. The ladder at the two lowest developments,

system and water supply.

As with the Riverdale Development, this

headpond would likely produce speckled trout in increased

numbers if spawning areas or hatchery stock are available

and water conditions remain suitable. The banks

2000' of White Brook and 1500' of McDonald Brook. The banks

courses are generally steep.

(H) Weymouth Falls

Present

Proposed

Level of Headpond	ly differ	about 66'	those at 128'	ent,
Width of River		generally about	100'	from 100' to 1000' approx.

except perhaps for temperatures, and it could probably produce

Weymouth Falls cont'd

Present

Proposed

Length of Pond

about 2 1/4 miles

about 4 1/2 miles

Head

about 59'

87'

General Effects of the Proposed Development:

It is proposed to build the new dam upstream from the natural falls, with a 1600 foot excavated tailrace in the riverbed from the new powerhouse to approximately the existing dam site, losing part of the present headpond area. Probably any fish moving upstream from tidewater would have access as far as the powerhouse draft tubes. A by-pass spillway is provided near the powerhouse but it is expected that it would seldom be used. The turbines proposed could use several times the quantity passed by the present turbines. Normal turbine flows will be 392 to 980 c.f.s. with average available flow expected of 570 c.f.s.

A normal fishway collection system for the site would probably require about 10 c.f.s., or 2% of average flow, from one entrance above the draft tube. To surmount the 120' head would require a total length of ladder and gallery probably at least 1200' long, costing roughly \$100,000, plus water consumption. A fish pass based on the lock principle or trucking would require a similar collection system and water supply.

The proposed headpond would extend practically to the foot of Sissiboo Falls, inundating approximately 3 miles of present more or less natural river channel, plus about 2000' of White Brook and 1500' of McDonald Brook. The banks of the affected water courses are generally steep.

It is not likely that conditions in the headpond would be greatly different from those at present, spawning grounds, and some obstructions may warrant removal or improvement for such a purpose.

except perhaps for temperatures, and it could probably produce increased numbers of speckled trout. Available information suggests there is little if any natural gravel available.

General Effects of the Proposed Development:

It would appear likely that access to the lakes affected will be greatly improved. Since levels would be relatively stable at Sissiboo Lake it could perhaps develop as a suitable area for camps and a base for an expanded local tourist and guiding industry. Fishing pressures will no doubt increase but lake areas would be larger and perhaps able to support larger fish populations or other attractive varieties of sport fish. Also it will probably become much easier to distribute hatchery-reared fish to the main lakes. Indications are that possibly fewer trout could be naturally reared.

It would appear that any prospect of developing salmon in the only possible suitable part of the system - the river below Sissiboo Lake - would be almost completely eliminated by the proposals to flood the river channel by sections to make use of the full available potential head. There would therefore appear to be no reason to consider fish ladders at the two lowest developments.

Any consideration of fishladders in the upper areas would be based on their need for other fish populations such as speckled trout. Such consideration would include the possible need for screens, either at turbine intakes or at spillways.

There may be a justification for fish ladders on smaller tributaries to permit access of trout to spawning grounds, and some obstructions may warrant removal or improvement for such a purpose.

Suggestions:

APPENDIX I

This preliminary report has been prepared from file material, with no direct knowledge of local conditions. Numerous suggestions have been made in it which must be checked by those familiar with the fish and the locality concerned, and have been included solely as a basis for criticism and further comment by Departmental personnel. It is expected that such correction and expansion will be made freely to ensure that a factual final report will be produced.

(e) A few of the matters concerning which further information or comment would appear particularly desirable are listed in Appendix I.

(f) Comparison with adjacent existing hydro development projects, as well as the effects of the present development of the Sissiboo would doubtless form a principal basis for decisions on probable effects of the present proposal.

ponds could become critical, a check of exact present and proposed operating conditions should be made with a view to developing suitable modifications to operational procedure.

(i) Comments regarding clearing of flowage areas as usually practical in Nova Scotia, the effect on fisheries and fishing, and suggestions for best practice.

(j) Description of any pollution sources. None appear to have been reported.



