St. Croix River

N. B. and Maine

Joint Fisheries Commission

Inquiries, 1893.

Notes and Interviews,

recorded by

Richard Rathbun.

St. Croix River.

Dams and Mills at Calais, etc.

First Examination, July Aug, 1893

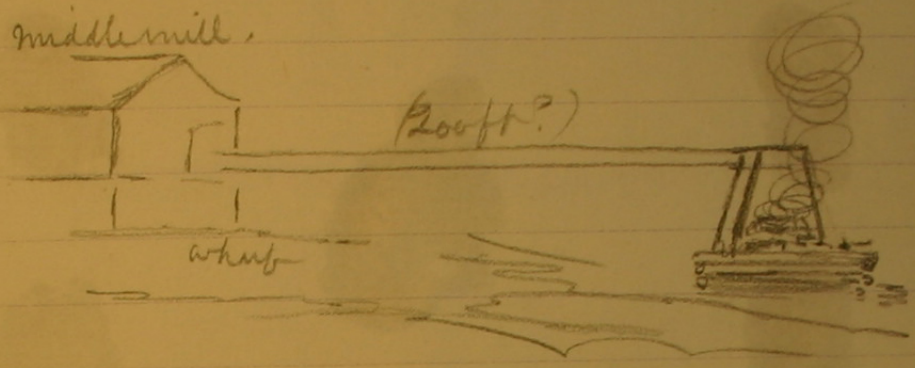
Small rapids and ripples just above R.R. bridge, which are covered at high water. Not much sawdust is retained here, as we can see pebbles on bottom. Behind boulders in eddies some sawdust, but this must be removed by changing currents. Considerable sawdust coming down, which tends to accumulate in lower pool just above main bridge. Very few edgings. In some places there is more of the sawdust than in Elliott. Could not do much damage to

run of fish, but does it cover spawning grounds? such as alewives and shad? No vegetation in stream. This appears like a good salmon stream, pebbly and rocky bottom.

First Dam.

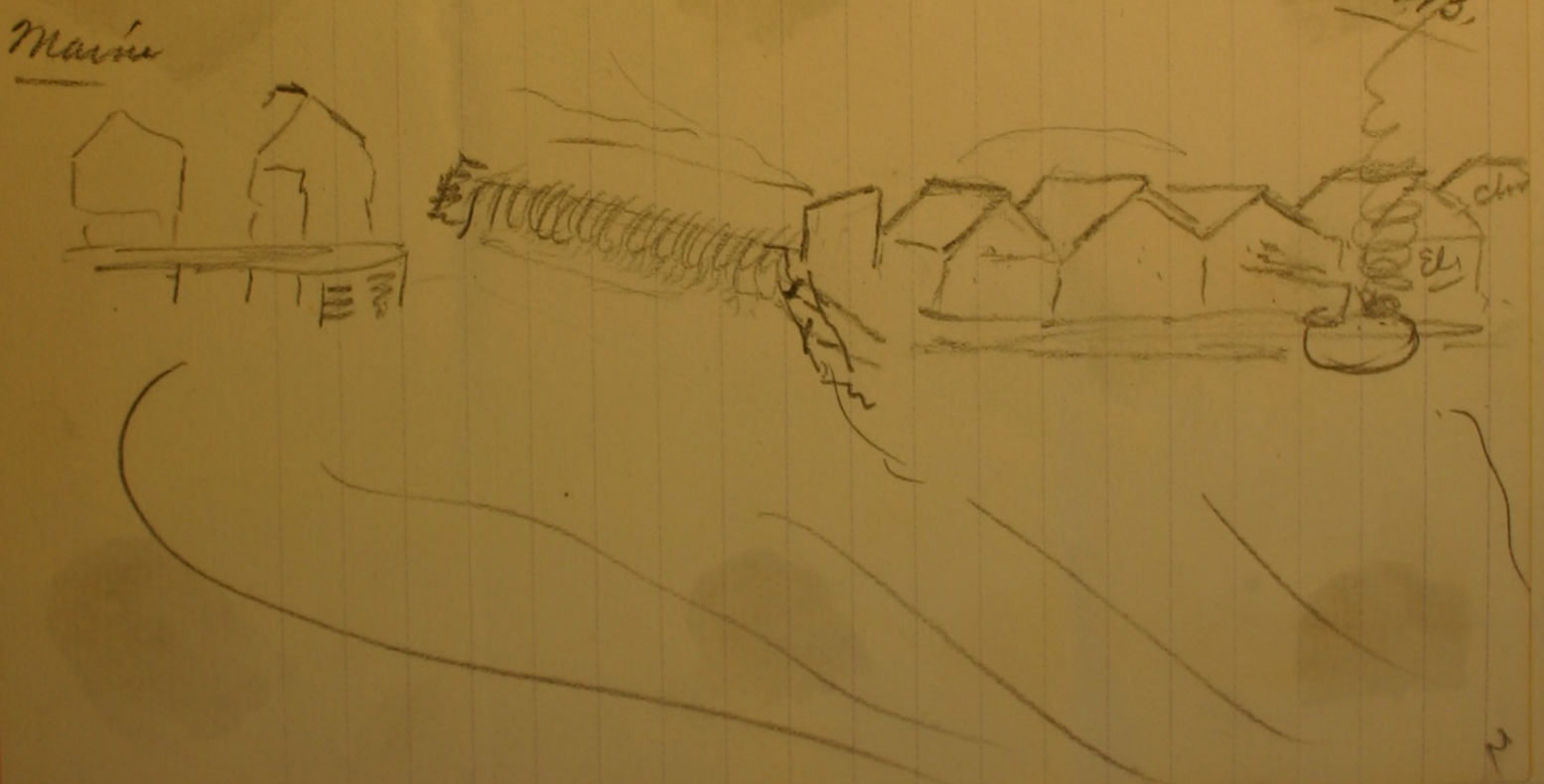
5 build up (roofs) on St Stephens side. Middle one has a platform with tramway running down, level with floor of mill, but high above the water. About 200 ft long, and empties on to a ~~it~~ crib, large, filled with stone, wall of brick towards mill; otherwise

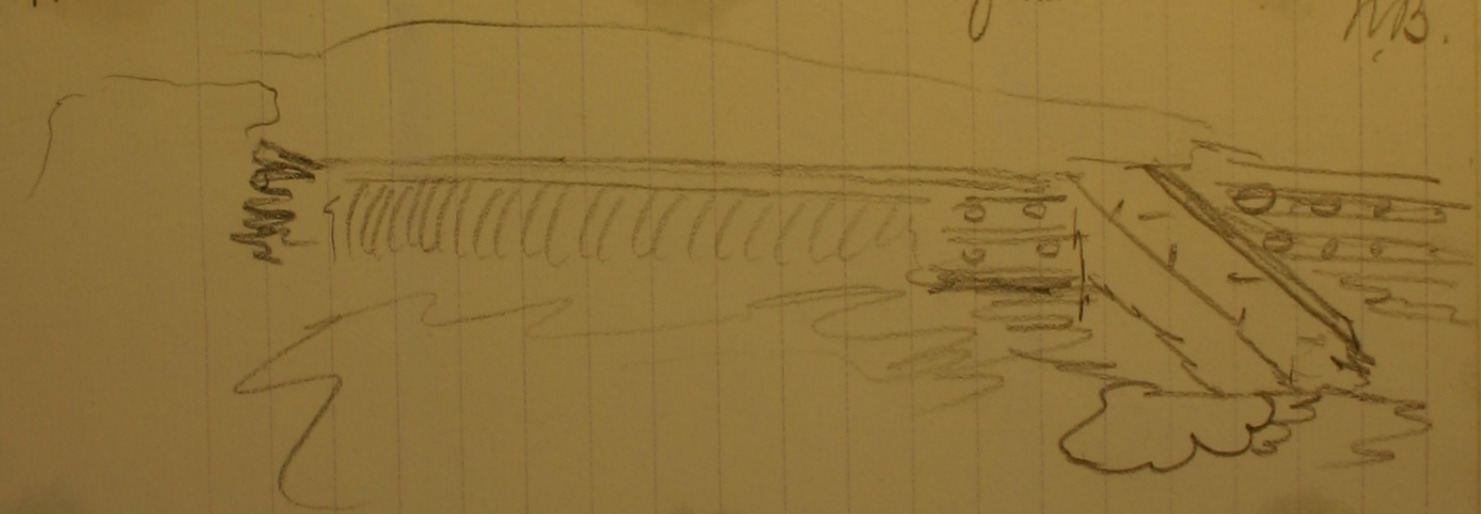
open, Edgings are burnt here.



Maine side of 1st dam. 1 gang saw and planer, F. H. Todd & Son. long lumber. The lower floor, underneath the working floor, has height of about 7 ft. to beams, nearly 8 ft. to ceiling. Below this floor there is considerable space to water. Saw dust falls to this floor, and there is abundant space to put in machinery to carry it off. No place here for burning edgings, but they are carried away.

Frank Todd owns all mills at this point.
L.S. or Illinois Dam




Bor Union.
from Below
N.B.

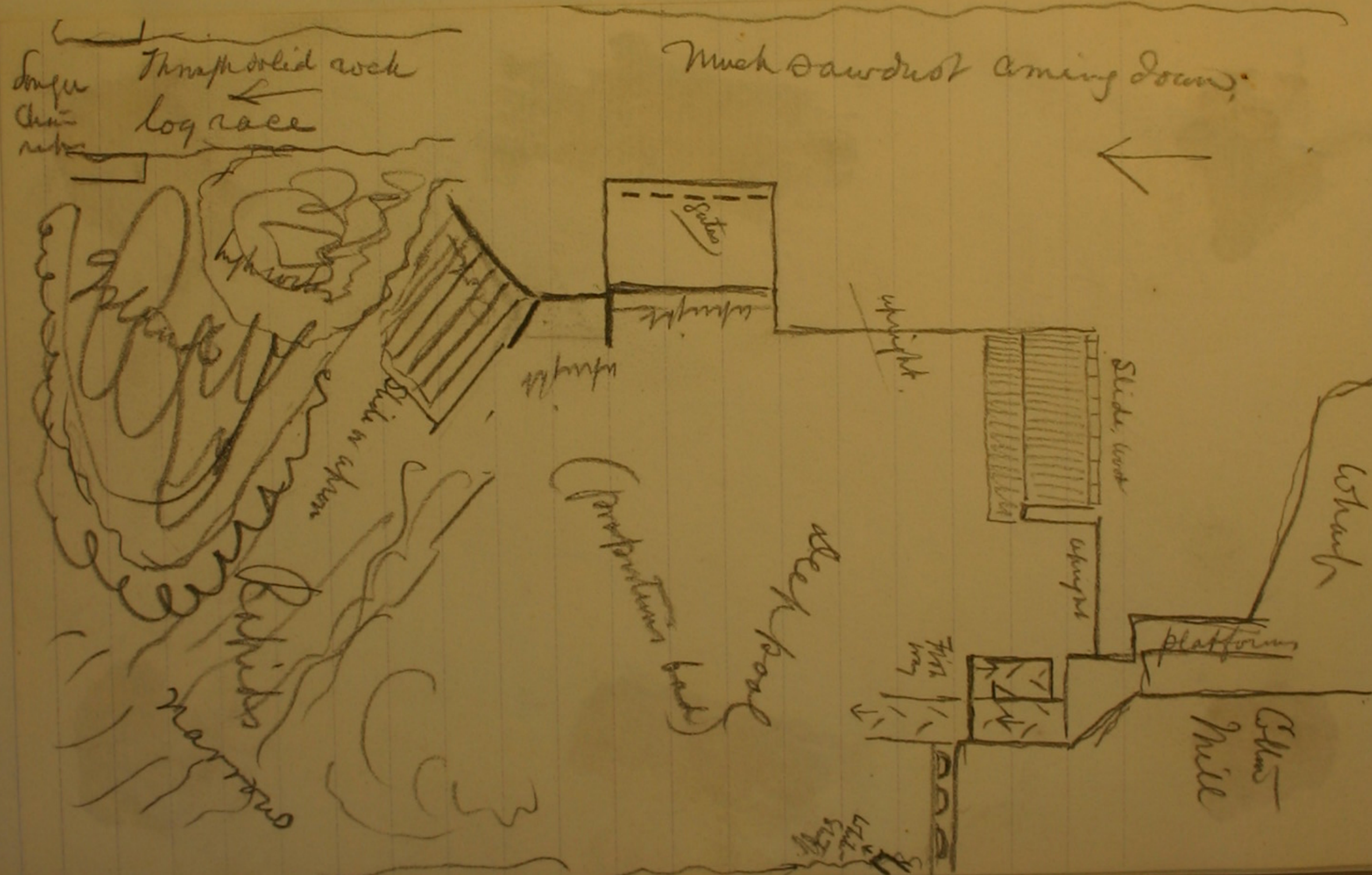
Above 1st or Union Dam

Just above trestle of R. R, we stopped and had a look at the river. The current is ± slight here, and the bottom and shore are everywhere covered with saw-dust (and edgings in places), especially collected in eddies behind rocks and cribs, and forming shoals in places. In this place there certainly could be no spawning ground for anything. The cribs are connected with log booms. They run across the channel here, and a double line down the channel encloses channel with connecting logs.

Tail of raised just above boom. Many logs. Sawdust accumulates among logs in large quantities; is coming down abundantly, also some edgings.

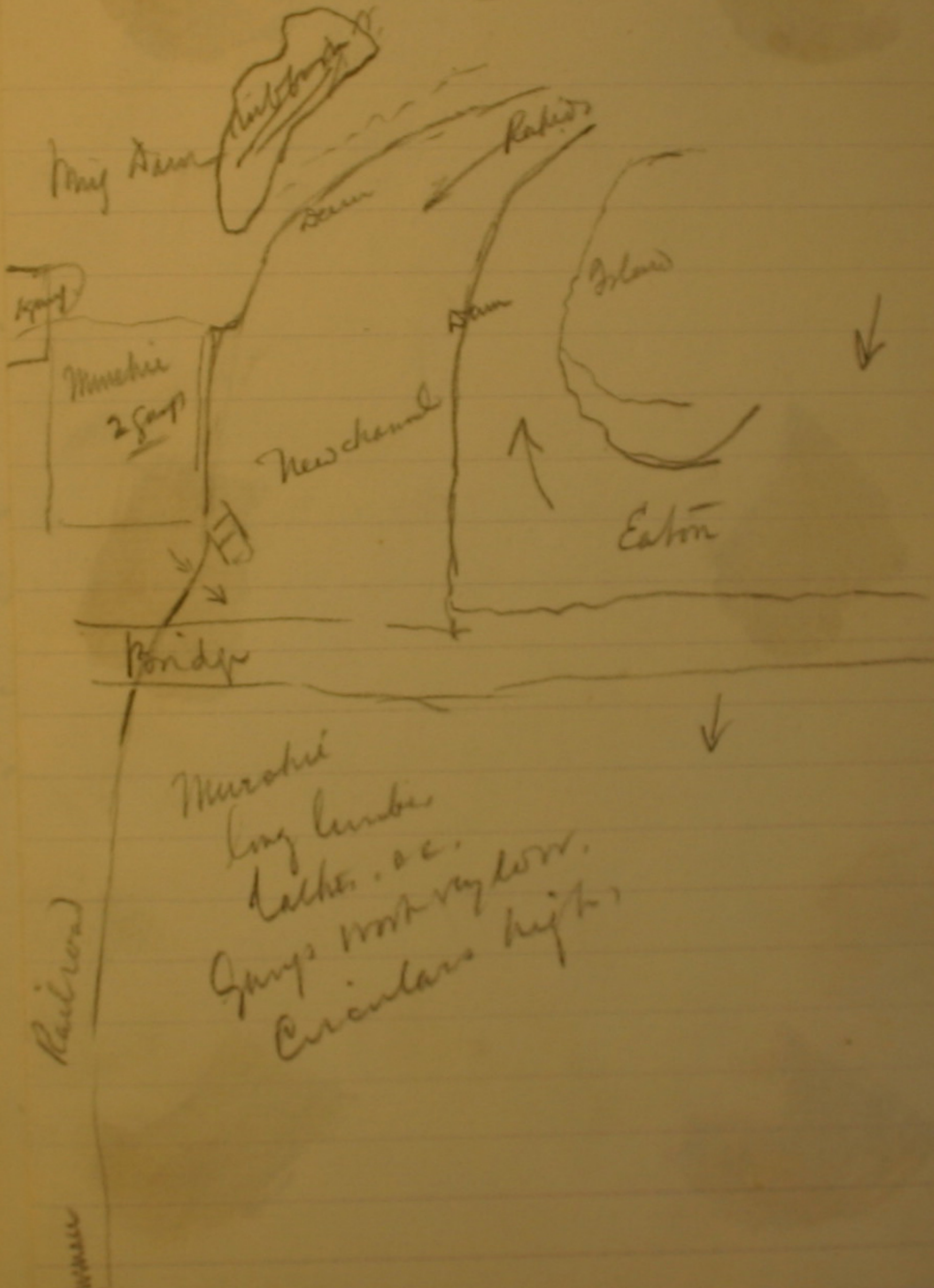
Cotton Mill Dam.

Built very irregularly; evidently to fit the rocks of the old falls. Shores very rocky. Currents very swift as they go over. Water very full of sawdust. Surface more or less covered, and distributed vertically down through the water as deep as one could see.


Much sawdust coming down;
Through solid rock
log race
Gates
upright
upright
upright
upright
Slide, wood
Wharf
platform
Cotton Mill
Fish way
Deep pool
(proportions bad)
Slide or apron
Rapids
narrows

3rd Mills.

3rd Dam

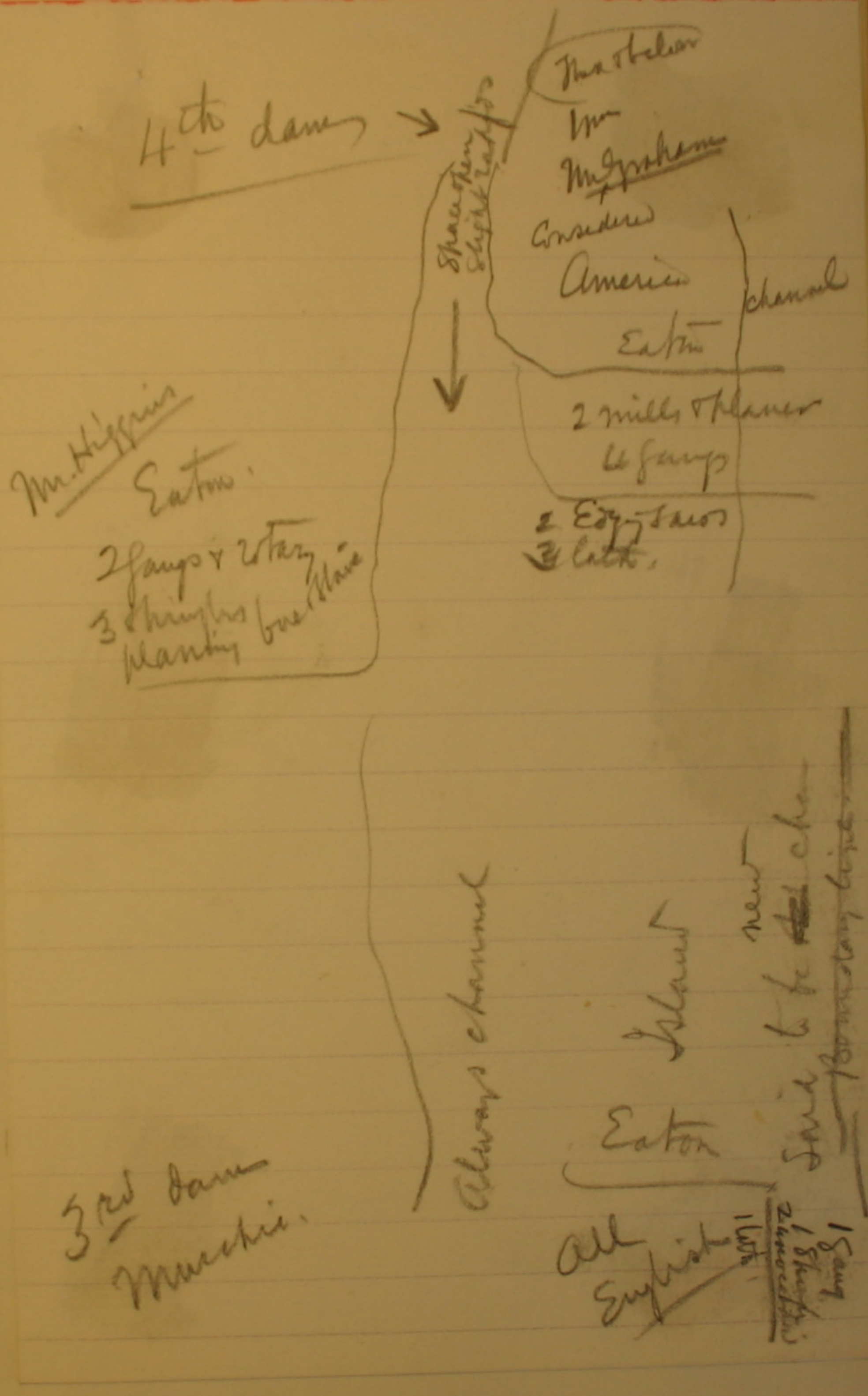


Murchie
long lumber
Lathes, &c.
Gangs work very low.
Circulars high.

4th Dam.

Perfect net work of channels, rocks, piers, etc., about this dam, so that we could not sketch it well. There seems to be plenty of room for fish

Maine side, beginning near shore, upper boy shoots. Mill high; sawdust could be removed. Shingles with long sawdust. Short lumber. H. F. Eaton.


4th dam
Mr. Graham
Considered
America
channel
Eaton
2 mills & planer
Mr. Higgins
Eaton.
3rd dam
Always channel
Island
Eaton
new
All English
1 gang

C. C. Whitlock, Calais, Maine.

August 1, 1893.

Steam saw mill on the end of a wharf in Calais, a short distance below the bridge. Saws box shooks (market and sardine boxes) and laths (from round lumber). Use spruce, fir and pine chiefly, some, but not much hemlock, receiving lumber in short (4 ft.) round logs. Uses small circular saws and one planer. The shooks are roughly sawn, and are finished to evenness by being planed on one side. Shooks for sardine cases go to Maine coast, and market boxes to Boston. The edgings and shavings are burned in his furnace. The sawdust is sold at 3 cents a barrel. Is bought here in Calais for some purposes and also sold to Eastport sardine packers. The sawdust is carried out on a belt at the upper end of the mill and falls on the wharf. In heavy winds some may blow overboard.

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Calais, Maine, August 2, 1893.

Conversation with a man in employ of Joseph Eaton, while at his mill, August 2, 1893 Told us that at one time the channel of river came right up to wharves, and vessels could come right alongside of end of wharf at low water. Thinks that the channel has been filled up by combination of sawdust, edgings, and mud sediment. We saw at low water an exposed ridge or bank, extending lengthwise through mid channel in front of the middle and upper wharves of Calais. Said that in this place used to be deep water of channel. We could distinguish the edgings and sawdust composing it. The muddy bottoms on the sides of the river he said are composed largely of edgings and sawdust. The river bed is still filling up with the sawdust and that some edgings and larger stuff still come down.

The sawdust never becomes firm on the bottom, but readily stirs up, and is so stirred up at every tide in large masses that a boat can hardly get through. A man may step into it, thinking it solid, might sink in to his neck.

Large vessels cannot now load to completion at the wharves, but after partly filling have to drop down before receiving balance of cargo, which is taken down in scows.

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Calais, Maine, August 2, 1893.

Joseph Eaton in lower part of Calais, at inside end of wharf, a short distance north of Granite Works. Planing, tonguing and groving. Small steam mill, shavings burnt in furnace, and sold for use in stables as bedding, etc. Saw some shavings on adjacent slip bottom, which may have blown over.

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CALAIS, ME., AUGUST 8, 1893.

While waiting on Barnard's Wharf, about 3 to 3-30 P. M., the water as far as I could see was covered with sawdust, mixed with a very large proportion of planer shavings, the latter evidently from Whitlock's mill. As the tide comes in this drift is carried into the slips, where it is left by the ebb tide. It may be carried out by the next tide.

Gullies are formed on each side of the wharves, where the vessels become imbedded at low tide. These gullies remain for a long time after the vessels have left. See notes of August 27, 1893, on footprints made in the same material lower down stream.

COTTON MILL DAM, MILLTOWN, N. B., AUG. 12, 1893.

In passing from Princeton to Calais on the train, we observed that the water had been run out of the space between the Cotton Mill dam and the next dam above, by means of the deep gates in the latter. There was water only in the deeper places, and the stream was flowing down through the gates. We observed, however, that water was still passing out through the fishway alongside the cotton mill. They were building a temporary wooden dam at the head of the log sluice to increase their head of water during this dry season. The most curious feature observed was the great thickness and extent of the sawdust, which seemed to fill in most of the bed of the river from the dam up. It was thickest in the eddy by the side of the mill. These beds of sawdust were cut through by many deep, abrupt channels, where currents had been flowing, which served to emphasize the thickness of the beds. We hadonly a glance at this strange sight, but after seeing it one could not help being impressed with the great amount of filling which could result from the letting of sawdust into the stream.

We do not know how long the temporary dam will be allowed to remain, but so long as it does it means cutting off the ascent of the fish by that passage. The fishway then becomes the only place for salmon to be certain of a means of ascending, and it becomes doubly important to determine if the waste from the cotton mill approaches too near the lower entrance to the fishway. The log sluice may be cut off at any time in this way. There was no water passing through it when we saw it, and its entrance must be much lower than that of the fishway. Among the upper dams at Milltown the water was also very low, and the banks of sawdust were everywhere visible above the surface. The only deep water seems to be where the currents have actually to force their channels. The river from the upper dam at Milltown to Union dam is everywhere in the same bad condition, and it is a wonder that salmon can find their way up. Certain it is that there are no places here where spawning grounds can exist for any fishes, and this would probably also be true as far up as Baring.

Noted

Calais, Maine, August 26, 1893.

With the steamer Fish Hawk.

The Fish Hawk was moored to lower (Flushing) wharf on the St. Stephen side, being just below the lower Rose Standish wharf on the Calais side. Detailed here to determine the thickness and character of the sawdust deposits between Calais bridge and Devil's Head.

At high tide 11: A. M. went down to the Ledge on the steam launch.

At 3: P. M. went out with Lieut. Platt in the flat bottom boat and worked during the low tide. Long iron poles were used to probe the bottom.

Interesting observations were made on the flats just below the Rose Standish lower landing. The sawdust here is quite thick and reaches pretty well up to high tide level. When the tide ebbs the sawdust dries more or less, and absorbs much air. This sawdust has

sunk once, has been waterlogged, but the dryness, especially if it be sunny and warm, as to-day, renders it buoyant for a time en mass (not singly). When the tide floods it raises up all the upper part of this bed, which is seen to be lifted all along the edge of the water, the thickness of the lifted layer being as great sometimes as 8 or 9 inches, possibly more. It breaks off with the movement of the water and great patches drift off a short distance. As the water penetrates this dry mass of sawdust, it forces out the air, which appears as bubbles of scum, arising generally in smaller or larger hemispheroidical clusters, sometimes of quite good size. As soon, however, as this floating sawdust becomes aggitated by any movement and the water thoroughly working through it, the masses lose their compactness, go to pieces, the sawdust becoming disseminated through the water and gradually sinking, being drifted more or less by the

currents. The scum accumulates together in large patches or streaks which are drifted with the currents.

Out in flat boat with Capt. Platt, Calais side of the river, on the long flat which begins on the upper side of the lower steamboat wharf, and extends up the clusters of wharves in the city. At steamboat lower wharf, the flat does not extend out beyond the outer edge of wharf, but it soon broadens and reaches far beyond the outer edges of the wharves above. Capt. Platt's sections will give its extent and outer line.

As this flat uncovered on the ebb it gave out a very disagreeable foul odor. Digging down to the depth of a foot the material seemed all to have this odor, but the mud brought up on the rod forced down to a depth of several feet had no odor at all. The day was warm with sun shining brightly.

Made this afternoon the section just above

the wharf marked "long" on the field charts, the first one above the lower steamboat wharf. The conditions seem to be practically the same all along the flat above indicated. It is not a bed of pure sawdust, and in fact seems to contain comparatively little sawdust. There may, however, be thick patches in places.

The top of the flat is covered with a dirty sawdust which gives it a yellowish brown color, when uncovered. Some new sawdust settles upon it at every tide, which adds a fresh and bright color in places, generally in longitudinal streaks. The sawdust on top gives it a coarse granulated appearance. The sawdust is coarse, and apparently not very old. The superficial layer is thin, and changes soon into a mud, which is soft and sticky. Stepping onto it the feet sink down from 3 or 4 to 10 or 12 inches, and it is very difficult to draw them out.

There are distinct evidences of sawdust

only near the surface. I dug down about a foot. The coarse grains of sawdust extended down not over 2 or 3 inches (this will probably vary), then it changed to a bluish mud, but by washing it, I obtained some sawdust, but it was very much finer than that on the surface. (Could it have been reduced to this size by a partial disintegration?). The mud to this depth was foul smelling, and the lower part contained less sawdust.

At probing station 22, depth , all of the bottom of the bore was through a tenacious mud, having no smell. I washed some but got no sawdust from it.

Over the surface of the flat amphipods of small to medium size were legion. They were actively scudding to and fro. They were everywhere, and very thick. Could not tell whether more than one species. Annelids were also somewhat abundant, buried in the bottom, and we found some dead shells of Mya arenaria,

which had been living here. The shells were hinged together. There was also one much smaller bivalve, dead.

Can it be that in some such places as this the sawdust being uncovered at every tide, that it decays and helps to form the mud? Such does not seem to be the case lower down, where thick beds of pure sawdust occur under the same conditions.

A large amount of mud must be brought down by the river, especially in the spring, and this must be deposited, but why not also in the places where we find the pure sawdust, as just below the lower steamboat wharf?

The river was very thick and muddy to-day, during the last of ebb, and first of flood, so that we could not see down through it more than 3 or 4 inches.

On the upper part of this section, Capt. Platt found a bank of sawdust 8 feet thick, resting on slabs, forming a springy mass, and

covering a large area.

There were no cracks on this flat such as occur on the pure sawdust beds when laid dry. Only little shallow channels, winding, were formed by the little rills of water coming down from the upper levels. The foot prints made the day before were nearly as distinct as when first made, showing the more or less tenacious character of the material.

There is evidently a great difference in the character of the deposits making up these flats, especially as to the quantity of sawdust which they may contain. Anything coarser than sawdust is very rare on the flats which I have examined. That is to say, the edgings, etc., form only an inconspicuous proportion. However, planer shavings composed to-day, and have every time I have examined the river along or below the Calais wharves, the greater part, as regards bulk, of the surface drift.

Very possibly they came from Whitlock's small mill in Calais. On the flats above and just below lower steamer wharf, these planer shavings did not, however, appear as a factor.

To-day there has been comparatively little drift of any kind. At high tide and beginning of ebb, the water was especially clean as regards sawdust, and I was almost of the opinion that the mills were not running. Throughout the ebb tide the quantity of this drift did not much increase. This has reference not only to the surface, but to the intermediate depths as far as we could see.

However, a towing net 12 inches in diameter was swung from the Fish Hawk from 10 to 11 A. M., the very last of the flood, but the current on the surface was down stream alongside the steamer. In an hour it had choked up with sawdust, planer shavings and a few small edgings and pieces of wood.

The thickness of the sawdust deposit on

the flat just below lower Standish wharf had not been determined, but it was considerable, nothing else being visible except rocks which projected through it. It is a characteristic of this material that when left dry for any time, it shrinks, causing deep furrows to run through, giving it the appearance of being cracked through in all directions, the cracks often being quite regular in their courses. This flat was pure sawdust on top, and I walked over it. It was like a springy bed, my feet went into it two or three inches or more, but they did not stick as on the flat above. At low tide the distinction between the pure sawdust flats, and those composed mostly of mud is very plain, and they can be told at some distance off.

While down the river in the launch between the Fish Hawk and the Ledge we could see the sawdust in deep water being stirred up by the water whirls or eddies, and lifted to near or

quite to the surface, in frequent patches. This must be going on all the while where the sawdust is not uncovered, and it must be an important means of movement, of stirring up, and feeding to the currents. When the tide goes down, the surface of sawdust flats are, to some extent at least, lightly pot-holed. This may be due to the eddies.

The wind has great influence in determining the place of deposit of the drift, which is actually on the surface. It tends to blow it on one shore or the other as the tide ebbs. On the succeeding flood it is again lifted, and a contrary wind may help to direct its movement elsewhere.

I am inclined to think that the shore deposits of pure sawdust are mostly below the lower steamer wharf. There are, however, heavy deposits of sawdust and coarse refuse in mid channel, way up to the bridge.

It is very important to note that the saw

dust washed from the mud, I think from all sources where it has lain sometime under water, is much smaller than the fresh sawdust just brought down. It will be important to determine if sawdust disintegrates under any of the conditions found in this river. May not the large fresh grains of sawdust go partly to pieces without actually decaying?

What effects have density (the varying densities in this river) upon the transportation and deposition of sawdust.

How much sawdust is carried down stream in Calais river annually? What becomes of all of it? What quantity of other stuff goes down?

Put some one in the field to study the sawdust question in this region.

Make thorough natural history survey of these waters.

August 27, 1893.

On the morning of this Sunday I took the Rose Standish at Calais upper wharf and went to Eastport. While passing through the upper part of the river, the tide was about 2 1/2 to 3 hours flood, and I was enabled to continue the observations recorded above. A large part of the surface from the bridge to some distance below the ledge was covered with the scum.

It formed more or less continuous streaks and patches, sometimes very wide and in places actually covering the width of the river. Over much of this distance mentioned there was more scum than pure water surface. This scum held small patches of sawdust all through it, of variable sizes, but whose thickness I had no means of knowing. These patches of sawdust were in the middle of the river as well as at the sides. They were everywhere, gently floating with the tide. This method of

transporting sawdust, of lifting it from one bed and carrying it to others is very interesting, and should be thoroughly studied. Can it occur in wet weather? Does it occur in anything but dry warm weather, and is it not intensified by the dryness. (There was a heavy shower during this night, (26-27). The sun was up in the morning and shining only an hour or two when a thick fog set in, which was prevailing when I went down the river. The weather generally, however, has been dry and warm).

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St. John, N. B., Aug. 28,1893.

Capt. Platt,
"Fish Hawk",
Calais, Me.

Dear Capt. Platt:-

Please save a few samples of sawdust, as follows, and take to Washington. The coarse sawdust just as it comes down the river on the surface; sawdust from the bed on the Calais side just opposite the Fish Hawk, and from two or three other beds farther down stream; sawdust taken from the eddy whirls below the Fish Hawk and coming from the deeper water; and sawdust washed out from themud. This is to show the size and character of the grains of sawdust under different conditions. Please also have some one obtain a few of the shrimps which the boys were collecting from the sawdust, and preserve the same in alcohol. The surface of the flat where you were working when I was with you was covered with multitudes of a small crustacean, which were moving actively about. The sailor who was left with me in the boat noticed them especially. I wish you would have some one scrape up, strain and preserve some of this stuff. A medium sized

bottle of the material just as it comes from the top of the flat would be sufficient.

R.R.

ST. CROIX RIVER, CALAIS REGION.

AUGUST 1893.

Additional inquiries to be made.

Some of the fishermen were not seen, but they are a hard lot.

The chief dyer of the Cotton Mill was to furnish us some additional facts.

Mr. George A. Boardman can give us much historical information respecting saw mills.

Benj. French, father of the fish warden, Albert French, can give much information regarding history of fisheries. Lives in Calais, near Union Mills.

Charles Pond, Princeton, has been fish and game warden. A very reliable man.

Louis Wilson,

Mrs. F. A. Pike, Plainfield, N. J., or care C. Hart Smith, #1409 Eutaw Place, Baltimore, has material collected by her husband relative to the history of Calais. Mr. Pike had intended to prepare such an account. Mrs. Pike will probably be with Mrs. Lee Porter, in Washington, sometime the coming winter.

Look up reports on Agriculture and Geolo-

gy of Maine, and publications of Maine Historical Society.

Capt. Jas. Worcester, Steam Tug,

" Wm. Coleman, " "

Roach, Engineer, Rose Standish, Lives in Eastport.

