54-55

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

JOB COMPLETION REPORT
DEVELOPMENT PROJECT

State of Montana

Project No. F-15-D-2

Title of Project: Marias River Fishery Restoration

Abstract:

The completion and closure of Tiber Dam in 1955 and the anticipated formation of a lake containing 22,700 acres created considerable fishery problems for the Montana Fish and Game Department.

Through survey work conducted in 1954 and 1955, covered in Investigational Reports F-5-R-4 and F-5-R-5, the uppermost limits of carp and goldeye were determined. In order to safeguard tributary waters of the Marias River and initiate as good a trout fishery in the Tiber impoundment as possible, this project was undertaken.

Approximately eighty thousand pounds of a commercial product known as "Fish-Tox" was applied to over six hundred miles of rivers, streams and sloughs in the Marias drainage upstream from the Tiber Dam site.

Application methods varied according to the nature of the water being treated. Backwaters, sloughs, slow-moving, small streams and ponds were treated by use of an airplane-mounted duster unit. Major streams of the drainage were treated usually by applying large "slugs" of toxicant. Small meandering streams were treated by spraying with a backpump or dragging a sack containing toxicant through them.

The main application work was carried out from mid-July to mid-September, with manpower varying from a few to as many as twenty-eight men.

In future projects of this scope, more time should be allotted to survey and preliminary application. More should be known concerning optimum frequency and methods of application. Tests should be devised to enable detection of toxicant in water or preferably to be able to measure concentrations. It would be helpful also to have knowledge concerning the pattern of dilution and dispersion of toxicants in running water.

Problem:

Large reservoirs in Montana have created numerous fish management problems. Because of light fishing pressure on most Montana reservoirs, the larger bodies of water have been practically unmanageable from a fishery standpoint. In addition to the management problem of a reservoir itself, the buildup of a population of undesirable fish and its extension into other waters of the drainage has been considered to be detrimental to Montana's fishery resource.

Tiber Dam, like many other large projects that preceded it in Montana, was planned with no provision to minimize the fishery problems that would be sure to arise as the result of its impoundment. Because it was not included in the original planning, the construction agency would not assume the financial obligation of preventing or delaying the spread of undesirable fish into the better trout waters of the area. Politicians made public statements that rough fish should be eliminated above the dam site, but it was not made clear which agency of government should pay the costs of rehabilitation.

Because of the lack of time and the likelihood that nothing would be done by another agency, the rehabilitation of much of the Marias drainage above Tiber Dam was undertaken by the Montana Fish and Game Department through its Dingell-Johnson program.

Objectives:

In order to safeguard upstream waters in the Marias drainage and to initiate the fishery in the Tiber impoundment in the best known possible manner, the Marias River Rehabilitation Project was undertaken. It was designed to rid, if possible, the carp and goldeye present from the drainage above the Tiber Dam site. To decimate other undesirable fish species as completely as possible in order to provide better initial conditions for trout was a further objective.

Description of the Area:

The major tributaries of the Marias River above Tiber Dam have their origin along the east slope of the Continental Divide, bounded on the south by the Teton River drainage (also a tributary of the Marias entering it near its confluence with the Missouri River) and on the north by the St. Marys and Milk River drainages. Several of the tributary streams arise in Glacier National Park.

Considerable use is made of these waters for irrigational purposes and all of the major tributaries of the Marias have flow control structures on them with the exception of Cut Bank Creek. Birch Creek contains a storage reservoir (Swift Dam), a major diversion and a large canal which provides water for the irrigation project near Valier and Conrad. Lake Francis is also used as a storage reservoir in this project and much of the water diverted from Birch Creek flows into this impoundment. Big Badger Creek, a tributary of Two Medicine Creek, contains a diversion from which water is diverted to Four Horn Lake and the associated irrigation system. Two Medicine Creek flows are controlled at a dam near the outlet of Lower Two Medicine Lake. A diversion structure and canal further downstream provide water for lands near Cut Bank.

Most years, much of the water is diverted from the major streams for irrigational use during the summer months. The control of water flows in these streams aided considerably in the eradication of the fish populations; however, due to considerable precipitation during the 1955 irrigation season, the storage impoundments were nearly full and reduction of water flows could not be sustained throughout the rehabilitation period.

In the upper reaches of the Marias drainage near the mountains, there are numerous pot hole lakes, most of which are small and shallow and contain no fish. A few of these such as Running Crane Lake have been planted with trout and provide

a limited fishery. Others such as Four Horn, Green and Kipp Lakes have been dammed at the outlet and are used partially for irrigational purposes and have also served as fishing waters.

