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TROUT STREAM IMPROVEMENT INVESTIGATIONS IN MICHIGAN

An account of work carried on for the Michigan Department of Conservation by the Institute for Fisheries Research, of the University of Michigan

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Maintaining trout fishing at its former standard of excellence is proving to be a serious problem. Fish hatchery methods and fish culture are only two of the necessary steps leading to more and better trout fishing in our streams. Some thought must be given to the welfare of the fish after planting, and attention given to improving the habitat. We can no longer depend merely on stocking, because if conditions in the stream itself are not favorable, we cannot hope to be successful in obtaining large numbers of fish of suitable size. Conditions in the waters themselves must be bettered if the fish are to have adequate cover and food. It is possible to improve a stream considerably by counteracting the natural deficiencies, by artificially improving upon what has been naturally provided and by restoring what man has destroyed.

Deforestation and lumbering practices have nearly ruined many of our streams. The former has removed shade and cover and has caused quick run-offs which are carrying immense quantities of ruinous sand into the streams every year, covering over the spawning beds and food producing areas. One of the methods of lumbering was directly in opposition to the production of trout. Dams flooded the spawning beds, and log drives scoured them out. Flooding for the drives widened the streams and washed into them non-productive sand which covered up the gravel. The rivers were cleared of all jams and cover before the drives, and they were swept clear of any vestige of cover

by the rush of logs. All these tendencies,--the destroying of spawning beds, the covering of great areas with sand, the excessive widening of the stream, and the removal of all cover, are now producing their harmful effect. To improve conditions already disturbed, it is desirable to restore the streams as nearly as is possible to their original and normal conditions. It seems possible even to improve on nature, by concentrated and intelligent effort.

This improvement of Michigan trout streams is being attempted by the introduction of various types of barriers, hides, and covers. These devices are modeled after those made naturally. It is thought that they will accomplish much toward restoring the streams to their former condition by digging pools, furnishing shade and cover, increasing food production, laying bare spawning gravel, building up the fish population and improving fishing conditions.

Trout will not remain in sections of a stream which have no pools or cover. Pools are being produced in such formerly barren stretches by speeding up the current so that it will dig. This may be done, and has been done successfully, with a wing-type barrier made of log or stone slanted downstream from one bank at a 45 degree angle. This crowds the water to one side and so speeds it up with the result that the current digs a pool. A raft made of logs and wired to the bank can be placed over this pool for cover. By producing more pools we obtain more fish in a section, because one pool can support only a limited number of fish due to competition for food and for home territory. Many natural pools are so exposed that trout will not lie in them. By putting cover over them they can be made into suitable places for trout. Some of the natural pools have been filled with sand. Speeding up the current will remove this also. A wing built from each side forcing the stream through a narrow channel in the center accelerates the current and causes it to dig out the sand to form a gravel bottom pool 100 to 3000 feet long. The sand is piled up in a bar on each side behind the wings. Thus the stream proper is narrowed and pools favorable for trout are produced. By means of a wing barrier the current can be thrown under a log so that it will dig a good pool underneath.

In gravel and stone sections the wings increase the speed of the current and make a good riffle for a long distance down stream. The fish will stay in the pools, and feed in the riffle so that a poor section can be transformed into good fishing.

The headwaters and small feeders coming in at the stream sides can also be much improved. The spawning beds in the headwaters can be changed by the introduction of wings to make the current faster and to keep the gravel beds clean of silt, which collecting on the trout eggs tends to smother them. On hard bottoms in which the fish are unable to dig their nests, the wings, by means of the current produced, loosens the bottom material and sorts it so that it may be fit for spawning beds. The work already done on the Little Manistee River has shown that new spawning beds can be made by removing the sand covering from the gravel. As many as eight rainbow beds have been noted around one of these wings where before, the sand made it impossible for the trout to spawn. Increasing the spawning areas in this way is a great help because there is then more space for individual nests, and these nests are not so apt to be worked over by other spawners and the eggs destroyed.

The headwaters and side-feeders can in many cases be made more favorable for the fry and fingerlings. Where the water is too shallow it can be brought to a suitable depth by placing a low dam of logs or stones across the stream. This will produce an area of still water for the young fish above the dam. The dark muck which collects in the still water is the habitat of midges and other small forms which constitute the natural food of young trout. Plants will grow in this quiet water and furnish protection from predators. By this means, food and cover can be given to the young, and they are prevented from dropping downstream where they would be devoured by the older fish. So by producing natural conditions here near the spawning areas, a larger production of young may be secured.

All types of barriers tend to increase the amount of food by creating a variety of conditions. While carrying on the active work of building the barriers, I was able to make one hundred insect counts in varying types of bottom, depth, and current.

Plant beds, especially of chara, are very productive. Rubble produces more than gravel, and coarse gravel more than fine. The dark material along the stream sides is very rich in smaller forms of insects. The species found in plant beds are much larger however. Sand is very barren of life,--in fact, I found absolutely nothing in it, in many places.

As for the sand, itself, a thin layer is as destructive as a thick bar. By cleaning the sand off the gravel and concentrating it in a heavy bar behind the barrier, a large area of gravel will be exposed. Dark muck collects on the bars in the still water behind the barriers, as I have already noted, producing food habitats. Plants soon establish themselves in the muck on the bars, making the sandbar useful in place of ruinous. This quiet water behind the barrier is, literally, a rich warm water nursery for young trout. When the bottom is already gravel the speed of the current sorts out the finer material so that more food will be produced in the coarser material that remains. I have also found that, up to a certain point not exactly determined to date, a swifter current produces a greater quantity of food. The larger forms, such as stone flies, hellgramites, and certain caddis and mayflies prefer a swift current. The still, shallow water behind the barriers make a suitable environment for the smaller forms of life, such as protozoans and algae, which are the basic food of trout stream insects. The wings concentrate all the drift food into one food channel and send it over the pool below, with the result that the trout can secure more of the drifting insects which have fallen into the stream.

From information gleaned from fishermen this year and last, the barriers improve fishing conditions in general and fly-fishing in particular. Different types are constructed so that each pool is slightly different than the next and gives versatility in fishing. The food channels thrown along the hides and covers make excellent places for dry-fly fishing since the barriers localize the fish for the fishermen. Fish have been reported caught from under barriers that were not twenty-four hours old, and as many as six fish have been taken at one fishing from under a single artificial shelter. A sand section about a mile long on the Little Manistee River, previously invariably omitted

by walking across a neck of land between bends, has been fished with marked success this year, following its improvement last year.

At present 850 barriers numbered for identification, are under observation in the following Michigan rivers: Little Manistee, East Branch of the Black, Pigeon, Huron, Rifle and Gamble. Data are taken on each barrier constructed, so the original conditions are recorded and all changes can be noted. The work is thus being treated as a series of scientific experiments, from which it is hoped that a tried and proved art of trout stream improvement may evolve.

The cost of intensive improvement in a stream averaging 30 to 40 feet in width, has proved to be $100.00 to $200.00 per mile, varying with the stream condition, the availability of material, and solidity of bottom.

This year a flood test was carried on in the Pigeon River, where 71 barriers built for the experiment were exposed with intention to a 22 inch flood, which slightly higher than a normal spring flood of this stream. None of the barriers were lost.

In conclusion, it may be stated that, after two years of work, this investigation has given us grounds for believing that the improvement of our public as well as private waters is feasible, and will lead to a very marked increase in the trout supply. It is planned to continue the work next year in various streams in the State, by checking of those dams built this year and last, and by installing a considerable number of new barriers.

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