

Sept 9-11, 1941

Palmer
Warren
R. D. Palmer

Sept 9-11, 1941
Palmer
Warren
R. D. Palmer

Preliminary examination of the Pawcatuck and Palmer (Warren) rivers to determine the feasibility of establishing salmon runs.

by

**George A. Rounsefell, Ph. D., Fish and Wildlife Service,
United States Department of the Interior.**

At the invitation of Dr. Charles J. Fish, director of the Narragansett Marine Laboratory of Rhode Island State College at Kingston, Rhode Island, I spent three days, September 9-11, 1941, examining the Pawcatuck and Palmer rivers with a view to determining their suitability for salmon. Dr. Fish and two of his students accompanied me and aided in making the observations. Dr. Fish also supplied part of the equipment.

The preliminary examination was necessarily superficial and not intended to take the place of a detailed survey, but rather to show whether the prospects for salmon work justified such a survey. It was designed to develop the following points:

1. Whether these rivers contained suitable spawning beds for adult salmon.
2. Whether these rivers contained waters suitable for the growth of young salmon before making their seaward migration.
3. The condition of the rivers for the upstream migration of adult salmon and the downstream migration of young salmon.

Woods Hole Laboratory
Manuscript Report Number
41 -04

Spawning beds

Pawcatuck river and tributaries The lower portions of the Pawcatuck river are slow and meandering. The elevation of the river 14.6 miles from tidewater where the Pawcatuck divides to form the Wood and Charles rivers is only about 40 feet. About 27 feet of this is estimated in the height of 4 dams and probably 4 to 5 feet more is in the rapid at Burdickville where an old dam has been abandoned.

The Charles river drains the Great Swamp of Rhode Island. At the outlet of Worden's Pond 23.2 miles from tidewater the elevation is only 94 feet. This increase of 44 feet in elevation from its junction with the Wood river is largely covered by the 26 feet estimated height of 4 dams along this section of river. The Chipuxet river connecting Worden's Pond with 30 Acaw Pond rises only 4 feet in the 3 miles. No suitable spawning beds were observed at any of the points visited on the Charles river.

The Wood river, which joins with the Charles 14.6 miles from tidewater to form the Pawcatuck, rises at a higher elevation than the Charles, and instead of traversing a swamp it flows through low hills, largely wooded. As a result it is a totally different type of stream, affording gravel for spawning fish. The best section observed was at a bridge southwest of Penny Hill and about 50 yards east of the 4B entrance to Beach Pond camp. Here a stream measurement showed a flow of 7 cubic feet of water per second, which is not inconsiderable if the present extreme drought conditions are taken into account. Here the stream is about 15 feet wide and 6 inches to 2 feet in depth with a fair current, and a bottom composed entirely of small to large gravel and small rubble.

affording good conditions for spawning salmon. The elevation at this point is about 180 feet, contrasted to an elevation of only 98 feet at 30 Acre Pond at the head of the Charles river. Fair spawning gravel was also observed on the Flat river, a tributary that joins the Wood river about one mile south of Penny Hill.

Palmer River The Palmer or Warren river lies in Massachusetts along the eastern border of Rhode Island, and most of its tidal estuary is in Rhode Island. This river supports a small shad fishery. The only spawning beds in this river that appeared very suitable for salmon were just below Harris Pond, where there is a short stretch of alternating gravel riffles and gravel-bottomed pools. Above Harris Pond the stream has too little flow for salmon and the bottom is largely sand, large rocks and mud.

Temperature

Powassuck river Since the adult salmon can enter the rivers in the autumn after the temperatures have fallen and stream flow increased, the summer temperature need not be a limiting factor for spawning. However, since the young salmon must spend one or two summers in fresh water before migrating to the sea the maximum temperatures must be considered. The temperatures taken at 7 stations on the Wood river and its tributaries above the last dam at Barberville ranged from 68.5 to 70.7 F. with the corresponding air temperatures ranging from 77.5 to 81.5 F. Temperatures taken on the Sheepscot, St. Georges, and Penaquid rivers in central Maine on the previous week ranged from 68.8 to 70.7 F with the air temperatures ranging from 70.0 to 81.5 F.. Thus at this season, at least, the Wood river temperatures are comparable to those in central Maine. Since trout

are planted in the Wood river and its tributaries information on their summer survival should give evidence of suitable summer temperatures.

