

THE BARR FISHWAY



A Brief Description of the Only
Successful Fishway Known Today



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OF IRONWOOD, MICHIGAN

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The Barr Fishway, is the invention of Harry Barr, of Ironwood, Mich., a widely known sportsman, who has fished the waters of Michigan, Wisconsin and Minnesota for over forty years.

Mr. Barr is a mechanic and electrician, having been engaged in these activities for many years.

As a fisherman, he knew that the chief problem in creating good fishing in the streams was some way to enable the fish to get up the streams to their spawning beds, as he realized, as do all those who have studied the question that the stopping of the fish in their yearly migration by dams or falls was the chief menace to the natural increase.

After many years of study of this problem, Mr.

Barr invented the fishway which bears his name and which has been pronounced by conservation officials and others interested in fish culture as the only successful fishway known today.

A Barr Fishway was installed at Rest Lake Dam, Wis., under the direction of Mr. Barr, and was tested by the conservation department of Wisconsin, which pronounced it as absolutely successful. While this dam was not an ideal spot for the installation of a fishway, it will be seen by the results obtained, as given elsewhere in this pamphlet, that it accomplished all that could reasonably be expected.

Unlike any of the many fishways which have been tried for many years in many different places, the Barr Fishway, does not require that the fish jump or climb to reach the higher waters above a dam or falls. They simply swim into the lower tank, impelled naturally by the agitation of the water, and are lifted to the level of the water above, when the tank opens and they are free to swim away naturally.

It will also be noted that the Barr Fishway is entirely automatic in operation and can be easily and readily timed to operate as often as is best for any location. The weight of the water in the tanks is the operating agency.

