MONTANA STATE DEPARTMENT OF FISH AND GAME
FEDERAL AID IN FISH RESTORATION SECTION
HELENA, MONTANA

JOB COMPLETION REPORT
INVESTIGATIONS PROJECTS

State of Montana

Project No. F-5-R-3 Work Plan No. II Job No. II-A

Title of Job: Removal and Replacement of the Otter Creek Fish Populations.

Abstract:

Studies conducted during 1952 disclosed a large population of coarse fish in Otter Creek, located in Cascade and Judith Basin counties, Montana.

Experimental rehabilitation work was conducted on this stream during 1953.

Aerial photographs were taken of the streams and aided materially in calculating effective killing distances the toxicant carried from specific locations.

Holding boxes were used to determine the effect of the toxicant on the various species of fish found in the stream.

From the initial fifty pounds of toxicant, trout and sculpins were killed for at least 28,000 feet downstream. All other fish found in the drainage with the exception of the small sucker (Pantosteous sp.) were killed for a distance of 5,300 feet. The sucker (Pantosteous sp.) appeared to be the least vulnerable species and a small percentage of these fish were observed alive though swimming erratically after all other fish had succumbed. Five hundred pounds of a commercial toxicant known as "Fish Tox" was used in killing out the fish from 85,350 feet of stream. The flow of the stream roughly measured was twenty-six second feet.

From information and data collected in the Otter Creek rehabilitation study it appears that fish toxicants can be used more effeciently in streams than in standing bodies of water.

Objectives:

Studies conducted during 1952 disclosed a large population of coarse fish and less than three percent trout in sampled sections of Otter Creek. Few trout of small size were found indicating a lack of natural trout production. By eradicating the existing fish population and introducing brown trout the natural production of desirable species in the stream may be increased. Repopulation of undesirables through movement and natural increase may be prevented by the brown trout. If the stream species can be converted to a self-sustaining, desirable population, this form of management may be applied on other streams where fishery restoration is needed.

During June, 1953, Otter Creek was among the streams of central Montana which carried an abnormally high volume of flood water. In order to obtain information relative to changes in the fish population, census work was conducted prior to the application of the toxicant.

Techniques Used:

In 1952, one thousand one hundred and sixty-eight marked rainbow trout were planted at five locations within an area closed to fishing. Subsequent checks were made to determine the extent of movement and other factors relative to the fish population of the stream. Findings were reported in a previous Completion Report.

Sampling was done with an electric shocking device and each 300 foot section was blocked off with one-half inch square mesh nets. All trout were weighed and measured and scale samples were taken from a high percentage. Coarse fish were counted.

Aerial photographs were taken and ground measurements were made of specific locations appearing in them thereby providing a scale by which stream distances and effective killing distances could be determined.

During September, 1953, the toxicant was applied to the stream and during that period the fish erradication work was completed. A commercial preparation known as "Fish Tox" was used in this work. In order to determine the effect of the toxicant on the fish found in the stream, the various species were captured and placed alive in holding boxes. Ten such boxes (1' x 1' x 2') were constructed of one by four inch lumber and 1/4 inch mesh hardware cloth.

Between September 23, 1953 and October 9, 1953, approximately fifteen thousand nine hundred and forty brown trout were planted in Otter Creek. They were well distributed throughout the rehabilitated area.

Findings:

Otter Creek originates on the north slope of the Little Belt Mountains in Judith Basin County. It flows in a northwesterly direction approximately thirty-two stream miles and empties into Belt Creek in Cascade County.

The flow of Otter Creek is more constant than other streams of this area possibly due to numerous springs flowing into it and its relatively unaltered course. The flow of the stream roughly measured on December 3, 1953, in the vicinity of Raynesford was twenty-six second feet.

Beaver are present in Otter Creek and in several stream sections intensive beaver activity is evident. Beaver dams near the mouth have, to some degree, isolated the stream from Belt Creek, as far as the movement of fish species is concerned. However, during June, 1953, abnormally high flood water washed out the beaver dams near the mouth of Otter Creek and carp moved into the stream.