Carp were introduced into several reservoirs along the railroad (Great Northern) such as Kipp, Virden and Devon. Breeding populations of these undesirable fish rendered the reservoirs unsuitable for fishing as well as for other recreational purposes.

Information relative to the Tiber impoundment is contained in Table I*.

Table I.* Tiber Reservoir Data

Water Surface At	Elevation Feet	Reservoir Capacity Acre-Feet	Surface Area Acres	Shoreline Length Miles
Maximum Pool (Including Surcharge)	3,014.9	1,393,000	22,700	93
Normal High Pool (Max. Operating Pool)	3,012.5	1,337,000	22,180	91
Spillway Sill	2,980	741,000	14,400	75
Average Annual Max. Pool	2,999	1,074,000	19,100	84
Average Annual Min. Pool	2,982	775,000	14,910	76
Minimum Operation Level	2,967	575,000	11,300	51
Top of Silt Allocation Pool		No Data Available		
Original Normal Stream Surface	2,830			
Stream Bed	2,825			

* From a Preliminary Evaluation Report on Fish and Wildlife Resources in Relation to the Water Development Plan for the Lower Marias Unit, Missouri River Basin Project, U. S. Department of Interior, Administrative Report, November, 1951.

Planning:

During 1954, aerial photographs were taken of a number of the waters in the drainage. Vertical shots of lakes and ponds were used as work maps during the physical surveys. The Kipp Lake survey and rehabilitation work described in the Completion Report for Development Project F-15-D-1 was planned and carried out using aerial photographs or maps.

Approximately twenty miles of Cut Bank Creek were photographed from the air, but because of a defect in the aerial camera, only a part of these photographs were usable.

Crew leaders in charge of rehabilitation areas were aided considerably in becoming familiar with the waters through aerial reconnaissance. In the Marias rehabilitation work, the aerial orientation was particularly useful since there was not sufficient time for crew leaders to conduct thorough surveys on the ground.

The planning survey and mapping of the project area was the most deficient phase of the Marias Rehabilitation Project. This was due to the fact that the project was not duly considered during the time Tiber Dam was in the planning stages and its construction was well under way when the rehabilitation work was planned and survey work started.

Had there been ample time, the men who took part in the rehabilitation work should have been in the area during the initial survey work and taken part in the planning stages. At least one full summer should have been spent for this purpose by the crew leaders.

Rehabilitation Operation:

Work previously done in connection with the Marias River project is contained in Completion Reports F-5-R-4 and F-15-D-1. These reports include survey work in the drainage and rehabilitation of Kipp Lake and associated waters.

During 1955, the field work was started on July 1, and was continued through October 31. The period of intense application of toxicant was from August 8 to September 20, 1955. The number of men actually working on the project varied according to need, the greatest number at one time being 28.

Rehabilitation of the main tributaries of the Marias drainage was started August 20, 1955 on Cut Bank Creek north of Browning. Two Medicine Creek was started on August 26th and Birch Creek on the 28th. Several crews were working on the different streams simultaneously. The timing of treatment of the several main tributaries was coordinated as closely as possible in order to combine the toxic slugs at the stream confluences.

The use of two-way radios enabled coordination between the different crews and expedited solving problems as they occurred. Radios in several motor vehicles, in one airplane and portable Walkie Talkie sets were used for this purpose.

Because of considerable variation in the nature, size and velocity of waters treated, different techniques of toxicant application were developed. Where toxicant could be applied aerially to advantage, an airplane-equipped duster unit was used. Backwaters, sloughs, isolated ponds and slow-moving, small streams were treated from the air.

A Whitaker duster unit was purchased and installed in a Department-owned 135 Super Cub airplane. The duster unit was modified by adding to the agitator assembly. This addition was necessary in order to prevent the toxicant from packing or bridging, causing it to clog and fail to feed properly. The commercial product used ("Fish-Tox") bridged badly even with the revised agitator assembly and careful handling was necessary for the "Fish-Tox" to feed from the duster at all.

An experienced spray-duster pilot was hired to fly the duster plane. Another Department Super Cub was flown by a Department employee and used to deliver a

supply of toxicant to the duster plane and to make observations. These two airplanes aided and expedited the project to considerable extent. Trucks were used to deliver a supply of toxicant into the area where the duster plane was operating.

The fish-killing action of "Fish-Tox" in the water was much more rapid when placed directly into the water as a cloud rather than when put in as a dust from the airplane. The slow dissolving qualities of the material used when applied as dust was an objectionable feature in this project.