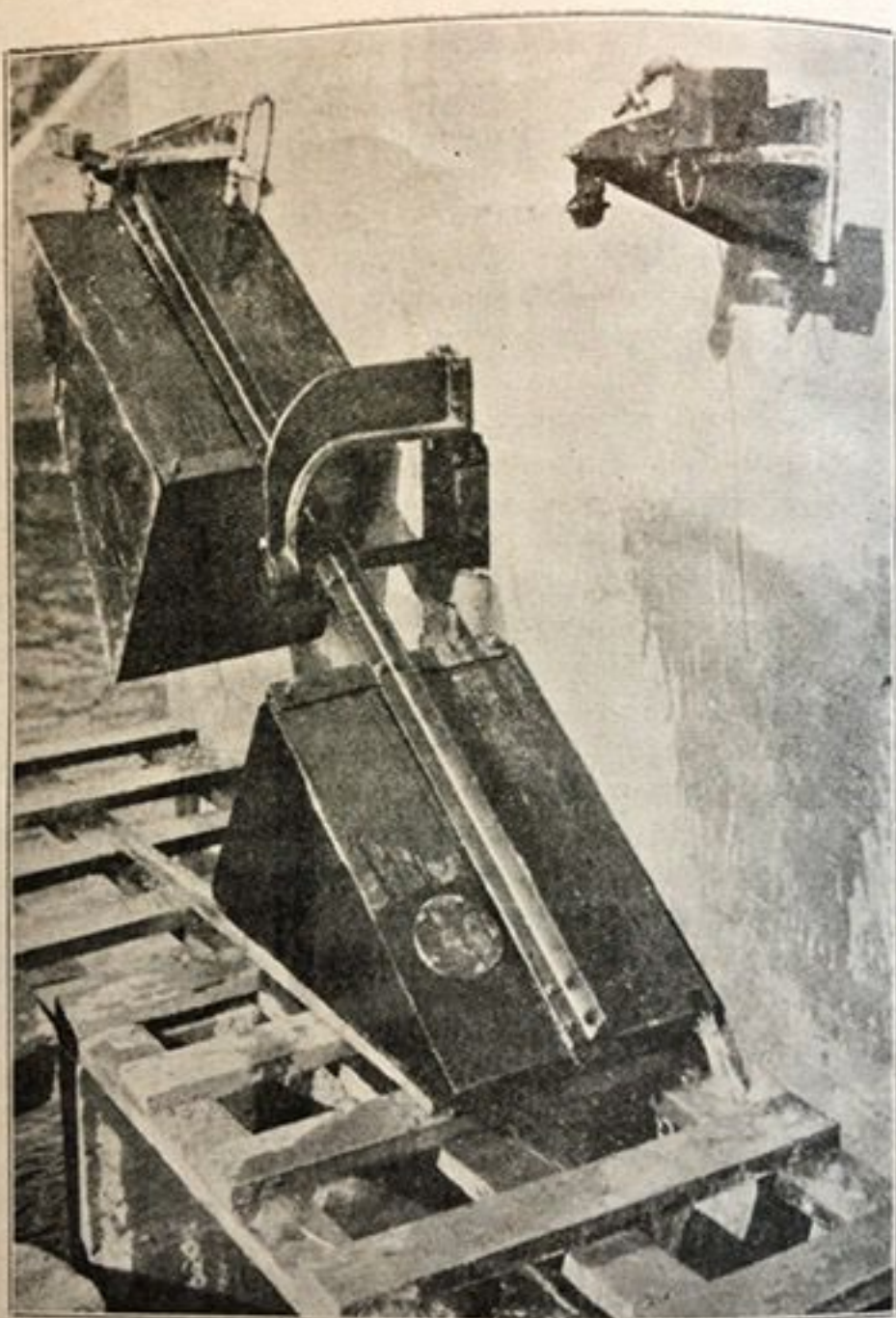
A FEW FISHWAY FACTS

In Mr. Webster's paper, he made no mention of the fact that the Barr Fishway may be installed at falls, which are preventing free traveling upstream of fish, and that it will work equally well there, as in the case of dams.

In the count of fish noted herein at Rest Lake Dam, a net with 1½ inch mesh was used, and thus all of the small fish escaped, none of them, therefore, being included in the count.

At Rest Lake dam, before the Wisconsin Conservation commission made an official count on May 15, 1931, the Barr Fishway lifted 192 fish from the lower to the upper waters, in two lifts, and on May 16, 1931, the Fishway lifted 1,017 fish to the upper waters during the afternoon.

Any further information concerning the Barr Fishway which may be desired may be secured by addressing Harry Barr, Ironwood, Michigan.

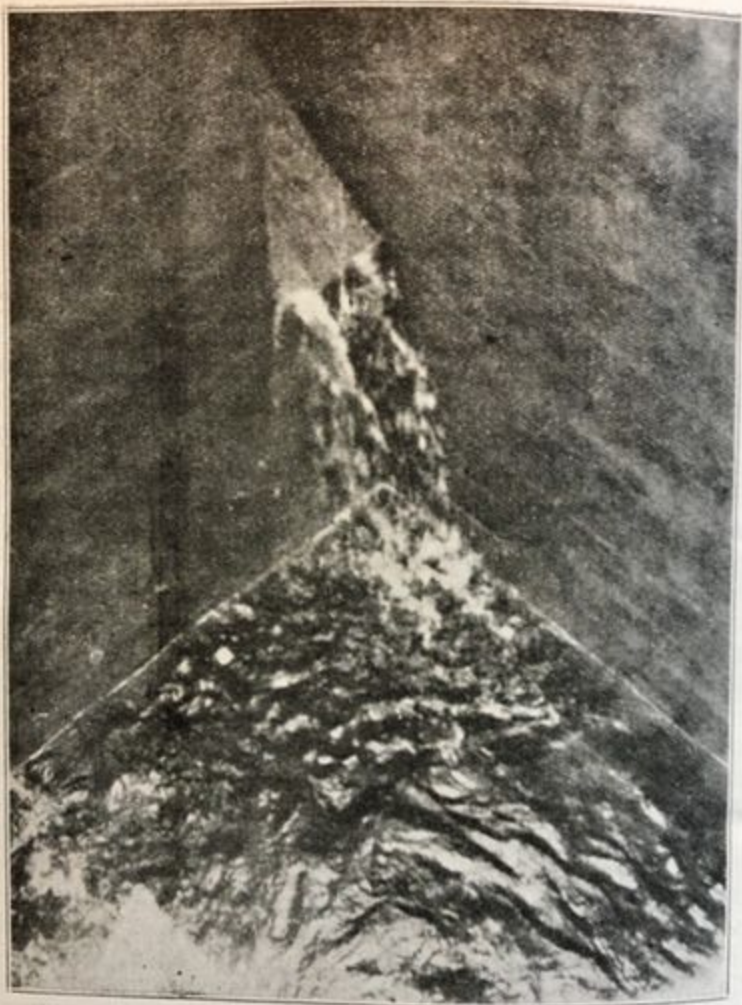


Tanks which automatically operate Fishway by weight of water.