The cotton mill at Milltown, N. B., belongs in the canadian Colored Cotton Co. Limited, and is called St. Croix Cotton Mill.

Navigation close at the Calais-St. Stephnn bridge, and that subject needs to be considered only below that point.

THE QUESTIONS PUT TO THE FISHERMEN

Were about as follows:-

What fish are taken(in different sections of the river)?

What is the character of the fishery?

What is the extent?

Can they give any definite figures as to the catch for this and previous years?

Especially as to salmon?

What has been the history of the fishery?

What has been the decline?

To what is the decline due; over-fishing, sawdust, etc.?

Has there been an improvement lately?

To what is it due?

What is the extent of the increase?

When do the salmon run up stream?

When do they come down?

Where do they go to spawn?

Where and when do the young appear, their sizes, etc.?

Alewives, same.

Shad, same.

QUESTIONS--COTTON MILL, MILLTOWN, N. B.

What do dye stuffs consist of?

What quantities of each are discharged daily?

Could waste dyes be kept separate from other wastes, and be emptied separately?

Bleaching material, same.

Oil or grease.

Is strength of dyes, etc. much reduced before going into waste?

Cannot these wastes be kept away from the river?

What is their opinion as to the effects of these wastes upon the river?

Size of drain.

Length of drain.

Number of vats used.

Size and capacity of vats.

Number of vats and of gallons emptied daily.

How often are vats emptied?

How about cutch and bags holding same, which are said to be allowed to go into drain?

What is cutch?

How much bleaching is done?

What material is used for this purpose?

How is the waste disposed of?

What is the consistency of waste of all kinds let into drain?

What is the white waste at lower end of mill?

ST. CROIX RIVER. OCTOBER 24, 1893.

Went from Calais to Eastport this day on the Rose Standish, leaving from the lower wharf at 7.30 A. M. The tide was 3 to 4 hours flood; fog very thick, and the morning disagreeable. Never before saw the froth so thick on the water, nor the sawdust so widely distributed over the surface. They formed together a broad irregu-law streak through the middle of the stream, reaching from along in front of the town to near the ledge. The saw dust was especially thick about the lower steamboat wharf. This observation tends to show, more strongly than previous ones, the power which the flood tide has to lift the surface of the beds of saw dust and carry them up stream, as well as out into the middle of the river. The motion of the waves caused by the steamer sent the saw dust to the bottom, where it formed any considerable patches, as we went along.

On the previous day (Oct. 24) the Rose Standish, in coming up to her lower wharf about 1 hour before low tide, went aground in midstream about 100 yards below this wharf.

She had to remain there about 1 1/2 hours before she could proceed. Her passengers had to remain on board that length of time.

CALAIS. NOVEMBER 5, 1893.

This morning took a walk up the St. Croix River from the Union Mills to about Magarrawaah stream along the railroad track, with some side trips. Being Sunday, no work was going on.

The fishways at the Union Mills and the Cotton Mill were running full of water. The passage way through the upper dam was clogged with logs in several places, and I do not think any salmon could have gotten up. There were some logs at the upper entrance, but the case was worse immediately above the wharf by the side of the mill, where we have gone to observe this passage before. The logs were piled in so that there was no clear passage whatsoever, the water having to work in all directions so as to get through. The water is so low at this place any way, and tumbles over the rocks, that nothing should be suffered to interfere in any way with the passage. It should be kept clear at all times. I would be almost positive that no salmon could get through as the conditions were to-day.

The adjoining mill (Todd Mill, owned by

Eaton & Sons) has one or more planers, and the planer shavings are blown out at the sides into a car, which comes into a small house or coop at the side. There is a hole through the floor by one planer at least, where large quantities of shavings find their way directly into the water. There was a large pile on the underlying rafter, and a bank of them underneath the mill.

Below these mills there were also many edgings in the water, but I should probably have found them elsewhere had I looked. At one of the burning places below on the American side, the water comes close upon the burning dump, and I could see that many edgings found their way into the water.

The water was not much higher to-day than during the summer.

The log sluice-way at the Cotton Mill was clear. They have now a gate and lock on the American side of the bridge leading onto the Cotton Mill dam and I could not get over.

(At the upper passage-way for fish, the logs could easily be prevanted from getting into it, by a log boom, properly arranged).

There is nothing to add in a general way to the remarks made in the summer. From the Union Mills up to the water works the river is foul, full of saw dust, bark, and other stuff, and it can be seen just below or at the surface. It fills in everything except where the water has to cut channels for itself.

Before breakfast I went onto the wharf below the St. Croix Exchange. The water was indeed bad. It had a very dark color and thick unpleasant appearance, suggesting city sewage. It was covered everywhere, as far as I could see, with saw dust and planer shavings. It was about high tide, with no marked current in any direction. The saw dust and shavings lay on the surface, and other portions, partly water soaked, were at different depths below.

Certainly not a pleasant medium for fish, nor very healthful for the adjacent city.

Notes

WARREN BRAGG, CALAIS, ME. NOV. 5, 1893.

Mr. Bragg lives on the Machias Road out from Calais, about 3/4 mile from the point where that road leaves the road leading to Baring. He is a farmer and has a large farm here, adjoining Magarrawaah stream. It used to belong to his wife's father, named Cousin. He owns a large tract of the meadow-land adjoining the stream, on which he raises large crops of hay.

The Magarrawaah is a still stream through the meadows, flowing gently, and in the spring broadens out with the freshet. It appears rather insignificant during the summer and at this season. The railroad crosses it near the mouth.

I was there and inspected it personally this morning at and below the railroad bridge.

The meadow is wide and level. The railroad crosses it with an embankment, there being only a very short bridge above the stream, which is constrict by the abutments, and there flows rather swiftly.

The meadow contained patches of water only in places, but the mouth of the stream widens out just below the R. R. bridge, being very shallow all about the margin. This makes a slight indenture into the bank of the St. Croix, which is now entirely occupied by a large boom of logs, which touches all around the shores. This seems to be a regular place for holding booms, judging from the numerous square piers in this place.

While the stream seems to have relatively good depth above, I could not tell whether it entered the St. Croix by a deep mouth, or whether the actual mouth was broad and shallow. It was covered with bark at the sides, and probably is all over. However, no salmon could possibly enter without passing under a great width of logs closely pressed together, and unless there is a perceptible current from the stream into the St. Croix at this place it is a question whether the salmon could readily find the stream.

The wagon road bridge is a short distance above the railroad bridge, and also in the

meadow. It is a little longer than the railroad bridge, giving a greater width to the stream as it passes underneath.

Both of these bridges are ballasted in spring to hold them down against the freshets, by large stones placed upon them. When the freshets are over the stones are thrown overboard. It has been the custom for some years to throw the ballast from the wagon bridge directly into the stream with the result of nearly filling up the channel under the bridge to the surface level of the water. When I looked at it there was only a slight depth of water, perhaps a foot over the stones near the middle of the stream. All the rest of the water percolated through the stones. No more effectual barrier against the salmon could be made, and it is a striking illustration of gross carelessness or spite, which should be stopped. Upon inquiry I was told that the Road Commission was responsible for this disposition of the stones. More care has been exercised at the railroad bridge, and yet the ballast here encroaches more than it should upon the channel.

The meadow extends some distance above Mr. Bragg's house. In about this place the stream forks and forms what are called the East and West Branches. East Branch (also called Roan Deer Brook) terminates in Vose Lake and Whidden Lake. The latter has been cut off from this branch by a stone dam, and a channel has been cut to carry the water to the plaster mills at Red Beach. West Branch (called also Rogers Brook) terminates in Howard Lake.

According to Mr. Bragg both of these branches are splendid streams for fish, and have been famous for trout, which grow ~~xxx~~ of large size, but their abundance has been greatly reduced by overfishing. They have an abundance of gravelly bottoms, interspersed with many deep pools, the water being swift except in the pools. He is confident that the salmon could want no better spawning grounds.

In the East Branch this quick water and gravelly bottom begins directly at the end of the meadows, and nearly as low down in the West Branch. It reaches in both up to the lakes.

Mr. Bragg does not know of any obstructions to fish in the East Branch, except the stone

dam at Whidden Lake. In the West Branch, however, there are two old dams belonging to mills which are no longer in existence, and there is no longer any use for the dams. They might as well be removed. They have no fishways, and are a complete obstruction to the ascent of any fish.

Mr. Bragg related his experience with salmon in the Magarrawaah as follows: He is well acquainted with the appearance of salmon, both old and young, and could make no mistake about their identity.

Some years ago, perhaps 12, he first noticed fish jumping in the stream between the wagon and railroad ~~krdi~~ bridges. He saw them from a distance, and supposing they were probably sturgeon, paid no special attention to them. A year or two later while out in a skiff on the stream near his house, he noticed three large objects in a pool. He stuck his oar down and frightened them. They went down stream a short distance. He followed them and poked them again with his oar. They returned up stream to the pool. He repeated this twice more, and they always did the same. He had a

good opportunity to observe them, and saw plainly they were salmon. This was the first time he had recognized salmon in the stream. They were of large size and he thought they might have weighed 15 to 20 lbs. apiece.

In subsequent years he caught young salmon in the stream, measuring 6 and more inches long, and his brother also hooked a large salmon, but was not able to land it.

As nearly as he can remember it was about 15 years ago when they first began to throw the ballast from the wagon bridge into the stream. It accumulated so as to quite fill up the stream perhaps 5 or 6 years ago, and since then he has neither seen nor heard of any salmon in the stream. He thinks that the ballast has prevented their ascent, and that if they had a clear way they would come up to spawn as before.

He says that Mr. Geo. A. Boardman has either caught or knows of the capture of salmon in the Magarrawaah, and that he would be a good person to interview on the subject.

He also referred to a young man, recently dead, who had observed salmon in the stream, and had often talked the matter over with him.

If any action is taken on the St. Croix, it certainly should be recommended that this stream be made presentable for salmon.

(COPY) Noted

U. S. Coast and Geodetic Survey Office,
Washington, D. C., Nov. 20, 1890.

Dr. T. C. Mendenhall,
Superintendent U. S. C. & G. Survey.

Sir:-

My examinations on the coast of Maine during the past summer have led me to believe that it is desirable to call your attention to the changes which are constantly going on in the river beds of that locality; changes which cause our charts and sailing directions to become incorrect almost before they can be published. The rivers of Maine, except during freshets, bring down very little natural deposit and from this cause there would be but very slight change in their depth of water, but the owners of the saw-mills, near their headwaters, do not hesitate to throw into them large quantities of saw dust, bark and other mill refuse. The result is that this soon becomes saturated and sinks to the bottom and, as this goes on largely at a time when the river current is not strong enough to carry it into deep water, shoals are formed that soon become a serious

obstruction to navigation.

It is true that at times of freshets some of this deposit is carried away and the scouer is sufficient to somewhat deepen the water where deposits have taken place during a previous stage of low water, but by far the larger portion is so mixed with sand, and mud, that it remains until removed by other than natural means and in a few years the general government is called upon to make improvements that are thus made necessary.

This is markedly the case in the St. Croix, Machias, Narraguagus, Union and Penobscot rivers.

The argument that this fault will correct itself because the supply of timber is fast being exhausted, is fallacious. While it is true of the largest cl ss of timber from which the heavier lumber is cut, there is still a large supply for the shingle and lath mills and they are the ones that make the greater percentage of saw dust.

As the St. Croix River is an international highway, it would be necessary to have combined action with the Dominion government, the saw-mills at St. Stephens being quite as great

offenders as those at Calais and other towns on the Maine bank of the river. Between 1871 and 1874, both the U. S. government and that of the Dominion appropriated money for a joint improvement of this river, but the Dominion Minister of Public Improvement wisely declined to sanction the expenditure until the necessary measures had been taken to prevent a repetition of this trouble. I do not know whether the Dominion government has enacted the necessary law, but I am quite sure that the United States has not, and so matters have gone on from bad to worse until the river is almost closed by the accumulation of saw dust.

I found that the depth of water between Oak Point and The Ledge has materially decreased since Lt. Crosby's survey of three years ago, the results of which are not yet published.

Between the years 1869 and '72 the government appropriated the necessary funds and removed about 80,000 cubic yards of mill refuse from the bed of the Union River to improve its navigation to the town of Ellsworth, Hancock County.

This opened a channel of about 160 feet wide with a least depth of from 3 to 5 feet at low water and from 13 to 15 feet at high water. Combined with the removal of a number of boulders and ledges this greatly improved the river, but notwithstanding its benefits, the practice of throwing in slabs and saw dust has continued ever since so that the river is again very much obstructed and the channel now is not so wide or deep as is shown by our last survey made in 1879.

Between Bucksport and Winterport the Penobscot River naturally had a wider channel than at almost any other point, but it has now become so contracted by the deposit of saw dust and other material on Frankfort flats, that there is much less water and a narrower channel at this point than is shown on the charts of the Coast and Geodetic Survey.

The two instances that I have cited are only fair examples of what is going on in all the rivers that I have mentioned. Congress has at various times enacted laws to prevent

the obstruction of river navigation and this would seem to be a case demanding its attention. The commercial interests of the State are quite content to allow the practice to go on, so long as the government will remove the obstruction at their request.

Very respectfully,

(Signed) S. M. Ackley.

Lieut. Com'd'r U. S. N.

Forwarded
Chas. M. Thomas, Com'd'r U. S. N.,
Hydrographic Inspector C. & G. Survey.

SAW MILLS, ETC., ABOVE CALAIS.

July 31, 1893.

St. Stephen:---Mr. Frank Todd. Has always lived here. Frank Todd is of the firm of F. H. Todd & Sons. His father was F. H. Tood, now dead, or at least not in the firm. Frank has always lived in St. Stephen, N. B. A young man, perhaps 40 years. Owns mills on both sides of river. Active, greatly interested in fishery matters, and a fish Overseer of Canada. One steam saw mill on wharf at Calais, C. C. Whitlock. Small mill making box shooks and laths.

Millton, Me.)))F. H. Todd & Sons. 2 gangs, 2 roof boards, 1 to 2 inch principally, dimension timber, scantling, laths, shingles.

James Murchie & Sons, 3 gangs, under 2 roofs. Same stuff.

H. F. Eaton & Sons, 5 gangs under 3

roofs, and 1 box mill. Same stuff. (All water mills).

Baring, Me.---3 mills. (add data). Water mills.

Princeton, Me.---F. Mercier & Son. Water lumber mill. C. B. Eaton, steam box shooks mill. C. W. Clement, Trustee, Tannery. L. Peabody & Son, woolen mill.

Grand Lake Stream, Me.---C. W. Clement, Trustee, Tannery, and saw mill? Mr. Todd thinks saw mill was erected to furnish lumber for tannery and has been abandoned. (Is tannery steam or water?).

Talmage, Me.---H. F. Eaton, water shingle mill, West Musquash Stream, between Princeton and Grand Lake Stream.

Vanceboro, Me.---C. W. Clements, Trustee, Tannery.

Lambert Lake Plantation, Me.---L. S. Mill, steam box shook factory.

Forest City, Me.---C. W. Clements, Trustee Tannery. Said to be a lumber mill by Foster & Haley, but Mr. Todd did not know of it.

Eaton, Me.---C. H. Eaton. Steam box factory, market boxes.

Danforth, Me.---Weatherbee & Co. Water mill. Hathorn, Foss & Co., steam box factory. George & Lane, water shingle factory.

Waweig, N. B.---Water mill, box and short lumber.

Partlett's Mills, N. B.---B. Ripley. Large steam mill.

Oak Bay, N. B. Small water mill, short lumber.

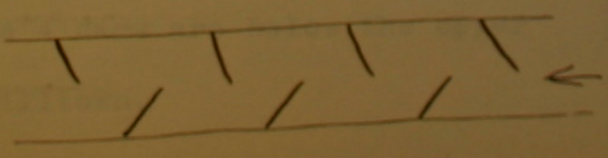
St. Stephen, N. B.---Haley & Sons, 1 box mill, planing mill, door and sash factory.

Moore's Mills, N. B.---Small water mill, run only a few weeks in the spring during high water. Maxwell.

Milltown, N. B.---F. N. Todd & Sons, 2 water saw mills. H. F. Eaton,& Sons, 2 water saw mills. Canadian Cotton Syndicate, cotton factory run by water.

Dams, St. Croix River.

1st. About 1/2 mile above Calais--St. Stephen bridge. Six feet high, from lower edge of apron to top of dam. One short part toward center only 5 feet high, but when we saw it to-day it had been temporarily raised to full height of dam. At high water the water below occasionally backs up to top of dam, making nearly smooth water over. Has fishway on New Brunswick side. Ordinary old fashioned ladder. Slope about 1 in 7.



2nd. dam. 1/4 mile farther up. Cotton mill dam. Was a continuous dam, but now has a channel on the Maine side in the rocks for logs. Head of 18 1/2 feet. Although very swift current, can undoubtedly be readily used by salmon. Fish ladder on New Brunswick side alongside of cotton mill.

Same pattern ladder as last, 3 flights, turning back on itself, and then heading up stream again. Mr. Todd thinks that while the salmon probably prefer the log slide, the alewives probably make use of the ladder.

3rd. dam. Consists of 2 wing dams, 500 to 800 yards above last. A free channel in the center.

4th dam. Wing dam extending out from the Maine shore, with a passage way on the New Brunswick side.

All of these 4 dams are below the upper toll bridge in Milltown.

5th dam. Baring. Dam extends practically across the river, but during the early part of the season, and in most years up to September, much water flows around the dam. Has a fish ladder same as previous ones, near center of dam. Said not to be in good repair. This is about 5 1/4 miles above Calais bridge.

(No further obstructions on main branch. No obstructions on Eastern branch below Vanceboro, and on Western branch below Princetown).

Vanceboro.---Tannery dam straight across the river, with good fishway.

Few hundred yards above this is a river driving dam, for storing water to drive logs down stream. Has no fishway, but 5 gates, almost level with level of water below. All the gates are never shut at the same time, one at least being always open, to permit water to flow for use of tannery dam. From this point to the lake the water flows smooth and with no

impediment.

And no impediments in the lakes up to near Forest City. There is a river driving dam just below Forest City, in so-called Grand Lake Stream (Eastern). No fishway here, but gates are always open except during few weeks of driving time, when they may be closed at times to flush the river, and work out a jamb.

At Forest City, a tannery and river driving dam. Always open except occasionally in the spring, about March. May be said to be open 11 months of the year. This is a steam tannery and requires water only for small purposes.

No other general obstructions in this set of lakes. Numerous small streams enter the lakes, on many if not most of which are small river driving dams, which are shut generally only in March, just after the snow has begun to melt, and for the purpose of catching the rise of water which occurs at that time for floating

down the logs. This is before the fish begin to run up and should have no effect on the fisheries.

Mr. Conrad at Vanceboro, Canadian Overseer has a small steam launch, the use of which it is said we can obtain to make a trip up the lakes.

WESTERN BRANCH ST. CROIX RIVER.

First obstruction, is at Princeton, just below the lake. Has a fishway of the Rodgers pattern, but built before Rodgers had expounded his pattern.

Second obstruction, is a river driving dam at Grand Lake Stream (Hinckly). Offers no impediment to fishes.

Third obstruction, at head of Compass Lake, in Dobsis stream, river driving dam, 12 or 14 miles above Grand Lake Stream. Has a fishway.

River driving dams in the small streams entering the lakes as in those at head of east branch, and used to the same extent. Not important for consideration.

Todd

OUTPUT OF LUMBER,

St. Croix System, beginning Calais.

The largest cuts were made between 1860 and 1865, when it ran up to 150,000,000 feet of long lumber annually. Has been decreasing gradually since that time. Princeton used to cut 10,000,000 annually, now only about 2,000,000. Baring formerly 25,000,000 annually, now makes no long lumber.

Decrease has been due partly to growing scarcity of timber, and partly to the failure of firms engaged in sawing. Formerly more firms were engaged in the business. Now controlled by few persons who limit the output. There is a disinclination to work beyond a certain limit, and new parties are deterred from entering the business by its uncertainties.

The present milling business is destined to grow smaller. If the forests could be kept intact there might be a better prospect, but

the forest area is becoming much less and size of wood much smaller.

Thinks that business is certain to turn into a pulp mill business, and the change may come inside of 10 years. The pulp mills would give them more for the crude timber than they could get by sawing it.

Spruce is the best wood for pulp. Could, however, use all the soft woods except cedar, such as pine, fir, hemlock, poplar, and bass. There is an abundance of fir, and there is excellent poplar, bass, hemlock, etc.

Mills saw no hard wood. They now saw spruce, pine, hemlock, principally. Cedar for shingles. The good fir is now too small, the larger timber being generally rotten on the inside. The timber should measure 7 inches at smallest end to cut boards.

Present output on the St. Croix River is about as follows: 50,000,000 feet long lumber; 50,000,000 short lumber, such as laths, palings

staves, shooks, etc., and perhaps 30,000,000 to 40,000,000 of shingles (by piece).

A large quantity of lumber, 30 to 50,000,000 more, comes in by rail from upper waters of St. John, etc., for shipment from here by vessel.

SAWDUST EDGINGS, ETC.

The laws on both sides prohibit any deliterious material form the mills being put into river. (Look up laws).

In sawing inch boards about 20% of the whole product goes into sawdust. The saw cutting 1/4 of an inch in thickness for each 1 1/4 inches of lumber. In sawing 2 inch would be 10% of sawdust. For all kinds of lumber cut, 8% of sawdust would be a fair average to calculate.

Large quantity of square stuff, such as scantling and frame stuff, cut. The dimensions of which we did not get an account.

Out of the 50,000,000 feet of long lumber reckoned above, 45,000,000 at least is cut between the head of tide water and 1 1/2 miles above. Very little sawdust can therefore be let in near spawning beds of important fishes.

The edgings are now all burned, except

what is carted away for domestic use. The mill owners are all anxious to see that no edgings are thrown in. This reform has been due mostly to the action and desires of mill owners themselves. (Mr. French, Am. Fish Warden, states that this good result has been brought about chiefly through the energetic action of Frank Todd). Edging beds he says have not increased, but in fact, have decreased within the past 30 years. The ice has helped to take them away. The beds which have been filling up the bed of the river in places is due almost exclusively to old edgings, which do not decay, but remain upon the bottom, except where ice action has removed them. The effect of the edgings has been felt down as far as the ledge near Devils Head, and may be seen at low water. Considers that sawdust causes no impediment to fishes or navigation. The tendency of spring rains and ice is to flush out such as may have lodged during pre-

what is carted away for domestic use. The mill owners are all anxious to see that no edgings are thrown in. This reform has been due mostly to the action and desires of mill owners themselves. (Mr. French, Am. Fish Warden, states that this good result has been brought about chiefly through the energetic action of Frank Todd). Edging beds he says have not increased, but in fact, have decreased within the past 30 years. The ice has helped to take them away. The beds which have been filling up the bed of the river in places is due almost exclusively to old edgings, which do not decay, but remain upon the bottom, except where ice action has removed them. The effect of the edgings has been felt down as far as the ledge near Devils Head, and may be seen at low water. Considers that sawdust causes no impediment to fishes or navigation. The tendency of spring rains and ice is to flush out such as may have lodged during pre-

vious seasons. Instanced the lower pool just above the Calais bridge where the sawdust covers all the shallow water borders. This is mostly cleaned away in spring. Sawdust troubles them some between the lower wharf and the ledges, about 6 miles down. Above this wharf no trouble is experienced.

Spruce sawdust remains on surface longest, a number of days, sometimes a week or more. Hemlock does not remain as long and pine still shorter, a very short time. Hard wood sawdust sinks at once, but practically no hard wood is sawed here.

Edgings are burnt in open furnaces below mills. The ice freezes to edgings where they occur in the river and tends to carry them down stream.

As the mills are built at present they are placed too low, too near the level of the water to permit of the arrangement of machinery to carry off the sawdust. If the mills were

obliged to remove sawdust, it would necessitate their rebuilding at a very great expense, more than they could afford. To oblige the mills to carry off sawdust would mean absolutely that the mills should close down, as they could not possibly provide for it. New mills could be built, but it would not pay,, and he does not think they would be built, if this requirement was made obligatory. They were built as they are, low down, so that the sawdust and edgings could readily fall into the water. The sawdust must drop down below the floor on which the saw is, but the edgings fall on the floor and can be saved. (The chief trouble is with the gang saws, which run down through the lower part of the mill, with the circular saws, the sawdust is left above the floor and might be controlled). Saw mills should be built high to control sawdust.

At the Ledge above referred to (mouth of St. Croix as understood in Calais) the sawdust

Jord

goes off into deep water where it practically disappears.

FISHES.

Salmon reach the large lakes at the head of each branch. Have been taken as far up as Forest City on eastern branch, and Dobsis stream on western. There are many streams on both sides of the river, and they turn off into nearly all of them. They are known to spawn in some of them. Instanced stream entering near Baring on east side.

Alewives have been taken at Vanceboro. They spawn in the dead waters along main and side streams, and on the overflowed meadows, between Calais and Baring and above. Is not, however, much acquainted with their habits, and his statements should be corroborated.

Shad used to be abundant before his experience, say 20 or more years, but since

that time have been very scarce. A few (2?) were taken this year in salmon nets near the toll bridge (First for 20 years). The St. Croix always used to be regarded as a good shad river, though not as good as the St. John. It was a better salmon than shad river.

Occasionally used to get striped bass in the upper weirs, just below Calais.

Brook trout are more or less abundant in the main river.

Pickerel in still water in lower parts of streams.

Other fishes in river and lakes are white fish, chub, white perch, smelt and alewives.

A few cod, haddock and halibut are taken as far up tidal river as the ledge.

Menhaden, when they used to be abundant on this coast would come up to within 2 or 3 miles of Calais.

About 3 years ago they again appeared, and schools were seen in a little bay, called Joe

Donald's Cove, about 3 miles below Calais.

Tinker mackerel come up every year as far as Oak Bay and the lower steamboat wharf. Formerly when the brush weirs extended further up the river they used to be taken in them. 40 barrels have been taken in a single weir.

Herring come up to about the same localities.

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CHARLES R. WHIDDEN, PROPRIETOR OF CALAIS TIMES--44 YEARS OLD--CALAIS, AUGUST 7, 1893.

Always much interested in the fisheries in this region, and has taken an active part in their improvement. Is used to fishing throughout the river and connecting lakes.

The salmon originally ran up the entire length of both branches of the St. Croix River, and to some extent entered the western lakes beyond. In colonial times vessels were fitted out in Plymouth and Boston to obtain salmon. So great were the quantities known to be in the St. Croix that they passed by all theother large rivers of the intervening coast, such as Penobscot and Kennebec, and came here to load with this fish. At that time it was considered to be themost important salmon river on the coast, and in Whidden's opinion it deserved that reputation. Remembers, when a little boy, seeing the ruins of extensive smoke-houses on the present site of the St. Croix and Penobscot Railroad. This used to be an extensive industry.

Calais used to let the privilege of dipping salmon at Salmon Falls, and as late as 1830 sold

the privilege at one small rock--called Salmon Rock--for as high as $600 a year. Used an ordinary large dip net(The City Records of Calais will furnish all facts of this character.)

In former times the Indians used to spear salmon, and he remembers going when a boy with an Indian who speared nine salmon on one birch bark torch. The river was fairly swarming with salmon at those times.

Alewives and shad were also then abundant. Said he saw alewives going up the log shoot at the Cotton Mills in 1886(?) Has taken them at Sprague's falls with a white miller fly as late as June, 1888. Has never seen them above Spragues Falls. Thinks they spawn along river below there and in the Mehannes on gravel beds. Thinks alewives spawn in June.

Smelt spawn in rapid water or on rips, on gravel beds, mainly below Union Mills and not above the Mehannes; also just above mouth of Mehannes near Baring.

On the western branch knows of salmon going as far up as Grand Lake Stream, where a few have been taken with ripe spawn, which was mixed

with milt of landlocked salmon, the eggs hatching and being planted there. Saw them in Grand Lake Stream when fishing for landlocked salmon, in the spring, as a kelt, spent fish or black fish, etc. On the east branch go up as far as Vanceboro, but does not know of their getting into those lakes.

Shad will not stand sawdust. They used to go over Salmon falls. Indians say they have seen them above and this is the source of his information. This used to be a great shad river and thinks the sawdust chiefly responsible for their extinction. Young shad have never been planted in this river, and he would not advise their introduction, while the sawdust nuisance continued. Thinks it would be entirely useless to do so.

At a time when the salmon could not run readily above Union Mills, they used to, he thinks, from observation, that they spawned in the meeting place of fresh and salt water below the dam. Could not say if the eggs came to anything.

Thefirst dam was constructed at Milltown, but thinks there must always have been a passage way there for fish. He thinks that at certain times of tide the fish could always go overUnion

dam, even before fishway was constructed. Has seen them go over dam. They first play between salt and fresh water as though to get used to latter. Remain sometime below Union dam before passing over.

Cited instances where he hooked a salmon about the Union Mills. Line broke off, leaving hook in mouth. A week later this salmon was taken in Pettegroves weir at Red Beach. This was during the up run, and the salmon had apparently run back on account of accident to it.(This is said to happen , or similar cases, when hurt. Wakeham.) The Union dam was the only one ~~xxxx~~ in this part of the river which could have retarded salmon at all, and there only in part.

Believes that fishway at Cotton Mill is of no good as poachers dam up lower end, shut off water from above, and take out salmon. Is positive that this has been and still is carried on to a great extent. Thinks that more fish have been taken illegally at this point than anywhere else on river. He recommended the placing of a fishway in this dam, but desired to have it placed elsewhere, nearer the American side of the river. The shoot

he considers to answer well for the salmon, and he would advise shutting up fishway. Thinks that Cotton Mill authorities have not done what they should in aiding the work on the river, have not exercised such vigilance at the fishway as they should. He thinks the fishway all right in its construction.

(Dr. Wakeham has conferred with French Warden and Frank Todd. Thinks there is very little poaching there now. No systematic poaching, and thinks that fishway should stand. They are more anxious about fish being poached in the place near entrance to drain, where we saw them. Think that place might well be filled up with rocks, to prevent fish geting in there at all.)

Thinks that fishway in Union dam is all right, but greater care shouldbe taken to keep it clear. More care should also be taken to guard the pool below this dam. Alewives and smelts go over this ladder without trouble.

The fishway at Baring is of a suitable kind, but is in bad condition and should be repaired. Sometimes it has broken off at the bottom and the fish have had to jump to get into it.(A new

ladder is needed). Salmon can also go up the log-way over the dam.

At Princeton dam they sometimes shut off all the water, and the salmon cannot get through. The water is undoubtedly shut off too much of the time. This is during a draught. Ladder needs extensive repairs.

None of the fishways are kept as clear as they should be. They are sometimes allowed to fill up with drift.

FISHES IN THIS SYSTEM.

Landlocked salmon weigh 2-6 lbs. Have greatly lessened in numbers. Blames the tannery on Grand Lake Stream for the destruction of these fish, as their principal spawning ground was in this stream. The tannery refuse has become scattered over all of this spawning ground. The fish have found new spawning grounds since, especially in two places, one of which is Ox Creek. He thinks that artificial culture is all that has saved this species from total destruction. Very few of this species are now to be found in the eastern lakes of this system, very much less abundant there than in western lakes.

Speckled trout abundant.

Togue follow up and destroy eggs of other species.

Blue-backed trout. Introduced by Dobsis Club.

Pickerel. Live in Big Lake, but not in Grand Lake, which has too clear water for them. Occur principally in still waters where there is vegatation.

Chubs, little streams, and along shallow

parts of river.

Minnows, both lakes and rivers, furnish abundant food for other fish.

White fish occur in Junior Thoroughfare between Junior and Dobsis Lakes. A good fish; not inclined to take fly, and seldom taken in that way, but mostly by nets.

Pickerel were introduced into the western lakes about 30 years ago, by two men who brought them over in a bark receptacle. In Big Lake and the narrows there was a good place for trout, but the pickerel have drivn them out.

White perch, native of these waters. Most plentiful in Dobsis Lake, where they prevented the introduction of blue back trout, which he and some others attempted. The young of landlocked salmon, togue and trout were driven up into the shallow waters along the edge of the lake in places by white perch, of which they were very much afraid, but seemed to know how to escape them in this way. Used to see these young in large numbers along the shore, especially in one cove.

Horned pout occur in sluggish and stagnant places in the streams.

Eels are common(genuine eel). Go into the lakes. Thinks they destroy eggs of many fishes. Do not get much above Grand Lake Stream. Grand Lake is too clear a body of water, suited only to the more gamy fishes.

Pickerel are the best pan fish they have in winter. Spawn in spring.

Mr. Whidden said that two things were necessary to correct the evil in these boundary waters,

1st. Uniformity in all laws relating to the river.

2nd. To have the boundary line strictly defined.

When these were done the fish could be properly protected, but not until such time.

(There is no question of the weight of Mr. Whidden's suggestion. Poachers, smugglers, and all wrong doers along the border, when arrested, are apt to claim that their misdemeanor was committed on the other side. There may be positive evidence of their guilt, without a means of knowing absolutely on which side of the river the act was done; or if the place was known, to say where the line runs, and in whose territory the offense was

committed.

On account of lack of uniformity in the laws, there can seldom be concert of action in dealing with criminals by the justices of the two sides, I.e., an offender will claim, if caught, that his offense was committed on the side where the law will not hold him, or will deal with him most lightly).

In speaking of Union dam before fishway was built, he said that salmon ran mostly at night, when water was highest, which aidedthem in getting over the dam.

Poaching has been carried on , more or less, at all fishways and passes, and in the pools below them. The fishways have been a convenient place for practicing this occupation. They should all be watched more closely than they have been.

JAMES MURCHIE, SENIOR MEMBER OF JAMES MURCHIE & SONS, LUMBER MILLS, ETC., CALAIS & MILLTOWN, N.B.

AUG. 5, 1893.

80 years old and has always resided in the neighborhood. Born in New Brunswick near St. Stephen. Until 12 years old lived on a farm, through which Porter's Mill Stream flowed.

There has always been a passage for fish at Baring. There is now a passageway around the mill on the American side and a fishway near the middle of the river. (The latter is now in poor condition).

Always a free passage through the two upper mill dams at Milltown. These are not fish ways, but narrow open channels between the wing dams.

Salmon have always been able to go over Salmon falls except the first year, when the dam was built--1881. The ladder was put in the fall of that year. About 25 years ago a short dam for a grist mill was built above the shoot on the American side of salmon falls, but rest of fall was available for salmon. This dam did not last long.

Union dam about 45 years old. For 8 or

or 10 years it was without a pass, but high water ferquently flowed over dam. Salmon could be seen jumping. Alewives he thought could not get over. At the end of 8 or 10 years a pass was built, but he thought it was not a suitable one for the purpose. The present ladder was built about 15 or 16 years ago.

Shad were caught at Salmon falls 50 or 60 years ago, and he thought they were able to pass the falls and run up.

Before Union dam was built, alewives used to pass by all the mills up to and including Baring. Some seasons probably 1,000 bbls. would be taken by dipping. They were taken mainly on the Canadian side of what now is the cotton mill pool below the salmon falls. He had at this place caught salmon, shad and alewives by the cartload. This was when he was a boy. Some salmon(40 or 50 a day) used to be caught with a set-net off the American shore below these falls. People used to come in numbers to Canada side early in the morning and cast lots for their turn to dip. Dipping used to take place part way up the fall in a hole or resting place.

Net fishing for salmon has been carried on in the estuary for the last 70 years. There were a number of weirs above those now in use, but the upper ones now existing do take salmon, and he buys salmon from them.

Smelt never went above the Union dam.

Salmon have always gone up both branches of river into the lakes. He instanced one salmon caught in West Grand Lake by Frank Brimmer, 30 inches long.

He thinks the alewives never entered Porter's Mill stream(just below St. Stephen) until after the Union Mill dam was built, which prevented their ascending the main stream. 39 years ago he said, from his experience, he knew they never entered Porter's Mill stream, and he thinks they began to go up about 30 years ago. They spawn above Moore's Mill(the testimony of others is to the effect that alewives have always entered this side stream, and this is more likely to be corrected, the waters being well suited to their spawning, but the stream itself becomes very small in summer.)

Does not know where the alewives used to spawn on the main St. Croix River.

His father was a fisherman.

Over 60 years ago they used to send salmon, shad and alewives away to market.