A P P E N D I X I

FIG. 1

Notes for further consideration:

- (a) General lake conditions for maintenance of present or increased supplies of speckled trout and exotics such as lake-trout, splake or other salmonoids and sport fish of other families under both present and proposed development.
- (b) Suggestions for reservoir operation to provide optimum environments for such fish under both present and proposed development.
- (c) Suggestions for other improvement work in both cases.
- (d) Suggestions for use of hatchery stock in both cases.
- (e) Suggestions regarding outlet screens in both cases.
- (f) Suggestions regarding depth of draw-off in both cases.
- (g) Suggestions regarding fishway requirements at each dam site in both cases.
- (h) If conditions in Fifth Lake or any other reservoir areas or headponds could become critical, a check of exact present and proposed operating conditions should be made with a view to developing suitable modifications to operational procedure.
- (i) Comments regarding clearing of flowage areas as usually practical in Nova Scotia, the effect on fisheries and fishing, and suggestions for best practice.
- (j) Description of any pollution sources. None appear to have been reported.

R. J. Damer

FIG. 2

FIGURE 7

Sissiboo Falls, Nova Scotia

FIGURE 6

Sissiboo Falls, Nova Scotia

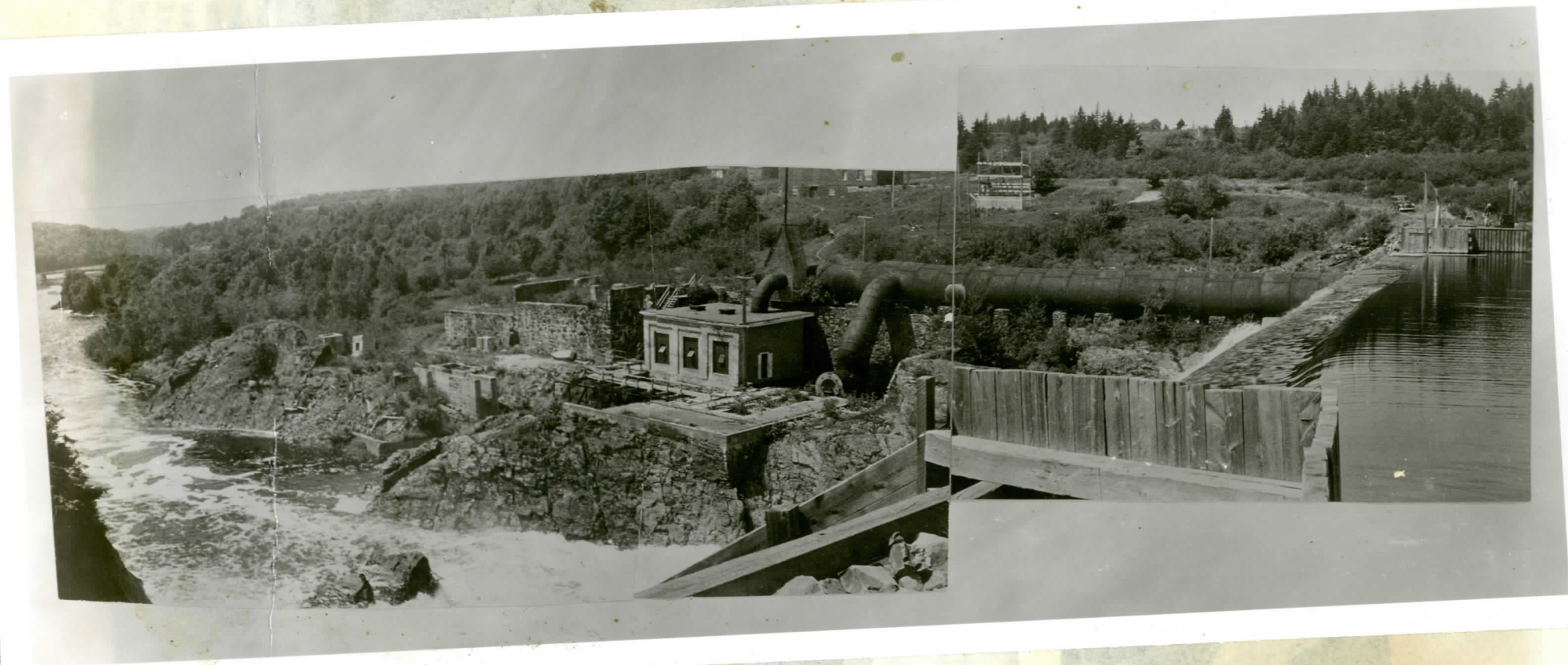


Sissiboo Falls and dam from right bank
above powerhouse. (c.1950)