In the major streams of the drainage, application of the toxicant was accomplished by "slugging" the river. A quantity of toxicant, depending upon the size and velocity of the stream, was applied as a large cloud by sloshing the burlap sack container in the stream current. This method of application produced a brownish cloudiness in the water which turned milky when aerated by cascades or falls. This characteristic was particularly noticed below the falls on Two Medicine Creek near East Glacier (see map, Figure 1). It afforded an opportunity to measure the speed and length of the toxic mass moving downstream. One hour and ten minutes was required for the toxicant to move downstream approximately four thousand feet or nearly sixty feet per minute. From the time the toxicant had been first applied until the visible signs had passed the falls, the toxic mass had lengthened nearly three thousand, five hundred feet. Two hundred and forty pounds was applied over a ten-minute interval followed by a waiting period of ten minutes, then 360 pounds was applied over a thirty-minute interval. The time required for the noticeable mass to pass over the falls was one hour and fifty minutes or approximately one hour longer than the application time.

The toxic effect on the fish in the stream was followed by crews of men as the mass progressed downstream. The men would endeavor to remain with the slug and apply more toxicant, where needed, in small backwaters, bays and isolated puddles. The differential effect of the toxicant on various fish species aided the observers in determining the lethal qualities of the toxic mass they were following. A small sucker (Pantosteous sp.) was a good indicator for those observing, as it seemed to be able to withstand treatment of the water by toxicant better than other fish in the drainage. Farther down in the drainage, particularly in the main Marias River, the sturgeon (Scaphirhynchus platorynchus) was used as an indicator to some extent. When these fish were observed dead there was some assurance that the treatment had been complete.

In the main river, a usual slug was produced with approximately eight hundred pounds of toxicant which carried effectively downstream from six to eight miles depending on the frequency and volume of the holes in the river. The flow of water in the river at this time was from two to three hundred cubic feet per second (See Table II). On specific days when the river flow recorded at the gauging station was 270 cubic feet per second, 800 pounds of toxicant was applied to form a slug.