Salmon falls were very steep, and salmon had some difficulty in getting up. They used to set nets in the main pitch of the falls. The falls had two shoots. Turns were taken to fish in the favored places. Dip nets were used there. The catches were very large, sometimes as many as 100 bbls. of fish would be taken at the falls in a single day. Nets were also set in the eddy on the American side.

There were 20 salmon when he was a boy to 1 now, but the number of fish has been greater this year than for sometime. There has been a long period of very poor fishing.

Salmon have never gone up Porter's Mill stream.

Used to take smelt abundantly above the lower bridge. They are much less common now.

The main part of the lumbering on the St. Croix began about 65 or 70 years ago. It was at its height about 15 or 20 years ago, before the mills at Baring burnt. It has been on the decline

for 15 years.

The cut of long lumber now for the river amounts to about 70,000,000 feet.

Formerly 4 logs would cut about 1,000 ft., but now 10 logs would be required for the same amount.

The river should be dredged and a good channel be made for steamers and large vessels.

Does not think the refuse from the Cotton Mill has done any harm to fishes. The river is so large, that the effects of the refuse is dissipated.

There is just as much water in the river now as formerly. This does not relate to depth, but volume, dependent upon the rainfall. While the old growth of forests has been cut down, young growth has sprung up in its place, and the precipitation of moisture remains the same.

Calais, Me., August 1, 1893.

ALBERT FRENCH, MAINE FISH & GAME WARDEN.

Has been warden 9 years, stationed on St. Croix River during salmon season as late as first part of August. Then goes elsewhere. Previously was a fisherman on the St. Croix River about Calais, and has poached, being therefore acquainted with poaching methods.

Grand Lake Stream(Hinckley). The saw mill still exists, connected with tannery. Used to saw for tannery and local trade. At work only occasionally.

During very high spring tides has known the water to flow up over lower or Union dam 200 or 300 yards.

Has actually seen salmon go half way up log run in 2nd(Cotton Mill) dam, and has no doubt they go through Western Grand Lake stream dam above tannery. Kep^e the gat^e closed down most of the time during summer, and not open as they should be. Considers that this dam does much harm to fish run as now managed, and something should be done to stop it. A ladder might be placed there.

The stream on which the Talmage mill is located is a fine fish stream(trout), but the dam has no way, and the fish cannot get through. Something should be provided in the interest of trout; salmon do not go up.

The togue is very abundant in the Western Grand Lakes, and West Musquash Lake(probably in all lakes) weighing 2 1/2 to 30 lbs. Important food fish found in deep water of lake and may come into shallow water to spawn.

About 10 small boats on the St. Croix River above Baring, but there is no navigation, and this matter does not give rise to question.

Thinks that salmon could go over all the dams at any time of the season, except cotton mill dam, without fishways. The fishways existing are sufficient for all purposes of salmon, the log shut in cotton mill dam being also readily ascended by them.

Salmon begin to run in April 1st to middle, and continue to run until last of September; main run May and June; run principally at night. Sees them lying about in the pools for a day or two; then they would suddenly disappear from that pool between dusk and daylight next day.

When dams shut down at night, there is higher water than at other times of day. At noon, when men go to dinner, the same thing happens for a shorter time, and this is taken advantage of to run logs down as we saw while here. Seldom see the dams dry on top, even this year, which has been an unusually dry season.

Has seen alewives above the 1st dam, but never above cotton mill dam. Doubts their going up further, and has no evidence of their reaching higher place. He is not, however, entirely certain on this matter. Between the two lower dams he has seen them dipped out in quantities every year, in the pool above the Union, or 1st dam. Has been told that they go above Milltown and even to Vanceboro.

Good many Indians live about Princeton. They fish throughout the length of both streams above Baring, by spearing, etc., evading the law wherever they can. They claimed to have a treaty right which allowed them to do so. They were proceeded against by French, and the law was decided against them. They continue their practices on the sly, and he thinks they do much harm to the fisheries.

As to the down-run of salmon, has first snen them running down in December. Occasionally one or two have been seen in November. Are noxtseen in the spring after the ice has gone--April, but never get them after April. They are black and poor, not fit for food, andmay readily be distinguished from the up run.

Salmon spawn in the main river, there being several places suitable for this purpose, as at Grand Falls(meeting of East and West branches), Spednic falls, andthe rips below Vanceboro. The Indians spear them commonly in this last place. Has seldom heardof their entering the Grand Lakes. 2 or 3 have been recorded from each of these systems (East & West lakes), some of these captures having been made near the F. C. Station at Grand Lake Stream, in connection with landlocked salmon.

They also enter numerous side streams of the St. Croix, but cannot say all that they enter. Knows especially of the following Magurrawock(Calais), Moannes(N.B. flowing in near Baring) and Wapsedaegan(about 9 miles above Calais, in Baileyville).

Sees young salmon coming down the river

in May and June, 4 to 5 inches long. A few may also bee seen the very last of April. They are abundant, and he supposes they run right down the river. They will take bait and many are dipped out with smelt. Has had hard work keeping the boys from catching them. Salmon have been increasing during the past 8 or 9 years. Thinks this is largely due to the fact that illegal drifting nets were put a stop to, and poaching prevented. On the Maine side, law permits drifting nets to be used only outside of a distance of 500 yards from any fishway, mill race or dam. He thinks that drifting should be entirely prohibited.

Alewives begin to run up the last few days of May, and continue running for about a month. The biggest run takes place in June, they come up in schools. Go up Porter's Mill stream(N.B. below St. Stephen) in large numbers; and are very thick about the lower mills, between 1st and 2nd dams. In this locality they are not captured except few desired for local use. They are not fished for regularly. Has seen them thick above 1st dam, especially in the pool. They disappear by the last of June from the river. They may be about somewhere, but are not where they can be observed.

Alewives were decreasing until nets were stopped about 8 years ago, since which time they have been increasing. Never saw them as abundant as they have been during past 4 or 5 years. 14 or 15 years ago, as he remembers it, they were very scarce. They subsequently increased, decreased again, and since 8 years ago have been once more increasing.

Does not think that decrease of alewives or salmon in this river was ever due to the presence of dams. Mainly due to overfishing, although perhaps sawdust and edgings may have had some influence. (Has Maine Fish Comurs. a history of fisheries on this river?).

Young alewives, 2 or 3 inches long, and seen abundantly below the dams in July and August--large schools at a time.

He has never seen the smelt go above the lowe dam.

Has not seen shad here for years. Two were takn this year in salmon set nets at the toll bridge One was taken about 7 years ago in drift salmon net. 20 to 25 years ago andpreviously they used to be abundant. Thisinformation came from his father.

but he had no experience with them at that time himself.

Salmon, alewives, smelt and eels are the only valuable fishes in the river at Calais below the dams. A few white perch are taken around the mill dams.

The only commercial fishing is the net fishing for salmon. Some hook and line fishing is done for sport.

On American side, about 10 men are engaged in salmon fishing between the dams and 3 or 4 miles down. They sometimes steal in above the lower dam when the warden is absent. The season lasts from April 1 to July 15. They use 1 set net each, and of drift nets one to two men. That is to say, they use 10 set nets and 5 drift nets altogether. Drift nets are 50 to 90 feet long, 7 to 9 ft. deep. Set nets 150 to 300 ft. long, 12 to 15 ft. deep(has known one 24 ft. deep). Mesh 6 inch stretched measure. Set nets are placed lengthwise of river, and must be set where water does not exceed 2 feet at low tide. Drift nets must naturally be worked crosswise. Nets must be taken on shore between Saturday morning at sunrise to Monday morning

sunrise. No nets allowed anywhere above the dams in the salmon fishery, or in any fishery except as follows:

During May and November nets may be used for whitefish in the lakes and in the tributaries of the St. Croix. The whitefish are abundant in some of the lakes. He thinks they spawn in November, same as salmon. Therefore, they ought not to be taken with nets in November, and he would also prevent their netting at any time. The right to use nets for whitefish was given on the representation that they could not be taken by any other method. French has caught them himself with fine hooks, and thinks they can be sufficintly well taken by that method. There are sveral persons whom he can produce as witnesses to prove this fact. During other months than May and November they are mostly in the deeper parts of the lake, where they may also be taken with the hook and line according to him.

Pickerel and perch are netted to some extent, but this is illegal. He thinks it is carried on to a considerable extent, and he has detected it by examining the fish which havebeen shipped away

in barrels. Says he can distinguish between hooked and netted fish, but he is notable to gain sufficient evidence in this way to conflict. Where seizures were attempted it was claimed that fish were taken in other side of river, etc. Has seen nets set illegally on this side, but could not prove owners.

There is a good deal of hook and line fishing in the lakes of this region, the principal species taken being pickerel and white perch. 8 or 10 small boats on the Maine side make this a business. They hail from several of the small towns.

No person is allowed in the lakes to take more than 50 lbs. of landlocked salmon, togue or trout, and is not allowed to ship them, unless he goes along with them; they cannot be sent away unless he accompanies them.

The open season for above fish(3 species) is February 1 to September 15, throughout the St. Croix system.

He has seen no difference in the abundance of the above fish during the past 12 to 15 years. The fishermen claim that they now find better fishing than they used to.

He used to fish for pickerel through the ice. He thinks they spawn in June. The spawn is attached to grass and lily pads, like that of frogs, for which it is often mistaken by the people. With one partner he had caught 2,600 lbs. pickerel in a week. The two together used 30 lines through the ice. He fished for them during 8 years before he became warden. His attention was first called specially to the cotton mill 4 or 5 years ago, after many fish had been found dead above the lower mills(saw). He collected a quantity of the dye waste and of white substance from rocks and sent to Augusta, but never heard of it afterwards. When the dye waste is flowed into the stream the salmon in the pool below fall back until the water becomes clear. Had not heard of any dead fish being seen in those places until they began to allow dye stuff to go into stream(Cotton Mill started about 1884). The fish found dead are chubs, horned pouts, suckers, small pickerel, a few trout and also a few salmon. The 3 species first mentioned have at times been found dead abundantly. (He acknowldged that some of the fish had cuts or marks upon them). Every year a few salmon are found from time to time.

The dead fish are found from the pool blow the cotton mill, down a distance of about 2 miles. Couldnot say positively that this was due to the cotton mill, but everything in his opinion points that way. From where the dye waste drops into the water to the outlet ofthe archway at lower end of mill is 50 to 75 yards. From this outlet he has seen the dark water, in the open water, reach 25 or 30 feet or more below the mouth of the arch, before it began to mingle well with the water in the pool.

Has seen salmon, but not alewives, in the pool just below cotton mill where the dye comes out. The white stuff(bleaching material?) finds its outlet through a covered conduit at lower end of cotton mill. Thinks it is blown out. It falls down over the rocks below andinto the pool. He does not know its composition. There is great difficulty in getting admitted to mills, and they take every pains to prevent visitors from entering.

The best time to examine pool and obtain material for analysis would be during period of draught--August or September.

Tanneries are not allowed to throw bark into the water, and now they burn it. The waste li-

quid, however, flows into the stream. They have been fined for allowing bark to go into water, about 5 years ago. French does not know entire nature of waste liquid from tanneries, but they use large quantities of vitriol, and other liquids.

Grand Lake Stream(west) was one of the finest fishing streams before building of tannery, but since then no good fishing has been obtained in the stream below the tannery, although it is still good above tannery to the lake(salmon, trout, togue, trout). A few years ago, when the Shaws failed, the tannery remained closed for 2 or 3 years, and during this interval the fish came back as plenty as ever. Since the tannery has started up again, the good fishing has ceased. This same principle applies generally to other tannery localities.

French has had a hard fight with the saw mills above Calais. They were heavily fined, and promised to remedy the evil of throwing things into the river, which they did as best they could, considering the manner in which they are built. They stopped putting anything in except sawdust. French begun this crusade as soon as he was made

warden. He considers that the law properly covers the prohibition of sawdust in the general clause. He thinks the mills are now doing the best they can without going to great expense.

He has seen no difference in the bottom of the river in tide waters since he was a boy. Consists mainly of sawdust, with some edgings and shavings. Thinks that the river is not filling up, and that no change is now taking place. The ice carries this material away every spring and it is more or less replaced the following season. There is a bad bed of sawdust in the narrows, about 2 or 3 miles below Calais. It is constantly removed and added to. He used to drift there with gill nets up to 12 years ago. Has never heard vessel people complain of filling up. Capt. Ryan of the Rose Standish would be a good person to consult on this subject.

While the sawdust cannot readily be saved with the gang saws at these mills, but with the circular saws they might be able to gather all the sawdust and burn it.

Very little hard wood is sawed here. Hard wood sawdust sinks at once, while other saw-

dust remains a greater or less time at surface. Sees sawdust on the surface abundantly 2 or 3 miles below Calais.

There is now no more sawdust in the pool below the several mills than there always has been since they have been running.

Sawdust is very deep in some places. Always remains loose; can thrust a pole through it to the hard bottom underneath, and its depth might be measured in this way.

If no more sawdust were put in the river, thinks that the sawdust now there would in time be completely swept out by the ice and spring freshets, which have great force.

JOHN MILLER, FISHERMAN, AT TOLL BRIDGE.

CALAIS, AUG. 5, 1893.

33 years old; born here. Has been engaged in fishing three seasons. Had done a little salmon fishing at times previously. Acknowledged that he was a poacher, and rather bragged of it. Not inclined to give much information, and his experience was evidently very limited. Used fixed nets just above Calais bridge, but was in the habit of drifting on the sly whenever he got a chance. Best fishing is done with drift nets, but not allowed on Maine side above ledge. The fishery at this point is for salmon solely. Took two shad, about 4 lbs. each in one of his set nets this season. The only ones he had heard of for a number of years. No regular fishery here for alewives. They come up very abundantly and are most abundant just below Union dam. They also pass over that dam, but has not heard of them above Cotton Mill dam. Five men, more or less regularly engaged in salmon fishing about Calais bridge. All using set nets. Complained that they were not allowed better privileges for fishing. Thinks that the few rich men are down on the poor ones. Salmon more abundant last two

years than for sometime before. Thinks that waste from cotton mill harms fish. Saw a number of dead salmon last year, but none this. On those he saw there were no external marks of damage. The gills were full of sawdust as he picked them up, but does not think that fish are killed by getting sawdust in gills. Has sometimes caught salmon in his nets that had scars upon them. The salmon become very abundant in the pool just below the cotton mill.

SWAIN NOSTRUM, FISHERMAN, AT THE BRIDGE.

CALAIS, AUG. 5, 1893.

In the fish business here 20 years. Only salmon fishing done about Calais as a business. No business in taking alewives. The only place where they are taken now is Porter's Mill Stream on New Brunswick side. The weirs used to extend up the river to just below the ledge. They did not pay so far up, and the upper weirs were abandoned about two years ago. A few alewives have been taken above the bridge during each of the few years past, except this year. Has never heard of them above Union dam.

This year and last have been the best fishing years they have had for salmon since he began. Supposes there have been other good years within his experience, but they did not fish so much, and they knew less about them. They have been seen in greatest abundance, jumping, in the space between the narrows and Devil Head. While laws existed before they first began to enforce them strictly when Mr. French became warden, eight or nine years ago. Thinks they would not be allowed to build weirs above the ledge, but weirs here

would, in his opinion, be very profitable now. Mr. Mostrum sets his gill net, by attaching one end to Calais bridge, and allowing it to drop down from there. It fishes best just before high water and on beginning of ebb tide. The net is not in over two feet at low tide.

Four men made a regular business of setting nets on American side this spring. They are not allowed to set drift nets above the ledge, and it, therefore, cannot be done openly. Better catches can be made with the drifting than with the set nets.

All the salmon taken here are sold locally, and do not catch enough to supply local trade. They obtain some salmon from St. John. The range of the salmon this year in size wasfrom about eight to twenty-six lbs. The average would probably not exceed twelve lbs. The largest salmon he knows of having been caught at any time in this locality weighed about 35 lbs.

Says there are plenty of salmon below the ledge, and was inclined to think from their abundance there that they did not all run way up the river, but this was a matter of opinion only.

During the past two years he has not seen many dead salmon, but previously had seen more. The extreme number he had seen in a year, however, he thought would not exceed five or six. This larger number he saw about four years ago. Has no positive opinion as to how these fish were killed. Formerly it was almost always laid to the refuse from cotton. This opinion still prevails to some extent, but is not so universal. He had no evidence on which to base an opinion. The fish did not show external marks of injury. One large fish which he picked up dead once did, however. One side of head looked as though it had been struck by a piece of timber.

Doesn't see how the salmon can come up the river, as they do, considering the amount of sawdust in the water, especially at the narrows, where it banks up and the water becomes very thick.

Thinks the sawdust deposits are increasing. At extreme low tides the Eastport steamer "Rose Standish" cannot reach the lower wharf now. The "Rose Standish" draws less than "Houghton" or "Belle Brown". Within at least eight years and previously she would go in at all times without trouble. (Have also heard similar statement from others). The bottom, abreast of wharves, on the

Maine side, consists of mud and sawdust. Edging bed in middle is deep. During past twenty years vessels have not been able to come up to outer end of wharves at low tide.

JOHN MILLER, JR., CALAIS FISHERMAN.

ADDITIONAL STATEMENT.

August, 1893.

Has been accustomed to setting his gill nets attached to the pier of the Calais-St. Stephen bridge, sometimes below, at other above, according as the tide ebbed or flowed. The net is about 90 feet long and would trend in the wake of the pier. A large part of the net would lie on the bottom, especially as the tide was low(the law prescribes the maximum depth of water), and the drift would come down so thick, and settle upon the net to such an extent, as to give him much trouble to clear it. The drift would mesh in the net and weight it down, so that the salmon could pass over it. The net would be torn, and at times it has been so completely buried that he has been obliged to abandon it. Very often impossible to haul it. This trouble has happened as late as the past spring. Bark has given the most trouble, but edgings interfere also, and sawdust helps to bury net.

CAPT RYAN--MASTER OF FRONTIER STEAMBOAT CO.'S STEAMER "ROSE STANDISH", RUNNING DAILY BETWEEN CALAIS AND EASTPORT, EXCEPT IN THE WINTER.

Calais, Aug. 7, 1893.

54 years old, born and always lived at Calais. Has been steamboating 35 years, and for many years has been captain on above line. Within his experience the condition of the river has changed enormously, by filling in, this having taken place lately to a greater extent down the river than up.

In former years all mill refuse was thrown into river, edgings, slabs, bark, sawdust, etc. This continued until about 15 years ago, although there was a law previously enacted which prohibited such practice. The milling interests united with others in stopping this practice, and some one was appointed to look out for the matter. The heavier refuse, such as edgings, and slabs tended to do more damage in those former times than takes place now, as that built a more solid foundation to which all other refuse clung. Ballast was also commonly thrown over in the channel of the river,

by large vessels, and that helped to cause the filling up. This practice has been stopped. There never has been, nor is there at present, any one who has made it his particular business to look after the harbor interests as it should have been, and in this respect matters drifted along in a very unsatisfactory way. (There is a harbor master). (By whom is harbor master appointed and to whom is he responsible?). Capt. Ryan also said that the mooring of vessels in the harbor had not always been properly looked after and they were sometimes allowed to lay ~~xx~~ so as to interfere with the navigation. This does not seem to be the case just at present.

Capt. Ryan called attention to a survey by Gen. Thom(stationed at Portland) of the St. Croix River about Calais, about 20 years ago. The map made by him will show the depths of water and amount of sawdust at that time.

About four years ago the coast survey made a very careful survey of this same region, sounding the depth of sawdust, etc.

In and about 1857, Capt. Ryan, in a steamer drawing six feet of water, could land at the end of Barnard's wharf at all low tides, except the ex-

treme spring tides, when he might have to land on the St. Stephen shore directly across. Now there is only three feet of water at low tide at the end of Barnard's wharf.

There used to be eight fathoms throughout the river channel, from the lower steamboat wharf to the ledge(breakwater) below, (This will be shown on Thom's map). Now the depth is very much less, not amounting to more than two fathoms in some places.

From the ledge to Devils Head there used to be six fathoms, now not over three fathoms.

At the lower steamboat wharf the wharf used to extend plumb down twelve feet under water at low tide. Now the steamer drawing 5 1/2 feet grounds there at low tides of the same elevation.

A heavy spring freshet carries out a great deal of the refuse, and improves matters until the next season. The amount of stuff thuscarried out, however, does not equal, on an average at least, the amount brought down from above, and the result is that the deposits are always increasing in height, and the condition of the river is becoming constantly worse. There has not been a strong freshet for two or three years, and the river is consequently in a very bad condition now.

The "Rose Standish", in coming up the river from the breakwater to the lower wharf, any time between two hours before low tide to low water stirs up the sawdust, which rises in great quantities and makes the water very thick. Saw more salmon jumping this season in this region than ever before, and thinks it may be due to the thickness of the water.

Barks, drawing 9 ft. could at one time sail up the end of Mark's Wharf, St. Stephen. The channel is on that side, and deep water has always come nearer the wharves on that side than on Calais side. This current forms an eddy on the Calais side, which has caused more filling up on that side than on the St. Stephen. Mark's wharf is abreast of Barnard's wharf. Below the lower steamboat wharf, however, the eddying and filling in has been much greater on the New Brunswick side.

The filling in with the mill refuse has also narrowed the mid channel, as must naturally happen. In one place, about one mile below the lower wharf, there is scarcely any indication of a distinct channel, the refuse matter having obliterated its margins, and filled in the bottom.

There is a very deep bank of refuse in

the center of channel just below Calais bridge, which have formed in the wake of one of the bridge piers. There are logs here(and elsewhere) as well as edgings, sawdust, etc.

The bark does not float as readily or as long as sawdust, but during freshets especially it is brought down in large quantities and distributed everywhere.

Sawdust is most abundant on the surface from Calais to the ledge. Seldom sees it on the surface below Devil's Head, and does not think that any from up here reaches mouth of river.

There is one place in the narrows, at Hill's Point, N. B., where there is a ridge or bluff of sawdust, six feet high, exposed at low tide. Its height is sometimes increased to nine feet.

He sees more sawdust in the river now than he ever did before. Last year C. C. Whitlock used to dump his sawdust over the edge of the wharf by his mill. Could not see that any one attempted to stop him.

Spring freshet cleans out the river a great deal, but they have not had one now for two or three years. In the course of several years,

however, there is more filled in than carried off. The freshets take off the sawdust most in the shallow parts up stream(apparently) and and leave it in the deeper places below.

There have always been mud flats between the wharves, but these places have been largely filled in with sawdust.

Has seen 18 big ships, foreign and American, anchored at a time below the ledge, loading deals for foreign markets. His acquantance with the practice of loading there ranges from about 1854 to twenty years ago, during which priod there were always more or less loading there.

The water at the wharves was too shallow for the larger vessels, while the others were not acquainted with the harbor above, andnot accustomed to running up. Vessels owned locally, however, have always been in the habit of coming up to the wharves. There was a settlement on the New Brunswick side adjoining this anchoring ground which isnow abandoned.

Most all of the vessels which come here take away lumber, although a few may bring cargoes here. Some coal barges from Nova Scotia leave here light.

Three steamers, "Rose Standish"(385 tons), "Flushing"(120-150(?) tons, runs once a week). "Arbutus"(not more than 40 tons, runs to Deer Island.

J. R. KIMBALL, PROPRIETOR ST. CROIX EXCHANGE,

CALAIS, ME., AUGUST 4, 1893.

Statement to Dr. Wakeham.

Was born and brought up here. When a young man was employed on the wharves in Calais Believes that one time before his day it was possible for light draft vessels to come up below the bridge abreast of the wharves at low tide on the Calais side. He did not see it, but always understood it was possible. Large vessels in former times never came up to the city to load. That was in his day, but anchored below the ledge. Has known as many as 15 vessels to be loading there at once. Loading with deals for Europe. There used to be quite a settlement at that place which supplied those vessels, and worked at the loading. It has since disappeared. The deals used to be scowed down. A deal is 3 inch stuff, 12 inches wide, and 9 to 12 feet

long. Not cut here now. The main channel was always on St. Stephen side, or toward that side. There the bottom is harder. Vessels were never able to go to the other side on low water, up to the wharves. On this side there has always been more of an eddy, a back-setting and a settling of sediment. Principal deposit are below the town, between there and the ledge. Vessels have always hauled in along side of the wharves, and have lain in the mud to be loaded.

In former days when he was a boy, salmon used to frequent the river in great abundance. Their favorite resting place in the lower part of the river was the pool at the foot of Salmon falls (the site of the Cotton Mill dam). They went over the falls quite easily. There was no guardianship then and anyone could take salmon as they pleased. A common practice was for everyone to secure a barrel for their family use, and this used to be done in that

pool, by spearing, netting and dipping. In the early days of the lumbering and when the mills were in full blast, about 30 or 40 years ago, no attempt was made to save any part of the refuse. Sawdust, bark, edgings and deal ends were all sent adrift in the river. It was in those days that great injury was done to navigation. It is only within the last 10 years that an attempt has been made to remedy the evil. He thinks within last 3 years there has been a considerable augmentation in the number of salmon going up the river.

Thinks all the sawdust made by the circular saws could be saved.

CALAIS, MAINE; AUGUST 3, 1893.

Conference with toll keeper at 1st bridge above the lower or Union mill dam. There were 2 or 3 persons with him, working in the neighboring mills, etc.

One person had seen 2 salmon dead taken from rock of lower mill, which had been injured externally. Did not know of any other dead salmon. Toll keeper stated he had seen a few dead salmon between 1st and 2nd dams. Thought it was due to injury by logs coming over the Cotton dam before log slide was cut there. Does not remember to have seen them before cotton mill was built, and has not seen them since log slide was excavated. The salmon play all about at the foot of the 2nd dam. Has seen no evidence that dye waste has done any harm. Has not seen any of the common fishes of this part of the river dead. Chubs, suckers, horned pout and trout occur here

abundantly. Smelt never come above the 1st fishway.

The fishway in the lower (Union) dam is the oldest and has been in about 15 years. The fishway at the cotton mill has been in 11 years (1882). Before that time there was simply a natural fall in the position of the cotton mill dam. Log slide built about 4 years ago. There is no grass growing in the river until you get above Milltown. All swift water from Milltown down. See young salmon very plenty in the spring.

Calais and St. Stephen, N. B.

August 4, 1893.

Mr. Ed. Hill, now of St. Stephen, used to live at Vanceboro, 20 years, between 1870 and 1875. He was out and some boys were dipping suckers from the river at Vanceboro. They dipped up one alewife among the suckers. He has no knowledge of the rest of the river as he was never on it. At about the same time a young salmon, a grilse, about 6 pounds, weight was dipped up at the same place.

He is not a fisherman, and has no further information regarding alewives on the St. Croix above St. Stephen. Has caught alewives 3 miles up the St. Dennis stream, and he knows that alewives go to lake at head of this stream There are 2 dams on this stream, one near mouth the other 6 miles up. They both have common fish ladders. Dennis stream flows in just

below St. Stephen.

Frank Todd.---States that he can secure witness to prove that alewives passed up through log shoot in cotton mill dam, during course of construction, when men were working there and had the means of observing them. They were seen in crevices, etc., on the way up. He is positive that alewives pass up through all 4 of the dams.

As alewives are not fished for above the lower dam, and do not take the hook, the people living along that part of the stream have not had the opportunity of observing them, and therefore it is not surprising that they cannot give more testimony regarding this subject.

The Union dam fishway has a rise of 1 in 7, and that at the Cotton mill 1 in 10. So that if the alewives pass through the former they certainly should be able to pass the latter. The cotton mill, however, is somewhat larger.

Todd

He has no evidence that any fish have been killed by dye waste from cotton mill. Has known of dead fish of several common species being found in the stream between Cotton mill and Union dam, but it resulted from their having stranded through the drawing off of water at the lower dam. They were thus left dry upon beds of edgings, etc., and when water was raised again they floated off. This happened particularly at one time when a temporary dam had been built. The occurrence of these dead fish might readily give rise to the belief that they had been killed by dye waste.

He knows from personal observations that salmon commonly go up into that part of the cotton mill dam close by the mill, where the exit of the drain is located, and endeavor to find their way up there. Whenever the dye comes down they retreat before it, but he has no knowledge that they are directly affected

Todd

by it. As soon as the water clears, they work back again.

He states that vessels were never able to come up to the ends of the wharves at low tide, and could not have done so at any of them, had they (vessels) drawn more than 3 or 4 feet of water. He pointed out the natural bed and the rocks in the river, along the wharves on the St. Stephen side, to show that there had been no filling in there. Whatever damage had been done by edgings and sawdust had taken place farther down river, below the mouth of Dennis Stream, and thence down through the narrows.

Told us of conferences with Chas. D. Owen, Vice President, Canadian Cotton Syndicate, and manager of the mills of that Syndicate in Canada (lives in Providence), in relation to trouble about dye waste. Mr. Owens had assured him that they would do anything they could to prevent their waste killing fish, but was confident that it had never destroyed any,

Todd

and that there could be no danger from that source. In response to demands from the Canadian Government to abolish the nuisance, they had offered to carry their waste through pipes to a pit which they would construct on the shore in the low land below the mill. This would involve much expense in working way through rocks, and the pit would be near the river. The water would percolate through but would undoubtedly filter out most of the refuse. They have not done so yet, and are pending further action by the Government. The present drain into the river, Mr. Todd thinks, measures 12 to 18 inches in diameter. Thinks they empty on an average about 2 vats a day, each probably holding about 400 or 500 gallons.

Bags holding catch are allowed to go out through drain, and on a small scale may be regarded as a nuisance. If many go through would settle and form a nucleus for other

Todd

things. They are often fished and left to dry on the shore.

The consistency of dye stuff poured out is that of meal and water, rather thick, and, on occasions when they were watched, opened the drain on the floor of the building, taken it out and hauled away in carts. Capt. Pratt was at one time instructed by Government to fine them daily, and it was then that they made a pretence of taking it out and hauling away.

In building up their defence they complained that other establishments, such as the tanneries above, the sheepskin factory in Calais (away from water) and a woolen mill at Princeton were also polluting the river. They made the case out against these parties to be worse than it was, and the result of an investigation did not sustain them (By Capt. Pratt).

The cotton mill and the Union mills have both been much troubled with edgings and saw dust from above. As regards Union mills, this

has been largely corrected, and they have no special trouble now. The cotton mill still suffers, but Mr. Todd thinks that a sluice way run through their dam near the fish way would create a current which would largely, if not entirely, remedy this.

As many of the logs are left in the stream a considerable length of time, a year or more, sometimes longer, the bark tends to soak off and a large number of logs become stripped of bark, which floats down stream, and is one of the greatest sources of trouble. It cannot be prevented. Enters largely into the debris, helping to fill up channel, and also passes through mill gratings.

Calais, August 4, 1893.

H. V. Eaton, of H. F. Eaton & Sons. Knows of 2 salmon taken in the Western Grand Lakes. One was caught off the mouth of Ox Brook by Frank Brimmer. The other was taken by Wm. Rose of Grand Lake Stream, who has a crayon picture of it. Does not know precise locality.

There are no pickerel in Grand Lake. They occur, however, in Big Lake. His cousin, 3 years ago, caught a togue in West Musquash Lake, through the ice, weighing 34 pounds 12 ounces.

Calais, August 4, 1893.

Conference with Geo. Eaton, and his father H. F. Eaton. The latter is 82 years old and has been in business here and St. Stephen since 1833. They state that at no time have vessels been able to come up to end of the wharves at Calais and St. Stephen at low tide. It was customary in olden times to load vessels at the ledge several miles down the river.

(Mr. Todd stated to-day that the mud which we have seen between the wharves was always there to his remembrance. There is little sawdust and other refuse mixed with it. This rubbish does not sweep in between the wharves, but is carried down the channel).

Geo. A. Boardman, and Mr. Copeland state that vessels were able at one time to reach ends of wharves at low tide, and the river has filled up since. Mr. Boardman is especially positive in this matter. He is 75 years old, and has always lived in Calais and Milltown, N. B.

Mr. B. says that it would be possible to save the saw dust from the gang mills if they were obliged to. He used to contend that it would be impossible, but knows that if the law had obliged them, they would have found a means. He thought it would be a very good thing if the river below the mills could be cleared of sawdust and no more permitted to run. Considers it a very great nuisance for the city.

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Calais, August 4, 1893.

George Eaton, says they use finer, thinner saws now than formerly, and consequently used to make a greater amount of sawdust.

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MR. HIGGINS.

Superintendent of H. F. Eaton & Sons' mills at the 4th dam, and James Rapley, a very old employee, who is acquainted with the fishes and Horace A. Hansen, another employee.

All edgings from the upper mills on Maine side are hauled away and sold. The planer shavings are blown out through large hoppers into carts and also hauled away, but burned. It pays them to save and sell edgings at this mill, as they do not do so at most of the other mills, and the market for them is left open to this mill. Some years, however, it might better pay them to burn than to sell, but they do not burn at all.

Rapley states that the passage way for fishes at this place between the two dams has existed for over 40 years. Salmon used to come up before the cotton mills were built.

Thinks they had a better chance then than now to pass the cotton mill locality. Never saw alewives above the cotton mill dam, but has above the Union dam, where they are abundant.

WATER WORKS.

Which supplies both Calais and St. Stephen with water, through a reservoir in Milltown, N. B., Is located directly below the upper bridge in Milltown, Me., and just above the upper mills on that side. Use large Blake pumps. The water is taken from the river directly under the first arch of the bridge. Pumped in and filtered by means of Warren filters, and then pumped to reservoir. The engineer states that there is plenty of sawdust on the bottom and sides of the river about here, but we saw none floating above these upper mills in Milltown. Some sawdust, however, is always contained in the water pumped in, and filters would scarcely be required except on this account. The sawdust becomes much more abundant during times of freshets, especially in the spring and fall. Pump from 800,000 to 1,000,000 gallons of water per day. Does not consider that the

sawdust gives them any material trouble.

MR. GRAHAM, in charge of Eaton's mills at 4th dam, N. B. side. Examined the passage way for fishes between and at the head of the two dams. Natural bottom, no attempt to construct a fish way. Narrow as a fish way at upper end, but broadening below.

Plenty of water was passing down, although the river was low. Many logs had been allowed to run in and were jammed in it. There seemed to be room for fish to pass up, but considering narrowness of channel, no logs should be allowed to remain in or at head. They are cleaned out occasionally. At noon and night, when water is not passing down under mills, this passage way becomes half full of water (some of the mills have electric lights and are run at night). He has seen salmon passing

through. Has never seen alewives and has never heard of them. Could not save sawdust at gangs as at present constructed. Edgings and planer shavings are burned. The crank shaft of the gang works in the water. The saw dust would average 1/5 of sawed lumber. At these mills have 4 gang saws, 1 planer, 2 edge saws, 3 lath saws;-15 logs to make 1000 feet of boards, average.

noted

REGARDING POLLUTION BY ST. CROIX COTTON MILL.

From files Dept. of Fisheries, Ottawa. No. 3,501, 1889.

LEWIS DEXTER, SECRETARY, ST. CROIX COTTON MILL, MILLtown, N. B., TO TUPPER, MINISTER OF FISHERIES, AUGUST 23, 1889.

. . . . . .

The facts in regard to our dyehouse are these: We mix our dyes in vats for the purpose of colouring yarns, and extract from that mixture, as fully as it is possible, all of the coloring matter in the process of dying our yarns. When these vats are ready to drain off and throw away, there is comparatively but very little colouring in the water. This water we allow to run into our drains which lead into the river. All of the sediment from our vats is taken from our dyehouse and deposited on the land andnot allowed to be washed into the river. We use water in washing our yarns after they are dyed. This water we also allow to run into the drain which leads into the river.

. . . . . .

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(CAPT.) JOHN H. PRATT TO DEP. MIN. FISHERIES. Nov, 6, 1889.

(Inspected the mill) . . . . .

I found that everything of a liquid nature, after being used in the dye vats, is allowed to pass into their drain, which runs under the dye-house, and thence into the river, and the only substance that is now allowed to make its exit in that manner is the wicker work binding around the bundles of a dye named cutch, which, if allowed to pass through the drain, would be liable to choke it up.

(Sends lists of drugs, diagrams, etc.)

Before leaving the mills, in conversing with Mr. Dexter, he argued(reasonably enough) that the dyes used, being very valuable, it was to their own interest to extract every vestage of dye possible, etc.

. . . . . .