A SUCCESSFUL FISHWAY

(Written by B. O. Webster, for the past twenty-five years Superintendent of Fisheries of the State of Wisconsin, and read by him at the convention of the American Fisheries Society, held at Hot Springs, Arkansas, September 21-23, 1931.)

Unless it be water pollution, there is probably no other one factor which has done so much to deplete the numbers of game fish in American waters as the construction of innumerable dams across the thousands of rivers and streams of North America. Any obstruction in a river or stream which interferes with the migration of fish at spawning time has a most detrimental effect upon natural reproduction. If fish cannot find the best spawning ground for which they search in the headwaters of rivers and streams, they must deposit their spawn under less favorable circumstances. Under the best of circumstances the number of eggs which ultimately produce mature fish, is very low and any lessening of the favorable circumstances practically results in no natural reproduction. This is the situation as it exists in water courses whose natural uninterrupted flow has been obstructed by dams. Some people claim, particularly those who are interested in belittling the detrimental effects of dams on natural reproduction, that artificial propagation counteracts the injury done. But to those of us interested in fisheries work, artificial propagation is never and should not be considered as replacing natural repro-



Interior of fishway tank, showing agitation of water and outlet to upper waters.

duction. At the best, artificial reproduction only supplements natural reproduction.

The damage done to reproduction by dams in streams has been realized by varying degrees for many generations. But, except in coastal rivers where commercial species only are affected, little has ever been done to counteract the damage until the last two or three decades. There are two reasons for this lack of attention in inland waterways: first, that it is only in the past few decades that the number of fish have seriously declined; and second, that it is in the last two decades that the number of dams across streams have increased so materially.

Almost without exception, the fishways which have been tried, and the few which have been found successful for commercial species, principally salmon in coastal rivers, have been of the fish wheel or fish ladder type. When the problem of providing means of access over dams for inland water species became acute, attempts were made to adopt the fish wheel or fish ladder type of fishway to these inland rivers. All such attempts failed.

Of the inland water species of fish, the only one which could adapt itself in any measure to the ladder type of fishway was the trout. But the power dams across inland water streams almost invariably were built on rivers larger than trout streams, which meant that the trout was not affected as much as other species.

In the north central part of the United States, and particularly in the Lake States, this problem has become very important. The species of fish most directly concerned are the wall-eyed pike or pike perch,

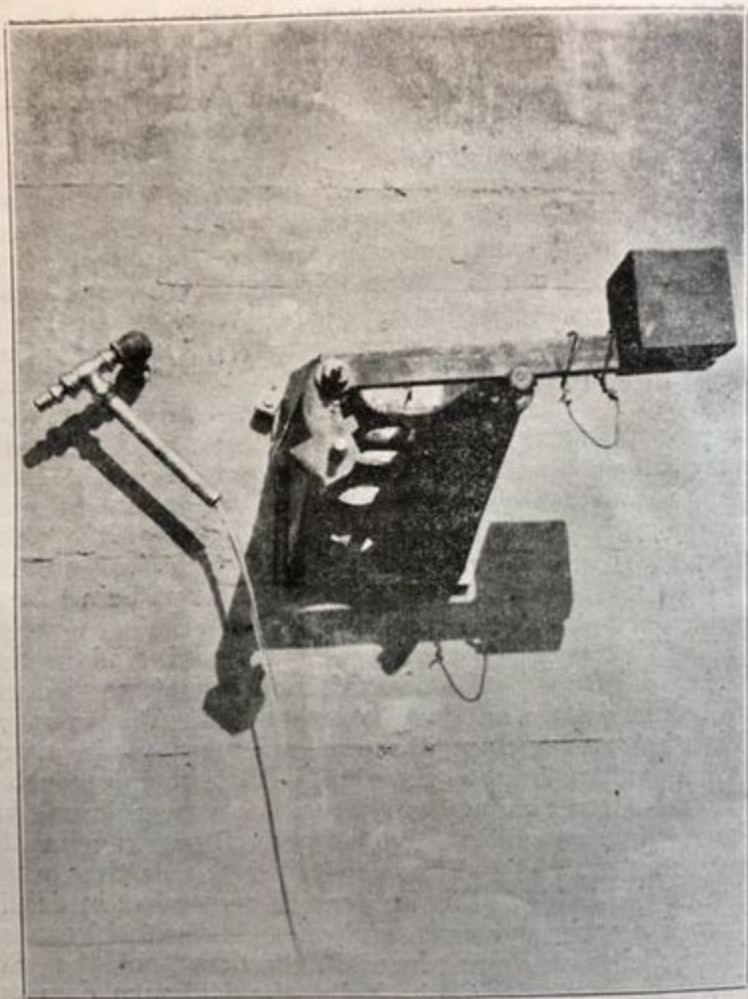


Agitation of water in tanks at low water level, and entrance gate.