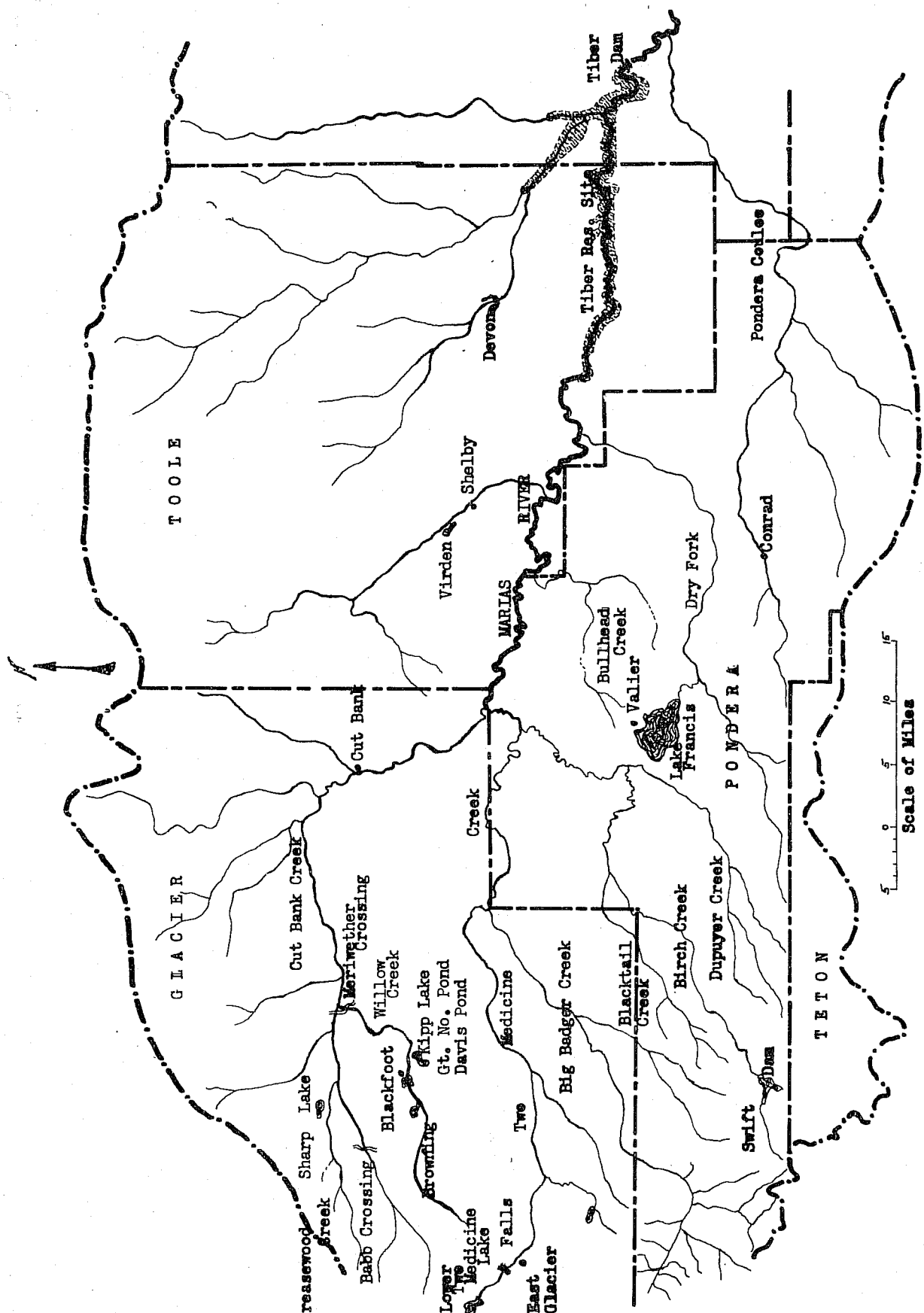


Figure 1. Rehabilitation Area, Marias River, Montana

Table II.* Flow in Cubic Feet per Second in the Marias River at the Shelby-Conrad Bridge Gauging Station During the Summer of 1955.

Date	July	August	September
1	2,260	955	275
2	2,010	875	250
3	1,840	851	220
4	1,690	843	205
5	1,660	827	205
6	1,530	746	200
7	1,540	760	205
8	1,650	760	200
9	1,880	718	235
10	1,950	683	290
11	2,100	641	322
12	2,540	585	328
13	2,490	549	306
14	2,110	555	260
15	1,900	561	245
16	1,780	555	265
17	1,880	513	270
18	1,760	501	270
19	1,660	483	270
20	1,480	465	270
21	1,360	477	
22	1,260	501	
23	1,230	507	
24	1,200	525	
25	1,260	501	
26	1,460	489	
27	1,400	489	
28	1,210	471	
29	1,100	399	
30	1,040	372	
31	1,010	322	

* From Bureau of Reclamation record, Great Falls, Montana

Biological Observations:

Carp were introduced into the Marias River drainage some years ago. Several of the impoundments along the Great Northern Railway had been stocked with these undesirable fish and it is felt that much of the spreading of carp in the drainage was from these breeding areas. Local residents as well as fishermen in the upper Marias drainage reported a buildup of goldeye populations conincident with the goldeye population buildup in Fort Peck Reservoir.

During the rehabilitation work of 1955, breeding areas of carp were found to be very localized. Where carp were found in a stream, the individuals in the upper limits of the population nearly always were males only. The carp breeding areas were

most often in sloughs adjacent to main drainages. Nearly all sloughs containing breeding populations of carp appeared turbid; however, breeding carp were found in an occasional slough which appeared relatively clear. Many backwater slough areas which seemed to be ideal locations for carp did not contain breeding populations, and a reason for their apparent preference for certain breeding sites was not determined. Small isolated ponds or sloughs hidden in brush were often difficult to find and frequently contained breeding populations of carp.

The upper portions of Cut Bank and Two Medicine Creeks contained many rainbow and eastern brook trout along with whitefish, at least two species of suckers, ling, dace and shiners.

As the rehabilitation operation proceeded downstream on Cut Bank Creek, carp were first found at the mount of Greasewood Creek followed by carp-suckers well below Merriweather Crossing. Within a few miles downstream from where the work was started, the preponderance of fish killed was undesirable species. After reaching the water intake dam near Cut Bank, sauger, black bullhead, and goldeye began appearing in the population of fish killed.

Sampling and observations of Davis Pond, Blackfoot Pond, Kipp Lake and Sharp Lake failed to give any indication of carp present. Kipp Lake was checked with gill nets for a week and visual checks were made from a boat as well as along shore. No evidence was found to indicate any live fish present. This lake was probably still toxic when the checks were made.

Willow Creek near Blackfoot was rehabilitated during 1954 from Browning to a point several miles downstream from Blackfoot. Carp were found in the Davis Pond upstream from Blackfoot during 1954 and in order to make certain that they had not reinfested Willow Creek during the spring of 1955, it was again treated with toxicant in the late summer of 1955. No carp were found in the stream or connecting waters until rehabilitation had proceeded downstream to a point below where toxicant had been applied during 1954. However, a myriad of other small fish were present in all parts of the stream, even where the water had been rehabilitated the year before. They were the young of suckers and small minnows. These fish were present in the drainage upstream from where the rehabilitation was started in 1954. These species were completely and abundantly distributed over approximately ten miles of rehabilitated stream within one year.