I have, during my visits to this locality, interviewed several respectable citizens of St. Stephen and Calais. . . . and Mr. Todd. . . .

After discussing the matter fully * * I do not feel justified in reporting to this department that our fisheries are injured to any perceptible extent.

Halifax, 10 Feby., 1890.

The Commr. of Internal Revenue,

Ottawa.

Sir:-

I submit herewith my report on three samples of water received from St. Stephen, N. B.

* * * * * * * * * *

No. 8,768, taken about a mile above the mill on the St. Croix River, and 8,770, taken about the same distance below, were clear waters, while 8,769 taken at the mill, contained a large amount of red coloring matter in suspension, and quite unfit for any purpose as water.

I found in this sample decided traces of lead and indications of aniline color.

The difference in the samples taken above and below 8,769 is not as marked as might be anticipated. The effect of the water flowing from the mill, though its influence is visible, does not appear at the distance below named, to have a very serious effect. Judging from their valuation 192 & 204, Class III, IV, in each case, I have reported

Nos. 87,680 & 8,770 as impure.

(signed) Maynard Bowman,

Public Analyst.

MEMORAIDUM OF S. WILMOT, SEPTEMBER 8, 1890.

After reading Prof. Bowman's report, and looking over the plan showing the numerous dyeing vats, usd for aniline colors, and other noxious matter to fish life, which are employed at the St. Croix Cotton Mills, and which are allowed to run into the river as refuse, he cannot but conclude that these deleterious substances are, and must be injurious to fish life, and that the water of the river must be largely polluted from the effects of this liquid dye refuse being allowed to run into it.

Quotes from Bowman's report.

Quotes from Prof. Fryer's report to the Board of Trade, regarding effect of refuse in rivers(Fishery Inspector's reports).

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MEMORANDUM BY C. H. TUPPER, MIN. FISHERIES, JAN. 7, '93

Mr. Gault and Mr. Morrice, Manager of the St. Croix Cotton Mills Co., waited upon me on the 6th of January.

They represented that it would cost some $15,000 to make arrangements to dispose of the refuse from the mill on land, and that in any event this refuse would leach through into the river ultimately; that a comparatively small portion of the chemicals ever reach the main waters of the river; that the salmon pass up the river in clear and clean water, and a visible improvement is observable in the salmon fishery of the river; that the tests upon which I am acting do not indicate that the pollution is sufficient to be deleterious to fish life; that the river is an international one, and on the United States side sulphuric acid is put in it from foundry works, and there are dye works further above the cotton mill in the state of Maine on this river, and that since the sawdust act is not enforced because of similar circumstances on the American side, they contend that no action should be taken touching the St. Croix Cotton Mills Co.

They further allege that the refuse reaches the water a mile and a half from the tide water.

They state that enormous quantities of sawdust are deposited in the river, and that there are large banks of it at various places; that there is no similar law in the state of Maine to sub-section 2 of Section 15, Fisheries Act.

For the above reasons they hope that the instructions contained in the Departmental letter of the 26th October, to Capt. Platt, will not be carried out.

Milltown, N. B., Jan. 25, 1893

Chas. D. Owen, Esq.,
Managing Director, C. C. C. Mills Co.,
Providence, R. I.

Dear Sir:-

The following is the result of my inquiries made at your request as to whether any parties on the American side of the St. Croix River are allowing acids, dye stuffs or other refuse to flow into the river.

At Princetown, 20 miles above us on the west branch of the St. Croix, and at Vanceboro, about 30 miles above us on east branch, are tanneries, both of which claim to allow no deleterious substances or acids to flow into the river, but both are known to be using acids; and furthermore I have reliable information that the tannery at Princeton is actually allowing its acids to flow into the river.

There is also at Princeton a small woolen mill, whose owner, Mr. S. L. Peabody, advises me, that what acids he uses when running in the summer months, find thir way into the river.

In Milltown, Maine, directly opposite our mill is a railroad machine shop belonging to the St. Croix & Penobscot R. R. The foreman of this shop has admitted to us that what acids they use in cleaning their castings find their way to the river, and that in former years they did outside job work and used considerable acid, but at present are not doing any job work.

In Calais, Maine, below the lower dam of river, is a wool pulling establishment run by H. C. Grant and other parties, who allow large quantities of acids to flow into the river, and who are free to admit this fact.

Yours truly,

(Signed) L. Dexter, Jr.

D. S. S. Carlow,
Grand Harbor, N. B.
Jan. 28, 1893.

Sir:-

I have the honor to acknowledge the receipt of the enclosed fyle No. 3501/89, containing letter of A. F. Gault, Esq., in which he mentions other manufacturing establishments on the St. Croix River, besides the dye house of the St. Croix Cotton Mills, that are allowing matter deleterious to fish life to escape into the river.

I proceeded to St. Stephen yesterday and made necessary inquiries. The railway machine shop is the small one of the Princeton railway, where a couple of locomotives are repaired, and we all know that in a shop of this kind there is no refuse which the proprietors wish to throw into the river or any other place.

Regarding the wool-pulling establishment, excepting a small one, employing probably one or two men, in the back part of Calais, without any connection with the river, there is not any. I do not believe anything injurious to fish life is used in this small mill.

There is not any mill 20 miles up river now. It failed 5 years ago; a little carding and weaving is carried on in it during the summer and in winter the building is used by some persons in the manufacture of hoops for barrels.

In my second report of this date on this matter I refer to the tannery.

(Signed) John H. Pratt.

Inspector of Fisheries.

The Deputy Minister
of Marine Fisheries,
Ottawa.

FROM CAPT. PRATT, JAN. 28, 1893.

Believes that the statement that it would cost $15,000 to dispose of refuse to be exaggerated.

No foundry works nor dye works on the United States side of river, or Canadian side.

Cannot find that anything escapes from tanneries injurious to fish life.

MEMORANDUM OF SAMUEL WILMOT TO DEPUTY MINISTER, FEB. 8, 1893.

Refers to the letter of Mr. Gault(dated Feb. 2, 1893, transmitting letter of Mr. Dexter, a copy of which is given) and to reports of Inspector Pratt, of Jan. 28, 1893, and then adds:

Notwithstanding these statements in Inspector Pratt's report, the undersigned is of the opinion that more or less injurious substances must flow into the river from the establishments referred to, which must, in a greater or less degree, affect the water injuriously, and necessarily have a tendency to militate against fish life. Thisdeleterious matter from these establishments, of which the St. Croix Cotton Mills are by far the most extensive, and the deposition of sawdust and mill rubbish into the river from both sides, without any restriction whatever, must, if not stopped, bring about, in a short time, a total destruction of the salmon and other fisheries connected with the St. Croix River.

As this river is an international boundary for some distance up it, the subject of polluting

its waters, would be a fit matter for consideration by the Fishery Commission appointed by the United States and Canada, and might be referred to them.

March 1, 1893.

Chas. D. Owen, Vice President, transmits $100., amount of fine imposed upon Cotton Mill.

"In this connection we beg to say that at an interview with the Hon. Mr. Tupper by the officer of our Company, on Jan. 6, it was understood(this river being partly in American territory) that if we found on examination any deleterious substances were being put in on the American side, the Minister would then take into consideration the exemption of this river from the restriction of the Fisheries Act, the same as has been done here relative to sawdust and refuse from saw mills. We learn that Capt. Pratt's report admits such impurities thrown in on the American side. We will, however, be glad to leave the matter to the decision of your Department".

Subsequently , March 2, 1893, Capt. Pratt was instructed to take no further action against Cotton Mill Co. until ordered.

COTTON MILL, MILLTOWN, N. B.

AUGUST 7, 1893.

SAW MR. DEXTER AND MR. MUNGALL, DYE MASTER OF ALL THE MILLS OF THIS COMBINE.

For dyes and other substances used in same connection see separate list.

Aniline dyes are mixed both with acids and with alkilis. The dyes are as nearly neutral as possible to avoid injuring the cotton. Most of the mixtures in the baths are slightly acid at the start, but when finished with are neutral. The refuse from the aniline dye allowed to go into the river. Muriatic and acetic acids are used for dissolving the aniline dyes. From 4 to 6 lbs. of acid are used for a tank of 2,000 gallons. They calculate to exhaust all aniline baths.

Indigo used in dyeing blue, and is mixed with slacked lime and zinc dust. This bath is not let into the drain, except a small amount of sediment.

Turkey red, The yarn is first placed in a neutral castor oil, called alizarine oil. No expense to let off in waste. The cloth then passes

through solution of acetate of aluminum and phosphate of soda. It is then dyed in the bath of alizarine, an aniline dye.

Cutch brown dye. Mixed in solution with blue vitriol. The stock kettle of this is not emptied, but a slight amount ~~might~~ may escape. The yarn then goes through bath of bichromate of soda or potash, depending upon the shades. The bichromate bath left goes into water.

Logwood, black dye. This is used in large quantities mixed with a little soda. It totally dissolves. The remainder, after use, goes into drain.

Nitrate of iron and black iron liquid are prepared either from sulphate or nitrate of iron used in black dyes. There is no waste into river.

Sumac, mixed or dissolved only in water. Used as a mordant for yarns before dyeing with all the anilines. The yarns are passed through this mixture to furnish a body for the dye. When exhausted this mixture goes into the river. Vegetable.

Chloride of lime for bleaching. Not run into the drain from the bleaching tank, but much water has to be used for rinsing the yarn, and this goes into river. After coming through the above

bleaching, passed through a weak solution of muriatic acid, 20 or 30 lbs. of acid to 4,000 gallons of water. The chloride of lime is mixed to the extent of $1\frac{1}{2}$ per cent with water by Twaddles glass.

All the sewage from the mill passes through this same drain. About six inches of water passes through drain. Of this amount $5\frac{3}{4}$ inches are clear water. Clear water running through all the time.

Never had seen dead fish in pool below mill.

There is a grating in the mill floor, at a place where there is a man hole. All solids are stopped here, and are taken out and hauled to a dumping ground. This consists mainly of loose cotton and cotton yarn which escape from the baths. All the waste otherwise is in solution, is thoroughly mixed with the water in the drain before passing into the river. The solids at the grating have to be taken out only at long intervals. There may be three or four wheelbarrow loads at a time, perhaps once a month or less often.

Allow no waste possible. Object is to get the utmost amount of good out of dyes. They are reduced to the utmost in strength.

Tank below grating in sewer, where solids are taken out, might be made deeper to allow more settling to take place.

There is some refuse running into the drain all the time. They are letting it out constantly from the baths.

Let out no sediment except from the indigo and sumac which might settle better in a deeper tank at grating.

White product at the lower end of factory consists of cotton dust, starch from potato starch or mostly flour starch. A very small amount of china clay is used in stiffening one special line of ticking only. The waste goes out this same way, but is very slight.

Salmon are very abundant in waters below the factory. See them in the neighboring pool and also passing through the fishway. We see most fish passing up in July, when the water is low. See no other fish but salmon.

The white stuff at end of mill might be blown out on the land, and formerly was.

Havegreat inconvnience from bark and edgings aginst grating, and also from sawdust which accumulated in the pool by grating, about eleven

feet deep in this pool. Sawdust comes to surface in upper part.

Mr. Mungall.

What different kind of dyes used?(See list).

What other substances are used with them?

What is the nature of the mixture when made?
Ans. Liquid state.

What nature of mixture after it has been used, and is to be turned out? Ans. Cannot say precisely.

When is refuse turned out. Ans. Something running all the time.

How often and how much each time? Ans. Will supply.

What is its consistency? Ans. Solids taken up, and dumped on dump to form new land. Consists largely of yarns, etc., which they save.

Does it run alone through the waste pipe, or is water going with it? What proportion of water?

What is solubility of the mixture? Ans. Practically all are soluble before going into river.

Give size, course and length of drain?

How far below drain is discolored liquid seen?

What mixtures give rise to the refuse at lower end of mill? Ans. Dust from shearing machines, cotton, the white stuff blown out through wooden sluice. Might be blown anywhere; used to be blown on the land between the two buildings.

Name each?

How are they combined?

What is the nature and consistency of the refuse?

What quantity is emptied out at a time? Ans. Perhaps not a pound weight a month of this stuff.

When and at what times is it emptied?

What is the process of emptying?

Are any of the products, or the mixtures made injurious? Ans. Only starch, potato starch, mostly flour starch. Thinks they do not use china clay. Used to be used in the cloth. May use in yarn. Purpose to weight cloth, now being abandoned. *Could they not be saved in some way?*

Has he an analysis of the water at intervals

below the drain during running out of mixture?

Does not the refuse contain some product that could be saved and utilized. Ans. Knows of nothing.

Is any part of the refuse of sufficient consistency to be removed otherwise than through drain?

What has been done toward constructing pits and drain to carry refuse away from river?

Could not refuse be pumped up, tbeasuddd constructing drain through rocks?

What can he say about the passage of fish up the fishway and up the log shoot?

Does he know of anything but salmon going up?

What does he know about salmon playing around the end of the refuse drain? Ans. See fish abundant going up fishway, shoot and in eddy just below mill, when sun has particular slant. Seen most when water is low in summer. Large numbers are taken , but mostly illegally.

W. H. NICHOLS, PAYMASTER,

COTTON MILLS.

The cotton mill began to run in July, 1882.

The white refuse blown out at the lower end of the mill. Is blown out at the edge of the cliff, which is much discolored by it at this place, and most of it must run into the water. This refuse consists of lint from the broad sheeting and is white (issues from the cloth room), and of a sizing made from wheat flour, potato starch and china clay. No oil or grease. The lint is dry, the other a thick paste.

The drain opening for the dye is below the dam, outside of and above the level of the ladder mouth, near the foot of the apron which is farthest up stream and nearest the mill. The distance from the mouth of the drain to the pool at the foot of the ladder is from 100 to 150 feet.

The fishway partitions are at right angles to sides and not inclined. They are full height of sides, with openings alternately on one side and the other.

Says that salmon used to go over the falls before cotton dam was built. He was there while building was going on.

A great deal of the accumulated sawdust and refuse from above is carried down by spring freshets. Are much troubled all the time with sawdust and bark, and some edgings (edgings formerly; not so much now) accumulating on the rack, especially in spring and fall. Two men are kept at work all the time to keep the rack clear of this material. There are two racks, one by the edge of the pool (at the head of the flume) leading into the mill, the other just above the wheels. Use 3 turbine (open) wheels made by the Holyoke Co.

The sawdust along the side of the mill,

being in an eddy, accumulates to depth of 20 feet. The spring freshets do not clean out much in eddy places. The bottom at and about the mill consists of rock. Have to clean the pool by the side of the mill out twice or more every season, through a door low down in the side of the dam. A large rake is worked for this purpose by horses to stir up sawdust, which then flushes out with current.

There is a boom along the edge of channel to corner of dam from coal wharf above to set the surface drift (logs especially) away from that part of the pool leading into the mill, but the smaller refuse sucks under and reaches eddy alongside of mill.

The cotton mill dam is built on the rocks across where the falls used to be.

They use mainly anneline dyes, with some indigo, and a small quantity of acids. The chief dyer, who can give full information, is Andrew Mungall, Milltown, N. B. He has

charge of the dyeing work in all the mills of this combine.

Since the log slide was cut, not so many salmon have been seen in the pool below the fishway.

They employ about 700 persons in the mill.

POLLUTIONS, NORTHAMPTON, MASS., AUG. 1893.

E. Horton, of Cotton Mill, Milltown, N. B., told us that he used to live at Mt. Toan, Mass., and was well acquainted with the conditions surrounding the Belden silk mill at Northampton, Mass. This mill is situated on a little stream which flows into Mill River. This stream is quite small and large quantities of dye stuff are run into it. Has known of its killing large numbers of horned pout, shiners, dace, suckers, yellow perch, etc., which would float a long distance down the stream. Mill River empties into Connecticut River about 2 1/2 miles below the mill. These dead fish were often found down in the Connecticut and for some time the cause was not known.

It would be important to follow this matter up.

POLLUTIONS, NORTHAMPTON, MASS., AUG. 1893.

E. Norton, of Cotton Mill, Milltown, N. B., told us that he used to live at Mt. Toan, Mass., and was well acquainted with the conditions surrounding the Belden silk mill at Northampton, Mass. This mill is situated on a little stream which flows into Mill River. This stream is quite small and large quantities of dye stuff are run into it. Has known of its killing large numbers of horned pout, shiners, dace, suckers, yellow perch, etc., which would float a long distance down the stream. Mill River empties into Connecticut River about 1½ miles below the mill. These dead fish were often found down in the Connecticut and for some time the cause was not known.

It would be important to follow this matter up.

ST. CROIX COTTON MILL, MILLTOWN, N. B.

List of drugs that are, or may be, employed in bleaching and dyeing, and the quantities used during the week ending July 29, 1893.

("An" stands for "aniline".)

Name, etc.		Lbs. used.
Acetic Acid,		
Muriatic Acid,		
Nitric Acid,		
Sulphuric Acid,		
Bismark Brown, Red,		
" Yellow,		
Alum, N. P.		6
Aniline Salts, crystals,		
Alizarine, R. B.	An.	429
" Assistant		
Auramine	An.	
Barwood Spirits,		
Bichromate Soda,		20
" Potash,		
Biarseniade Soda,		
Black dye,		

Black dye, Mordant,		
Blue Meth, o	An.	
" oo	An.	
" ooo	An.	
Blue vitriol		
Blue black, E.	An.	
Chloride Lime,		750
Chrysoidine	An.	
Copperas,		
Cutch,		
Emerald Green,	An.	
Extract Fustic,		
" Logwood		
Developer,		
Extract Sumac		500
Fast blue developer,		
Acetate Soda,		
Fustic, Bolted,		
Garnet,	An.	
Glauber Salts,		
Wzo Mauve, R.,	An.	
Indigo,		10
Iron Liquor,		
Violet,	An.	

Logwood, Bolted,		
Litherage,		
Nitrate iron,		
Indigo auxilliary,		20,
Whiting,		
Olive Oil,		
Phenal,	An.	
Stannate Soda,		
Red liquor,		
Sal Soda,		
Safranine,		
Soda Ash,		
Sugar lead, brown,		
" White,		
Sumac, Am.		535
" Sicily,		
Tannin,		
Tartar Emetic,		2 1/2
Tin Crystals,		1 1/2
Diamine violet, N.		
Turmeric,		
Salt,		
New Blue, C.	An.	18 1/2
" D.	An.	20

New Blue, B.	An.	
" R.	An.	
Cresotine Yellow,	An.	
Lime,		
Chlorate potash,		
Benzo flavine,	An.	
Benzal green,	An.	
Russian red,	An.	
Red developer,	An.	
Tol orange, G.	An.	
" Brown, R.	An.	12
Tol Brown, B.B.O.	An.	5 1/2
Marseilles Soap,		
Aeth. Blue,	An.	
Benzopurpurine,	An.	
Cotton softener,		
Diamine blue, B.X	An.	25 1/2
" " 3 B.	An.	48 1/2
" black, R.O.	An.	12
Ureka, G. N.	An.	7/16
Nitrate soda,		
Tol brown, G.	An.	
Diamine Sky blue,	An.	
Golden yellow, $1	An.	

Golden yellow, $2.	An.
Aeth. blue, R.	An.
Diamine Green,	An.
Br. Sul. Soda,	
Diamine bronze, G.	An.
" fast red, F.	An.
Aeth. Blue, R.R.,	An.
Naphtazurine,	An.
Diamine gold,	An.
Neutral red, extra,	An.
phos. soda,	
Liquid caustic soda,	
B. Naphtylamine,	An.
B. Napthol,	An.
Diamine brown V.	An.
Green olive oil soap,	
Diamine cutch,	An.
fast blue, B.	An.
Direct brown, B.B.O.	An.
" R.	An.
Tri. Sul. potassium,	
New Meth. Blue, N.X	An.
Diamine black, B.O.	An.

Red Liquor, L.	49 gallons.

It should be noted that the small quantity of drugs used during the week in question was probably due to the fact that they shut down at the end of a week for a week's time.

ST. CROIX COTTON MILL.

DYE HOUSE.

Drug and Dye Report for 52 weeks ending

June 24, 1893.

Quantity of Drugs used.

Aniline Salts	680		lbs.
Bismarck Brown. Red	29	14/16	"
Meth. Blue. ooo	8	7/16	"
Ganory's Chip Soap.	20		"
Violet	21	3/4	"
Safranine	12	13/16	"
Trumeric	83		"
New Blue. B.	181	3/4	"
" " R.	109		"
Chlorate Potash	244		"
Bengal Green	46	3/4	"
Tol Orange. G.	31		"
Aeth. Blue. B.	54	5/8	"
Azamine Red	570		"
Cutchine	4500		"
Acetate Chrome	202		"
Dry Carb. Soda	665		"
Titan Pink	6	1/2	"
Softening Compound	558		"
Liquid Cutch	428		"
Muriatic Acid	1887		"
Alum	138		"
Garnet	7	1/16	"
Red Liquor	528		galls.
Salt	1		bag.
Lime	31		bbls.
Bengo Flavine	21		lbs.
Marseilles Soap	470		"
Erika. G.	1	1/2	"
Pho. Soda	6249		"
Sumac. Sicily.	2240		"
Aloz. Blue	5		"
Aceitic Acid	358		"
Alozarine. R. B.	606		"
" Assistant	3793		"
Extract Fustic	1000		"
Indigo	1825		"
Chloride Lime	37447		"
Extract Sumac	48500		"
Cutch	25850		"
Stannate Soda	16112		"

Sal Soda	9372		lbs.
Soda Ash	9280		"
New Blue. G.	1663	1/2	"
New Blue. D.	1964		"
Tol. Brown, B.B.O.	989		"
Tol. Brown. R.	545		"
Extract Logwood	30500		"
Iron Liquor	1112		galls.
Nitrate Iron	15400		lbs.
Indigo Auxillary	1530		"
Whiting	720		"
Ganory's Cotten Softener	665		"
Russian Red	40	1/2	"
Tin Crystals	50		"
Diamine Sky Blue	40		"
Benzopurpurine	7856		"
Biarseniate Soda	773		"
Diamine Fast Red/ F.	441		"
Barwood Spirits	121		"
Bismark Brown, Yellow	4	1/2	"
Tannin	175		"
Red Developer	200		"
Aeth. Blue. R. R.	8	1/2	"
Naphtazurine	240	3/4	"
Copperass	900		"
Diamine Bronze, G.	17		"
Diamine Gold	66	1/2	"
Neutral Red Extra	4	1/2	"
Phenal	20		"
Diamine Cutch	95		"
Liquid Caustic Soda	376		"
B. Naphtytamine	324		"
B. Naphtol	293		"
Nitrate Soda 96%	286		"
Blue Black. E.	16	1/2	"
Acetate Soda	568		"
Green Olive Oil Soap	35		"
Sulphuric Acid	172		"
Meth. Violet. B. B.	9		"
Fast Blue, B.	76		"
Bichromate Potash	29		"
Glauber Salts	10378		"
Azo. Mauve R.	6		"
Developer	16		"
Bichromate Soda	3352		"
Blue Vitriol	5242		"
Tartar Emetic	437		"
Cresotine Yellow	130	3/4	"
Nitrite Soda	101		"
Tol Brown. G.	10		"

Sumac Am.	17392	1/2	lbs.
Diamine Violet. N.	1	1/2	"
Cotton Softener	11950		"
Diamine Blue, 3. B.	1768	1/2	"
" Black. R. O.	938	1/2	"
" Blue. B. X.	1704	1/2	"
Erika, G. N.	64	1/8	"
Bi. Sul. Soda	25318		"

ST. CROIX RIVER, PRINCETON.

AUG. 11, 1893.

We spent not over an hour in a general examination of the river at Princeton. The general features are represented on the accompanying sketches and in the Atlas of Washington Co. In the latter, however, more mills are represented on the end of the dam in Princeton than now exist, and the projection of mills shown there is reduced in size to one mill. All of the mills are on the Princeton side of the river. One saw mill, owned by F. Mercier & Son is directly at the end of the dam. Just below it is the small woolen mill of L. Peabody & Son, and in an adjacent very small building was done last winter the temporary sawing of hoops for orange boxes referred to elsewhere. A short distance below this is the tannery, the smallest one of the four we have yet seen. These are all the factories there are. There is a bridge across the river just below the tannery, and just below the bridge on the other side of the river is a burning ground for edgings and other large refuse from the saw mill. A large pile of it was on fire

when we were there.

We obtained none of the measurements of the dam, but they may probably be taken approximately from Colby's atlas. A diagram of the fishway was obtained from Mr. Rolfe, and a copy of it made. It seemed to me that the fishway did not correspond entirely to the drawings, but I might have been mistaken. It was, at any rate, the same in all essential details.

As to the fishway, it struck us that the system of small gates above was not satisfactory and subject to great abuse. When we saw it, gates 1 and 2 were out of water. 3 and 4 were closed, and 5 only open. The ladder is greatly out of repair, leaks badly, and notwithstanding the small opening afforded by gate 5, there was a large flow of water through it. It might as well have opened boldly above, so far as waste of water was concerned. The stream on the side of the fishway where the gates are is very shallow, and it is doubtful if salmon would find their way to the gates. (Col. McDonald says this is not essential; that salmon would be more apt to go down over the dam.) The fishway is very much out of repair, and needs imme-

iate attention.

The saw mill is provided with one large rotary saw for logs, 1 edger, 1 planer machine, 2 lath machines and a shingle saw.

These machines are all above the main floor of the mill, which in turn is about 8 feet above the upper edge of the dam(level of lower floor of mill). From the top of the dam to the level of the water under the mill when we saw it was 9 or 10 feet. These saws were, therefore, in the neighborhood of 18 feet above the water. The lower floor of mill is continued out as a spacious wharf. In the mill, however, it is not floored over as it should be; and there is the greatest opportunity possible for all the rubbish from the mill to fall into the water.

The entire mill is underlaid by the rapidly flowing water. There is one opening in the upper floor at the large rotary saw, and one at the edging saw, for throwing edgings through. There was a car under one to receive the refuse, but under the other there was nothing, and all the rubbish was being thrown through into the stream in large quantities.

There is no automatic arrangemnt for sav-

ing the planer shavings. They fall on the floor and on the wharf outside, where much of it readily finds its way into the water.

The shingle sawdust is supposed to be carried out by an automatic contrivance, but it opens over the water, and apparently a large proportion of this stuff falls directly into the water. There is a slide into the stream for the regular sawdust.

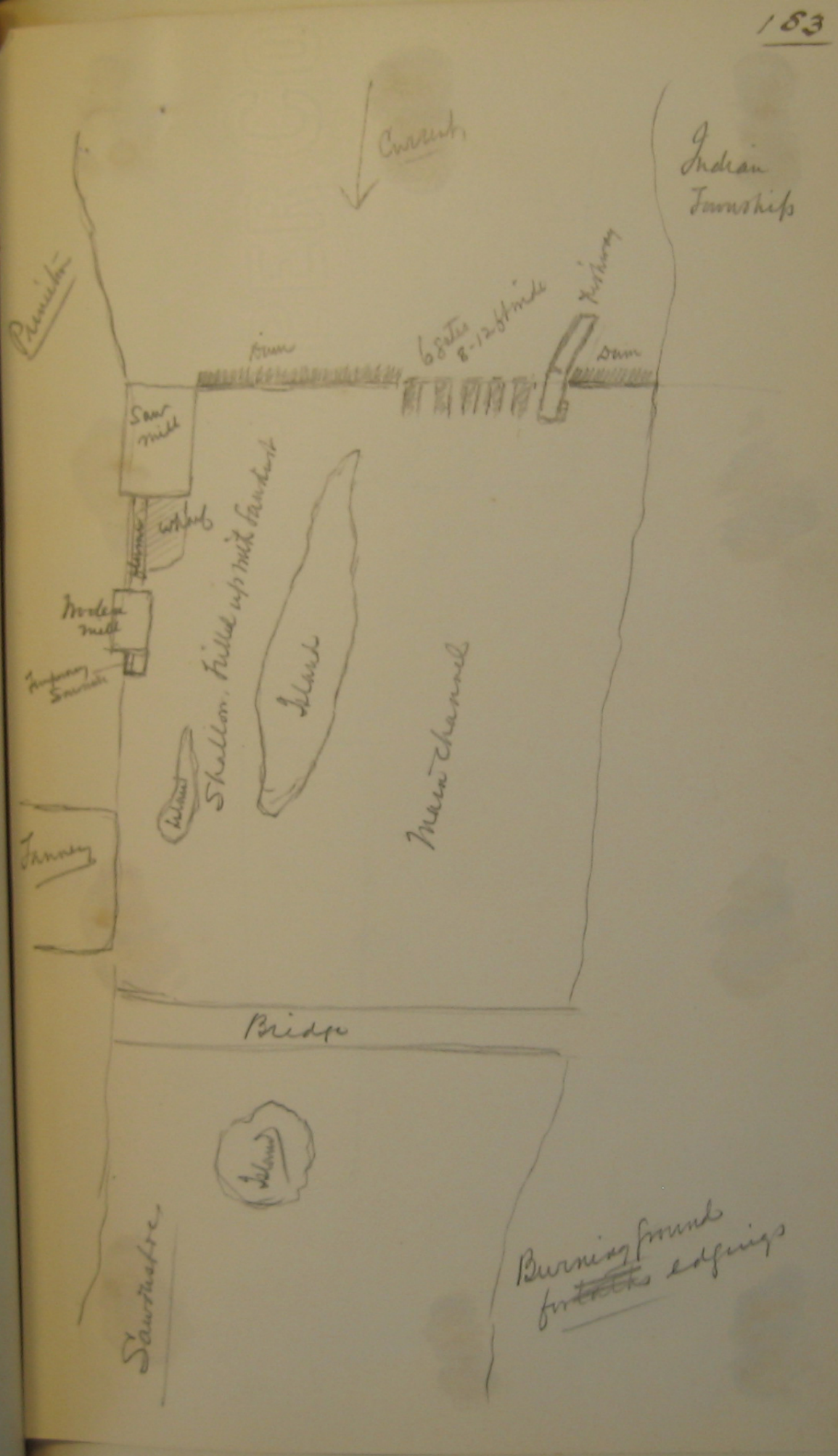
In none of our experience so far had we seen such a deplorable state of affairs as exists here resulting from this saw mill. There is some appearance of conforming to the law, but it is superficial, andit is safe to say that, at the time of our visit, perhaps a half of the coarse rubbish, as well as all of the sawdust, was escaping into the river. This included the slabs, edgings, planer shavings and shingle sawdust. All of these articles were falling from the mill into the current, and were being carried down stream, as we could see standing on the wharf and on the bridge, until they found a resting place on the bottom.

There was formerly a large island at this place, called Lewey's Island. The building of the dam and the diversion of the current resulted in

cutting away most of the island, leaving in its place 3 or 4 smaller islands. The main current flows on the Indian township side of the river, the bottom on this side of the river above the bridge being clear from mill rubbish. On the Princeton side, however, everything is filled up with this rubbish, and the width of area so filled in widens as one goes down stream. We did not have time to follow it below the bridge, but standing on the bridge we could see it as far down as the turn in the river, showing everywhere at the surface, and in places rising above it. This rubbish was composed of all the material above described, each occurring in large quantities. Shingle sawdust was a very prominent component of the mass, and edgings and planer shavings were piled in everywhere amongst the sawdust. It was very evident that no special effort was being made to save any of the rubbish, and the river was in a very unfortunate condition. It would be no trouble to save and burn everything at this place.

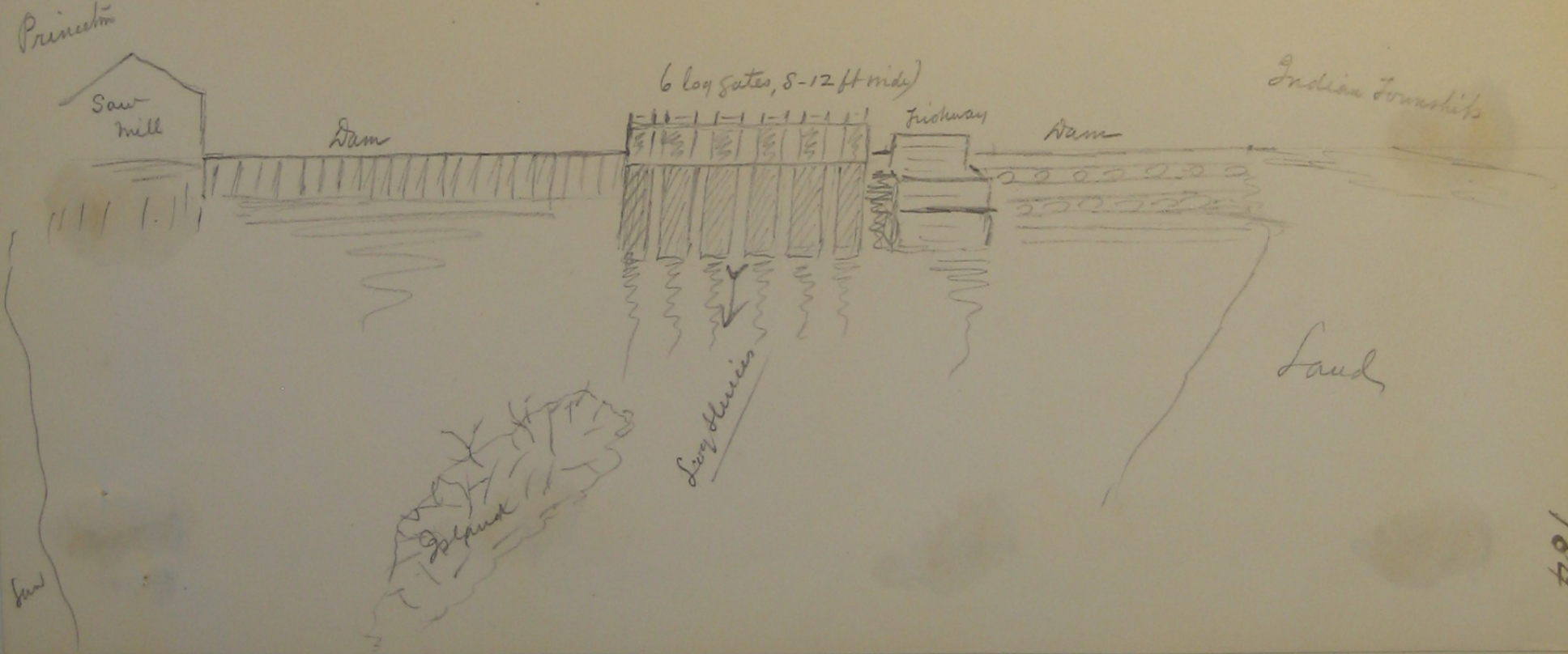
Some of the edgings are saved for fuel. They were using them in the tannery. We were informed that the pile of edgings being burned on the other side of the river were accumulations from win-

ter sawing. The railroad does not run down to this place, but only out into the yard at the mill. This subject requires further investigation and should be carried down the river as far as it continues. Down the river the rubbish from the tannery should also be found.


Current
Indian Townships
Penniston
Dam
6 Gates 8-12 ft wide
Dam
Saw mill
Modern mill
Skeldon. Filled up with Sawdust
Island
Main Channel
Tannery
Bridge
Island
Sawdust
Burning ground for edgings

St. Croix at Princeton, Dam. looking up stream

Aug. 11, 1893



TO ACCOMPANY DIAGRAM OF FISHWAY IN THE PRINCETON DAM.

This fishway was designed by Chas. G. Atkins, as Engineer for the Commissionersof Fisheries for Maine, the speifications being dated Aug. 24, 1878. Sept. 4, of the same year, the owners of the dam were notified by these Commissioners to construct the fishway, the letter being signed by Stilwell and Stanley.

Scale 1/8 in. to 1 foot.

Elevations are stated with reference to the crest of the dam in the most northerly gate. The sign + so much above crest of dam, and - so much below same.

The gates to be fixed as to securely lock open, halfway or closed, at pleasure(We saw no means of locking).

Upper part of fishway down to near crust of dam to be planked completely in, sides and top. The latter was covered with stones.

Penncrest pitmans

Gates 2½ ft square
Sunk in crest of dam

1st Gate. Sill. 3 ft. above crest of dam
2 " " 2 " "
3 " " 1 " "
4 " " ½ " below "
5 " " 1 " " "

Top of pier

Rollway of dam

A

B

C

El. -8 ft. 9 in

3 ft.