Creel census was conducted during the first part of the 1953 fishing season. On opening day the catch per hour of fishermen checked was 1.2. Of the rainbow trout checked 30.8 percent were from the 1952 plant. Prior to this day these marked rainbows had been unmolested by fishermen since they had been planted the year before and the waters had remained closed to fishing. Of the total catch checked in 1953, 26.4 per cent were of the 1952 plant. If previous hatchery plants had been marked, undoubtedly the percentage would have been even higher since natural reproduction of trout in this portion of Otter Creek seemed to be almost totally lacking.

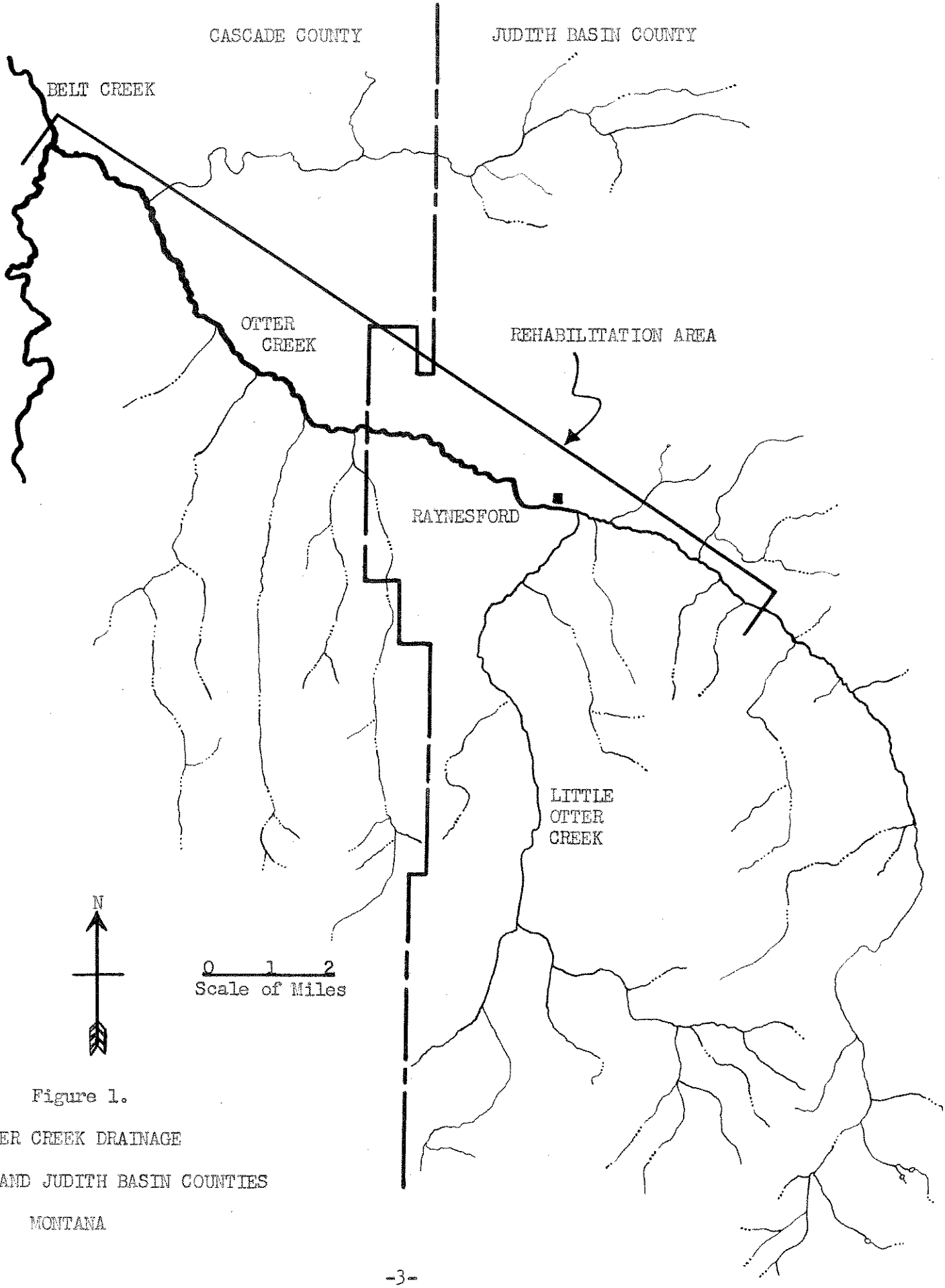

Figure 1.