Recommendations:

In planning a rehabilitation project of this scope, at least two years should be allotted for survey and preliminary toxicant application. In the Marias project, the planning and survey work was too short and consequently it was necessary for the field workers to familiarize themselves with the terrain and waters of the drainage while the rehabilitation work was in progress.

Because of the relative newness of stream rehabilitation, the most effective methods of application could not be incorporated except as they were arrived at by trial and error. Research should be conducted to determine optimum frequency and methods of application.

The aerial application of waters in the Marias drainage was not as effective as was desired, primarily because of the slow acting qualities of the toxicant

used when applied as a dust. The coverage of sloughs, backwaters, ponds and even streams by aerial application was excellent and saved a great deal of time and effort. More rapid acting toxicants should be used for aerial application in a rehabilitation project of this scope. When the "Fish-Tox" was applied manually, it was exceptionally effective.

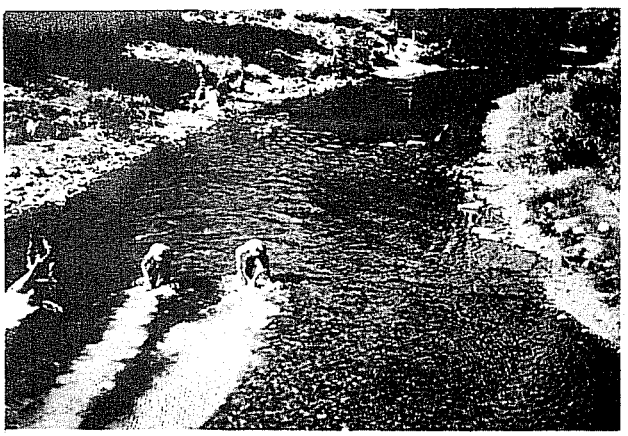
Backpumps were used on small waters, but it was difficult for the men to carry these for long periods and keep a supply of toxicant. This method of application was effective on waters too small for aerial application without considerable waste. The backpumps probably could be improved upon by using power-driven spray machines such as those used for spraying weeds. Hauled on a four-wheel drive vehicle such a unit would be very useful in drainage rehabilitation where small waters were involved. If the spray pump and motor were built so that it could easily be separated from the supply tank, it could also be used for applying toxicant from a boat.

To detect the presence of toxicants or preferably to be able to test concentrations of such materials in water, would aid greatly in work of this nature. Practical field tests for such measurement would be highly desirable. In running water, where dilution would likely be rapid, a field test involving the shortest time possible would be most usable.

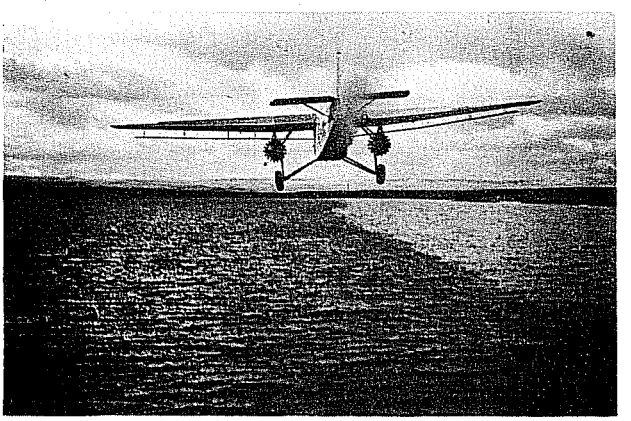
The pattern of dilution and dispersion of the toxic material in flowing water would be useful information in stream rehabilitation work.

Prepared by Nels A. Thoreson Approved by Charles K. Phenicie

Date August 15, 1956

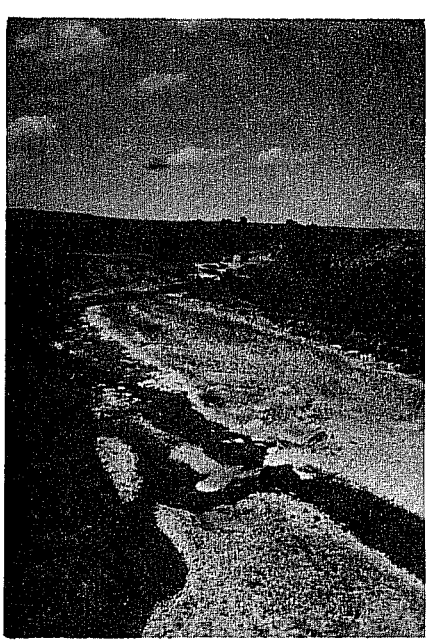


Toxicant was applied to the fast-moving streams such as the Two Medicine River in "slugs."