Lower River St.
1950



Sissiboo Falls from right bank, downstream.
(c.1950)



Weymouth Falls, dam, powerhouse, and lower river from left bank
crest of dam. (c.1950)

FIGURE 7

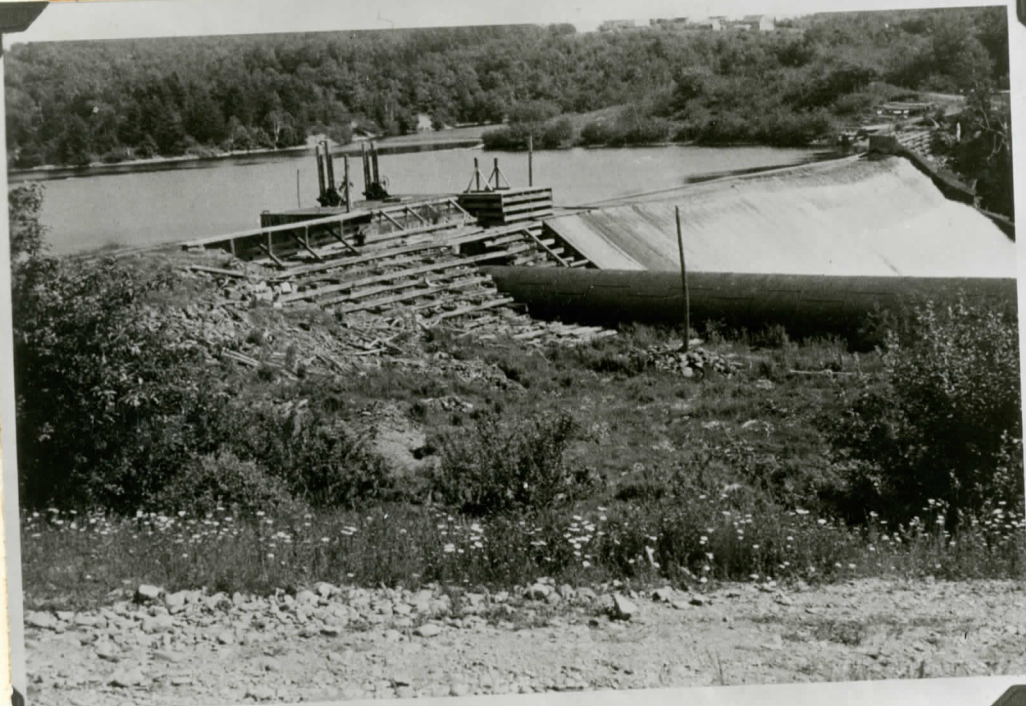
Weymouth Falls, Nova Scotia

FIGURE 8

Weymouth Falls, Nova Scotia



Weymouth Falls, full view of spillway. (c.1950)



Weymouth Falls, dam and headpond from left bank. (1951)

REMARKS ON THE PRELIMINARY REPORT,
SISSABOO RIVER, DIGBY CO., N.S.

After reviewing Mr. Hamer's report, and the accompanying map of proposed Hydro changes, the following comments and suggestions are offered:

GENERAL CONSIDERATIONS

1. It appears very impractical to consider this system for anadromous fishes, including gaspereau, for which the proposed layout would be most suited.
2. All Flowages, with the possible exception of Fourth Lake, probably could be maintained as separate and fairly well balanced residual game fish environments without the use of fishways; but it is believed that those flowages above Grand Lake Development would be better utilized if opened to each other by fishways at: (a) Fourth Lake development and (b) at the dam between fourth and fifth lakes (for low-water use). Inlet streams to Sissaboo Lake, which could provide natural spawning and nursery areas, are not extensive. There is only one inlet to Fourth Lake, and the dam between fourth and fifth lakes would provide a complete barrier to migration during: (a) critical temperature periods in late summer when low drawdowns occurred, and (b) during October and November when spawning migrations must occur.