Palmer River On the Palmer river the temperatures (excluding one taken in tidewater and one taken in the Perryville reservoir) ranged from 67.1 to 71.9 F. with air temperatures ranging from 69.0 to 74.6 F. Thus the water temperatures appeared slightly higher than those on the Wood river in spite of being taken on a cooler day.

Hydrogen-ion concentration The hydrogen-ion concentration was taken at most of the points visited on both the Pawcatuck and Palmer rivers. Nowhere did the pH fall below 6.1 or over 7.0. Since the pH above all possible sources of pollution (Stepstone Falls and Chipmuck river) on the Pawcatuck was only 6.2 and 6.1 we feel that no importance can be attached to any of the variations.

Pollution

Pawcatuck river On the Pawcatuck river there is unquestionably a certain amount of industrial pollution. The amount of this pollution, its constituents and their effect on the fish, either through lowered oxygen, osmotic pressure, or direct toxic action, need to be carefully worked out before any salmon restoration work is undertaken.

At the White Rock dam the manager of the textile mill stated that they discharge chlorine, some dyes and a little caustic into the river. This is probably typical of the other textile and dyeing mills on the river. In order to determine the actual hazard to the fish it would be necessary to know not only the quantities of each pollutant discharged by a mill, but also whether it is discharged continuously or in large quantities at certain times, since the concentration will largely determine

mine the lethal effect. In some cases the effect of one pollutant may be greatly enhanced or modified by another pollutant discharged at the same time.

That this pollution may not be critical is suggested by the fact that in spite of the extremely low stage of the water which would tend to cause a concentration of the pollutants, Daphnia was found swarming in the quiet water above the Stillman dam and only about a mile below the textile mill at White Rock dam. Similarly, pickerel and numerous small fish were observed only one hundred yards below the mill at the lower Wyoming dam on the Wood river, although the mill was dyeing wool and the water just below the mill was discolored with blue dye. However, until there has been a thorough study made of the pollution hazard, we suggest that no plans be made for passing salmon by the obstruction in the lower river.

Palmer river The Palmer river does not appear to have any source of pollution.

Obstructions

Pawcatuck River In considering the obstructions on the Pawcatuck river system those on the Charles river need not be discussed as no suitable spawning beds were found in the Charles river system.

In order for salmon to ascend or descend from the sea to the upper Wood river where conditions may be suitable for spawning and for the growth of the young salmon, they must run a gamut of 9 dams, ranging in height from about 4 to 18 feet.

If it were merely a question of getting the fish up and down over the dams these obstructions would not be too serious a problem, except for expense. However, there are several complicating circumstances.

In practically every instance the water discharged from the mill re-enters the main river at some distance below the dam, amounting to as much as half a mile in one case. Since some of the mills are using nearly the entire flow of the river at present levels, there may be no water in the main river channel except what may leak through the dam. Even when the water flow is normal these mill discharges would need to have a coarse screen or pickets so arranged as to deflect adult salmon moving upstream into the main channel of the river.

At least 4 of the 9 dams would require the expenditure of considerable funds to build a satisfactory fishway. The other five fishways could be built at less expense.

Another vexing problem is how to get the young salmon downstream without having them pass through the pumps and turbines of the mills. This would require a considerable outlay for the screening of water intakes. If the river contains sufficient debris to clog permanent screens it might even involve some type of rotary or belt screening.

Palmer River The Palmer river contains only one obstruction, the dam at the outlet of Harris Pond. This dam has a fishway that appears to be satisfactory.

Conclusions

Pawcatuck River The Pawcatuck river system, due to pollution and obstructions is not now suitable for salmon restoration work. Since areas in the upper Wood river and its tributaries may be suitable for spawning and for the growth of young salmon, there may be a desire to put the river in condition for salmon restoration. This would involve great expense and we therefore recommend that before making any studies

of the lower Pawcatuck river, the area of the potential salmon spawning beds in the upper Wood river system should be carefully estimated, as only a large potential area will justify the expense involved in correcting pollution and obstructions on the lower river.

If sufficient spawning beds are found then a detailed study of the pollution hazard should be made before proceeding with any plans for passing salmon over the obstructions.

The nine dams on the Pawcatuck and Wood rivers between the sea and the potential spawning and nursery areas present several problems for migrating salmon that can be solved only at great expense.

Palmer River Apparently the Palmer river is free of pollution or obstructions to migration but the river contains only a small area of suitable spawning beds. The flow of this river is so small that we do not feel that it should be recommended for salmon work at this time.