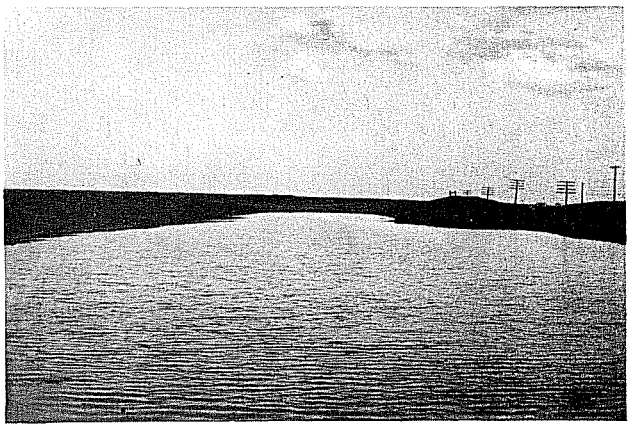


Toxicant was applied by air to lakes, ponds, sloughs and slow-moving streams. Note the clear-cut line on the water which shows the pilot the extent of toxicant application made on the previous run.

Cut Bank Creek near the town of Cut Bank, heavily infested with carp and goldeye, has the potential of a good trout stream.

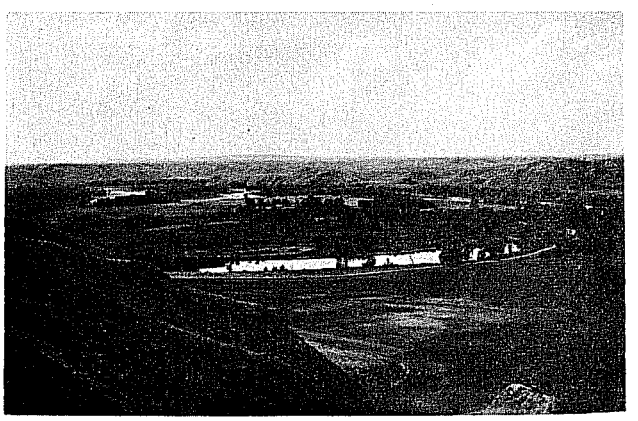


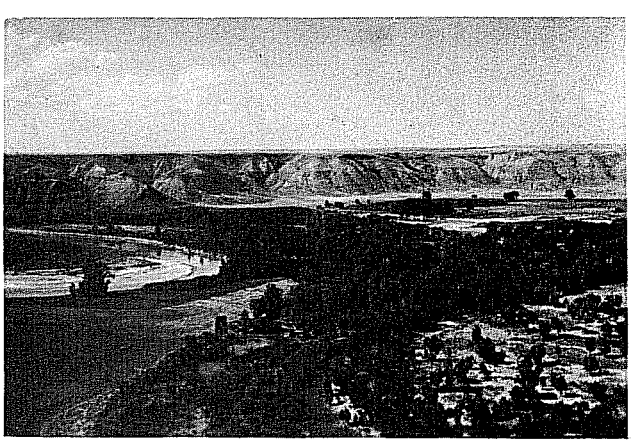
Even though many of the streams such as Dupuyer Creek were heavily dewatered for irrigation, they had to be covered with toxicant.



Virden Reservoir, west of Shelby is typical of the carp-infested ponds which had been dug along the railroad.

Large sloughs in the river bottoms were very abundant and heavily infested with carp.





Small isolated sloughs such as this one along the Marias River (located to the left and below center of the picture) were most difficult to locate, especially if they were hidden by trees from aerial view.

F-5-R-4 -1955

Job I

Survey of the Streams and Lakes of the Project Area

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-4 Job No. I-A

Title of Job: Hatchery Contribution Study

Abstract:

During 1954, as in 1953, fin clipped hatchery rainbow trout were planted in a study section of the Missouri River between Wolf Creek and Cascade, Montana. Creel census and fishermen car count checks were made in the year-long fishing season. During 1954 no large amount of creel census data was collected at any one time with the exception of one day, September 12, when a fishing contest was held in the study section of the river. During the contest, a return of 100 marked rainbow (observed) and a calculated return of hatchery rainbow contributed 53 percent to the total game fish turned in. The average count of fishermen cars on the river during week days was calculated to be 4.3.

