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Installation of a portable two-way fish weir in the outlet from Birch Lake (T. 7S., R. 13W.), Cass County

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Following reports that rainbow trout were escaping from Birch Lake through the outlet, it was deemed advisable to install a weir there to determine the extent of this reported migration. Several members of the Birch Lake Conservation Club were consulted regarding the plan, and they agreed to it. Permission was obtained from Mr. Floyd H. Leach, who owns property bordering the outlet, to allow installation and tending of the weir.

Briefly, the Birch Lake problem has the following history: Beginning in 1938, rainbow trout have been planted in Birch Lake each year, excepting 1939. After the introduction of trout into the lake, it was thought some of the planted fish were escaping through the outlet stream. A dam for stabilizing the lake level has been in the outlet for some years. A steel grate was provided at the existing concrete dam after the Fish Division granted the Birch Lake Conservation Club a permit for five years, dating from January 1, 1941, to install, maintain, and operate a suitable screen between the lake and the Williamsville Mill

for preventing the downstream movement of rainbow trout. After its installation, however, the grating guard was not considered adequate because the spacing between the bars permitted the passage of small fish, and it was suspected that even legal-length trout could go through. Moreover, opposition to the guard was expressed by some people who thought it obstructed the springtime migration of a considerable number of suckers from the lake into the outlet stream where they would be available to fishermen. Hence, to determine whether migrations out of and/or into the lake are extensive enough to affect fishing in Birch Lake and to warrant a special management policy for the outlet, it was decided to install the two-way weir below the dam.

The weir was installed on December 11 to 13, 1946 by Stanley Lievense, Arthur Kerle, and Clarence Taube of the Institute for Fisheries Research. This device had been used in Portage Creek (an inlet to Big Portage Lake), Jackson County, during the spring of 1946. Designed and built by Institute personnel, the weir is a portable, box-frame type, adapted for small streams of various width. The wings are detachable, and the doors, sides, and bottom are fitted so as to permit disassembly and convenient transport.

The trap of the weir has the following approximate dimensions: length, 8 feet; width, 4 feet; height, 3-1/2 feet. It is constructed of heavy, galvanized, square-meshed wire mounted on wood framework. A removable partition of the same material divides the trap into two parts, one for holding fish captured while moving downstream, and the other for holding fish captured while moving upstream. Two removable, pyramidal, wire funnels having 5-1/2" x 4-3/4" openings, fit in the ends. The floor is of

wood, and the top consists of two wood trap doors, one for each half of the weir. The four guide wings consist of wire screen, like that used in the trap, mounted on 8' x 3-1/2' wood frames. The woodwork of the weir is protected by asphalt paint.

When installation of the weir was begun on December 11, no water was flowing over the spillway of the dam, and the stream bed below was dry. Dry conditions are a convenience, for obvious reasons, when a weir is set. Because of rain on the night of the 11th and during the 12th, there was overflow, resulting in considerable water in the outlet below the dam on the 12th, when work was delayed on account of rain. That day boards were placed so as to increase the height of the dam; these served to hold back all except a trickle of flow. In addition, the stream was cleared of debris to facilitate better drainage. When installation was resumed on the 13th, the stream bed was mostly free of water.

The trap was set in mid-stream, with the upstream end about 6 feet below the base of the apron of the dam (See photo, Figure 1). It was anchored by driving 3" x 3" timbers into the ground at each corner and connecting these to the framework with lag screws. Wings were set on both upstream sides, extending from the corners of the trap to the abutments of the dam, each at a 30° angle with the bank. On the downstream end a wing was set on the left corner, and was run into the left bank. A wire wing was not used on the right corner; instead, a short wing of sheet piling was provided here. The tongue-and-groove boards were driven into the ground about 2 feet and were allowed to extend above the bottom about 3 feet. The downstream wings were set nearly perpendicular (at about an 80° angle) to the banks.

Figure 1.--The weir at Birch Lake just after its installation had been completed and before water was allowed to spill over the concrete dam.

In a position immediately back (downstream side) of each wire wing, sheet piling consisting of 8-inch tongue-and-groove boards of 1-inch thickness were fitted and driven into the ground endways side by side for the full length of the wing. The purpose of this was to prevent erosion beneath the wings, thereby preventing fish from evading the weir. A double row of piling was provided at the left upstream wing, for additional security against undercutting. The boards used for all protective piling were cut into lengths of about 3 feet, with at least 6 inches allowed to remain above the bottom. At each end of the weir two 8-inch boards as long as the width of the trap were fitted tongue into groove and submerged sideways and perpendicularly until the upper edge of the top board was even with the weir floor. This was done to prevent erosion beneath the weir.

A sheet piling dam was built about 12 feet below the downstream end of the weir. This was intended to insure water of sufficient depth to permit fish to enter the trap. Here again 8-inch tongue-and-groove lumber was used, the boards being cut in lengths of about 4 feet, and driven down until about 18 inches remained above the bottom. Each board was pointed on the grooved side (sawed at a 45° angle) to prevent its "buckling out" while being driven down alongside the adjacent board.

To forestall erosion at the ends, the sheet piling dam was extended into each bank for a distance equal to the width of two boards. The bed of the outlet stream is approximately 10 feet wide at this point. Two boards somewhat longer than the width of the stream were set tongue into groove and nailed to the piling on the upstream side. This was for reinforcement.

The dam was notched to the right of the middle, providing a spillway about 1 foot wide. Boards were laid flat on the bottom under the spillway and rocks placed over these to counteract washing which might undermine the sheet piling. It has been considered that it may be necessary to build a trough below the notch for allowing fish moving upstream to negotiate the dam.

After the sheet-piling dam had been completed, water was allowed to flow over the concrete dam by removal of the boards temporarily placed there. The impoundment formed by the piling dam was soon filled to a depth of from 12 to 18 inches; this presumably is adequate for the weir to function.

Before the weir was put into operation, the grating guard over the concrete dam was raised so that it does not obstruct the passage of fish. The weir is to be attended daily for cleaning of screens and transfer of fish. Fish captured in the trap while moving downstream will be released in the stream below the sheet-piling dam; fish taken while moving upstream (excepting any northern pike or mud pickeral, which are to be kept out of the lake) will be released in the stream above the concrete dam, whence they will have free passage into the lake. Records are to be kept on all fish caught, for determining future management policy in regard to the outlet.

Lumber purchased for this project consisted of 224 board feet of tongue-and-groove gum wood boards 12 feet long, 8 inches wide, 1 inch thick, and six 3" x 3" yellow pine timbers 12 feet long. The total cost of this material was $27.15. The Birch Lake Conservation Club will bear this expense. Not all of the lumber was used; the surplus was

left to be used for any additions or repair work that may be necessary.

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