Rises 4 ft. 9 in. in this 3 ft.

crest of dam

Pier

Pier

15 in

12 in

19 ft

10 ft

5th Gate

4th Gate

3rd Gate

2nd Gate

1st Gate

Pier

2 ft planking

El. + 7 ft. 3 in

El. + 5 ft. 6 in

El. + 3 ft

El. + 2 ft

El. + 1

El. - 1

El. - 3

62 ft

Rises 6 ft. 3 in in 62 ft

Total rise of rollway 11 ft,
This is on flat

PRINCETON, ME., AUG. 12, 1893.

Examined the stream to a point a short distance below the dam. Also tannery, woolen mill, saw mill, and the mill of James Murchie for preparing wood for orange boxes.

Noted

Murchie Mill uses three kinds of hard wood. The logs are sawed into short length, and these pieces are revolved under a knife which cuts a continuous shaving between an eighth and a quarter of an inch thick. This is then cut into suitable lengths by a knife. There is also a small thin saw for cutting the slender hoops used upon these boxes from small stems or twigs. The sawdust is fine, andnot much of it. This mill is on the lake front, opposite the rail road station, but some distance from the water, andit would be difficult to put the rubbish in the water. There is no danger from this source. The sawdust was piled up. The small round log left in each instance is sold for firewood.

The woolen mill, run by Mr. Peabody, is a small affair, and presented nothing for consideration. It is a single old frame building, situated between the saw mill and tannery, and is now restricted to carding and making yarn from wool brought in from the neighborhood. Does not run all the time. Run by water; one wheel, supplied through a closed square flume, running under the inner side of saw mill. No dyeing is done. Nothing much can go into stream, and Mr. Peabody assured us that not more than a barrel or two would so go in during a year. It would consist of pickings from the wool. No oil, grease or any other deleterious substances are used.

In a very small building adjacent to woolen building, some of the slender hoops for orange boxes were sawed for the Murchie mill, the weather being too cold to operate in the latter mill. It is not likely to occur, and if any sawdust went in last winter it was a very small amount.

Tannery, one of the Shaw system, and much smaller capacity than the other three we have visited. Contains three leaches and 100 vats. They tan a variety of kinds of hides, all sole leather, however.

Mr. Dole, foreman, showed us through entire building. It is run by steam. They get a very small amount of water from the flume which supplies the woolen mill. Other water is obtained from two springs near by. Water is utilized only where it is needed in the different processes.

Mr. Dole assured us that the water in which the hides were soaked was used in the leaches, as water supply was small, and it saved some pumping. We saw the vat in which soaking was done, and they were full of old water about to be pumped into the leaches.

The fleshings are all carted away and generally disposed of to farmers.

After fleshing the hides are soaked in a very weak solution of vitriol, contained in several vats. This mixture is so weak that we tasted it, and observed only a very slight taste, that was not unpleasant. Mr. Dole said a cup could be drank without harm, andhe may have been correct. The running out of this mixture it seemed to us could do no injury. It is used to cause the hides to thicken, or swell out some.

The tan liquor is never wasted, but used over in the leaches.

The exhausted bark is all burned in the furnace, and they also burn edgings from the saw mill, and in the winter sawdust from the same source.

The water used in washing the leather after tanning runs into river, but is undoubtedly harmless.

We saw no signs of tannery refuse in the river here, and heardno complaints about it.

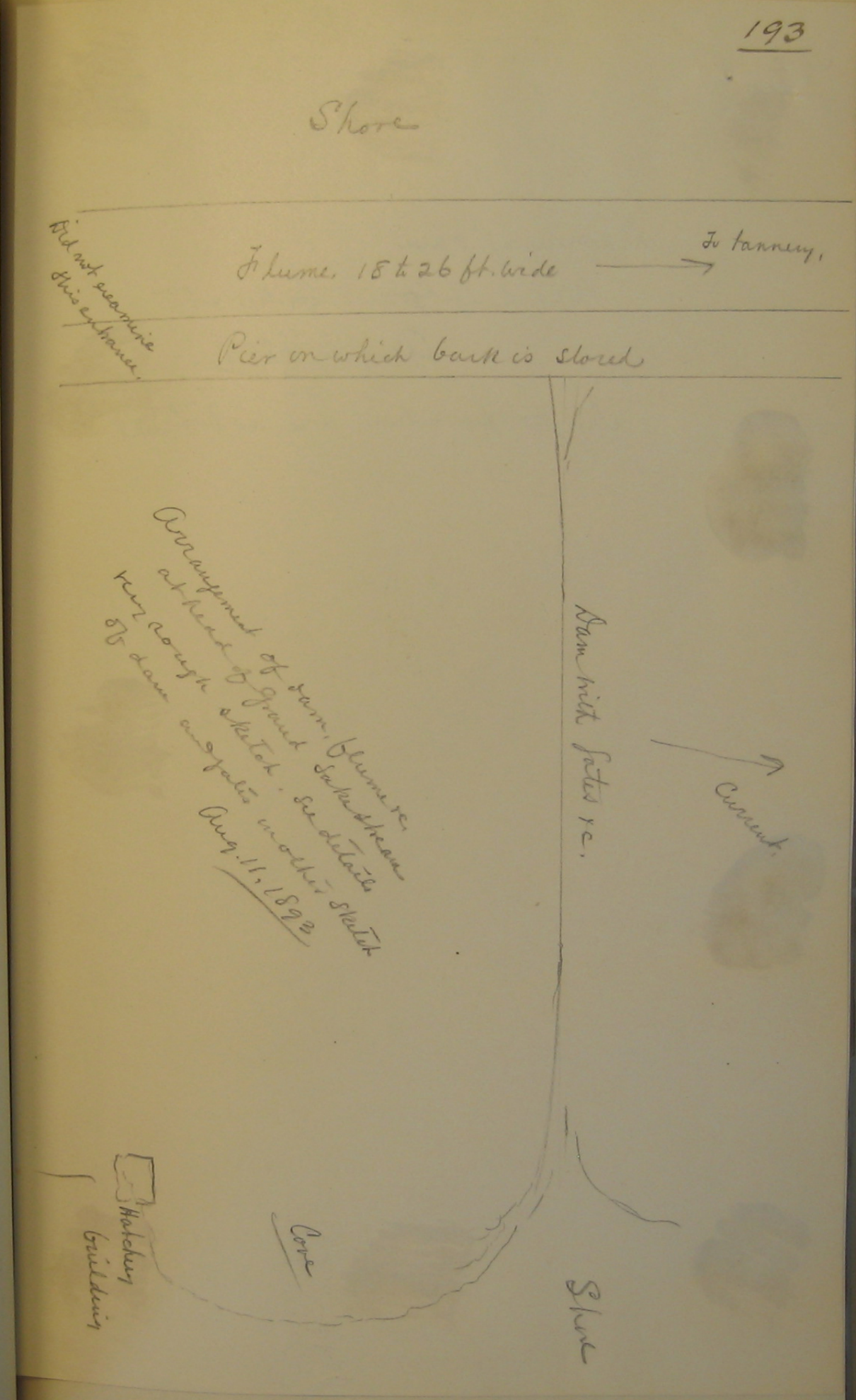
Saw Mill. The saw mill is to be condemned in its practices. It has violated the spirit and letter of the law, more than we have yet seen. Notes on the structure are given elsewhere. They profess to save everything but the sawdust, and do save most of it, but a large proportion of everything--edgings, slabs, planer shavings and shingle sawdust, as well as all the sawdust, were pouring into the stream in great abundance. The entire river below the mill was in a fearful state from this cause, as far as we could see, and in the channel on the mill side were shoals of rubbish, reaching everywhere nearly or quite to the surface. The rubbish on top of these shoals and on the shores was fresh and of recent origin. For some distance down there was more of the coarser stuff, edgings

and pieces of wood, planer shavings and shingle sawdust, than of ordinary sawdust, and this thing had evidently been going on for some time.

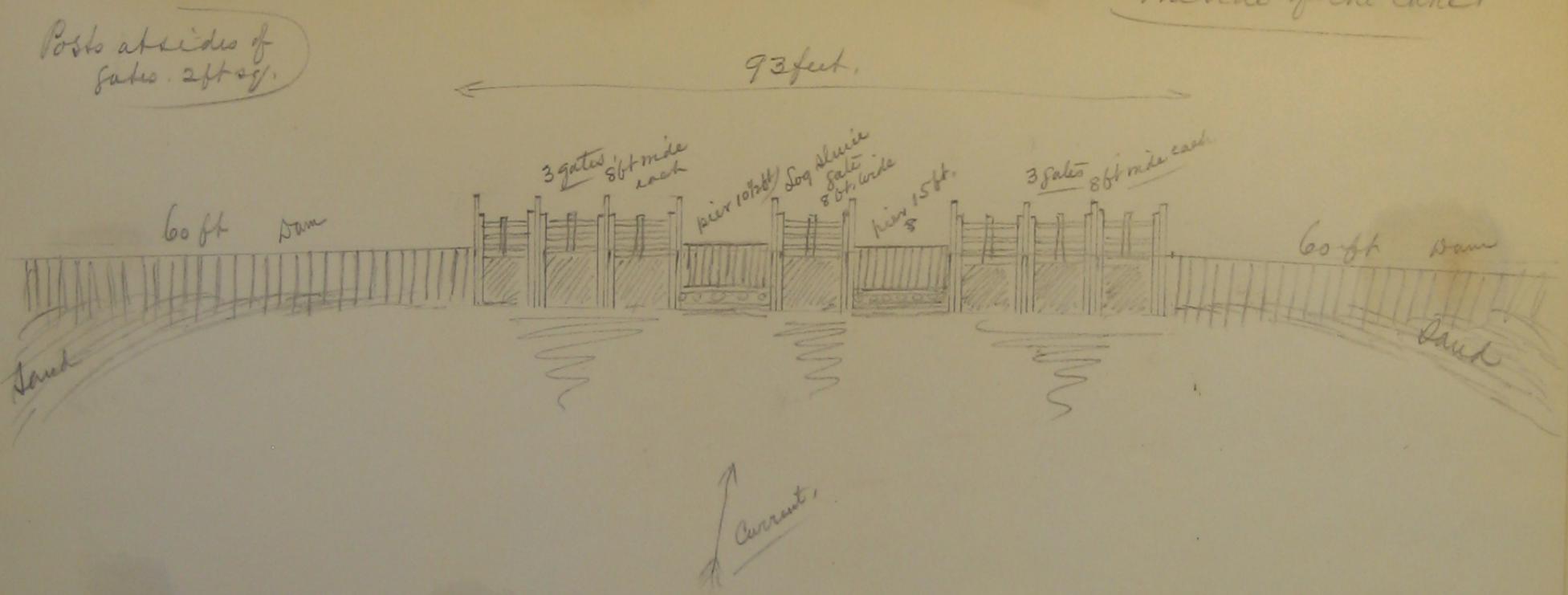
Diagram of dam at head of
Grand Lake Stream.

Aug. 11, 1893.

(The proportions in the drawing
are not true).


Shore
Flume. 15 & 26 ft. wide
To tannery.
Did not examine this extension.
Pier on which bank is stored
Arrangement of dam, flume &c. at head of Grand Sachem stream Kent Borough Sketch. See details under Sketch 86 dam and falls
Aug. 11, 1892
Dam with gates &c.
Current
Cove
Hatchery Building
Shore

Dam at head of Grand Lake Stream. Veiwed from the upper side, or from the side of the Lake.



194

W. H. MUNSON, PRINCETON, ME., AUGUST 12, 1893.

Had been in the service of the U. S. Fish Commission 18 years, all of the time except the past year having been connected with the work at the Grand Lake Stream hatchery. Had been thoroughly acquainted with the region for some 40 years.

Some refuse from the tannery at Grand Lake Stream and a good deal from the saw mill still go into the river, but nothing compared with former times. At one time everything nearly was allowed to go adrift, and it was in the early days of the tannery that the great damage to Grand Lake Stream was done. He thought the tannery had been built about 21 years, but does not remember when they stopped putting in all the refuse. The material originally allowed to go to waste were the exhausted tan bark, fleshings, ashes, and some of the tan liquor. Had the practice continued thinks the mouth of the stream would have practically become filled up by this time. There used to be a deep place at the mouth of the stream, right at the head of Big Lake, the depth having been 10 feet at low water. This was in a cove, but

the eddy formed there by the stream brought in the tan bark to such an extent as to fill it up so that at extreme low water you can walk over it dry shod. This place is about 2 1/2 miles from the tannery.

The tan bark, fleshings and ashes also (Tanning) accumulate in many places on the bottom throughout the length of the stream below the tannery. This material has been more or less covered with gravel so as not to be evident always from on top, but it is readily uncovered with a shovel, and some years ago he and Major Ferguson spent two days in digging in order to determine its extent and the damage it had done. The conclusion they came to was that the very places where the landlocked salmon had been in the habit of spawning were so underlaid with this rubbish as to be entirely spoiled for this purpose, and that the salmon no longer resorted to them, at least as before. They concluded that the spawning grounds had been permanently destroyed but he could not say but that the condition of the places might improve again with time. He thinks, however, that as long as the bark remains in those places it will be bad for the fish. The fleshings which they found partly buried were still in an of-

fensive state, the presence of the water not seeming to purify or to dissipate them.

Bark and ashes are not allowed to go into the stream at present. All of the sawdust from the saw mill does go in, however, and also some liquor, the soakings of the green hides and the washings of the freshly tanned leather. Thinks that the tannery probably puts nothing more in at present than they can help, and is not certain that the refuse now allowed to go adrift from the tannery does any special harm. The sawdust probably should be kept from entering the stream. The harm to the stream has already been done by the tannery.

He explained that only the middle gate in the dam above the tannery is used for sluicing logs. It is a larger and deeper gate than the others and was intended as well to take the place of a fishway, leaving a large channel through the center of the stream. Mr. Munson always looked after the opening and closing of the gates while he was at the hatchery and states that they were always kept open all the time necessary for the passage of landlocked salmon. They were in fact kept open all the year(the single one in the middle at

least) except from the last of March to the last of April, when they were getting a headway of water for log driving. No fish were running at that time. The sluicing of logs continued until the last of June. While the sluicing continued the gates were opened by day and closed by night. After that they were open all the time, being locked up. He thought the closing of the gates at night while the salmon were running did no harm, as they had plenty of opportunity by day.

The landlocked salmon begin to run down into the stream about the middle of May, soon after the ice goes out. In the spring they rarely went through the dam, but remained in the upper part of the stream, returning to the lake about the middle of June as the water warms up.

They commence to run into the stream again the last of September, they then pass the tannery and proceed to their spawning grounds. He thinks that many remain in the stream all winter, as the stream getsso low that he does not see how they can get back.(This statement may be questioned). The following spring he thinks they run back to Grand Lake in May after the ice goes out. He strengthens

his argument by stating that in May there is a difference in the fish above and below the dam. Those below are thin, while those above are fat and plump, having been in the lake all winter.

The landlocked salmon which run into Grand Lake Stream must come from Grand Lake, as there are none of this species now in Big Lake. (A very interesting problem is suggested by the fact that the salmon here run down stream and not up, while going to their spawning grounds).

The manner of taking landlocked salmon at Grand Lake Stream for hatching purposes during the past 10 or 12 years at least, has been as follows:

On Sept. 15 of every year a fine mesh barrier net was placed across the northern entrance to the stream, at the small stripping building. This kept the fish from proceeding down the stream, and held them back in the lake. About October 25' one end of the barrier net was taken up and in its place were arranged 8 pounds or traps for taking and holding the fish as they came up. The number secured this way each season ranged from about 1,000 to 2,000, and the number of eggs from about 900,000

to 2,000,000. The pounds were kept down until about November 24. The fish after stripping were retained until the stripping season was over, as it was feared thatif realeased at once they would return to the stream and be caught again. They would finally be taken some distance up the lake in floating cars, and there released.

By this means no fish were allowed to reach their natural spawning grounds. The average number of eggs hatched may be estimated at about 90%. 25% of the fry were always returned to these waters and some years 30%. It was considered that this gave better results than would have come from allowing the fish to spawn naturally, as it is probable that only a relatively small percentage of the eggs would be fertilized in nature, and the eggs were subject to great mortality from their natural enemies.

Mr. Munson had seen this species spawn and had watched the male hover over the nest. He has also taken up the eggs from the nests. There were many chances that the milt from a single male would not be extruded so as to cover all the eggs. It might land upon one edge of the nest, and as the

spawning is all done in rapid water it was possible for all the milt to be swept away by the current before it had reached the eggs. I suggested that it would be a good plan to take up the contents of several nests, and observe what proportion of the eggs had been fertilized in each. Mr. Atkins has many observations on the spawning habits of this species.

The landlocked salmon are very much less abundant now than they were 35 or 40 years ago, which has been within the experience of Mr. Munson on this stream. They have, however, much increased in numbers and in average size since the hatching operations have been carried on there. Mr. Atkins has a record of the weight and size of every fish taken by him at Grand Lake Stream hatchery.

Sea Salmon, During the continuation of the hatching operations on Grand Lake Stream he knows of 4 or 5 sea salmon being taken there. Mr. Atkins has a record of them. He heard of the one taken by Mr. Grimmer, but did not see it. Never knew of sea salmon being taken around Princeton.

Brook Trout are not abundant in the lakes but are in the stream. Could not say anything

positive about their decrease. A few trout might pass the dam in Grand Lake Stream, but the passage-way there was not needed specially for any fish but the landlocked salmon.

A few landlocked salmon spawn in Dobsis stream and a very few in Junior stream.

Pickerel have always been in this system of lakes since he has lived there and he supposes they are native to them. There are very few in Grand Lake, as the water is too clear for them. The occur principally in Big Lake and Lower Dobsis Lake, in both of which they are captured for market. Pickerel and white perch are the species taken for market. Does not know whether either of these species has decreased in abundance.

Never saw or heard of any cusk in these lakes.

Does not understand that nets can be legally used in these lakes, but thinks it is done on the sly. Trolling is allowed with a minnow attached to a hook, but not with the other special devices.

The fry of sea salmon have been planted in Grand Lake Stream and in Junior Stream.

He has taken the eggs of landlocked salmon

from suckers captured in Grand Lake Stream. Thinks the chubs also may destroy many of these eggs.

C. A. ROLFE, PRINCETON, MAINE, AUG. 12, 1893.

Mr. Rolfe is one of the principal store-keepers here, and was recommended to us by Chas. R. Whidden, of Calais as a man whose statements could be thoroughly relied upon. He does a great deal of fishing for sport.

The saw mill firm of F. Mercier & Son, now comprises only the two sons, the father having died a few years ago.

(Some one informed us that the father used to defy the law against running mill refuse into the river. Considered it cheaper to pay a fine occasionally and not bother with caring for the refuse. The scene about the mill indicated that such might have been the case.)

F. Mercier & Son own about 80 feet of the Princeton dam privilege. Mr. Peabody owns about 12 ft. The town owns remainder of the dam. The entire dam was originally built by theLewy's Island Mill Co. The rights of the town have been given to the Log Driving Corporation, on condition that they keep the farther end of the dam and the gates in repair.

There is at present, time of our visit,

about 3 feet head of water at the dam. During times of spring freshet the head may increase to about 7 feet. The present season is most unusually dry.

It is customary to keep the gates in the dam closed from about July 15 to about April 1 following. From April to July they are opened more or less as required for sluicing logs. In case of heavy fall freshets, may have to put up one of the gates then for a time. The opening today by the sheriff of two of the gates, on an injunction issued from Calais, was quite unusual.

The plans of the fishway in this dam were made bu Chas. G. Atkins, as Engineer for the State Fish Commissioners, by whom it was transmitted to the mill owners, with directions to build at their expense, etc.(See copy of plans of dam elsewhere). (We did not have plan of the fishway before examining it, and cannot say, therefore, that the fishway at present corresponds exactly with it. There seemed to be some slight differences, but they would be immaterial).

The tannery is run by steam, using water only where required as such, washing, etc. They

take a small amount of water from the flume which supplies the woolen wmill. The most of their water, however, comes from two springs.

James Murchie's mill for cutting orange box stuff can only work during the warmer months, and last winter they made use of a small building adjacent to the woolen mill for sawing hoops for their boxes. The machinery was taken there and afterwards removed back to the regular mill. This change is not likely to be repeated again. This is the third season of Mr. Murchie's mill(See account of it elsewhere.)

Had heard of three sea salmon being taken in Grand Lake Stream, one by Mr. Grimmer, caught on a hook, and two taken in the nets of the Fish Commission hatchery. Persons had told him that they had seen sea salmon at the foot of the Princeton dam, but he had no personal knowledge of their occurrence there, and did not know what credence should be given to these stories.

Never heard of shad or alewives at Princeton.

Landlocked salmon are now rarely taken below Grand Lake Stream. They are occasionally

caught at the head of the St. Croix in Princeton.

40 years ago, previous to the construction of the Princeton dam(built about 1852), it was all quick running water in the St. Croix from the lake to the Princeton tannery. Landlocked salmon used then to be very abundant in that part of the river, and were frequently taken at Black Cat Rips, about two miles farther down the river. At that time they were occasionally secured in the three lower lakes, not in still water, but in the rips, especially in the narrow channels connecting the lakes.

This species,has, however, always been most abundant in Grand Lake Stream. Thirty years ago all landlocked salmon above Big Lake were taken in Grand Lake Stream, or in Dobsis stream. They did not then fish for them in Grand Lake as they do now. June 1 to 15 is the best fishing season, and it is then that most of the sportsmen visit this region. September and October are also good fishing months. He thinks that this species comes down from Grand Lake into the stream. Cited several reasons for his view. One was that good runs of salmon follow a boom of logs into the stream. Bet-

ter fishing follows immediately after the passage of a boom.

Had not observed the spawning of landlocked salmon at the head of the St. Croix at Princeton. They have, he thinks, spawned more in other streams than the Grand Lake, since the introduction of the method of barring fish at the hatchery of the Fish Commission.

The average size of the landlocked salmon at the head of the St. Croix at Princeton forty years ago was about 2 1/2 lbs. They sometimes run up to 4 1/4 lbs. In the eastern Grand Lakes(above Vanceboro) they run larger in size than in the western Grand Lakes(above Princeton).

Brook trout are taken now in the St. Croix River below the Princeton dam and at Black Cat Rips; also in the small streams; but not in the lakes below Grand Lake Stream. Very much less abundant now than formerly, and average much smaller. Forty years ago they would average about 2 lbs. in weight, and run up to 4 or 4 1/2 lbs. Does not know specially where their spawning grounds are, but suppose they spawn in the main river as well as in the smaller streams.

The other fishes occurring in the river are yellow perch, chub, horned pout, minnows, eels and occasionally pickerel.

The same species with the addition of white perch occur in the three lower lakes, which are all practically alike in character and conditions. No togue nor white fish occur below grand Lake Stream.

West Musquash lake contains landlocked salmon, togue, the salmon being smaller than in Grand Lake Stream, and averaging about 2 lbs. There are good spawning grounds in the stream from this lake. East Musquash Lake contains landlocked salmon, but never heard of togue there. This latter species has, however, been taken in the streams emptying from Farrar's Lake into East Musquash Lake.

The togue in the lakes average about 5 lbs. and are captured by trolling as well as through the ice.

Never took a white fish with a fly. No black bass in these lakes.

In May and November are allowed to take white fish with nets. (This should be verified). Nets are set between Compass Lake and Grand Lake.

Does not know of their fishing elsewhere by this means. The whitefish average about 1 lb. each; range up to 2 lbs.

About fifteen men fish as a business on these lakes. There are about eight at Princeton. They fish with hooks and troll. Pickerel are taken in still water. Musquash is the best stream for them, and they are abundant there. The fish are shipped to Boston from Princeton in barrels with ice. Each person ships on his own account. The shipments amounted to about 1,500 lbs. of fish for two months, from early in July to early in September. Do not fish in the winter as a business, but sporting parties fish for togue through the ice. At present through the ice it may be said that five togue are taken to one landlocked salmon. Forty years ago more salmon would be taken than togue by this method. However, during the past year the salmon have been most abundant, taking the entire season through.

The first week after the ice goes out (early in May) more landlocked salmon than togue will be taken any year. This is in Grand Lake, not in the stream. This is the best time for trolling.

There are rapids in all the streams flowing into Grand Lake, and landlocked salmon occur in all of them to a greater or less extent.

JOHN H. ROSE, CASHIER AND BOOK KEEPER FOR THE TANNERY, GRAND LAKE STREAM.

AUG. 11, 1893.

Small landlocked salmon, weighing 1 to 1 1/2 lbs. have been abundant during the past 2 years. Thinks this species has been on the increase.

Has lived at Grand Lake Stream 10 years, and does much fishing every year. He finds lots of landlocked salmon, and says the stream is full of them.

The sluicing of logs through the dam continues about 30 days, beginning somewhere between May 15 and June 1. Thinks gates in dam are open sufficient length of time for the landlocked salmon, but one practice in closing the gates had been very harmful(The same thing was also described to us by W. B. Hoar, who has lived here 11 years, does much fishing, and gave us the impression of being very intelligent and honest). This practice was as follows: Logs are sluiced when the wind is favorable, blowing westerly or northerly. The gates are then opened and the logs pass through. In case of a change in the wind from a direction which tends to hold the logs back, the gates were all closed sud-

denly, and the entire body of water was shut off from the stream. As the stream is rapid below the dam, the water ran out quickly from the stream, so quickly as to leave many fish stranded in pools and elsewhere in the bed of the stream. Many of these became dry and died, and large numbers of dead ones would be seen. Mr. Rose called attention to this fact, and since then the gates have been closed one at a time, so as to stop the flow moregradually and give the fish a chance to escape. This has had a beneficial effect, and he is not aware of much trouble from this cause at present.

There is plenty of water on the aprons below the dam to allow the fish to run freely.

After the close of the sluicing sason it was customary to open the gates and keep them open till fall, when the net of the hatchery was stretched across. They were then closed to raise the water and simply for the benefit of the hatchery. They were probably not opened again until the following spring. Beginning last fall, however, the gates were left open until fall. Their being closed at present, during our visit, was probably an overight.

Landlocked salmon come down into the

stream in September and October. Some of them remain in the stream all winter. Knows of an important spawning ground about 2 miles down the stream. It is a large eddy, having a sandy bottom. Suppose, however, that they spawn all along the stream, and even above the dam when they were not given the opportunity of passing by it.

Adult landlocked salmon are most abundant in the stream in the fall and early spring, until about July 15, when they go back into the deep water of the lake. They may be said to average about 2 1/2 lbs. each, and to range from 1 1/2 to 6 lbs. The larger sizes, however, are scarce. They come down into the stream to spawn. Lice become abundant on the fish while in the stream, but they have no lice upon them when they first come into the stream from deep water in the fall. They will not take the fly in the spring until June, but will take bait most any time. They will take the fly when they come down in the fall.

The saw mill is run by water. It belongs to the tannery, and saws only for the tannery. Is shut down most of the time. Will saw on an average about 50,000 ft. of lumber in a year. Has only

one rotary saw and one planer. Very little sawdust goes into the stream, not more than 5 lbs. went in last season. It is hauled away to use in ice houses, for banking around houses in the winter, etc. The demand for it is greater than they can supply. The edgings are used for fuel, etc. We saw no signs of sawdust in the stream. Thinks there is nothing harmful in the green hides when they are soaked. They use here hides from Madagascar, which come dried. The fleshings and hair are hauled away for fertilizing, or are thrown away. None go into the stream.

The liquor is entirely exhausted, being used over in the leaches, never thrown away. Bark is burned. This is a larger tannery than those at Vanceboro, Forest City, and Princeton, but is worked only to about the same capacity as the two former. Use both steam and water.

The rise of water to top of apron at dam is about 4 1/2 ft. on an average. Extreme rise would be about 5 ft. 10 in.

Thinks fishway might be serviceable, but would not be needed much except at high water, when the gates are shut. Last spring the gates were

not shut until about April 1.

The following fishes occur in the lakes above Grand Lake Stream:

Togue are very abundant. They prey upon whitefish and brook trout.

Brook trout arenot plenty in the lakes, but arc in the tributary brooks.

Whitefish are not abundant in Grand Lake, but are in the thoroughfare between Compass Lake and Grand Lake, on a sandy bottom. They do not take the hook.

White perch occur at the mouths of streams. Not abundant in Grand Lake, but areabove.

Yellow perch, rare.

Chubs, suckers, minnows and eels are abundant.

No pickerel in Grand Lake, except occasionally at the mouths of muddy streams.

Sea salmon taken only once in a great while. Besides those takn by Fish Commission could remember only one captured by Mr. Grimmer. It was a spent female, weighing 25 lbs.

Small fresh water smelt occur in Grand Lake and the lakes above it, but are more plenty in

Big Lake.

No black bass in these lakes.

The ice goes out from the lake between May 1 and 10. Landlocked salmon are taken most abundantly in the stream just after this time.

It is complained that the hatchery returned only 25% of the fry to the lake. Thinks this is reason why the fish have not increased here as rapidly as they should, considering that the ingress of the fish into the stream was entirely cut off during the season when they run in to spawn by the nets set across the head of the stream by the Fish Commission. Thinks that a larger percentage of young would have resulted from the natural spawning, providing the fish had uninterrupted access to the stream.

The decrease of landlocked salmon has been greater in the eastern than in the western lakes. Grand Lake Stream has been a natural spawning ground for them.

Do not occur now below this stream excepting rarely.

There is now no netting in these lakes, but there used to be. The matter is now looked

after better than it was.

Grand Lake is especially clear, and the water cool and nice as any spring, although it naturally becomes warm at this season.

Has caught trout weighing as high as 3 lbs. They mostly range from 1 to 2 lbs.

The Grand Lake Stream dam belongs to the log corporation. This tannery has nothing to do with it, but when the water gets low may ask to have the gates shut at times.

Steam is the power used at the tannery. Water is only brought in for such purposes as are necessary--washing, soaking, making tan liquor, etc.

VANCEBORO, AUGUST 9, 1893.

The only dams are one at Tannery just below railroad crossing, and one river driving(or corporation) dam, between 1/4 and 1/2 mile up river from railroad bridge. The tannery dam extends straight across river. Has a log roll way near center and sluice way leading to wheels close upon the Maine shore. In fact it is built upon the shore most way. The fishway leads out of sluice way at right angles, into what might be regarded as sufficient depth of water. This has been a very dry season, but there is plenty of water now at foot of ladder. The Superintendent, Mr. Hunter, says that he knows of no map showing the dam and connections. The fishway we will measure later.

In fleshing hides the fleshy parts and hair are stripped off . These are hauled away, and it has been the custom the last few years to use them upon land as a fertilizer. They wereput upon the land in the winter, but objection has been made to their use by the residents of the town, and it has been stopped. The water in which the rinsing is done goes into river. Some hair, but only

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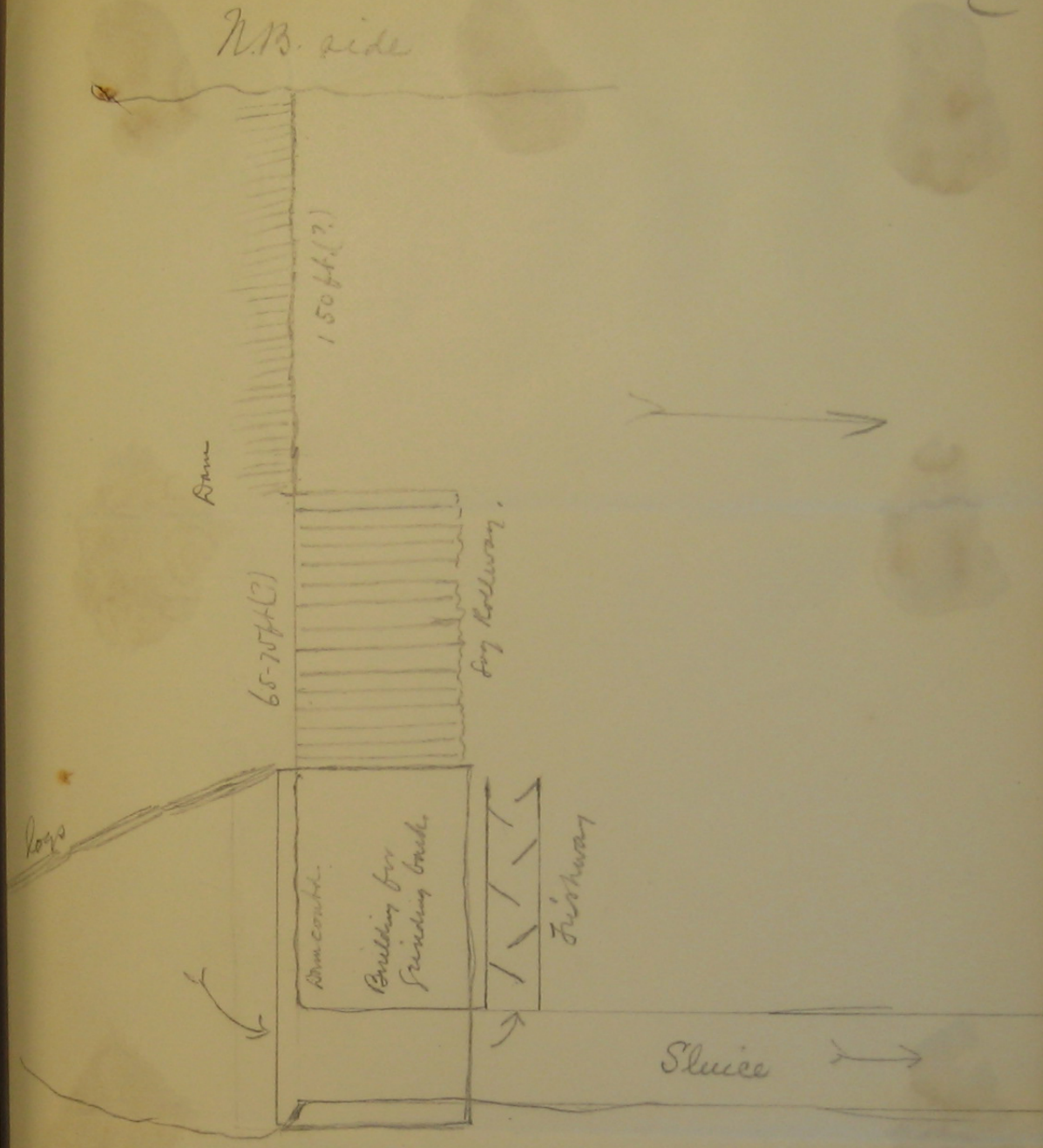


Tancebow

Tannery yard and buildings

a very little could escape. Assured us that nothing harmful from this source was allowed to reach the river.

It should have been said above that some of the hair was hauled away and burned, only the fleshings used on land.

The liquor, or bark mixture, in which the hides are tanned, is never allowed to run into river. Whatever remains in vats after tanning is used over again in making new liquor. Assured us that they never allowed the liquor to go to waste. (Mr. Conrad says he is confident that the old liquor sometimes reaches a state when it cannot be utilized, and that it is then passed into the river. This could readily be done at a time when it would not be noticed. He had no defienite information on the subject, however. James Ross, on the other hand, states that he has seen the liquor passing into the river a few times, and that it discolored the water for some distance.

The green hides are soaked in water in vats, about 9 by 7 ft. square and 5 ft. deep. Ten of these vats may be in use at a time. In the winter the soaking of each lot lasts 8 to 10 days; in

the summer, 3 to 4 days. When soaking to this extent, they may average emptying about 1 vat a day into river, but much of the time they are not doing much work. They had no green hides while we were there.

None of the bark allowed to go into river. It is all burnt after the liquor is made from it. Stopped putting bark into river about 15 years ago.

The bark is first ground, then goes into large circular tanks in which the hot waste liquor is first run by means of a sprinkler, which revolves about the top of the tank. This liquor being exhausted, hot water is added to the required amount. This process is called leaching, and the tanks are leachers. The liquor is thence conveyed to coolers, and finally into the tan vats, of which there are 400(346 layer ways).

The hides after tanning and draining are washed and brushed in falling water, by revolving brushes. Considerable water is used in this process, and it passes into the river close by the building where this is done. Some refuse must go out in this way, but we examined the stream here and tasted the water from it. There were some

small floating particles in it, but no particular, if any perceptible, discoloration, and no appreciable taste. The hides are now dried and then burnished or polished.