OTTER CREEK DRAINAGE

CASCADE AND JUDITH BASIN COUNTIES

MONTANA

In order to augment the stream population information and to determine the effect of the flood on resident fish, additional sampling, by use of an electrical shocker, was done during 1953.

Additional information concerning the main stream population obtained during 1953 was that carp had moved into the stream and that trout from a washed out reservoir were present in one section. The relative numbers of coarse fish and trout found during 1952 had not otherwise significantly changed.

In determining the effective distance only the initial application and its effect were used. Further checks could not be considered reliable because the fish had received portions of the toxicant and were observed to act abnormally though still alive. In some cases very small amounts of toxicant applied in areas where fish were acting abnormally immediately killed them. As previously mentioned the upper limit of the rehabilitation area was bounded by beaver dams. The several beaver dams were considered as a buffer zone. In the series only the lower of the beaver dams was treated with toxicant. The initial dosage of toxicant applied was fifty pounds. Twenty-five pounds were applied to the beaver dam and twenty-five pounds to the area immediately below it. Within seven minutes the fish in the first live box, three hundred feet downstream, were showing signs of distress.

From the initial fifty pounds of toxicant, trout and sculpins were killed for at least 28,000 feet downstream. All other fish found in the drainage with the exception of the sucker (Pantosteous sp.) were killed for a distance of 5,300 feet.

Following the initial observations subsequent applications of toxicant were delayed until the effective killing distances had been determined, consequently several days elapsed between applications.

Distressed fish were often observed moving downstream, no doubt due in part to their inability to hold a normal position in the stream current; however, several brook trout were noted swimming rapidly downstream. Trout and sculpins were most vulnerable and killed for long stream distances in spite of numerous beaver dams in some sections. The small sucker (Pantosteous sp.) appeared to be the least vulnerable species and a small percentage of these fish were observed alive though swimming erratically after all other fish had succumbed.

Beaver dam sections did not stop the action of the toxicant but were beneficial in prolonging the movement of the effective mass downstream and thus increasing the time interval fish were subjected to the toxicant.

Five hundred pounds of toxicant were used in the Otter Creek rehabilitation study. This phase of the work was completed on September 17, 1953.

Following the elimination of the coarse fish the stream became noticeably more clear. A large percentage of the fish killed were suckers and their activity no doubt had created the turbid condition prior to rehabilitation.

Scale samples of trout were collected during 1952 and 1953. Growth rate analysis of rainbow trout found in the stream are summarized in Table 1. The scale samples were read and checked by personnel at the Fish and Game department laboratory located at Montana State College in Bozeman.