the pickerel or great northern pike, the bass, and in Wisconsin, the muskellunge and sturgeon. None of these species will use any type of fishway that requires leaping as does the fish ladder type; also, each of these species is entirely too cautious and wary a fish to enter any fish wheel. Consequently, up to the present time, all attempts to provide access through or over dams for these fish have failed.

For more than 25 years the division of fisheries of the Wisconsin Conservation Commission has been experimenting with every type of fishway that seemed practicable. Intensive experimentation began in the three year period 1907-1908-1909. At this time experimental fishways were placed in dams across several Wisconsin rivers. Everything was done to make fair tests and to try to devise a successful fishway. A careful check was made and accurate records were kept of all fish that went up each of the fishways. Hoop nets were placed at the upper outlets so that no fish could go through without being seen and recorded.

The first major experiment was conducted in the spring of 1909. A fishway of the ladder type was installed in a dam on the Wolf river near Weyauwega, Wisconsin, and close observations were made every day from April 16 to June 15. During this entire two month period only seven suckers negotiated the fishway successfully. In 1912, further experiments were made. The fishways installed at this time were also of the ladder type, but varied somewhat in detail from the earlier unsuccessful one. In the 1912 experiment fishways were placed in the dam on the St. Croix river at St. Croix Falls, the Kilbourn dam on



Tank support with counter-weights; also water timing valves.

the Wisconsin river, the Eureka dam on the Fox river, and again in the Weyauwega dam on the Wolf. As in the earlier experiment, hoop nets were placed and daily records were taken. This time the observations continued throughout the month of May.

At St. Croix Falls not a single fish, either game or rough fish, went through the fishway. One sucker went through at Kilbourn, and at Eureka there were two bass, three pickerel, two suckers, one carp, thirteen dogfish, and one sunfish. At Weyauwega only suckers, forty-nine of them, went through.

None of these early fishways could be called successful in the least. Since 1912, the fisheries division has been experimenting with every type of fishway that seemed practicable. However, none of them, until 1931, showed any promise of being satisfactory.

As well as carrying on experiments in the state of Wisconsin, the fisheries division through all this time has kept in close contact with fish commissions of other states, the federal government, and Canada.

Within the past year the fisheries division has corresponded with every organization, with official or unofficial, which was in position to be informed on late development in fishways. Eminent authorities throughout the country were asked their opinion about various types, and questionnaires were sent to every source from which emanated reports of successful fishways.

Invariably the response was the same. Men interested in fish culture all realized the imperative need of a successful fishway, but no one had anything constructive to offer. Newspaper stories claimed that there were successful fishways in certain states.

However, direct requests for information and records to these places proved fruitless as no records had been kept, which meant, there was no way to prove the value of any fishway.