The above information, in addition to what we saw ourselves, was given us by Mr. Hunter, who is Superintendent of the tanneries at Vanceboro, Princeton, Grand Lake Stream, Forest City, Brookton, and township 39. The diagram, page 2, shows approximately the condition of matters at this tannery. The figures are more guess work, but the Coast Survey should show them accurately.

At the log roll way the water below was only about 3 ft. below the outer edge of the flooring. Mr. Hunter said in high water the water was often nearly level at this place. With much water flowing over any fish like salmon would have no trouble in getting over.

The part of dam under the bark grinding building we did not see, and is of no consequence. At the inner end begins the sluiceway, which runs along the edge of the river for some distance as an open square conduit, and then changes to a round wooden conduit, perhaps something over 2 ft. in di-

ameter, leading to the lower building of all, where the freshly tanned hides were washed and brushed. The dimensions of the sluice were not taken, but it must have been 3 to 4 ft. wide, perhaps fully the latter, and quite high. There is no gate at the upper end of the sluice, and there is, therefore, a continuous channel through. The side outlets leading to the wheels may be closed and the lower outlet may be closed at the lower wheel, which would simply cause more water to escape by the fishway and other openings. There was a deep flow of water through it as we saw it.

The fishway is the oldfashioned ladder, with oblique partitions, is of good size, and the slant seems to be entirely within bounds. It had an ample supply of water when we saw it, and sufficiently dep water at the lower end. It occurred to us that fish ascending, and getting into the sluice might pass down the sluice and get into the wheels. Although they would have a free passage that way, it does not seem, however, as though they would take a direction with the current when they had started in to ascend. There is a further question as to whether the direction of the ladder and the posi-

tion of the lower end are the best, whether it would not be better to have it run straight up through the dam. The water at the upper end of the sluice, however, is sufficiently deep and is kept clear of refuse by the boom of logs indicated on page 2. It seems as though it would be kept cleaner located as it is, as the tannery, of course, will see to it that no refuse enters their sluice.

A series of experiments only could determine whether the position of the fishway is advantageous. Observations should be made to see if fishes actually ascend it, and what species do. The ladder is somewhat out of repair and requires attention.

TALK WITH MR. HUNTER ABOUT FISHES.

Never saw anything but chubs and suckers ascend this ladder. Landlocked salmon used to be seen going up the former fishway, which had practically the same position as this one, but it was shallower, longer and with less pitch, the water passing through in a shallower stream. They may pass up the present one.

He has taken 10 landlocked salmon in a day's fishing close by the drive dam a short distance above. A number are taken further down stream than atnnery dam, but they are smaller than those above. May is the best month for this species, that is, they are the most abundant, but the water is very much higher, and full of dirt or logs, so that the fish cannot be seen, and fishing is more difficult.

Only a very small amount of sawdust is made at Forest City, and none is seen ~~at~~ near Vanceboro.

Heard of 2 sea salmon caught last year at Loon Bay, about 20 miles below Vanceboro.

Pickerel are very abundant in the lake, and occur to some extent about the tannery.

Black bass were planted some 8 or 10

years ago in Laputo Lake by State Commission, where they are now abundant. He is confident that a few haveben caught about tannery.

Speckled trout occur all along the main river.

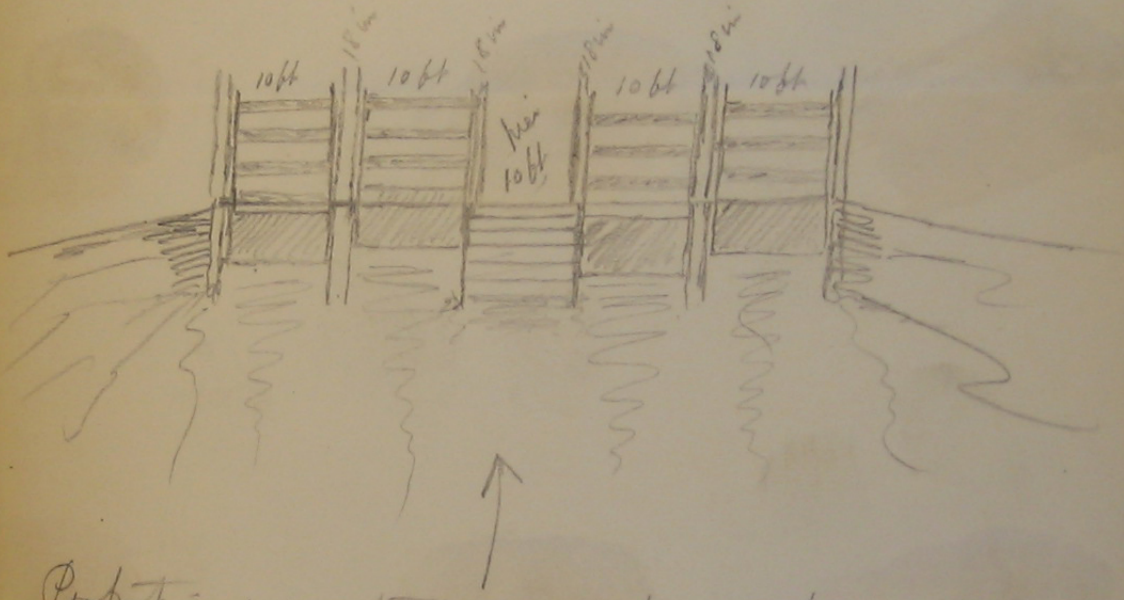
There are no endof horned pouts, and plenty of eels in their season.

White fish occur in the lakes.

VANCEBORO.

The driving dam is located directly below the site of the abandoned railroad bridge, of the private railroad which used to connect McAdam and Vanceboro. The site of this bridge is indicated on the Coast Survey field map(Forney). The driving dam ismade part of a wagon bridge, the stream being rather narrow at this place. The total width between the side piers of the bridge is about 55 feet. There is a central pier about 10 feet wide. Four gates which haul up are each about 10 feet wide. The frames between the gates, etc. are about 18 inches each. There is deep water through this passageway, somewhat deeper than just above and below, and there was a strong current with plenty of water. With gates open the bridge is no more of an obstruction than any ordinary bridge. The gates are shut down a good part of 2 months, beginning last of March. The remainder of the year they are kept open. They are bound to let water through to the tannery dam below, and James Ross, who is in charge of the bridge, assured us that one gate was always kept open in the spring, on account special-

ly of the tannery. According to his statement there never is a time when there is not a gate open.



Proportions & construction not true, but gives good idea.

There is a small steam saw mill for short lumber just above the abandoned railroad bridge-- Maine side. I saw only laths being made there. There is one circular saw for cutting logs into 4 foot lengths, and 2 lath machines. The edgings and other refuse pieces of wood are burned in the furnace. The sawdust is piled up around the mill. It is sold locally for different purposes, stabling, banking around houses in winter. The mill is located a little back from the river. We were assured that no sawdust was allowed to go into river, and we saw no traces of it.

JAMES ROSS, IN CHARGE OF LOGGING FOR THE CALAIS ST. STEPHEN MILLS.

The lower lakes referred to are those below the river emptying into Mud Lake.

The shutting of the log gates at Vanceboro will in time of high water raise the water in the lower lakes, (up to the narrows only) about 12 feet above what it was at the time of our visit. It then had a head of about 4 feet at the driving dam. The highest water is usually from middle of May to 1st of June, but such high water as this has not taken place now for three years. These freshets cause the water to extend back over the present shores, and in under the trees for some distance wherever the shores are low. The average high water at the dam is about 13 feet.

The high water resulting from the driving dam at Vanceboro is felt as far up as Forest City landing, which is at the foot of the stream draining Mud Lake. It could not be felt at Forest City, as will be observed from the notes later on. It is felt, however, 4 or 5 miles up Pirates Brook, at the head of the lower lakes.

Never heard of the sea salmon being taken in these lakes. Never saw any in the St. Croix near Vanceboro, but had heard persons speak of their occurrence there.

The following fishes occur in the lower lakes: pickerel, white perch, white fish, suckers, horned pout, chubs, minnows, trout, landlocked salmon, eels and black bass.

The commoner fishes taken the year around are pickerel and white perch.

About the same species occur in the river below(St. Croix) except white fish and black bass.

CAPT. FORNEY, IN CHARGE OF U. S. COAST & GEODETIC SURVEY PARTY, WITH CAMP NOW AT COLD WATER TAVERN ON THE LOWEST LAKE.

Informed us that at Forest City the tannery dam had one gate, but no fishway. The driving dam at lower end of Mud Lake had gates, but no fishway.

At the tannery dam, which is also a driving dam, the gates are kept closed until they get the logs out of Monument Stream, and down through North and Grand Lake to Forest City. This is generally from about March 1 to August 1.

The dam at lowerend of Mud Lake is then closed until the logs are all run into Mud Lake, when dam at lower end of Mud Lake is opened and that at Forest City closed. The latter is kept closed the better part of the year--always except when sluicing logs. The lower dam is generally kept open except as stated above.

Monument Stream has 3 driving dams between its mouth and the initial monument, which is about 13 miles up the river by its course. These are provided with gates, but have no fishways.

They were open when he was there, during the logging season.

From the dam at lower end of Mud Lake to the upper part of the lakes fish are now very scarce.

He thought there was more netting done in Grand Lake than in the lower lakes(probably mistaken, at least for present time).

(There are 2 men at Vanceboro who net fish in the lower lake, Gorden and Knight. They live on the American side, but some of their men on the Canadian. Not being allowed to net on the American side, they resort to that method on the Canadian, probably not legally. Their fish are marketed through Vanceboro. There is no other commercial fishery in this lake, and nothing of that sort above Forest City, so far as we could learn.)

CONFERENCE AT VANCEBORO, AUG. 9, 1893, WITH SIMEON CONRAD(CANADIAN FISHERY OVERSEER), HORACE KELLOGG(STOREKEEPER AND ONE OF THE PRINCIPAL RESIDENTS), AND JAMES ROSS, IN CHARGE OF LOGGING DOWN THE RIVER BY THE CALAIS-ST. STEPHEN CORPORATION IN STORE OF HORACE KELLOGG.

Netting is carried in on the Canadian side of the lowerlake. No license is exacted, but a close time prevails each week, over Sunday.

There was good hook and line fishing when he came here, especially for pickerel and white and yellow perch. Landlocked salmon have been scarce since he lived here. Never heard that they were abundant at any time. Considerable number of suckers are taken from the lake and shipped to market. With the pickerel white perch mostly are taken. Perch are about as abundant as ever, pickerel not. The majority of the white fish run about 7 inches long. They are taken for the market to some extent. They are shipped mostly to towns in Maine. All the other kinds of fish are generally shipped together mainly to Boston. Togue are abundant in some places in the lake, Not many are taken, however. Trout are pretty well thinned out. Eels occur all through the lakes; they are not caught as a business. They

have never caught fish in this region with hook and line for the market in his day. All fishing for the market is done with nets(Conrad).

There are two men only, with help, who net between Vanceboro and Forest City--Gorden and Knight. They use between 1,000 and 1,500 feet of gill nets each, having $2\frac{3}{4}$ inch mesh. There is scarcely any business above Forest City. Not allowed to net openly on the Maine side, and do most of their fishing on the Canadian side. Their help resides partly on one and partly on the other side. Never heard of salmon, smelt, alewives or shad in these lakes. The fishermen think that the tannery has done much harm, and great changes have taken place in the river since it was built(Conrad).

When he was a boy could go out most any day and catch all the trout and landlocked salmon he wanted. Now there are scarcely any. 20 to 25 years ago landlocked salmon used to be caught in lower part of lower lake, and upper part of St. Croix river below(Ross).

Once in a while they do run liquor from the tannery into the river. Has sometimes seen it going in in a red stream. They used to put every-

thing in, but this was stopped 10 years or more ago. The fleshings have been put on the land about the town for some time, but it should be burnt, as it is a bad nuisance, and smells badly, besides menacing health. Objection has been made, and they have virtually stopped using it near the town. Burn all the bark; has not seen them put any in stream of late year. Has examined frequently, but never saw any fish going up the tannery fishway. It might do better if it passed through the dam. The old fishway which preceded this one was built somewhat differently. He thought it turned down river at lower end, but went into the flume like this one. Thinks the tannery is doing the best it can with respect to allowing refuse to enter river(Ross). (The question as to whether this fishway(at Vanceboro tannery) has the right position and direction can only be decided by observation. Landlocked salmon and trout would probably be the principal fish to use it. These fish might be observed in the way, and their habits should be studied to know whether they pass up middle or sides of stream, etc.)

Some one said they still catch some trout

and young landlocked salmon in the stream above tannery. About the bridge and driving dam is one of the places where they fish.

Close the gates in tannery and driving dam at Forest City, and in driving dam at foot of Mud Lake as soon as the logs are all through for the season(Ross).

There are no dams in the lakes above Forest City. Only one brook above Forest City is dammed. Nearly every stream entering the lakes below Forest City, however, have driving dams. All the commoner fish go up these streams, except those which belong distinctively to the lakes.(Ross.)

Fish will go over Grand Falls in the St. Croix River. Sprague's Falls are worse than Grand Falls. The fish enumerated above for the upper part of the river are more or less common to all the St. Croix down to Baring, the exceptions to those enumerated for the lakes being white perch, white fish and togue. Never saw sea salmon in the St. Croix between Vanceboro and Baring, but had heard of them. Saw one salmon go through pass in upper dam at Milltown about September of last year. This is the farthest up he has seen them(Ross.)

The only source of sawdust above Vanceboro which he

knows of is a small mill at Forest City(Canadian side) where they work only a few weeks every year, to make lumber for the local trade. They cut long and short lumber and shingles. They cannot make much sawdust, but suppose some may get into the stream from this source. It is a water mill.(Ross)

There is an abundance of large togue in Grand Lake which are taken through the ice. Knows nothing about landlocked salmon there. One was taken last year near the dam in Forest City.(Ross).

Conrad says that the two men fishing in the lower lake ship about 6 bbls. of fish a week. There are about 100 lbs. of fish to a bbl., the remainer being ice. They get about 4 cents a pound for it. The help is hired on wages.

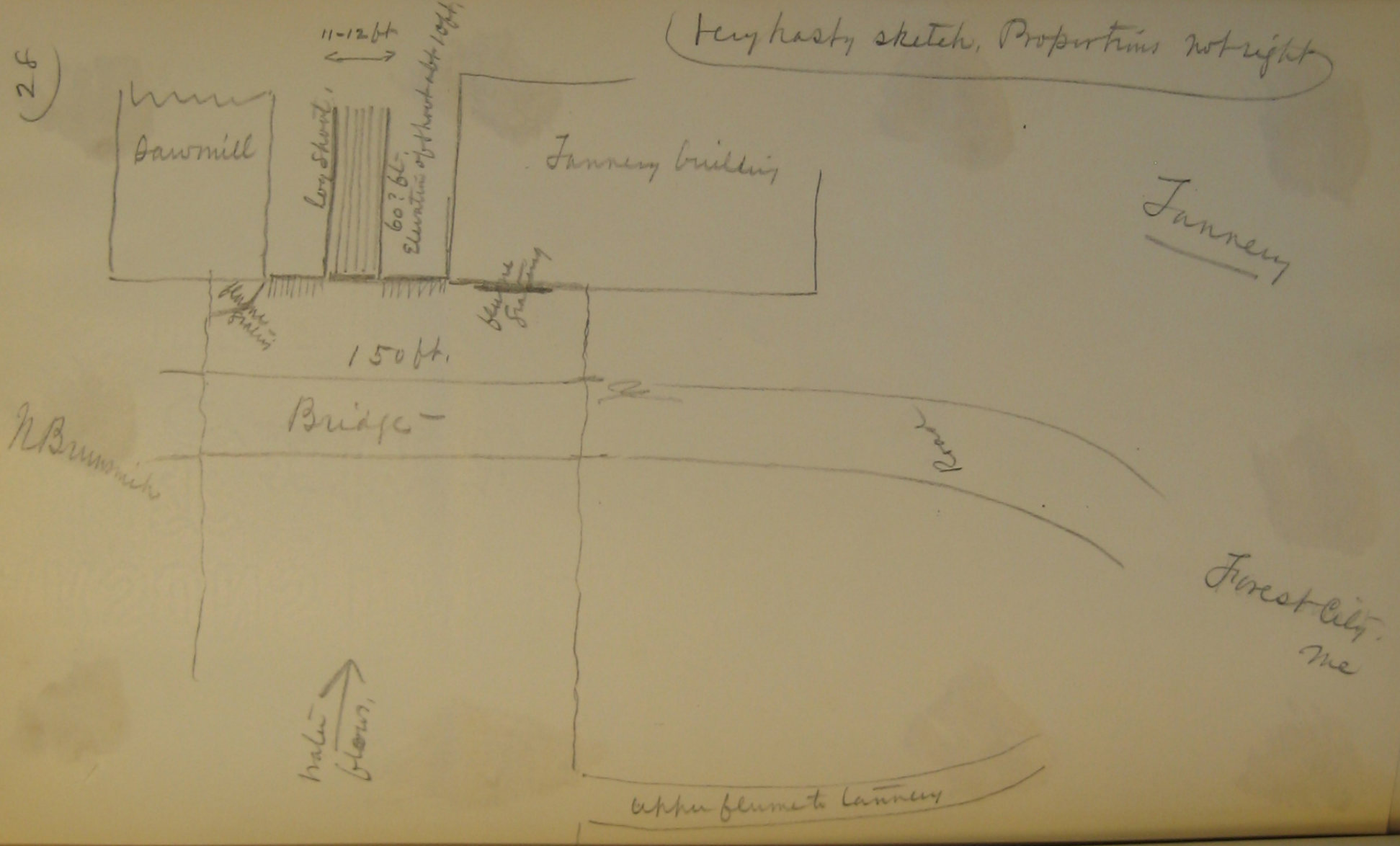
FOREST CITY, ME., AUG. 10, 1893.

The river is very narrow here, with a small settlement on each side connected by a bridge. The water power is produced just below this bridge, and is utilized for 3 purposes--the tannery on American side, a small saw mill on Canadian side(W. O. Foster & Son), and as a log driving dam.

The dam is short, being only about 150 ft. long, including gratings on sides. It extends entirely across the river. There is only a short free part in the middle of the river. The mill and one tannery building are built over the sides of the river, so as to apparently contract it. The gratings leading to the two buildings are directly under the upper fronts of the buildings. The center of the dam is occupied by a very long log shoot, about 11 or 12 feet wide, with a single gate at the upper end. This gate was closed when we saw it, and there was a packing of earth along the lower part to prevent leakage, showing that it had apparently been closed for some time. The log way of boards was dry. This tight closing of dam was owing to the low water, and the attempt to cause all

(26)

(very hasty sketch, Proportions not right



water to pass through the gratings in the flumes.

Thefall ofwater to the wheels on both sides of river at the present time isabout 6 1/2 feet, but during high water in the spring it increases to 9 or 10 feet.

The distance from the surface of water above dam to surface below was estimated at about 10 feet. There was no water running over dam or through log shoot. Water was running through mill flume, although the mill has not been in operation for some time. A considerable body of water relatively would be required to render the log shoot serviceable for fishes. On account of landlocked salmon at least this dam should have a fishway.

Below this regular dam, just the distance of a small pool from it the tannery has built a small temporary wooden dam to head in some water for one of their lower buildings. As it stands it is a complete prevention to the passage of any fish. It could be removed in a few hours. Consists simply of boards driven in slanting, with perhaps some banking on the lower side.

Conference with three men in store of Tannery Co. Two were connected with the tannery, the other somewhere outside.

There was formerly a fishway at the tannery dam at Forest City. The state made or approved the plans, but the way was built by owners of dams. This is common practice. This fishway was given up about 15 years ago. It was about 12 feet wide. The partitions were slanting.

Did not consider a fishway necessary here, as no fish, they were confident, could pass over the falls below foot of Mud Lake.

The temporary dam below regular dam referred to, is put in every year, after the drives of logs are through. It leads to a lower building of the tannery. It could be torn up in 20 minutes (nevertheless it is there every year, and the two dams completely obstruct the passage of fish).

The saw mill does not run more than two months each year. Supplies local demand only. Cuts on an average probably 50,000 feet of long lumber, and a few shingles and laths a year. Saw a large pile of sawdust and edgings on the shore below the mill, but did not have time to examine and see whether there were any in stream.

Dam is controlled by the Tannery Co.--W. H. Foster & Son--the millers, and the log driving corporation.

There is much togue fishing through the ice in Grand Lake every winter for sport, not for market. Has seen as many as 50 men fishing at a time, each having several lines.

Landlocked salmon are caught in the lake along the shore and in the stream above the tannery. One of the men had caught them from the bridge. Called shiners here and elsewhere in these lakes. This species is frequently seen.

No pickerel occur in Grand Lake, but they live in Monument Stream.

The tan bark from the tannery is used as fuel in the furnace. Do not have as much as they would like for that purpose. None allowed to enter the water.

Soakings of the hides go into the stream. They are soaked only in water to soften up. In curing them for shipment(the raw hides) they follow different methods, lime, salt and perhaps other things being used. They do not have a clear idea here of what may result from the soakings, but the refuse from that source of all sorts go into the stream.

None of the fleshings go into the stream.

It is all used now as a dressing for the land.

The old liquor is used over and over again. It never becomes bad, though week after it is exhausted. None is ever allowed to escape. They protested that no liquor was ever allowed to go to waste.

A sediment accumulates in the vats, which is shoveled out, dried, and used for different purposes, such as banking houses in winter. Never goes into stream.

This tannery contains about 300 vats and 8 leaches. When business is brisk they may use some of the leaches twice the same day, so as to make more than eight leachings a day.

The capacity of the tannery is three tons of leather per day. At this tannery they use only Buffalo hides received from the East Indies. They are shipped here from Boston by railroad.

Pickerel are as abundant in Mud Lake as in Spednie Lake below.

FOREST CITY, MAINE.

AUG. 10, 1893.

In the afternoon we took a canoe and went down through Mud Lake from Forest City, to its lower end. Our canoe man was Samuel Patterson, an artisan in town, not connected with the tannery, who has done much fishing about here, and displayed considerable intelligence. In returning here another year, it would be well to get more information from him, and he might be a good one to assist in any work. He was an old man and had lived at Forest City about 30 years.

He has been well acquainted with the land-locked salmon, having done much fishing for them ever since he lived here. He states that they have decreased in numbers very greatly, and there is no comparison now in their numbers to what there was. He lays the blame for this to the tannery, and the dams. The dams have prevented the fish running to their spawning grounds, and tannery refuse has filled in many places, and put in much bad stuff. They have mostly stopped this practice now, but it is still carried on to some extent. He

showed us where the old tan bark had been allowed to form extensive and deep banks at the head of Mud Lake, and the foot of the stream from Forest City, about the small island which occurs there. These banks arevery deep in places, and have closed the channel on the Canadian side to all navigation and log rolling. The bark is there, and can plainly be seen from the surface. Our canoe grounded in it as we triedto make a landing, but it is soft on top and the paddles could be thrust down some distance into it. Some was taken up in our hands, and seemed to have changed little or none since it was deposited. We could not get an adequate idea of the extent of those banks, as our time was limited, but they covered a considerable area which may possibly be indicated on the C.S. plans.

Mr. Patterson says that many ashes have also been heaped up by the tannery, where they get into the stream and lake more or less and that there has been a tendency on the part of the tannery to fill up all the lower part of stream and head of Mud Lake. He says that whatever the tannery people may say some refuse is still allowed to get into stream and that fresh damage is still being done

by it. He cannot say that new bark is still being run in.

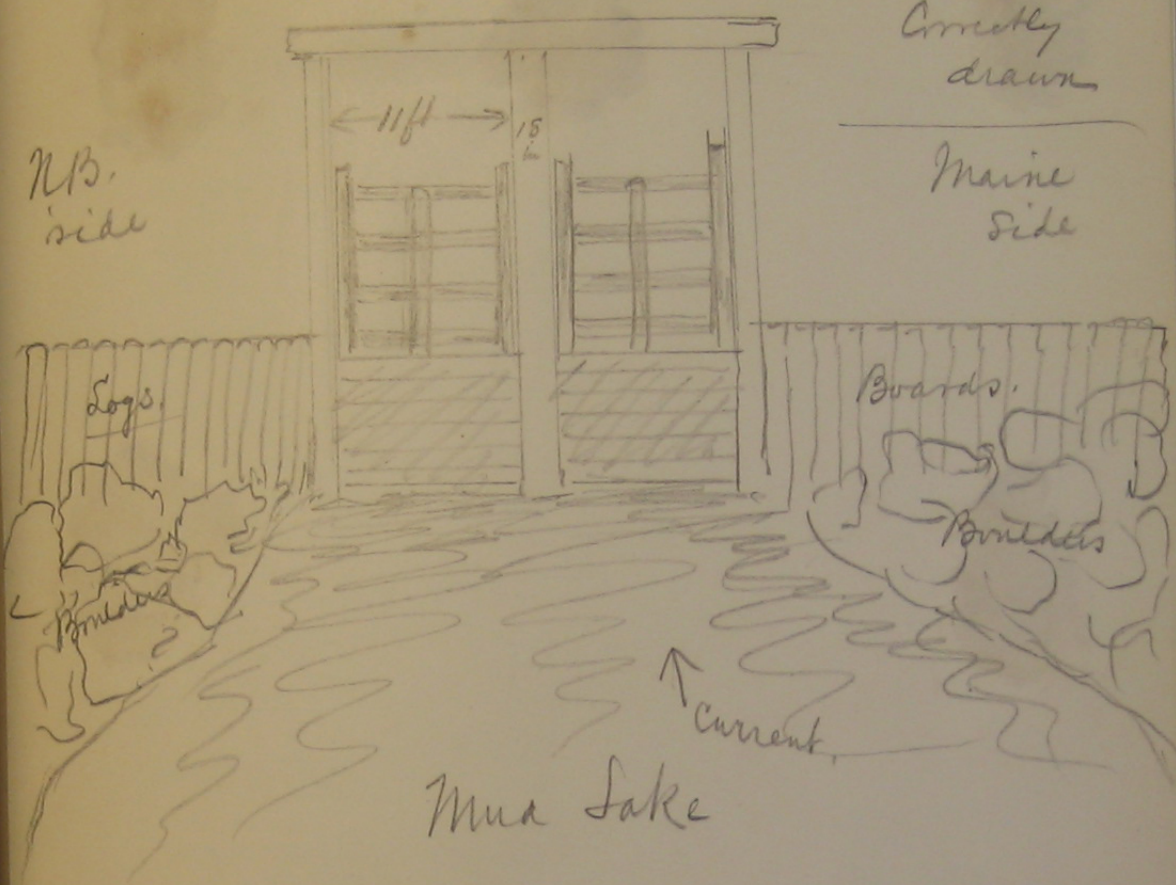
Moreover, the closed dams are keeping the land locked salmon from their natural spawning grounds. This species was formerly abundant in all of the lakes, including Mud Lake. Those from Grand Lake are kept from the stream below by the tannery dam. Those in Mud Lake cnnot enter the stream below it on account of dam, nor the stream above it on account of tannery refuse. If these causes are overcome he sees no reasons why the species should not increase.

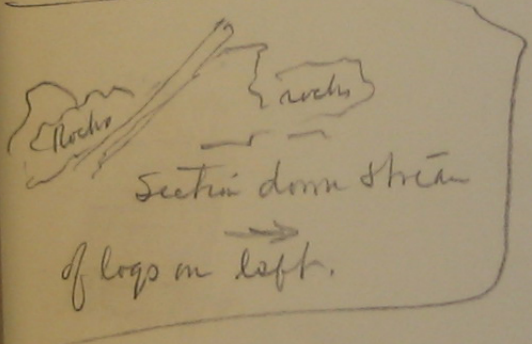
12 to 15 years ago Patterson used to catch many landlocked salmon in the rapids or falls below the dam at the endof Mud Lake, and the fish used then to attain a large size, many running up to 6 or 7 lbs. and an occasional one up to 10 lbs. 20 years ago they were even more numerous. Now the larger ones reach only 3 and 4 lbs. Last spring he caught quite a number in this stream, but there is nothing now compared to what there was formerly.

Mud Lake is so called because much of its bottom consists of mud.

~~44~~

Proportions not correctly drawn





River driving dam at foot of Mud Lake. Aug. 10/93. The sills and posts are drawn too light in proportion but they show construction

When Mr. Patterson came to Forest City the dam at foot of Mud Lake was in existence, and it is practically the same structure now standing.

Immediately at the foot of the lake, where it constricts to form the rapids, or falls, as it is called. The dam is at the head of these rapids, and the water begins to fall immediately from it.

Mud Lake is so narrow that it is only a lake in contrast with the streams which enter and leave it at the two ends. Its banks consist everywhere of large boulders, and there are very many scattered everywhere through the lake.

The falls in the stream below the dam are only a series of rapids, not very long, the water tumbling over and among huge rocks and boulders. The highest fall is only a short distance below the dam. It is easy of access, and Dr. Wakeman thinks most any fish would have no trouble in working up, certainly not any of the salmonidae. This largest fall is a broken tumble, irregular in outline, and only a few feet in entire height.

The head of the stream has not been artificially constructed, except that the logs and boards

of the dam at the sides would cut off some of the flow of water, more in proportion at times of freshets than when we were there. It is naturally narrow here, and many boulders lie in front of the dam. The channel does not widen much below the dam. There are great rocks at the side of the dam, and the entire channel, as far as we could see, was bordered and filled in by large boulders. Outside of the boulders, close to the stream, the land is low, but the surrounding region is hilly.

The gates were both shut when we were there, but they and the dam leak badly, and at this season they do not serve to hold back the water, although they would prevent the running of any fish. So far as concerns the holding back of the water, the gates might as well have been open, as the water was not banked up against them, having a perceptible descent in front of them. In the spring, according to Mr. Patterson, the lake is about 4 feet higher than at present. This is an ideal place for landlocked salmon and trout.

GEORGE WALLS, MAIL CARRIER BETWEEN FOREST AND FOREST CITY.

An elderly man, well acquainted in the region, and has a large farm at Forest City. He took us over andback. Gave us the following information:-

noted

The fruit box factory at Forest, near the station, belongs to C. H. Eaton. Logs are peeled the same as at James Murchie's mill at Princeton. It is a steam mill, using birch, beech and maple. During a part of the year some sawing is also done here. Tomah Stream, coming out of Tomah Lake, passes here, and flows into the St. Croix River below Princeton. There is a small dam in the stream to gather sufficient water for the engine. This stream is, in reality, only a little brook, more or less filled in with growing brush, and has not enough water to drive a mill. We saw the stream and also the mill, but did not have time to examine either. Such sawdust as is produced at this mill is hauled out over the land, and has been used for filling in to a very large extent. Some edg-

ings have also been used for the same purpose. The refuse wood generally, however, is burned.

"Lambert Lake", on the lake of the same name. There is a small mill here which formerly sawed box stuff, but lately and up to this year has sawed long lumber, staves, shingles and laths. It is a steam mill at the foot of the lake below the railroad. The sawdust is hauled out to make land along the shore, ~~and~~around the station. All the refuse of sufficient size has been sold for fire wood. The remainder burnt in furnace to make steam. Nothing goes into the lake.

Noted

HIRAM BLANCHARD & SON. EASTPORT.

Factory for sawing thin boards for cases for sardines. Imports lumber in rough and saws sardine case shooks.

1,200,000 feet yearly product.

Spruce and fir principally.

Comes to him in 4 foot pieces.

Lets no sawdust or edgings go adrift.

Sells about half of sawdust to sardine factories for packing. Remainder, with edgings, are used in furnace.

(Sawdust) brought together in heaps and wheeled to fire pit.

Said it was carried into fire room on belts, but we saw nothing of the kind. In his opinion, would not cost much to cart away or burn sawdust. Would not cost him much more to send his sawdust 1000 feet further away from the mill than he has to.

Is aware that in many places sawdust and edgings have seriously interfered with navigation,

LIST OF SAW MILLS, ETC., ON THE ST. CROIX ~~AND ST. JOHN~~ RIVERS IN MAINE. FROM THE MAINE REGISTER, 1893-94.

ST. CROIX RIVER.

~~Lubec.~~

× Eastport.

Perry. Saw and box mill, J. M. Leighton.

Robbinston. Laths and shingles, James J. Carson

Calais. Lumber, James Murchie & Sons, H. F. Eaton & Sons, A. H. Sawyer, F. H. Todd & Sons, C. C. Whitlock.

Baring. Shingles, Chase & Bailey. Shingles and staves, Belyea and Averill. Box shook, Chase & Quimby. Staves and heading, Wm. Creamer.

Princeton. Box shooks, C. B. Eaton. Woolens, L. Peabody & Son. Lumber, F. Mercier & Son. Tannery, W. F. Shaw Bros.

Hinckley (Grand Lake Stream Plantation).

Tannery (and saw mill), F. Shaw & Bro.

Talmage. Shingles, H. F. Eaton. water

Vanceboro. Tannery, F. Shaw & Bro.

Lambert Lake Plantation. Bure packing steam
~~Lumber~~, L.L. Mill Co
not running this year, waterfall saw

Forest City. Leather, F. Shaw & Bros.

(2) Lumber, Foster & Haley. ~~Waterfall~~

Danforth ~~Eaton~~. 1 Lumber, Weatherbee & Co., water

1 Bure packing steam 3
Hathorn, Foss & Co. Shingles, George &

Lane.

~~Eaton~~, Forest Fruit Bure packing, C.H. Eaton, steam

Danforth, 3 Shingles, ~~waterfall~~ water. Dam not over water, 2 and 3 set water out of frame dam. a long one.

Mills in Charlotte Co. N. B.

St. Croix River.

Cummings Cove, Deer I., 1 saw mill.

Waweig, on Waweig River, tributary to St. Croix River, below St Stephen. 1 saw mill. (Cove and short lumber)

Oak Bay, on a small brook flowing into Waweig, thence B. Ripley. Saw mill. Water

Oak Bay. On Oak Bay, off St. Croix River, below St. Stephen. Small short lumber water 1 saw mill, 1 carding mill.

St. Stephen. (3 large lumber offices, Many mill. etc (Door and sash factory, ~~[illegible]~~. 1 mill, Cove) Haley Bros.

Milltown, 6 saw mills, 1 cotton factory, 1 axe factory, 1 saw factory.

Moore's Mills, On Moore's Lake, Dennis stream, tributary to St. Croix below St. Stephen. 2 saw mills, 1 carding mill.

Magaguadavic River.

Second Falls, 9 miles above St.
small shingle mill
George. (2 saw mills.?)

Bonney River Station, 1 steam saw mill.
C. F. Todd Abandoned.
Probably never start up again

Clarence Ridge, apparently on Lake Stream;
possibly also on Bonney River.
1 saw mill. bre. Short lumber, Small, does not think
it is now running nor has
been but fairly [illegible] years

Flume Ridge, South Branch Lower
saw mill shingle, water
Trout Brook. North Part of Co.
(Tributary of Magaguadavic?) 1 saw mill.

Digdeguash River.

Baillie, N.W. Branch Digdeguash River, near
Watt Junction, 1 saw mill.
nothing now

Bay of Fundy.

nothing
Lepreaux, 24 miles from St. John. 1 saw mill.

Unknown Location

Bartlett's Mills. 11 miles from St Andrews. 1 saw, 1 carding mill
Elmsville, 18 miles from St Stephen, 1 saw mill.
nothing

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Vanceboro. Tannery, F. Shaw & Bro.

Lambert Lake Plantation. Lumber, L.L. Mill Co

Forest City. Leather, F. Shaw & Bros.
Lumber, Foster & Haley.

Danforth (Eaton?). Lumber, Weatherbee & Co.,
Hathorn, Foss & Co. Shingles, George &
Lane.

Noted

PRIVATE AND SPECIAL LAWS OF THE STATE OF MAINE.

1849.

Chapter 257.

An Act for the preservation of fish in the St. Croix river.

Be it enacted by the Senate and House of Representatives in Legislature assembled, as follows:

Sect. 1. The legal voters of the town of Calais shall, each year, at their annual meeting in March or April, elect by ballot two discreet, suitable persons, inhabitants of said town, not owners of nor interested in mills; and the legal voters of the town of Baring shall, each year, at their annual meeting in March or April, elect by ballot one discreet, suitable person, an inhabitant of said Baring, not an owner of nor interested in mills, which three persons shall constitute a committe which shall have the supervision, care, and management of all fishways made or to be made in American waters on the St. Croix river or streams emptying into it from this State. A majority of said committee

may act in all matters hereby committed to them, and such committee shall be sworn to the faithful performance of their duty.