Objectives:

Substantial numbers of legal-sized rainbow trout are planted annually in the Missouri River canyon area between Cascade and Wolf Creek, Montana. In an effort to effect the best possible fishery management of this water resource, it is important to possess information concerning the return of the planted fish to the creel.

During 1948 and 1949, a fisheries survey* was conducted on a section of the Missouri River between Holter Dam and Cascade, Montana. The survey disclosed that trout growth is comparatively rapid in the river and that rainbow are the most important trout species present from the standpoint of fisherman catch.

Fifty percent of the fish planted during 1953 were marked by fin clipping. Subsequent creel census checks were made. The results of the 1953 work were reported under Project No. F-5-R-3. The 1954 work has been evaluated and is contained in this report.

Techniques Used:

During 1954, as in 1953, marked hatchery trout were planted in a study section of the Missouri River, bounded by two highway bridges (U.S.91). In 1953, fish were marked by clipping the left pelvic fin. The right pelvic fin was clipped in 1954.

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*. Kathrein, Joseph W.
1951. Growth rate of four species of fish in a section of the Missouir River between Holter Dam and Cascade, Montana. Trans. Am. Fish. Soc., Vol. 80 (1950), pp. 93-98.

Approximately nine thousand rainbow trout were planted from the Great Falls hatchery in 1954, of which seven thousand eigh hundred and fifty were marked. Six thousand six hundred and seventy two were planted during April and May. The remainder (2,320) were planted on September 2, 1954. Eleven hundred and fifty of those planted in early September were marked.

A partial creel census and car fishermen count was made throughout 1954 and continued into 1955. Spot checks were made of fishermen on the river and on September 12, 1954 a check was made of fish caught during a fishing contest sponsored by a Great Falls civic organization.

A section of the river approximately twenty miles in length is paralleled by highway U.S.91. Most of the fishing water in the area is clearly visible from the highway, making it possible to conduct a census of fishermen use.

Findings:

As in previous findings, creels checked during 1953-55 contained a predominance of Mountain whitefish especially during the winter months. However, the rainbow trout found in creels during 1954 was greater than the number reported in the 1953 Completion Report. During the period May 1, 1954 to May 1, 1955, 104 fishermen were checked who had completed 388 hours of fishing. Their creels contained 197 whitefish, 156 rainbow trout and 27 brown trout. The average catch per hour of Mountain whitefish was 0.50, rainbow trout 0.40 and brown trout 0.07. Average catch per hour of all fish was very nearly 1.00.

The most opportune time to measure, weigh and observe marked fish ratios is during the one day when a fishing derby is held. In 1954, this contest took place on September 12 and attracted several thousand fishermen. Two hundred and forty fish were recorded of which 84.1 percent were rainbow trout, 5.0 percent were brown trout and 10.8 percent were mountain whitefish.

Since approximately fifty percent of the September plant were marked fish, it can logically be assumed that the number of returned hatchery rainbow trout can be increased by the same percentage figure. Old and new fin clips were readily distinguishable. Thus, the number of 1954 hatchery rainbow caught during the contest can be increased from 100 (observed) to 128. This figure represents approximately sixty-three percent of the 202 rainbow caught. Hatchery plants of legal-sized rainbow trout planted during 1954 contributed 53 percent to the total game fish turned in during this contest day. In the 1953 derby, the hatchery rainbow contributed 10.5 percent to the game fish turned in. An abnormal flood condition during June of 1953 may have adversely affected the trout population in the river.

Brown trout turned in averaged 1.30 pounds and whitefish 0.79 pounds. Rainbow trout planted during April-May averaged 0.68 pounds when taken on September 12. Their average weight at planting time was 0.34 pounds. Those planted during September averaged 0.58 when returned.

The car count data collected during 1954 showed an average of 4.3 week day count of fishermen cars on the river. The week end counts exceeded twenty, but the sample of these counts is not considered large enough to be reliable.

Recommendations:

In the canyon section of the Missouri River upstream from Cascade, rainbow trout are an important game fish. It has not yet been determined conclusively if the rainbow stocks are made up primarily of naturally spawned wild fish or if previous hatchery plants have assisted materially in providing the present stocks. More hatchery trout were found in the 1954 catch than in 1953. The abnormal flood condition of early 1953 may have made the difference.

It is recommended that observations be made during 1955 in an effort to observe if there is a carryover from the 1954 plants. Checks should be made on this portion of the river until enough information is secured to provide a sound basis for future management practices.