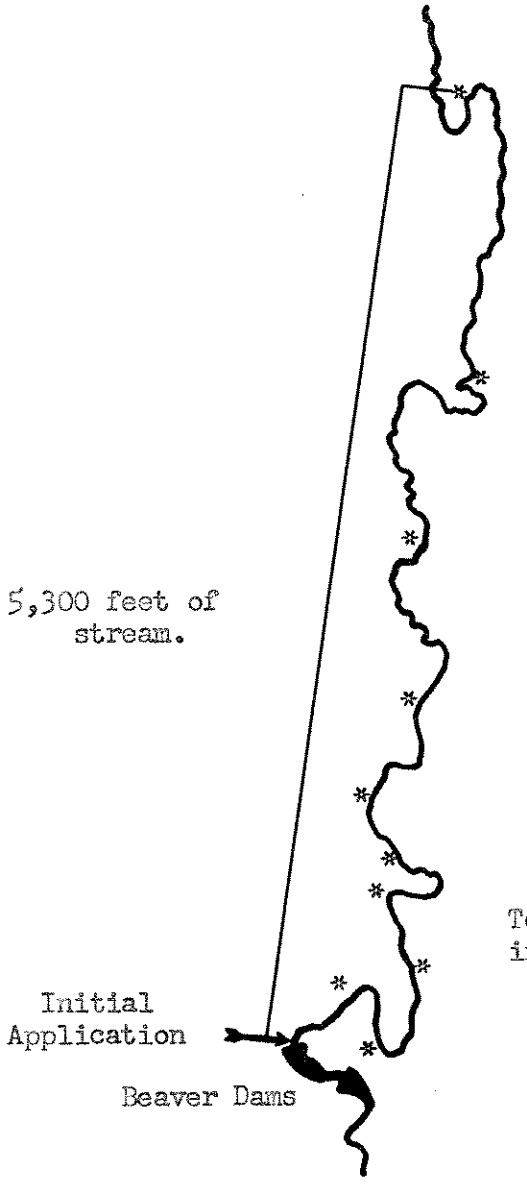

Figure 2.
Test area of toxicant effectiveness in Otter creek, Judith Basin county Montana.

Table 1:

Average Calculated Total Lengths and Increments of Rainbow Trout Collected in 1952 and 1953 from Otter Creek, Cascade and Judith Basin Counties, Montana

Group	No. of Fish	Ave. Actual Length	Calculated total lengths (inches) at end of year of life. 1	2	3	4
I	3	6.6	3.6			
II	13	9.0	3.7	7.4		
III	12	10.7	3.8	7.1	9.5	
IV	4	12.1	3.4	7.0	9.6	11.8
Grand Average:						
Calculated Length			3.7	7.2	9.5	11.8
Increment			3.7	3.5	2.3	2.3
Number of Fish			32	29	16	4

The rehabilitation area (Figure 1) was established by sampling the population in tributary streams as well as the main stream. Tributaries containing a predominance of brook trout were not included in the area. One tributary stream, Williams Creek, was excluded because the flow had decreased to such an extent as to create a residual effect of the toxicant in the main stream for a longer period than was desired.

From aerial photographs the length of the main stream to be rehabilitated was calculated to be 85,350 feet.

On August 31, 1953, ninety-eight fish of all the species commonly found in Otter creek were collected with an electric shocker and placed in three holding boxes spaced three hundred feet apart, the first being located three hundred feet below the upstream extremity of the rehabilitation area. On September 1st, one hundred and seventy-five more fish were collected and placed in the remainder of the holding boxes. The ten boxes were located as shown in Figure 2. The boxes were inspected on the second of September and the fish contained in them all appeared normal.

The first application of toxicant was placed in the stream on September 2, 1953. The effective distance to toxicant carried downstream was measured by the reaction of the fish held in the live boxes.

Analysis and Recommendations:

From information and data collected in the Otter Creek rehabilitation study it appears that fish toxicants can be used more efficiently in streams than in standing bodies of water.

Theoretically the application of toxicant over one square foot of lake surface will sink and kill fish in a square foot column to the bottom of the lake. In order to insure complete kills, the toxicant must be effective completely throughout the column or at least to where it reaches the hypolimnion. The killing qualities often remain active long after the fish have been killed.

It appears that in stream rehabilitation work a square foot toxicant column can be projected downstream for great distances depending on the physical and chemical factors of the stream.

The mass of toxicant kills fish as it moves along and continues until its killing qualities are exhausted or diluted to the extent where they are no longer effective.

In roughly calculating the amount of toxicant used in Otter Creek as parts per million, an average of measured depths and widths was used and the length was obtained from aerial photographs. Treating the stream as a standing body of water the amount of toxicant used in the entire job would be less than one-half of one part per million. In spite of this small amount several species of fish, including carp, were killed throughout the rehabilitation section.

Many of Montana's streams are badly contaminated with undesirable species of fish. The observations made in the work conducted on Otter Creek indicate that the stream use of toxicants will be a valuable measure when used as an aid in effecting sound stream fishery management elsewhere.

Summary:

During September 1953, 85,350 feet of Otter Creek in Cascade and Judith Basin counties, Montana, were rehabilitated. A test of the effectiveness of one application of the toxicant indicated that all species were killed for a stream distance of 5,300 feet and that trout and sculpins were killed for at least 28,000 feet downstream. Several species of suckers and minnows including carp were present and their removal was accomplished by using less than one-half of one part per million calculated on the basis of a standing body of water.

Data and Reports:

The original data is filed with the fisheries biologist at Belt, Montana.

Prepared by Nels A. Thoreson Approved by _____

Date April 27, 1954