Sect. 2. It shall be the duty of said Committee to examine from time to time, and as often as need be, the several fishways named in the first section hereof. It shall be the ~~dx~~ duty of the owners or occupants of all mills, on any dam, to keep open and free from all obstructions to the free passage through them of salmon, shad and alewives, all fishways made through over or by said dam by order of the county commissioners. If such fishway shall be closed up, or if there shall be in it any such obstruction as is aforesaid, for the space of twenty-four hours, said committee shall open said fishway or remove said obstruction, the expense of which shall be recovered by the town in which said fishway may be, to its own use, of the owners or occupants or any of them, of said mills or any one or more of them, in an action on the case in the district court in the county of Washington.

Sect. 3. No person shall, by any way or

means, catch or take any salmon, shad or alewives in said river or streams,* after sunrise on Friday morning in each week, until sunrise of the next succeeding Monday, under a penalty of not less than five nor more than twenty dollars for each offense; to be recovered by and to the use of the inhabitants of the town within which said taking may be; and if the taking be without the limits of any incorporated town, by and to the use of any person who shall sue for the same, in an action of the case before any justice of the peace in said county, whether residing in the town sueing or not.

Sect. 4. Each member of said Committee shall receive of the town by which he is elected, one dollar fifty cents for each day he is necessarily employed in the duties hereby devolved on him.

Sect. 5. All Acts and parts of Acts inconsistent with the provisions of this Act are hereby repealed.

(Approved August 7, 1849).

* "Above the ledge so-called", Mch 17,1858, Chapter 206.

Chapter 206.

An Act amending an Act for the preservation of fish in the St. Croix river.

Be it enacted by the Senate and House of Representatives in Legislature assembled, as follows:

Section three of "an Act for the preservation of fish in the St. Croix river", approved August seventh, eighteen hundred and forty-nine, is hereby amended by inserting the words "above the ledge so called" after the word "streams" in the second line of said section, so that the whole section shall read, as follows:

Sect. 3. No person shall by any way or means catch or take any salmon, shad, or alewives in said river or stream above the ledge so called, after sunrise on Friday morning in each week, until sunrise the next succeeding Monday, under a penalty of not less than five nor more than twenty dollars for each offence; to be recovered by, and to the use of, the in-

habitants of the town within which the taking may be; and if the taking be without the limits of any incorporated town, by, and to the use of any person who shall sue for the same in an action of the case before any justice of the peace in the said county, whether residing within the town sueing or not.

(Approved March 17, 1858).

PRIVATE AND SPECIAL LAWS OF THE STATE OF MAINE.

1871.

Chapter 677.

An Act to prevent the throwing of slabs and other refuse material into the river St. Croix and its tributaries.

Be it enacted by the Senate and House of Representatives in Legislature assembled, as follows:

Sect. 1. No person or persons shall cast, throw, place, or put into the St. Croix river, or into any of its tributaries, any slabs, board or lath edgings, bark, grindings of edgings, wood or lumber, refuse wood or timber, arising from the manufacture of lumber, or waste, including sawdust from shingle manufacturing; nor shall any person or persons place, pile or deposit on the bank of said river or its tributaries, any such material or refuse stuff in such negligent or careless manner, that the same shall fall or be washed into said river or its tributaries, or with

the intent that the same shall fall or be washed into said river or said tributaries, whereby any one in his mill or other property shall be injuriously affected, or whereby the navigation of said river shall be impeded or injuriously affected, or which shall tend to impede or injuriously affect the navigation of or fill up said river, under a penalty for each offence of not less than ten dollars nor more than fifty dollars.

Sect. 2. The penalties under the provisions of the foregoing section, may be recovered by complaint or indictment, before any court having jurisdiction in like offences, or by an action of debt with costs of suit by any person who may sue for the same, before any judge or the municipal court of the city of Calais, in the county of Washington, or before any other court of competent jurisdiction in said county of Washington, the fine or penalty to be appropriated one-half to the use of the city of Calais, or the town where the offence may have been committed or the offender prosecuted, and the other half to the complainant; and on failing to pay the fine and costs of

prosecution, the offender may be committed to jail as and for a wilful trespass, and under like disabilities, as provided in section fifty of chapter one hundred and thirteen of the revised statutes.

Sect. 3. Every owner, lessee, or agent of any mill engaged in the manufacture of any description of sawed lumber on said river or its said tributaries, who shall allow any of the said refuse or waste material to be cast or thrown, or washed from any or either of their mills, whereby the said river or its said tributaries or any individual shall be injuriously affected, are and shall be severally liable for said penalties, whether the act complained of be committed by themselves or those in their employ, or under their control, or those actually engaged in the manufacture of said lumber; and the said owners, lessees, and agents subject to said penalties, may have recourse under this act to recover such fines and costs from the party or parties actually committing the offence in the same mode and manner as the penalty is collected of them.

Sect. 4. Owners of shingle machines on

the dam across the western branch of the St. Croix river at Princeton, shall not be subject to the operation of section one, so far as sawdust from shingle machines is concerned.*

Sect. 5. This act shall take effect when approved.

Approved February 22, 1871.

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* Section 4 was repealed by Act of 1873, Chapter 361.

PRIVATE AND SPECIAL LAWS OF THE STATE OF MAINE.

1879.

Chapter 163.

An Act for better securing the Navigation of the St. Croix River.

Be it enacted by the Senate and House of Representatives in Legislature assembled, as follows:

Sect. 1. Every owner, lessee, or agent of any mills engaged in the manufacture of any description of sawed lumber on the St. Croix river, in the city of Calais or town of Baring, who shall throw or allow to be thrown out of any or either of their mills any slabs, edgings or other waste lumber into said river, that may tend to fill up or obstruct the same, shall be liable to a fine of ten dollars for the first offense and twenty dollars for each succeeding offense, to be recovered, with costs of suit, in any action of debt, by any person sueing for the same, in the municipal court of Calais or by complaint before any court of competent jurisdiction, one-half to the use of complain-

ant and the balance to the city or town where the offense is committed.

Sect. 2. Each and every of said owners, lessees, and agents are severally liable to said action or complaint, whether the act of throwing in such waste stuff be committed by themselves or those in their employ or under their control; and such owners, lessees and agents, subject to such action or complaint, may have recourse, under this act, to recover all sums so paid by them, from the parties actually throwing in such waste stuff, in the same manner as said fine is collected of them.

Approved February 20, 1879.

SEVENTEENTH LEGISLATURE.

No. 21.

SENATE.

STATE OF MAINE.

IN BOARD OF INTERNAL IMPROVEMENTS,

February 9, 1837.

To the President of the Senate and

Speaker of the House of Representatives:

By direction of this Board, I have the honor to lay before the two branches of the Legislature, the Report of William Anson, Engineer, appointed to make an Exploration Survey of the two Branches of the River St. Croix and the adjacent Lakes.

I am, Gentlemen,

Very respectfully,

Your obedient Servant,

A. R. Nichols, Secretary.

REPORT

of an

EXPLORATION SURVEY

of the

TWO BRANCHES OF THE RIVER ST. CROIX

and

ADJACENT LAKES.

By

WILLIAM ANSON, Civil Engineer.

1836.

To the Honorable the Board of

Internal Improvement of the State of Maine.

The undersigned, an Engineer employed to make an exploration survey of the two branches of the river St. Croix and adjacent lakes, under the general superintendence of the Hon. Timothy Pilsbury, a Member of the Board, appointed for that duty, respectfully submits the following

REPORT.

In the synopsis of the survey, and observations made on the route, a view is presented, of which the plan will be a Key or Index of the general features of the river with the elevations of all the principal Falls, accurately measured, and the proper allowances for elevation where no quick water is found, which will come as near mathematical accuracy as will be required for all useful reference.

Calais Bridge is the point at which the survey commences and from which all the distances are reckoned, - thence to Union Mills, 220 rods up the river, is the head of tide water. Here the rise of water at spring tides, is about 8 feet. At a distance of a little more than 1 1/4 miles from the Bridge is Salmon Falls, where is a water power by a fall of 14 feet, over a base distance of 3 rods, equal to any now under improvement, and which lies in a natural state. The water at these falls forces through a narrow channel bounded by rocks, which are high on the American side. From the head of these falls 1 1/2 miles and 46 rods, is the lower Dam at

Milltown, between which and Salmon Falls, is another excellent water power, connected with another fall, making in all 11 feet 8 inches, - the former part unimproved, and the latter improved. The water-power at Milltown, a part of Calais, is excellent, and the village so called, is rapidly increasing in population and business. To the upper Dam at Milltown from nearly low water mark at Calais Bridge, there is an elevation of 72 feet 7 inches. From Milltown is dead water, or nearly so, 3 1/4 miles to a small fall of water 6 feet 11 inches, running over a surface of 50 rods from the foot of the Dam at Baring. There is a further elevation of 7 feet to the water in the Baring Dam, making 86 feet 6 inches from the level at Calais Bridge. The improvements from Calais Bridge to Baring and intermediate places, consist of 23 saws, besides lath-machines and grist-mills on the American side - and 33 saws, besides lath-machines and grist-mills on the English side. Baring Bridge is 5 1/4 miles and 40 rods from Calais Bridge. From Baring Dam,

through nearly still water 2 3/4 miles, is the foot of Bailey's Rips, at which place are many small Islands, overflowed during the spring freshet. From Baring Bridge 1 3/4 miles is Stoney Brook, which enters the St. Croix with rapidity. A hasty view of the stream, which want of time only prevented exploring, at the head of which is Maddavemps Lake, convinced me (confirmed as it was by the testimony of many respectable persons residing in that quarter) that this spot offered great facilities for a cheap and profitable improvement by a canal to the aforesaid lake, which is said to be surrounded with good timber lands. Here the land is in general level and susceptible of easy cultivation. Bailey's Rips, give an elevation of 3 feet 1 inch, in the length of 120 rods, where again is nearly still water, which continues 1 1/4 miles and 72 rods to the foot of the rips below Sprague's Falls. These Rips in 148 rods give an elevation of 3 feet 7 1/4 inches to this lower end of Sprague's Falls. Wapsaconhagen Stream enters the river here.

Sprague's Falls extend 114 rods and have an elevation of 25 feet, 5 1/4 inches, in that distance. This is a beautiful fall, and the water power is adequate to carry on the most extensive operations. It is an excellent privilege, and nature has done much to lessen the cost of erecting any kind of machinery. The land on each side of the river is good for cultivation, and connected as it is, with a fine water power, its present unimproved condition must soon be exchanged by works of art, into a place of business. Whole distance to Sprague's Falls is 10 3/4 miles, 14 rods; total elevation is 118 feet, 7 1/2 inches. Follow the same course 102 rods in still water to Enoch's Rips, and continue 119 rods and 17 links, gives an elevation of 9 feet 4 inches, which is also a good mill privilege, and the land is good for cultivation. From the head of these Rips, in still water 1 1/2 miles and 26 rods, is Ryan's Rips, which continue 148 rods, and an elevation of 2 feet 9 1/4 inches; at a distance of about 1/2 mile is Sprague's Meadow Brook which runs through

a meadow of the same name. Continuing in a magnetic north direction 1 1/2 miles is Weatherby's Brook, entering the river on the English side, at the head of some small rips:- at 1/2 a mile farther are some small ripplings of short extent, and at 40 rods more is the entrance of the Mill Race, so called, which mingles with the Main River in quick water at this point. Proceeding 140 rods to the head of the Mill Race, which is a passage made through low wilderness lands during the freshets, and forms a small Island with slight elevation. Continuing in nearly still water from Ryan's Rips 4 1/2 miles, 44 rods, is found the foot of Long-Look-'em, and the aggregate of elevation is 7 feet 3 inches, thrown into one projection on the profile. The whole channel distance being 17 3/4 miles and 54 rods, and elevation 138 feet 2 1/4 inches from the starting point. Proceeding in nearly still water the length of Long-Look-'em, and about 1 mile to some small rips of quick water, and 3/4 of a mile in still water, is the foot of Lower Falls, together

1 3/4 miles, and an elevation of 7 feet 9 inches. The length of the Lower Falls is 76 rods, and elevation 6 feet 4 inches, making a light water power. From the head of these falls, 56 rods in dead water, is the foot of Upper Falls, and 48 rods more to the head of these Falls, and an elevation of 13 feet 4 inches; but the chief elevation is with in 20 rods of its head. The local position of these Falls is of the first kind - here is slate of a fine texture, dipping at an angle of 75 degrees with the earth's surface, - it appears in abundance, particularly at the Lower Falls. Whole distance, 19 3/4 miles, and 73 rods; elevation 165 feet, 11 1/4 inches. For the last 13 miles, or from Stoney Brook, the river ranges generally a little to the west of magnetic north, making about 3 1/4 miles westing in that distance. Continuing 40 rods from the head of Upper Falls is the outlet of the Western Branch Lakes, called Schoodick Lakes, which are passed over now to be hereafter reported in order. Smooth water for 1/2 a mile to Tea Kettle

Rips, very quick water 2 rods, giving an elevation of one foot. Following the winding of the river 1 1/2 miles, in nearly still water, and passing other small ripplings and an elevation of 2 feet 5 1/2 inches, is the foot of Chepelnacook Grand Falls. Continuing through a channel of slight elevation and quick water 98 rods, and giving an elevation of 4 feet 9 3/4 inches, to the principal Dam, and then taking the western channel 72 rods to an old wing Dam, gives an elevation of 15 feet 6 1/4 inches. These falls nearly deserve as much attention for the beauty of their location as was applied to Sprague's Falls, and with the addition, that, the water power is greater - the banks more uniform and bold, particularly on the American side; and on the whole, are compact and well adapted for extensive operative machinery - now entirely unimproved. The whole distance 22 3/4 miles 3 rods, elevation 189 feet 11 3/4 inches. Proceeding on a dead water 1 mile, are two small rips of 1 foot 3 inches elevation, and at 1 1/4 miles and 40 rods

more in still water, Enoch's Brook falls into the St. Croix. In still water and three miles from Grand Falls, is Clark's point, at which place Mulberry Brook enters the River. Logs are driven 10 miles on this stream. At Clark's point, and in the vicinity, the land is excellent,- the current of the river is gentle, and the breadth at the point 250 feet. There is a good carriage road on the English side, 12 miles to Calais, Milltown, etc. The depth of water here is 4 to 10 feet in summer. The cost of a Bridge would be small and would connect the western interior by the nearest and best route with Calais. The whole distance is about 25 3/4 miles and 4 rods, and the elevation 191 feet 2 3/4 inches. Following the line of survey 2 miles and 40 rods, in dead water, to Robinson's Hay Farm, where are small rips of short distance, and elevation 10 inches, to which add 4 1/2 inches for allowed elevation in other places, gives 1 foot 2 1/4 inches elevation. King's Brook enters the river here on the English side,- in 1 mile and 40

rods more quick water, is an elevation of 2 feet 3 inches,- and 1/4 of a mile farther is the entrance of Hound Brook on the American side,- 1/4 of a mile and 40 rods farther, is the N. E. corner of Fowler and Ely Township No. 1, and the S. E. corner of Dyer No. 1, also, at Dog Island. At this point, there is a small compact mill privilege. On 1 1/2 miles and 6 rods, passing several small rips of 6 feet elevation, is Canoose rips. Total of these distances is 4 3/4 miles and 20 rods from Clark's point. Here Canoose stream enters on the east side. The length of Canoose Rips is 1/2 a mile and 20 rods, and elevation 11 feet 3 inches. The channel is rocky and shoal with bold and uniform banks. Here is a good mill privilege.

We now come to the outlet of Loon Bay, and 2 1/2 miles and 40 rods in dead water to the head of the Bay. In about 1 1/2 miles of the distance, the breadth varies from 10 to 25 rods, and then widens successively to about 140 rods for 1/2 a mile and then again narrows to the head, where is the foot of Haycock's rips. Considerable hay is cut on the

margin of Loon Bay, and the small Islands scattered in it. Heath and meadow land adjoin it. Depth of water from 6 to 20 and 30 feet. In all the still water in the different sections, the depth ranges from 6 to 12 and 30 feet, and the land is low through which the river passes. The Rips, on the contrary, are very shoal and channel rocky, so that a skiff can scarcely pass. Allowance, however, should be made for the remarkably dry summer, and, consequently, uncommonly low water, being 7 feet 9 inches below the freshet high water mark at different points.

At the head of Loon Bay on Dyer Township, so called, resides Mr. Todd, an industrious farmer, who has a neat cottage, a good barn, and a fine family. The land here, although said to be a good timber township, has a light soil and is poor for cultivation, at least it is so on the borders of the river. The prospect from this spot is very fine. Farther on, 120 rods, is the head of Haycock's Rips, elevation 6 feet,- and 280 rods farther, in dead water, the river interspersed with small islands, upon

which considerable hay is cut, is the lower end of Meeting House Rips. The length of these rips is 1 mile and 20 rods, - elevation 7 feet 9 inches. The channel is full of large rocks. Sunsquash Brook falls into the river here. Farther, 200 rods, in a moderate current and 1 foot elevation, is the foot of Rocky Rips, and 3 miles on, in quick water, is the entrance of Big Sunsquash Brook, - and at a quarter of a mile and 242 rods farther, is the head of these rips, at an elevation of 24 feet 8 3/4 inches. The channel here is rocky - banks of small altitude, but uniform, with various qualities of land. A distance of 1/2 a mile more, is an elevation of 1 foot 3 inches. Up to this station the river has ranged generally near a magnetic north. Whole distance 38 3/4 miles, 64 rods, and elevation 253 feet 9 3/4 inches.

Note. The last named 1 foot 3 inches are in Profile, Section 3.

Proceeding now in almost an east direction, 1 1/4 miles and 60 rods, rips are found of 12 feet

5 1/2 inches; and 114 more, the elevation is 6 feet 8 inches; and then through smooth water to a small brook entering the river on the American side - then to rips which extend 30 rods to still water, and again 30 rods to rips and an island 30 rods long. The whole distance 2 1/2 miles and 120 rods, and total elevation 21 feet 11 1/2 inches. (Profile, Section 3d.) The direction here becomes again nearly north. Continuing 3/4 of a mile, and passing several ripplings, is an elevation of 12 feet 3 inches. (Section 4th). The banks here are low and irregular. At 1/2 a mile easterly, a brook enters the river on the American side, and 16 rods more pass some ripplings, elevation 5 feet 11 inches, in those distances, (Profile, Section 5). Here the river bends nearly south, and for eight rods are rapids; and at 12 rods farther, is Little Falls, rocky and short - at 15 rods farther, is a small Island and a Dam, extending from the English side. Continuing 25 rods farther, in all 60 rods, is an elevation 9 feet 4 1/2 inches. At 3/4 of a

mile more, are some easy rips of 1 foot 9 inches elevation - making the whole elevation for Section 6, 11 feet 1 1/2 inches, in the distance of 3/4 of a mile and 60 rods. A northerly direction again, 60 rods, brings us to Hall's Meadow Brook, which enters on the English side through low land; 3/4 of a mile and 40 rods farther, and passing some rips, is an elevation of 9 feet 6 inches. East, nearly 6 rods, are narrows - 44 rods farther, makes a total distance of 1 mile and 16 rods, and gives an elevation 11 feet 8 3/4 inches, as seen in Section 7. Winding southerly and easterly 1/2 a mile and 56 rods over rips, is an elevation of 8 feet and 7 inches; and 1/2 a mile and 24 rods farther, the elevation is 2 feet 11 inches; and 48 rods more gives an elevation of 2 feet 6 1/2 inches; aggregate distance 1 1/2 miles 48 rods, and elevation 14 feet and 1/2 inch, included, Profile, Section 8. The river now winds nearly north, and at 8 rods is Township marked I. P. and I. A. S. - 40 rods more, 120 in all, is an elevation of 4 feet. Here is low land, heath and

meadow. 10 rods farther is a Brook, entering from low land to the N. W. 30 rods more, and the river takes a South Easterly direction 104 rods in slow water - then east 40 rods, in all 1/2 a mile and 24 rods. It now winds to the north again, half a mile to Front Brook, on the English shore. Here is Porter's Meadow. 1/4 of a mile farther is the south part of an island, 140 rods long. A 1/4 of a mile and 40 rods farther is Porter's Hay Farm on the American side. A great range of meadow lies on the English side. The distance to Porter's Farm is 1 mile and 40 rods, and 1/4 of a mile farther is the foot of One Mile Rips, and an elevation of 1 foot allowed. A 1/2 a mile and 60 rods, over a rocky channel, the elevation is 15 feet ~~and~~ 1 inch to the foot of the falls - 2 rods more, elevation is 1 foot 8 1/2 inches, and continuing 1/4 of a mile and 20 rods to head of Mile Rips, elevation is 7 feet 9 1/2 inches, including the Falls. The land is here good, with 7 feet banks. These rips and falls give a fine water power of 22 feet 10 1/2

inches elevation. Continuing in nearly dead water 3/4 of a mile and 64 rods, the elevation is 1 foot 6 inches. Here is an island. The direction is now East 100 rods, through rocky channel and rips,- thence a north direction 72 rods, and passing Elbow Rips, - in all, the distance is 1/2 a mile, and 12 rods, - elevation 10 feet 1 3/4 inches. Still water 1/4 of a mile and there is an Island, from which dams are attached to the main land, - 24 rods farther and there is an elevation of 6 inches from head of Elbow Rips - whole distance 1/4 of a mile and 24 rods. 40 rods farther is an elevation of 1 foot 11 1/4 inches, and 1 mile and 32 rods farther is allowed 6 inches elevation, through level low land, up to Kill-me-quick Rips. Bank here, 20 feet high, length about 28 rods. Here is a clearing. A 1/4 of a mile and 60 rods northerly, and 60 rods easterly, is the head of these rips, and an elevation 9 feet 9 inches. Here is a carrying place 130 rods long on the English side - a broken dam, and a small Island lies here, giving a small channel on the American side. Still water North Easterly

40 rods, then Northerly 1/2 a mile and 32 rods farther are the Narrows and entrance of Chepetnacook Lake. Whole distance 54 1/2 miles 40 rods, and total elevation 382 feet 7 1/2 inches. The narrows are 12 rods wide, - on farther 3/4 of a mile, is an Island on the English side. The breadth of the lake here is a 1/2 a mile,- at a 1/2 a mile and 40 rods farther, the lake is 50 rods wide. Here is an Indian (Lacoote) settlement:- a few rods farther, and the Lake expands into an irregular form, with bays and coves on each side, interspersed with Islands - that, a reference to the plan only can show. N. W. a 1/2 a mile is a small island, - 1 mile farther in the same direction, you pass Big Island, nearly 1 mile long. Depth of water 8 to 20 feet. To north from this point lies Palfrey Lake, into which Palfrey stream enters, and at the head of which are Islands. West of this Lake lies Silas's Cove; also, a deep cove with a number of Islands at the entrance, and in a N. W. direction is Turtle Cove, all on the English side. West

1 1/4 miles, is a passage made by Islands, extending 3/4 of a mile in a south easterly and southwesterly direction to narrows rocky, and shoal; and 120 rods to middle of the lake, here opening broad, being 3/4 of a mile wide, and widening as you proceed up. One mile farther, N. W. course, lies Musquash, a deep cove on English side, and on American side Sandy, Vance's and Meadow coves. Breadth of Lake here 1 3/4 of a mile, - a 1/2 a mile farther the lake narrows to 3/4 of a mile. 1 1/4 miles farther are two deep coves on the English side, with a number of large Islands; and Lambert's and Pike's Cove on the American side. Nearly 200 rods, is Sandy Point on the English side. The lake here is 1/2 a mile wide. N. W. 1 1/2 miles, are some Islands on each side, and 1/2 a mile farther, the lake is 120 rods wide; and at 1/2 a mile farther, the lake is 1/2 mile and 60 rods wide,- at 1 1/2 a mile farther, is a point on the American side, and an Island, called Beech Island, on the English side. At a 1/2 a mile N. W. nearly, Pike's Brook Cove lies

to the S. E. on the American side, which is 1 1/4 miles deep, - and on the English side, nearly north, is McAllaster's, which is also a very deep cove, with one long, and one small Island, lying in same north direction. More northerly the lake narrows to 120 rods width, and there are small Islands, at mouth of Spruce Cove on the American side. A mile N. W. brings Spruce Cove open lying to southward. The entrance of this cove is narrow, and widens as you go in. It lies at the foot of Spruce Mountain. A north course nearly of 2 miles, and there is a small Island, and 1 1/2 farther, is the carrying place into Mud-lake. Average breadth of this part of the Lake, 1/2 a mile or more. A northerly course, 1 mile farther, brings us to the stream entering from Mud-lake; about one mile farther, and same course, is the head of this lake, making the length 20 miles. Following up through heath and meadow land, winding southerly, westerly, and northerly, 1 mile, to quick water, and continued nearly north 100 rods, gives an elevation 6 feet 4

inches, and 96 rods more, elevation 14 feet 10 inches (Profile A.) The river now turns to nearly west, 24 rods, and elevation of 5 feet 8 inches; and 12 rods more, an elevation of 17 feet 5 inches (Profile B.) Whole length of this stream 1 1/2 miles 72 rods, and elevation 44 feet 3 inches. E. Grand L. Stream

We now enter Mud Lake. The banks on the American shore rocky and irregular, - on the English side more uniform; depth of water from 2 1/2 to 10 feet. The lake lies nearly N. and S. - is 4 miles long and 1/8 of a mile wide, on an average. From the entrance of the lake, and to the carrying place, is about 3 3/4 miles, and continuing to westward 1/4 of a mile, is an Indian settlement and cleared land - and lies at foot of rips, which form the outlet of Grand Lake. S. W. and N. W. 120 rods, elevation is 5 feet 5 1/4 inches, - 80 rods farther, the elevation is 9 feet 2 inches, - west 13 rods more and elevation 2 feet 10 inches, making 1 1/4 miles and 16 rods from Mud to Grand Chepetnacook Lake, and whole elevation up the stream 17 feet 5 1/4 inches. Mud Lake

The channel is shoal and rocky. Whole distance 81 3/4 miles 32 rods, elevation 444 feet 3 3/4 inches.

At the entrance of Grand Lake, are two Islands on the American side, the larger, Long Island, 3/4 of a mile long. A north-westerly course, 3/4 of a mile farther, is the narrows, a passage about 12 rods wide, with 10 feet water in the channel. Farther a 1/2 a mile, lies a large cove, extending nearly 4 1/2 miles southerly, and the head of which is about 1 mile from Spruce Mountain Cove in the Chepetnacook: a stream enters here, where considerable logging is carried on. The average breadth of the Cove is about 1/2 mile, and several Islands lie scattered in it. Continuing up the Lake 1 mile, in same direction, the water deep, and banks rocky, there is an Island on American side. The lake here is 2 1/4 miles wide. Farther 3/4 of a mile, are two small islands on the English side, and at a farther distance of 3/4 of a mile Greenwood Cove bears nearly south on the American

side - and another S. E. on the English side. Up from this, 1 mile, the same N. W. course, the lake is 2 3/4 miles wide,- 1/2 a mile farther are three points of main land, lying E. and W. - one on the American side and two on the English side, called Norway Points. A westerly direction 2 1/2 miles into a cove, is a landing place with a road which leads (3/4 of a mile distance) into the Baring and Houlton road, in the town of Weston, where Messrs.. Butterfield and Gilpatrick reside. Here are fine farms, and an industrious, hardy, enterprising and virtuous population; and it bids fair, to be as fine a farming town as can be found in the State. North Easterly 1/4 of a mile, the lake is 3/4 of a mile wide,- the lake is 3/4 of a mile wide <u>between</u> the Norway Points, but directly east, past these points, the lake expands to 2 miles. Depth of water 10 to 30 feet, and shores rocky. Two deep coves lie to the westward. At a 1/4 of a mile farther, and same direction, North Easterly, is shoal water, and some Islands on the English side, and many rocks around

them. Continuing nearly north a 1/2 a mile, are two points of main land on the American and English sides, and a cove lies west on the American, and another east on the English side. A 1/4 of a mile farther, is Burnt Island on the American side. Lake here 1 3/4 miles wide. A 1/4 of a mile farther, is the lower end of an irregular Island, about 1 mile long, on the English side. Breadth of lake here 1 mile and 40 rods. Winding to the east a 1/2 a mile, is a small Island, and a 1/4 of a mile farther is another about 120 rods long. A 1/2 a mile farther is another nearly a 1/2 a mile long, beside some small islands, all on the American side. Depth of water 10 to 40 feet in channel way. More easterly a half a mile, is a long, narrow point of main land; and 200 rods west, nearly, is widow Deering's farm on the American side, bounded on the east by a cove. Here is an extensive clearing and the land good. At a 1/2 a mile from this place the lake is 130 rods wide. Farther 3/4 of a mile, are three clearings on the American side; on two of

which, are Trask's and Bramin's farms. The land here is excellent. To the S. E. is an irregular cove, extending to one mile to the English shore. 3/4 of a mile farther is the entrance of the thoroughfare into the North Lake. The collected distances on the Grand Lake make 12 3/4 miles. Through the thoroughfare in a north easterly direction, 1 mile and 56 rods, through heath, meadow, and still water, is the North Lake. Nearly north, 1/4 of a mile, the lake is 1 1/4 miles wide. 40 rods farther is the outlet of Monument Brook, which is nearly still water. Total distance from our starting point, channel route, 96 1/4 miles, and 48 rods. The actual measured distance round the shores, American side, 166 miles, and 35 rods. Allowing the elevation the same at Monument Brook as at the entrance of Grand Lake, it cannot vary much, and the whole elevation from Calais Bridge is 444 feet 3 3/4 inches. The shores on the American side of the Grand Lake, are generally rough and rocky, and broken poor land, until we pass Norway Points,- after which, the land becomes better, to

the head of the lake. Average channel depth of the water, about 15 feet, and navigable for boats of considerable burthen, through this long and capacious lake.

In returning to the Western branch, we took the route of the channel which divides the United States from the British Provinces, sounding occasionally, and the line of our course will be traced on the plan.

WESTERN BRANCH.

This Branch enters the Eastern or Main Branch, at the head of Upper Falls, about 20 1/4 miles from Calais Bridge. The elevation here is 165 feet 11 1/2 inches from that point. Proceeding N. W. 48 rods, in nearly still water, and S. E. 24 rods farther, are Islands on the American side. Continuing magnetic south 120 rods, then S. W. 24 rods, is the head or upper part of another Island. The river now bends nearly north 1/2 a mile, passing Bailey's Mistake, and then turns to S. W. again a

1/4 of a mile to Tomer Stream Rips. Whole distance 1 1/4 miles and 56 rods and elevation 1 ft. Continuing Westerly 40 rods to head of rips, elevation is 2 ft., 40 rods more over two small rips is an elevation of 1 ft. 6 inches, southerly and westerly 1 mile and 40 rods and over some small rips the elevation is 1 ft. 9 inches. The banks of the river here are low. Pursuing the same course 1 mile and 24 rods, is the entrance of Tomer Stream. This is an important stream, whose source is a small lake, near the Chepetnacook Lake. Much lumber is driven on this stream. The land is good, and considerable quantities of hay are cut on the low land upon this beautiful stream. The water at the outlet of this stream is very deep, in other parts from 2 to 8 feet. At a 1/4 of a mile farther, are some small rips, elevation 6 inches. Continuing one mile farther, in nearly still water, of the average depth of 8 feet and low land, where is cut quantities of hay. North westerly a 1/4 of a mile is the town lines of Princetown and Baileyville, and 1 1/2

miles farther is the foot of Black Cat Rips, and 1 foot elevation. Nearly north a 1/4 of a mile, and the river turns again to nearly west, and 60 rods farther, is the head of those rips and an elevation of 4 feet 4 3/4 inches. Distance on this branch 6 3/4 miles and 20 rods, and elevation 11 ft. 10 3/4 inches. At 40 rods farther, is a small Island; and at 40 rods farther, is the outlet of George's Brook, which falls into the river on the southern side. Hay is cut in considerable quantities here. The course is now southerly and distance from Black Cat Rips 1 3/4 miles through heath and meadow land, to the foot of Louie's Rips, and 6 inches elevation. Nearly west 20 rods is the lower end of Louie's Island. A 1/4 of a mile and 12 rods farther, with bad banks and rocky channel, is the head of Louie's Island, and 1/2 a mile and 20 rods to Houlton Road Bridge and Louie's outlet, an elevation of 7 feet 3 inches. Whole distance 9 miles and 40 rods, and elevation 19 feet 7 3/4 inches. Here is a village in the town of Princetown, rapidly settling, and

rising into importance. The water power is excellent but not heavy, and improvements are in contemplation, that must, when erected, make Princetown of considerable importance. The improvements in roads and agricultural employment, have been rapid and great within a few years. Here on the north side is the Indian Township, where Louie resides, an Indian, who lives comfortably by his own industry, and who is one of the few examples of an Indian abandoning hunting and fishing for a farm.