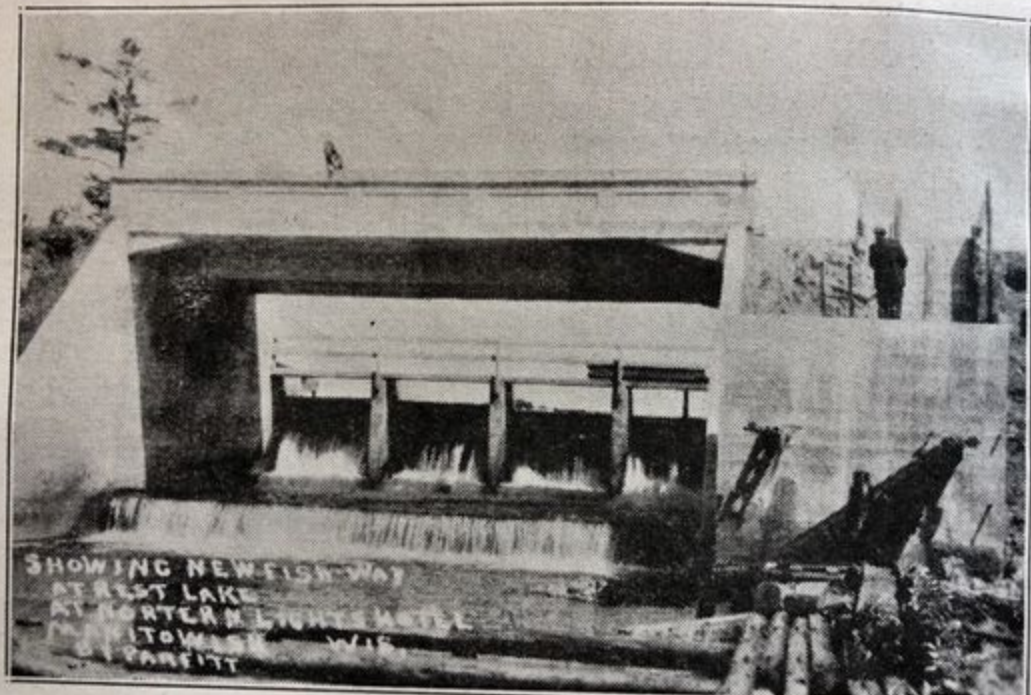
Late in the summer of 1930, another rumor of a successful type of fishway came to the attention of the fisheries division. This one was not of a fishway in operation, but rather of a plan or miniature designed, invented, and patented by Harry Barr of Ironwood, Michigan. Steps were taken to communicate with Mr. Barr and through the interest and co-operation of many individuals and agencies, a new experiment was made. Mr. Barr was so sincerely confident of his fishway that he paid the costs of installation himself. Local citizens living in the western part of Vilas county, Wisconsin, the Wisconsin railroad Commission, the Chippewa and Flambeau Improvement Company, the Wisconsin Highway Commission all co-operated to make this final test. The Rest Lake dam in the Manitowish river was chosen as the site for the experiment. There were many advantages and many disadvantages to this site. Among the advantages were the fact that the Rest lake dam is the furthest one upstream in the Manitowish river which means that it obstructed the passage of fish just before they reached their spawning ground; the Rest lake dam is not a power dam in itself, but a control dam regulating the water level of seven connected lakes; the Manitowish river and the lakes above are all well stocked with fish.

Among the disadvantages of the experiment were: (1) the company which owned the dam did not feel that they could risk the possibility of endangering

the dam by constructing the fishway where it should have been constructed, i. e. immediately adjacent to the dam at the highest point upstream in the river; (2) the Rest lake dam is built underneath a highway bridge on U. S. 51, which means a large number of sightseers which could not help but act as a deterrent to fish entering the fishway; and (3) construction delays meant that the fish lock could not be finished until late in the spring after the fish had finished their running season.

Radically different in type from any fishway suggested before, the Barr type is really a fish lock or fish elevator rather than a ladder or wheel. In operation it is quite similar to the locks which elevate boats from one level to another. As installed at the Rest lake dam, the Barr fish lock consists of a large concrete box with a concrete floor, inlet and outlet valves, an egress tube, and an automatic counter-balance tripping device. The outlet for water and inlet for fish are at the bottom of the river bed. Fish pass out from the fishway through a 24 inch pipe from the box to the lake. This pipe is 60 feet long and extends entirely through the right-of-way of the road. Its extreme length is another reason that would tend to prevent fish from going through. If the fish lock could have been placed where it should have been placed, there would have been no necessity for such a long egress tube.

The lock is extremely simple in operation. It is filled by means of the inlet tube from the lake above to the bottom of the concrete box. Water enters the box at considerable pressure which results in a constant swirling, which is an attraction to the fish.



SHOWING NEW FISH-WAY
AT REED LAKE
AT NORTHERN LIGHTS HOTEL
TOWNSHIP WIS.
J. FARRITT

The fish are first attracted to the entrance to the fish lock by the great rush of water which results from the emptying of the box. After they pass through the inlet, the swirling of water about in the box acts as a further attraction. In the corner of the box immediately below the entrance to the egress tube, there is a break in the wall which slants down from the lake level more than halfway to the bottom of the box. As the fish swim around in the box following the current of the swirling water, they find this opening. The second or third time they again find the opening and by this time the water is high enough so that the automatic trap has opened and they can pass out through the egress tube.