Fishways would help to make this system of flowages into one biological unit, giving relatively complete freedom of movement to game fish throughout feeding sorties, periods of critical local environment, and periods of spawning migration.

3. From a Map inspection, the flowages appear to be relatively shallow, exposed to wind action, and will have extensive shoals subject to regular drawdown. This is likely to result in (1) relatively little thermocline for good summer holding conditions for cold water fish species, and (2) reasonably good environmental conditions for warm water fishes. In other words, it is very possible that the warm water species, (usually the undesirable species) may take over from the native speckled trout in the new habitat.

Biological examination, after the flowages are created, should indicate this.

4. Exotics - (a) Brown trout, or Rainbow trout may do better than the native trout (char) under the newly created conditions by (1) being better adjusted to survival in warm water conditions, and, (2) by being more versatile in their use of spawning and nursery areas, and, (3) by attaining large enough size to become carnivorous in their feeding habit, thus helping to maintain a balanced warm water - cold water fish population.

It is understood good speckled trout fishing does occur above 5th Lake. We know that the Rainbow trout - Speckled trout relationship is quite satisfactory. The Brown trout-Speckled trout relationship is not so well known and there is some evidence to indicate the Speckled trout fishery does not stand up where Brown trout utilize the same habitat.

It would be possible, after further investigation, to consider a diversified sport fishery for the system, utilizing some of the dams as fish blocks; or, if necessary, utilize other types of barriers, e.g., electric screens, or fixed screens.

e.g. Brown trout and Speckled trout below Grand Falls development. Rainbow trout and Speckled trout above Grand Lake development.

Note: It is realized that introducing Rainbows (spring spawners) with other species, creates protection problems but this perhaps could be resolved by considering the flowages as Rainbow water and the tributaries as Speckled trout waters and perhaps set back the S.T. opening date to May 1st.

now known A to B the water

(b) Chain pickerel (pike) - One very bad feature noted is that a portion of the 4th Lake water is to be diverted to the Tusket system. If chain pickerel (pike) are in these waters, it will be only a matter of time before this undesirable exotic warm-water species spreads throughout the extensive Tusket watershed. There seems to be no practical way to prevent this extension of species, other than not to permit this spillage.

B. SUGGESTIONS TO APPENDIX 1

A & B. In respect to Speckled trout, the flowages, if properly cleared, will increase the water area, feed, etc., but will no doubt flood out a large proportion of the spawning and nursery areas now used. The Power Commission and other interests, using dams, etc., in the area, will have to guarantee the removal of any barrier in any of the tributary streams to the flowages that would hinder or impede fish from using new spawning areas further upstream than formerly used.

C & E. Turbine entrances should be screened where necessary to prevent entry of large fish; or, when proved practical, electric fish diverters may be employed in conjunction with a fishway or sluice. This could be of direct benefit to the Commission, if eels are present in the system.

D. Use of hatchery stock will be very essential for the first few years until new spawning grounds are located and made accessible; or, in the case of exotics, until these species have become self-sustaining. Size and numbers for

/stocking

stocking will be determined by a complete survey of the system after the flowages are full.

F. As gradual as is possible, considering the dual usage of the water (power-fish).

G. See General Considerations Nos.1, 2, and 4.

H. Conditions in all headponds will have to be studied and reported upon after they are full.

I. & J. Clearing of the flowages is very important and should be done thoroughly.

Serious pollution conditions occur as a result of decaying vegetation, if this is not done, e.g., Grafton Lake, N.S., Sisson Lake, N.B., Anderson Lake, N.B., and many beaver ponds.

JMB & GACW/mfm

July 4, 1958.