Here is the entrance of Louie's Lake one mile extent North and South and about 200 rods East and West, and 3 3/4 miles in circumference. In a S. W. direction from the bridge 3/4 of a mile and 40 rods to the Narrows, and farther 1/4 of a mile, rocky channel and shoal, to a Pond, elevation 2 feet 5 inches. There is a small Island in the channel. In a S. W. direction again, 136 rods, is a passage 8 rods wide and 10 long, which leads into Long Lake. The circumference of this Pond is 1 1/2 miles and 6 inches elevation. The land here is of inferior

quality. A westerly course up Long Lake 1 mile, is Greenland Cove to the south, 1/2 a mile long, and narrow. Continuing 1 1/4 miles and 46 rods farther is another narrow passage, into the Basin. Distance from Louie's channel route 2 3/4 miles and 56 rods - from main St. Croix 12 miles 16 rods, and elevation 22 feet 6 3/4 inches. The circumference of Long Lake, 8 miles. At the entrance of the Basin is a small island, and 140 rods West, including 8 rods of the narrows, 12 rods wide, is the entrance of Big Lake, where is a larger island. Shoal water and gravelly channels. The land is level, and in many places good, from the entrance of Long Lake. Westerly 1 mile, is Pope-shrine Cove, to the south, 2 miles deep. Stone's Island, on which is a clearing, lies at the entrance, and many islands within the cove. Stone's Island 3/4 of a mile, and average about 100 rods wide. To the north is another large cove, into which Big Musquash Stream enters, which is nearly still water 8 to 10 feet deep. Considerable hay is cut here. The lake is 3 1/4 miles broad at this place. Continuing

westerly 1 mile more, are narrows in which is a small island. Here are clearings on each side, on which reside Cass, and Yates, and Smith. Proceeding S. E. 1 1/2 miles, is the south point of White's Island, 1 mile long, on which are Indian settlements. This island extends into Dyer's Cove, which is very large, with many islands in it. To the south lies Gordon's Island. The passage here is 120 rods wide, water from 4 to 15 ft. deep. At 3/4 of a mile to the south lies Clifford's Cove or Bay, which is 2 1/2 miles deep, very irregular, with many islands within. At the entrance lies a long island, leaving passage at each end into the cove. The lake here in a north and south direction, is 3 1/4 miles broad, say from the south part of Clifford's to the north part of Dyer's Cove. Westerly 3/4 of a mile, we pass a point of land 1/2 a mile to the south. To the north 3/4 of a mile, is Hard Wood Island, and many small islands lay to the north. Proceeding west nearly 1/2 a mile, and south 130 rods, Little River enters, where logs are

driven 20 miles. At 3/4 of a mile northwesterly, is the head of Big Lake, or entrance of Grand Lake Stream, which runs through heath and low land. Depth of water in channel of Big Lake, 4 to 18 ft. The length of this lake is 6 1/4 miles, and circumference 48 1/2 miles and 40 rods. There is much good land in the vicinity of this lake. The shores are level, and the whole appearance indicate it as a favorable spot for settlements. Slate is found, particularly in Clifford's Cove. At the outlet of the stream, is an island, and N. W. a 1/2 a mile and 40 rods, is the head of nearly still water which is 2 to 6 feet deep. Distance from Louie's 10 miles and 40 rods, and from the main river 20, elevation 23 feet, 1 inch. Proceeding nearly north 40 rods is a noted elm, and 40 rods farther the course is westerly, and 1/4 of a mile farther, is an elevation of 15 feet on the last distance of 1/2 a mile. Continuing southerly 32 rods N. W. and N. 1/4 of a mile and 72 rods, is Little Falls, and nearly west 100 rods more, in all 3/4 of a mile and 20 rods, the elevation is 10 feet 4 inches. At a 1/4 of a

mile and 12 rods N. W. is an elevation of 24 feet 4 inches, and nearly west 12 rods, is the foot of Big Falls, and 49 rods more to the head of the same, and an elevation of 11 ft. 1 inch. Continuing nearly north 3/4 of a mile is the Grand Lake stream, and an elevation 15 feet 8 inches. Length of the stream from the beginning of quick water to the dam 2 3/4 miles and 37 rods, and whole elevation of 82 ft. 5 inches. This stream is rocky and shoal, but the water power great. Both Little and Big Falls are very compact and extensive water privileges. The banks are bold, the soil light and rocky. Extensive works may be erected at small expense. Whole distance from Calais Bridge 42 1/2 miles and 67 rods, channel route, and elevation 271 ft. 5 1/4 inches. Continuing up the lake 28 rods, is a small island - and 92 rods farther, is the carrying place to the Big Lake - a 1/2 a mile and 40 rods more, is another small island, making 1 mile from the dam before mentioned. The lake is 80 rods wide, and water 3 to 10 feet deep. Proceeding nearly north a 1/4 of a mile, and 100 rods East, is an island 60 rods long, situated near the main land. A cove

lies near, from which a small stream runs into the Big Lake, at Bonny Brook, during the freshets. This stream was made by cutting through a piece of light upland 2 feet deep, and 150 rods long. This opens easy communication between Grand and Big Lakes by a S. E. course, 4 miles, being only about half the distance of the present route. The elevation must be overcome, but it is nearly an inclined plane, of 20 feet to the mile. At a 1/2 a mile in a N. W. direction, Burnt Island lies to the westward, and two other islands 100 rods easterly, one of which is 70 rods long. A 1/2 a mile farther is Birch Island - and 1/2 a mile farther, Half Moon Island. Proceeding a short distance, is Coal Kiln Island, which lies near the western shore; and 1/2 a mile farther, is Sloop Island. Sprague's Cove lies a 1/2 mile to the westward. Breadth of the Lake 2 1/2 miles. The same course 1 1/4 miles, near Caraboo Rock, is a small island, and 100 rods to the W. is a point of land. On the E. is Mark's Island, about 3/4 of a mile long, and to the S. E. Dyer's Cove opens, which is large,- irregular, and

rocky shores. N. W. 1 1/4 miles, and Whitney's Farm Cove lies to the south, is 2 miles long, and in which is a crowd of Islands. At the head is a run of water during the freshets, which empties into Little River, distant about 3 miles. Depth of water in this cove 8 to 17 feet. In a north direction lies Whitney's Cove 2 3/4 miles long, average breadth 3/4 of a mile, and depth of water 10 to 50 feet. Breadth of lake, including coves, 7 miles - the shore of which is rocky. To the N. E. lies Columbus Island, Big Island, and several small islands. Proceeding N. W. 1 1/2 miles, pass a point of land to the north 1 mile distant. Breadth of lake 1 1/2 miles. At a 1/2 a mile farther a cove lies to the N., and farther 1/ 2 a mile, is the narrows, it being 8 miles from the Dam. The breadth of the lake here 1/2 a mile, and depth of water 10 to 15 feet. At 1 mile farther the lake is 3/4 of a mile wide, and to the south is a point of land, beyond which is the thoroughfare into Compass, Sysledopses Lakes. To the N. there is a channel which leads to Mink Carrying Place. On the

W. side is a long Island, and on the E. the main land. A number of Islands lay at the head of the channel, or cove, after passing the carrying place. At a 1/4 of a mile, nearly N. W., is the lower end of a large Island, and to the N. 100 rods, several small ones. From this station, the thoroughfare leads due S. and 2 miles up to narrows 20 rods long, and 4 wide, into Compass and Sysledopses Lakes. This thoroughfare is the outlet of several lakes, some of which are large, particularly the Sysledopses Lakes. In shore, is a continuation of this branch, which extends westerly towards the Penobscot river. The opening of a communication, through the wilderness lands in this quarter, to the western waters, is an object of vast importance to the State. The cost of uniting these waters would be very small in comparison with the almost incalculable benefit to these unsettled parts of the State. The land for the most part is excellent, and affords the greatest encouragement for new settlers. Farming is decidedly the most profitable in these

yet unsettled parts of the State of Maine, owing to the great demand for hay and provisions of every kind, than is, probably, in any other part of the United States. Internal communication opened here, would bring into cultivation much good land, - the surplus productions would go to increase trade and commerce. At a 1/4 of a mile and 40 rods, nearly north parallel with a large Island, is a point of land 40 rods to the W. above which is a cove a 1/2 a mile long, and near to the head of it, a brook enters on the west side. Heath and meadow land join it. Northerly 40 rods the lake is a 1/2 a mile wide, and 1/4 of a mile farther 80 rods wide. At a farther distance of a 1/2 a mile, is the upper end of a large Island; west of it is the cove, and Islands lying about Mink carrying place. The passage at the carrying place is about 4 rods wide, and the cove and shore is very rocky. Continuing 40 rods, and making in all 10 1/2 miles and 40 rods from the Dam first mentioned, is the outlet of Junier Stream which is narrow, and nearly still water. This stream, like the outlet of Compass

lake, is very important to lumbermen, as 9 or 10 lakes of various size empty their waters through it, thence through the two outlets described 20 lakes are emptied. Tomer's Stream leads towards Whitney's famed Hay Farm, which fronts Scraggly and Junier Lakes. Continuing a 1/2 a mile and 40 rods northerly is the head of Grand Lake, into which Bug Stream enters. Length of this lake 11 3/4 miles, and the circumference 55 miles and 40 rods, and contains an area of 13,240 acres. The natural boundaries of this lake are for the most part, rough and rocky, and the land sterile. There is, however, a ridge of good land on the western side of the lake 1 1/2 to 3 miles in extent. General depth of water in the channel from 6 to 25 feet, and in some places more. Here the survey closed,- there having been measured on this Branch 130 1/2 miles, and on the Eastern Branch, 161 miles and 40 rods,- aggregate 291 1/2 miles and 40 rods.

Commencing at Calais Bridge, and the levels from nearly low water.

Eastern Branch.

	From Station to Station Miles.	Rods.	Whole distance from Calais. M.	R.	From Station to Station Feet.	Inches.	Whole Elevation from Calais. F.	I.	Remarks.
Upper Bridge, Milltown,	1¾	8			72	7			
Baring Bridge,	3½	32.	5¼	40	13	11	86	6	Land good, Banks uniform, in general.
Foot of Sprague's Falls,	5	20	10¼	60	6	8¼	93	2¼	Do. do.
Head, etc.,	¼	34	10¾	14	25	5¼	118	7½	Do. An excellent water power.
Head of Enoch's Flips,	½	61	11¼	75	9	6¾	128	2¼	Do. Another good mill priviledge.
Pitch of Lower Falls,	7¾	58	19¼	53	17	9¼	145	11½	Land variable, Banks upon the whole, low.
Head of Upper Falls,	½	20	19¾	73	20	0	165	11½	Western Branch enters St. C. ten rods up.
Foot of Grand Chebetnacook Falls.	2¼	0	22	73	3	11½	169	11	Land low and for the most part light.
Head of do.	½	10	22¾	3	20	1	190	0	Another excellent water power.
Foot of Canoose Flips,	7¼	16	30	19	10	8¼	200	8¼	Land good.
Head of do.	½	20	30½	39	11	3	211	11¼	Rocky Channel, — water shoal.
Foot of Haycock Flips.	2¾	40	33¼	79	0	6½	212	5¾	Head of Loon Bay, - Settlers lives here, - Todd.
Head of do.	¼	45	33¾	44	6	0	218	5¾	Channel very rocky, Land light and gravelly.
Foot of Meeting House Flips,	1	0	34¾	44	0	2½	218	8¼	Good land, with small exceptions.
Head of do.	1	20	35¾	64	7	9	226	5¼	Channel very rocky, - banks rough
Foot of Rocky Flips	½	40	36½	24	1	0	227	5¼	Land low, and burnt over
Head of do.	3¼	40	39¾	64	24	8¾	252	2	Extremely rocky channel, Shores rough. 253 ft. 3¾ in.
Foot of Mile Flips	10	24	50	8	83	3¼	335	5¼	Past much good land, banks rather regular
Head of do.	1	0	51	8	22	10½	358	3¾	Water shoal - Channel a little rocky,
Foot of Kill-me-quick Flips,	3	12	54	20	14	7	372	10¾	Low meadow land.
Head of do.	½	20	54½	40	9	8¾	382	7½	Entrance of Chebetnacook Lake. (Narrows)
Head of Chebetnacook Lake.	20	0	74½	40	0	0	382	7½	The shores of this Lake are for the most part rocky.
Stream into Mud Lake,	1½	72	76¼	32	44	3	426	10½	Meadow land at the entrance - then rocky.
Head of Mud Lake,	4	64	80½	16	0	0	426	10½	Channel rocky - water from 2½ to 10 feet.
Stream into Grand Lake,	1¼	16	81¾	32	17	5¼	444	3¾	Very irregular, and also rocky - Land good.
Length of do.	12¾	0	94½	32	0	0	444	3¾	The depth of the water is good up the channel.
Do. Thoroughfare,	1	56	95¾	8	0	0	444	3¾	Narrow confined dead water stream.
Up North Lake to Normouth Brook.	½	40	96¼	48	0	0	444	3¾	Lake irregular. Land excellent on the American side.
			96¼	48	0	0	444	3¾	Brook at the entrance, nearly 6 ft in water.

Table, shewing the Distance and elevation of various sections, to the head of Grand Lake, - commencing at St. Croix River.

Western Branch.

	From Station to Station Miles.	Rods.	Whole Distance. M.	R.	From Station to Station. Feet.	Inches	Whole Elevation F.	I.	Remarks.
Foot of Louie's Flips,	8½	24			12½	4¼			Land low - considerable hay is cut near the stream.
Head, or bridge on Houlton road,	½	16	9	40	7	3	19	7¼	Good mill priviledge - capacity not large.
Foot of Grand Lake Stream.	10	76	20	36	3	5¾	23	1	Channel route from 3½ to 25 and 30 feet.
Head of do.	2¾	37	22¾	73	82	5	105	6	Very rough channel - good mill priviledge - land light.
Head of Grand Lake,	11¾	0	34½	73	82	5	105	6	Water about the same as Big Lake, up channel.

The undersigned, in closing this brief Report of the exploration survey, acknowledges the unremitting and prompt attention of the Honorable Timothy Pilsbury, to whom he is indebted for aid throughout,- and also, Lieutenant Bradbury, Assistant as well as all the men employed, whose cheerful and ready obedience enabled him to go over a large extent of rough shore, and through woods, when great labor and perseverance were required, to make a proper despatch of the survey.

WILLIAM ANSON,

Surveyor and Civil Engineer.

Portland, February 6, 1837.

STATE OF MAINE.

In Senate, February 10, 1837.

ORDERED, That 1000 copies of the foregoing Report be printed for the use of the Legislature.

(Extract from the Journal.)

Attest, WILLIAM TRAFTON, Secretary

Calais, Me., Aug. 5, 1893.

Leonard P. Carver, Esq.,

State Librarian,

Augusta, Me.

Dear Sir:-

You will probably recall my visit to Augusta about a month ago, and the objects of the fishery inquiry along the border which I am conducting in company with Dr. Wakeham, of Ottawa. I write to you now more especially to ascertain whether the following named report, a small pamphlet published by the State many years ago, can still be obtained together with the accompanying map to which it refers. The title page of the report reads as follows:

Seventeeth Legislature.
No. 21. Senate.
STATE OF MAINE.
In Board of Internal Improvements,
February 9, 1837.

To the President of the Senate and
Speaker of the House of Representatives:
By the direction of this Board, I have the honor to lay before the two branches of the Legislature, the Report of William Anson, Engineer, appointed to make an exploration survey of the two Branches of the River St. Croix and the adjacent Lakes.
(Signed) A. R. Nichols, Secretary.

My attention was called to the above re-

port by a lawyer here, and I should very much like to secure a copy, if possible, for reference, in preparing our report upon the St. Croix River. I would also like to inquire if there have been any later State Surveys of this river, or maps of the same, or any accounts of the milling interest, historical or otherwise. We have found the St. Croix a very interesting river, but in this place we have been able to find very little historical or engineering information, which has been a great disappointment to us.

When in Augusta, you were kind enough to offer me a copy of the State report on the Mill Power of Maine, but I neglected to ask for it before leaving. Does your offer still hold good, and, if perfectly proper, might I ask you to send me a copy. It is of course for the U. S. F. C., and I send you enclosed a frank which can be used in mailing, by simply pasting the same upon the outside of the package.

I believe also some one was to send me a copy of the revised game and fish laws of the State, but it has probably been overlooked. Could I not impose upon you to the extent of

asking you to remind whomever has this matter in charge that a copy would be of great value to me just at present.

My address is still Eastport, Me. We expect to visit Augusta again sometime before the end of the Summer.

FROM ANNALS OF CALAIS, ME. AND ST. STEPHEN, N. B.
BY REV. I. C. KNOWLTON, CALAIS, 1875.
(Mills, beginning p. 184).

About 1780, Daniel Hill, Jeremiah Frost and Jacob Libbey built a small, rude mill, on Porters Stream, near its mouth. This was the first saw mill. It was supplied with ~~saw~~ logs from trees growing near the stream, cut and rolled in, without the aid of a team. Here the first boards were sawed, and here the great business of the place began.

About 1785, Mr. Moore built a saw mill and grist mill, in the parish of St. David, at the place ever since called "Moore's Mills". These mills, often rebuilt or repaired, are still running, and partly owned by thrifty descendents. There is also at the present time, machinery for carding wool and making shingles and turning on the same dam.

In 1789 or 90, Henry Holdsmith erected a grist mill and saw mill on the Waweig River; and thither the farmers of St. Stephen and St. George carried their grain to be ground.

Not long after, Daniel Hill's mill having been swept away by a great freshet, another mill was

erected by Peter Christie, Joseph Porter, and others, on the same stream and near the site of the first one. This was run profitably for many years.

The first mill on the main river was built at Milltown about the beginning of the present century, by Abner Hill, Peter Christie and others. On its completion it was found to go so swiftly and strongly that it was christend the "Brisk Mill". It stood on the American side of the river; and a mill bearing the same name still saws briskly on the old site. The Washington mills were built soon after, on the same dam. In 1805, a mill was erected at Baring, by Daniel Rhodes and Maltiah Lane, for William Vance, Esq.; and soon after, other mills were built at such places on the river as seemed most convenient for the lumbermen.

These mills run well, and it was easy to procure logs for them; but it was very difficult to get the manufactured lumber to tide water. Rafts could not be run down Salmon falls without breaking, and the roads in summer were almost impassible fora loaded team. In this emergency, a sluice from the mills to the head of the tide was suggested, and

about 1805, after much talk and correspondence, Margaret and Susanna Campbell, of Scotland, furnished the money, and the sluice was built for them, on the St. Stephen side of the river. It proved so useful and profitable that it has been kept in operation ever since. It remained the property of the Campbells until five or six years ago, when it was sold at auction in St. Andrews, and bought for a few hundred dollars, by C. F. Todd and the Eaton Bros., by whom it is still owned.

About the same time, i.e. 1805, a broad sluice was also built on the American side of the river, from Milltown to Middle Landing. It worked well and was much used until the Union Mills were built, when lacking a convenient place to discharge its freight, it ceased to be used.

In 1824, Capt. Seth Emerson and Amaziah Nash built a saw mill and grist mill, for Green and Shaw, at Ferry Point Rapids, near the site of Samuel Rideout's grist mill. These mills for a long time were valuable property.

In 1826 and 1827, Capt. Emerson built for Joseph Whitney, A. Pond, Jones, Pike and Whipple, at Middle Landing, now Union Village, the Lafayette

Mills. They went into operation in the spring of 1827. A few years after, these mills were purchased and for a time successfully run by Messrs. Henry and Frank Richards.

* * * * * *

Since then, many mills have been built and rebuilt, and great improvements have been made in their machinery. There are now in Baring eight gangs, two mules or muleys(single saws that move very rapidly), four shingle and six lath machines; in Milltown, seventeen gangs, two muleys, and seventeen lath machines; at the Union, nine gangs, one muley, nine lath and two shingle machines, all in active and profitable motion except during the winter.

(Ferry Point, referred to in one place above, is the site of the lowest or Calais-St. Stephen bridge, and the Ferry Point rapids must be the first rapids above the bridge. These rapids are not used now to furnish power. R.R.)

(Shipping, p. 160).

The river(St. Croix) has bold and picturesque shores, and varies in width from 50 rods to 200. The tide rises and falls 26 feet, making the river navigable for large vessels twice in every 24 hours. At low water, however, the river appears like a shallow stream running through a wide and deep valley. The bed of the river, made soft by vast accumulations of mud and sawdust, permit vessels of any size to ground without injury.

Investigation of Fresh Water Fishes of the Grand Lake System and West Branch of the St. Croix River, Me.

M. C. Kendall & Hardin

Grand Lake, Oct. 19, 1893.

Grand Lake is a large sheet of very clear water occupying a great rocky basin in Washington Co., Me. The Lake is about 12 miles long, averages 3 or 4 miles in width, and contains a number of rather large islands. The most characteristic features of the Lake are its bold rocky shores and its very clear water, which as a rule, is quite deep being 125 feet in some places. So far as could be seen, the bottom was made up entirely of huge boulders with sunken logs scattered here and there, as a consequence of the log driving in the spring. Its rocky shores are surmounted by a number of hills of varying heights, clothed by a heavy growth of beach, maple, birch, and pine. At this season of the year the foliage is very beautiful, the brilliant crimson and orange of

the birch and maple standing out in bright relief against the sombre green of the pine. Here and there, as one skirts the shore of the Lake in a small boat, he sees a gap in the foliage, forming a complete vista through which a merry little brook comes dancing out, seemingly a pretty picture enclosed in a framework of autumn-tipped foliage. There are a number of these little brooks bothentering and flowing out of the Lake, and these are said to abound with trout. This Grand Lake is one of a system of Lakes which together form the headwaters of the West Branch of the St. Croix River. The principal waters above Grand Lake are the Compass, Sysledobsis, Sysledobsis-Sis and the Wabash lakes. Our investigations did not extend into these waters but we were informed by various people in the neighborhood that with the exception of the white fish (Coregonus ?), the same fish inhabited these lakes as were found in Grand Lake, being much less abundant however.

We went up the Lake to-day with a small seine and alcohol in a canvass canoe. We explored the shores for several miles but could not discover a spot where it would be possible to cast the seine. The bottom along the shores was covered with huge boulders and great logs over which the seine could not be hauled.

White fish--Coregonus ?

We were informed by Mr. Rose and others of the neighborhood that white fish are taken in great quantities at one season of the year in the thoroughfare between Grand Lake and Compass Lake. These white fish are said to run up into the thoroughfare to spawn during the months of October, November, and December. It is allowable by the State law to capture these fish in the thoroughfare from the 1st of November till ice appears. They are taken by means of gill nets which are set in the thoroughfare for the purpose. These fish do not take the hook, but it is thought that they make the deep waters of Grand Lake their habitat during other than the spawning season, since they are caught in great quantities passing through the thoroughfare from Grand Lake in November. These fish have never been seen or caught anywhere in this region except in the narrows between Grand and Compass Lakes.

Arrangements were made with parties living there to ship a few of these fish to us in order that they may be identified.

Fishes of Grand Lake.

We were informed by various reliable people that Grand Lake, in addition to being the home of the land-locked salmon, contained principally togue (Salvelinus namaycush), brook trout, white perch, yellow perch, white fish, smelt, chubs, suckers, eels, and minnows in great abundance, and a very few horn pout and pickerel.

Grand Lake is connected with Big Lake, the next lake below, by three separate streams; Little River, Grand Lake Stream and Bonny Brook of which Grand Lake Stream is the largest and most important, since it constitutes the spawning grounds of the land-locked salmon. Salmon have never been seen in the other streams, but these afford very good trout fishing, especially the lower part of Little River.

Conversation with Mr. Rose.

Mr. Rose, bookkeeper for the tannery on Grand Lake Stream, is a thorough sportsman and deeply interested in the fisheries of the region. He invited us to his house where he has in what he calls his "den" a great variety of fishing tackle and hunting outfit, and the walls of his room are decorated with paintings of all the principal fishes of the region done by his own hand.

Mr. Rose says the land-locked salmon (Salmo salar sebago) were in the very greatest abundance here a number of years ago, and while a number are taken now, they are not by any means so plentiful. Mr. Rose says this decrease is due "on dit" to the following reasons:

Beginning about the middle of September, the salmon run down out of Grand Lake into Grand Lake Stream to deposit their spawn. The State of Maine formerly had a hatchery here, whereby the salmon were propagated. For this purpose a net provided with a number of com-

partments was stretched across the foot of Grand Lake at its outlet into Grand Lake Stream by which means every salmon going down into the stream to spawn was captured. Of the small fry hatched, it was claimed that 25 per cent were returned to the Lake, but the people considered this too small a number, thinking also that at least some of the salmon should be left to deposit their spawn on the natural beds. The rest of the salmon that were hatched, were sold to different parties for planting in other waters. The U. S. Fish Commission began to take an active interest in the operations of this hatchery together with the State Commissions of Massachusetts, New Hampshire and Maine in 1875, and the work was conducted successfully until the hatchery was abandoned, 2 years ago.

Whether these be the correct causes or not, says Mr. Rose, it is very palpable that the salmon are not by any means so plentiful as they were before the inauguration of the hatchery operations.

Another thing, as related by Mr. Rose and afterwards examined by us, is the condition of the dam at the foot of Grand Lake and head of Grand Lake Stream. This dam has no fishway but consists of seven compartments each with a gate. In order to have a big head of water in Grand Lake for log-driving in the spring, the gates of the dam are suddenly shut down about the 1st of November and kept closed till the following spring. As a result of this sudden closure of the dam, the water in Grand Lake Stream instantly falls off and thereby thousands of fishes (especially young) are stranded and die. The young salmon naturally seek shallow pools in the stream, and at this sudden dropping off of the water, they are left high and dry. A number of persons in the village say that thousands and thousands of young fish are killed in this manner every spring. Then too, on account of the destruction caused by closing the dam, the salmon which are late in coming down can not get into the stream, while those in the

stream are not able to pass back into the Lake.

Mr. Rose says very little poaching is done here and as a general thing the laws protecting the salmon are well regarded.

Immediately below this dam there are situated in the stream a tannery and saw-mill. At the present time Mr. Rose says none of the offal from either of these factories is allowed to pass into the stream; the refuse from the tannery serving as a fertilizer for the soil, and the sawdust used for packing ice.

Examination of the tannery however, and information from other sources, showed that some of the refuse from the tannery does go into the stream, but the larger portion of it is hauled away and thrown upon the land as fertilizer.

The operations of the saw mill are not very extensive now, and only a sufficient amount of wood is sawed to meet the requirements of the village people. Most of the sawdust is used for packing ice, but a very small

quantity still passes into the stream. On our way down the stream we saw several banks of saw dust and tanbark, and, at the mouth of Grand Lake Stream, a delta of sawdust and tanbark has been formed leaving only about two feet of water on each side. This condition may be compared with that of the past when vessels of considerable draught passed through the mouth of the stream and made landing over a half mile above.

Fishes of Grand Lake Stream.

October 18, 1893. Hauled 25 foot seine 1/4 mile from the mouth of stream; sandy bottom, few small stones and a little bottom grass. Water 3 feet deep and temperature of water 48° F. Took: Semotilus bullaris, 5 specimens 2 to 3 inches. Saw a number of these small minnows near the banks of the stream in this vicinity.

Oct. 19, 1893. Hauled seine in a little pool 100 yards below dam at head of Grand Lake Stream. Small cove with gravel and sandy bottom about 1 1/2 feet deep. Took:

Salmo salar sebago, 3 specimens 2 1/2 to 4 inches long.

Rhinichthys atronasus, 2 specimens 2 inches.

Catostomus teres, 6 specimens 2 to 3 inches.

Lucius reticulatus, 2 specimens 4 and 5 inches.

Hauled seine immediately below dam at head of stream, in a quiet pool at side of rapids. Very shallow (3-4 inches), gravel and sandy bottom. Took:

Salmo salar sebago, 2 specimens 3-4 inches.

Catostomus teres, abundant 2-5 inches.

Semotilus bullaris, abundant 2-7 inches.

Notropis megalops, few specimens 2-5 inches.

Osmerus mordax, plenty 2-3 inches.

Fundulus diaphanus, plenty 3 inches.

Rhinichthys atronasus, few 2-3 inches

Perca flavescens, 1 specimen about 4 1/2 inches.

Temperature of water 47° F.

Standing on the bridge crossing Grand Lake Stream about 200 yards below the dam, we saw a number of large salmon in the water below us. Here the current is very stiff, the water 4-5 feet deep, and the bottom rocky. The

salmon were at rest upon large flat rocks with their heads pointing up stream. They remained in the same positions throughout the day and were evidently casting their spawn. We cast a small stone at and disturbed one of them, but it occupied its former position in a few seconds. These salmon appeared to be between 1 1/2 and 2 feet long. Four or five salmon were also seen in the mill race by the side of the stream. Under the sawmill the following were obtained:

Salmo salar sebago, 2 specimens, one mature male, 22 inches long and weighing about 3 1/2 lbs. In this specimen the incurved tooth-like prolongation of the distal end of the lower jaw was well developed, as were the other well known periodical sexual characteristics. The other was a small specimen measuring about 9 inches.

Oct. 20. Hauled seine 50 yards above "Little Falls", Grand Lake Stream; still pool at side of rapids behind a big log in the stream, depth of water 6 inches, bottom soft sand, tan-bark and sawdust. Temperature of water 47 1/2° F. Took:

Lucius reticulatus, 5 specimens 6-8 inches.

Catostomus teres abundant 2-3 inches.

Gasterosteus ? 2 specimens about 3 inches.

Few minnows?

Hauled seine 30 yards above Little Falls. Between two large logs in the rapids, sandy and gravely bottom. Took:

Salmo salar sebago, 1 specimen 3 inches.

Catostomus teres, few specimens 2-3 inches.

Notropis megalops, 1 specimen 2 1/2 inches.

Semotilus bullaris 1 specimen 2

Water bugs, few species.

Just above Little Falls where the stream is 2 to 3 1/2 feet deep, we saw 25 or 30 large salmon on the bottom. The bottom was smooth, consisting of sand and gravel. We did not disturb these salmon but hauled the seine in the shallow water bythe bank. Took:

Osmerus mordax, 3 specimens 4 or 5 inches.

Lucius reticulatus, 1 specimen 6 inches.

Rhinichthys atronasus 3 specimens 2-3 inches.

Pugnitius ? several about 3 inches.

Semotilus bullaris, 1 specimen about 2 inches.

Catostomus teres, few about 2 inches.

Few water bugs several species.

Temperature water 48° F.

We were told that the salmon begin to go down into Grand Lake Stream to spawn about the middle of September, the State law prohibiting their capture from that time until the next spring.

The main spawning bed of the salmon is that part of Grand Lake Stream between Great and Little Falls, nearer to Little Falls. It is extremely rare, we were told, that a salmon ever goes down below Little Falls. They never go through the stream into the Lake below (Big Lake).

Gardners Brook is a small stream flowing into Big Lake, a short distance below the entrance of Grand Lake Stream. About 1/2 mile from the mouth, the seine was hauled in the Brook, water full of dried leaves, brush and twigs--water 2 or 3 feet deep and its temperature 36° F. Took:

Salvelinus fontinalis, 2 specimens. Female about 6 inches and male about 4 inches, both fully mature.

Seine was hauled near here several times but nothing else was taken.

Mr. Goram, a man living near the brook, told us that there were numbers of these trout in the brook during the spring season, but those he had seen had all been very small. He had never noticed any other kind of fish in the brook.

Big Lake.

This Lake is about 8 miles ~~long~~ long, 7 miles wide and contains a number of Islands both large and small. The characteristic features of the Lake are in a marked degree different from those of Grand Lake. In Grand Lake the water is remarkably clear, while in Big Lake it is very turbid, presumably due to the enormous quantity of decayed vegetable matter. Its shores are not so bold and rocky, there are several sand beaches here and there, and a large part of its bottom is soft and boggy. Quite a number of brooks flow into this lake and it is connected with Grand Lake by the three streams above mentioned. The lake as a rule is shallow, there are however depths of 60 feet to be found in some of its holes. Big Lake terminates in a short thoroughfare called "The Narrows" which empties into Long Lake, the next Lake below.

As might have been expected from a hasty glance at the features of Big Lake, we learned that no salmon, togue or brook trout are ever taken in its waters. In fact none of these fishes are found in any of the waters of this system of lakes below Grand Lake Stream. Big Lake is especially valuable for its vast numbers of white perch and pickerel.

Fishes of Big Lake.

We were informed by various parties that the following fishes were known to inhabit Big Lake: white perch, pickerel, horned pout, eels, smelt, suckers and chubs, all abundant, and yellow perch which are not so numerous.

Seine Hauls.

Hauled seine in a small shallow cove on an island at the upper end of Big Lake, bottom soft and boggy, short sand beach, little grass out from bank. Took:

Perca flavescens 1 specimen 3 inches.

Mussel ? 1 specimen

Gastropod ? 1 specimen

Hauled seine twice on Stone's Island near lower end of Lake Sandy and Gravely bottom with a quantity of long thin-bladed grass.

First was water haul.

Second haul took:

Fundulus diaphanous 1 specimen 1 1/2 inches.

Nothing else. Temp. water 51 1/2° F.

Long Lake.

is the next below Big Lake. It is 3 miles long and from 1 to 2 in width. The water is turbid and bottom mostly rocky except near the head of the Lake, there, in places, the water is very shallow, the bottom and beach so soft and boggy that one can not get foot hold. No brooks enter the Lake. The Lake terminates in a narrow winding passage about 100 yards long which empties into Lewes Lake the next Lake below. This thoroughfare was filled up entirely by a jam of logs.

Fishes of Long Lake.

This Lake we were informed contained the same species of fishes as the Lake above; Pickerel and white perch abounding.

Seine Haul.

The seine was hauled just below the narrows on a shallow soft gravel bottom covered by a small quantity of long grass. Took:

Lepomis gibbosus, 1 specimen 1 3/4 inches.

Two young tadpoles.

Hauled again a short distance off with no success.

Lewes Lake

is about 1 mile in length and from 1 to 2 in breadth. The water is turbid and the shores and bottom so rocky and so covered with logs and snags that it was impossible to seine except in one place. This was at the mouth of Huntley Brook across the Lake opposite the town of Princeton. Here the bottom is soft muddy and very boggy.

Oct. 17th took:

Lepomis gibbosus, 7 specimens 5-6 inches.

Notemagonus chrysoleacus, abundant 2-3 inches.

Perca flavescens 4 specimens 2 about 2 inches and 2 about 5 inches.

Semotilus bullaris, few 2-3 inches.

Temperature water 51 1/2° F.

Lewes Lake is said to contain the same species of fishes as the next Lake above.

Lewes Lake terminates in the West Branch of the St. Croix River at the town of Princeton.

West branch of St. Croix River.

This branch of the St. Croix River begins at the foot of Lewes Lake at the town of Princeton.

There are no fishways at any of the dams on the Grand Lake system above Princeton. The fishway at the dam just below Princeton is evidently not very effective.

Seine Hauls.

The seine was hauled without success off the town of Princeton above the dam.

There is a cotton factory and sawmill at the dam and we were told that the sawdust and edgings from the mill were all put into the River, strong evidence of this being manifested to us further down the River.

Hauled the seine in the mouth of Georges Brook, a stream of some size entering the West Branch of the St. Croix about 1 mile below Princeton. The bottom and banks consisted of sawdust out of which grew long grass

and lily pads. Took:

Lucius reticulatus, 1 specimen one 5 inch and one 3 inch.

Semotilus bullaris, one specimen 2 inches.

Perca flavescens, 1 specimen 3 inches.

Temperature of water 48° F. The bottom of the River was covered entirely with sawdust below this, great banks, composed of it alone, high and dry in the center of the River. At the foot of Black Cat Rips 1/2 mile below George's Brook, the seine was hauled on a gravel bottom covered with sawdust. Took:

Perca flavescens, 5 specimens 3-7 inches.

Lucius reticulatus, 1 specimen 4 inches.

Temperature of water 48° F.

Hauled seine again 1/2 mile below Black Cat Rips. Bottom soft, covered with sawdust and a great quantity of long water grass.

Took:

Notropis megalops, several about 3 inches.

Notemagonus chrysolencus, 2 specimens about 3 inches.

Hauled again about 1 mile above the entrance of Tomah Stream. Bottom soft, sawdust pickerel weed and bladder wirt plentiful. Took:

Lucius reticulatus, 1 specimen 4 inches.

Gasteropod 1 specimen ?

Temperature water 48° F.

We then went up Tomah Stream for two miles as far as the "roll dam". There is no fishway here and I do suppose any fish could go up over the roll. This roll is built for driving logs down the stream. The seine hauled at the foot of the dam took nothing.

Hauled seine again in a quiet little cove 100 yards below the roll. Bottom covered with grass and dead leaves near the bank. Took:

Amiurus nebulosis, 2 specimens about

3 inches.

Perca flavescens, 1 specimen 4 inches.

Hauled seine again on Tomah Stream 1/4 mile below the roll dam in a shallow cove filled with grass, dead leaves and lily pads. Took:

Lucius reticulatus, 6 specimens 7-10 inches.

Temperature water 43° F.

Below Tomah Stream a short distance a big jam of logs was encountered through which our boat could not pass.

St. Croix River.

Oct. 23. Hauled seine in this River two miles above the town of Baring on a soft yellow clay bottom covered by long fresh-water eel grass. Took:

Semotilus bullaris, 6 specimens about 2 inches.

Hauled again 75 yards below above position. Very soft muddy bottom and quantity of eel grass. Took:

Lucius reticulatus, 2 specimens 7-10 inches.

Semotilus bullaris, abundant 1 1/2-2 inches.

Water bugs numerous species.

Planorbis 1 specimen.

The seining done on the St. Croix River was done under adverse circumstances, not so thoroughly as we could have wished even in the limited time at our disposal. We could not secure a boat at, above, or below the town of Baring, so wading was our only resource and the

water was entirely too cold to do much of that. Then too the water along the shores of the River was full of logs and snags, so it was almost impossible to seine.

One and a half miles below Baring the St. Croix River runs through a grassy meadowland and is divided on the English side by alluvial grassy marshes into several narrow streams. Here where the bottom was soft and boggy, grass, weeds, moss, and bladder wirt abundant the seine was hauled and took:

Lucius reticulatus, several 4-13 inches.

Lepomis gibbosus, abundant (j) 1 1/2-3 inches.

Semotilus bullaris, abundant 1 1/2-2 inches.

Notemagonus chrysolencus, abundant 1 1/2-2 inches.

Water bugs, several species in great abundance.

Gastropods ? 3 specimens.

Tadpoles abundant.

We saw three large yellow perch in the stream but took none in the seine.

Above Calais and near Milltown the Magurrewock stream enters the St. Croix River on the American side. For a mile or so above its mouth, this stream runs through a meadow-land which is inundated to a large extent at every rainfall to any extent. We found the banks of the stream for 2 and 3 rods out were so soft and boggy that it was impossible to secure foothold anywhere near the stream. At the foot of a bridge crossing the stream 1/4 mile from the Saint Croix River, where some huge boulders are laid to support the piers of the bridge, sufficient foothold was obtained to haul the seine two or three times. Bottom of stream here consisted of soft mud, covered by long grass, few lily pads and a little bladder wirt. Took:

Lucius reticulatus, 3 or 4 specimens 4-5 inches.

Amiurus nebulosis, 3 specimens about 3 inches.

Lepomis gibbosus, 8-10 specimens about 2 inches.

Notemagonus chrysolencus, 2 specimens about 3 inches.

Few water bugs and quantity of tadpoles.

We learned that at one time this stream contained many salmon and alewives but that the stream had been filled up in recent years and now no salmon go up at all.

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