The entire operation of the fish lock is automatic. The tripping device on the back which is on the counter-balance principle and regulated by a flow of water through valves into iron boxes suspended on a pivot, can be set at different time intervals. During the record taking this spring the fish lock operated at 40 minute intervals.

After the filling interval has passed, the lock empties, and the water rushes out into the river channel below, attracting the fish. They enter through the opening at the bottom, the lock fills, and the operation continues.

The best test of a fish lock, or of anything else, is found in the answer—does it work? The Barr fishway installed at the Rest lake dam last spring, did work and is still working in spite of the many disadvantages with regard to the location and the lateness of construction. It worked so well that the Wisconsin Conservation Commission which has been made



Net used by State in counting fish going up over Fishway
at Rest Lake, Wis.

skeptical of all fishways, adopted a very commendatory statement about it at a meeting held July 25, 1931;

"Complete investigation and careful checking over a period of two months has convinced the commission that the Barr fishway in operation at the Rest lake dam on the Manitowish river fulfills its purpose. It is the best means yet devised to permit the passage of fish from the lower to the upper side of dams.

"This commission is intensely interested in providing suitable fishways wherever they will benefit fish life. The Barr fishway appears to be entirely satisfactory, and the conservation commission recommends that fishways of the Barr type be installed in all dams in Wisconsin where it is considered that such installation would be beneficial to fish life and practicable."

This is the first public announcement which has been made of the success of the Barr fishway at Rest lake dam. But even though there has been no public announcement, fisheries authorities of several states have heard of it and are making investigations. All of such fisheries authorities who have seen the Barr fishway, speak of it in the most commendatory terms. For instance A. B. Cook, Jr., field superintendent of the fish division of the Michigan Department of Conservation, wrote as follows to Mr. Barr, the inventor. "The device you have invented was given a very thorough inspection and we were able to observe all the stages of its operation. Frankly I believe you have devised the only practical method for successfully elevating fish to higher levels in streams obstructed by dams."



Hatchery men from Woodruff, Wis., removing fish from net and counting them.

In making observations of the Barr fishway last spring, the fisheries division of the Wisconsin Conservation Commission made just as detailed records as it had of the earlier unsuccessful fishways. A hoop net was placed so that it completely covered the outlet of the egress tube and no fish could go through the tube without being caught in the net and no fish that did not go through the tube could possibly be caught. In the tabular records taken during the month in which the observations were made, from May 19 through June 18, and with the exception of June 3, on which day no records were kept, there was a total of 1,181 fish that went through. Those included 399 pike, 173 bass, 552 suckers, six lawyers, 32 muskellunge and 19 sunfish. These totals are all the more convincing when it is considered that the running season for all species considered was at an end before the fish lock was put in operation. Daily records were kept and tabulated. The table shows just how many fish of each species went through the fishway each day.

The question might be raised that while the Barr fishway has proved unquestionably successful at the Rest lake dam in Vilas County, Wisconsin, would it be successful on a large dam? The Rest lake dam is comparatively small having a total drop of less than 12 feet. However, there is no reason to believe that the Barr fishway modified to meet changes in circumstances would not work on any dam regardless of height. It could be modified by increasing the single box or lock to the required height, or by having a series of locks. The total difference in height between the level of the river below and the

level of the lake or flowage above the dam is not a particularly significant factor as there can be more or fewer locks depending upon the differential.

It is interesting to conjecture the ultimate significance of a successful fishway. Its tremendous importance in making possible more efficient natural reproduction is paramount. In addition to this however, there are other factors which will become increasingly more important in fisheries work as more and more Barr fishways are put in operation. It will help in securing spawners for artificial propagation work; it will be of great assistance in regulating the proportion of rough fish and game fish in waters; it will also tend to relieve temptation to violation in those places below dams where game fish congregate in large numbers.

Most states have statutes or have empowered public service commissions or conservation commissions to compel the construction of fishways in all dams. Those laws have not been enforced, and wisely so, because to date there has never been a successful type of fishway. Administration of the laws, therefore, would have meant a futile waste of money. But with a proven successful fishway available, these laws should be enforced. Undoubtedly, power companies and others responsible for the construction of dams, will be glad to co-operate.

As the science of fisheries progresses, one after another of the one-time seemingly insurmountable obstacles are overcome. It is my firm belief that this Barr fishway is the most important contribution to the inland water game fisheries program that has been made in the past 25 years.