Table 1.- Temperatures and hydrogen-ion concentration on the Pawcatuck and Palmer river systems, with comparative temperatures for three Maine rivers.

River	Locality	Date	Hour	pH	Air F	Water F
Pawcatuck	Above Stillman dam	9/9/41	4:15 p.m.	6.6	75.1	71.1
Do.	Above Carolina dam	9/9/41	6:45 p.m.	---	72.1	70.7
Do.	Burdickville	9/10/41	12:00 N	6.5	75.7	67.6
Charles	Above lower dam at Shamrock	9/10/41	11:00 a.m.	6.2	73.4	66.6
Charles	Above upper dam at Shamrock	9/10/41	10:30 a.m.	6.2	74.8	66.0
Chipuxet	Outlet 50 Acre pond	9/10/41	10:00 a.m.	6.1	74.4	67.6
Wood River	Above Woodville dam	9/10/41	1:00 p.m.	6.2	75.8	66.4
Do.	Below Woodville dam	9/10/41	1:00 p.m.	6.4	---	---
Do.	Below Wyssing dams	9/10/41	2:00 p.m.	6.3	80.4	64.7
Do.	Millville-Beach Pond road	9/10/41	3:30 p.m.	6.7	81.5	68.5
Do.	4B entrance to Beach Pond camp	9/10/41	5:30 p.m.	---	77.5	69.8
Do.	Stepstone Falls	9/10/41	5:00 p.m.	6.2	79.1	69.8
Tributary of Wood River	Just south of Kopeville	9/10/41	1:30 p.m.	---	81.1	69.8
Parris Brook	Millville-Beach Pond road	9/10/41	4:00 p.m.	6.5	81.0	70.7
Flat River	Road west of Break- heart Hill	9/10/41	6:00 p.m.	---	76.5	66.2
Target Brook (Breakheart	At New Pond above dam	9/10/41	6:30 p.m.	---	---	68.5
Palmer	Route 6 bridge (tidewater)	9/11/41	11:00 a.m.	7.3	72.1	71.0
Do.	Shad factory	9/11/41	11:30 a.m.	6.4	69.0	68.0
Do.	Below Harris Pond	9/11/41	1:00 p.m.	7.0	74.6	71.9
Do.	Bridge one mile above Harris Pond	9/11/41	1:30 p.m.	6.7	74.6	67.1
Do.	Reservoir at Perryville	9/11/41	2:00 p.m.	6.7	73.0	72.9
St. Georges	Upper Falls(Warren)	9/5/41	10:30 a.m.	---	72.5	65.5
Sheepsfoot	Whitefield	9/4/41	5:30 p.m.	---	81.5	70.7
Pemaquid	Pool's mill	9/5/41	12:00 N	---	70.0	65.0

Table 2.- Dams on the Pawcatuck river system.

River	Miles from tide-water	Locality	Height (feet)	Construction	Used for	Passable by salmon
Pawcatuck	0.0	Stillman	4	Stone, spillway 45 angle	Pumping water	Possibly, needs ladder
Do.	1.3	White Rock	6 & 2	Concrete, canal 1/2 mile long taking all water except leakage.	Textile & dyeing	No
Do.	4.9	Potter Hill	6 & 2	Concrete	Woolens	No
Do.	11.1	Bradford	3-4	Stone, face broken	Dyeing	Yes
Do.	13.4	Burdickville	0	Stone - open	Abandoned	Yes
Charles	13.8	Carolina	5	Stone, face broken, 30 angle	Not in use	Yes
Do.	20.1	Shannock Falls	5	Rock at head of rapids	In use ?	No, ladder easy to build
Do.	20.5	Shannock, Hereshee	15	Concrete horse-shoe, millrace 50 yds. below dam	Mill	No
Do.	21.2	Kenyon	4	Rock	Mill	No, ladder easy to build
Wood	14.9	Plainville	8 A & 4	Concrete, under highway bridge	Lace works	No, ladder very expensive
Do.	14.7	Woodville	7	Rock	Mill	No, ladder easy to build
Do.	20.9	Wyoming, lower	7	?	Woolen dyeing	No
Do.	21.0	Wyoming, upper	15	Rock	2 mills one at each end of dam	No, very expensive to build ladder as no main channel
Do.	23.1	Barberville	6	Rock	?	No

When two figures are given for height the first is the height of the dam itself, and the second is the height of the flashboards.