Summary:

During 1954 marked (fin clipped) rainbow trout were planted in the Missouri River between Wolf Creek and Cascade, Montana. Greater returns of the marked fish were found then during the 1953 evaluation. Flood conditions in 1953 may have made the difference. Over one-half of the game fish turned in during a fishing derby on September 12, 1954 were 1954 hatchery rainbow.

Study on this section should be continued in order to determine carryover and to obtain additional information in order to provide a basis for future management.

Data and Reports:

The original data are in the files of the fisheries biologist at Belt, Montana.

Prepared by Nels. A. Thoreson Approved by _____

Date April 28, 1955

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

JOB COMPLETION REPORT
INVESTIGATIONS PROJECTS

State of Montana Job No. [illegible]II

Project No. F-5-R-4

Title of Job: Survey of the Streams and Lakes of the Project Area

Abstract:

The objective of this evaluation was to determine the approximate fishing pressure on Nilan reservoir, a 600-acre irrigation impoundment, near Augusta in Lewis and Clark county.

Two controlled impulse automobile counters were used in determining the travel to and past the lake. A physical count of automobiles and trailers was made in order to obtain a correction factor for trailers. A record of week end use and weekday use was kept, especially during the early part of the fishing season.

During 128 days, from May 15 to September 20, 1954, the corrected totals indicated that 6,615 fishermen automobiles were driven to Nilan reservoir. For the period covered, this use would average slightly less than 52 cars per day. The corrected opening week end count was 524 cars. Fishermen continued to use Nilan reservoir after September 20, but the counters were removed because of the opening of bird and big game seasons.

Objectives:

One of the objectives of the Central Montana project, as outlined in the Preliminary Project Statement, is to establish methods of measuring fishing pressure of various waters of the district.

Nilan reservoir is a newly impounded body of water near Augusta in Lewis and Clark county. When filled, it covers a flooded area of 691 acres. During the past two years a greater than average number of fishermen, for Central Montana waters of comparable size, have fished in this reservoir. In order to provide an economic foundation for future management work on this body of water, a measure of existing fishing pressure would be valuable information.

The objective of this job was to obtain a measure of the number of automobiles driven to Nilan reservoir during the greater part of the 1954 fishing season.

Techniques Used:

Two controlled impulse counters, each operating by a six volt batter, were used in this study. The counters, sold by the K-Hill Signal Company, Inc. of Uhrichsville, Ohio, are designed to resist the hazards of outdoor use. The mechanism and battery is enclosed in a metal case, the lid provided with a lock and sealed by

a gasket. However, those used in this evaluation were also placed in locked wooden boxes and secured by use of chains to posts. Nothing molested the counting equipment and there was no failure in its operation. The hoses were stretched across the road and were secured with metal pegs and held in place on a firm base of belting. At the time of their removal, ridges had formed beneath the belting.

On May 6, 1954 the counters were installed on the county road leading to and beyond Nilan reservoir, the only public route to this lake. One counter was installed between Augusta and the reservoir and the other beyond the reservoir. They were placed in position prior to the fishing season in order to obtain a figure for normal travel by persons using the road for purposes other than fishing in the reservoir.

The counters were read and checked at intervals usually at the beginning and ending of week ends in order to separate the week end count from that made during the weekdays. They were read throughout the season by the game warden in the area and by district fishery personnel.

A physical count of cars and trailers parked at the lake was made whenever practical in order to obtain a ratio of trailers to cars for count correction purposes.

The counters were removed on September 20, 1954 in order to avoid the inseparable car count of hunters using the road shortly after this date. Fishermen continued to travel to the lake after September 20th, but were not counted.

Findings:

On fourteen occassions physical counts of automobiles and trailers were made at the reservoir for a total of 603 cars and 157 trailers. Since the counters record one-half a number for each set of wheels and since most trailers checked had only two wheels, the number recorded by each trailer was only one-half that recorded by each automobile. Six hundred and three cars were recorded on the counter as 603, but 157 trailers were recorded as 78 or 11.5 percent of this total recorded count.

The following includes the car count evaluation from May 16 to September 20, 1954 of fishermen automobiles driven to Nilan reservoir:

Total number of automobiles past Augusta (lower counter) ----------	25,234
Total number traveling beyond Nilan (upper counter) (both ways) ----------	7,084
Total number to the vicinity of Nilan reservoir. Difference ----------	18,150
Travel to three ranches in vicinity, ditch rider, etc. ----------	3,200
Travel by fishermen to Nilan reservoir and return. Difference ----------	14,950
Trailer count as recorded on lower counter (11.5%) ----------	1,719
Fishermen automobiles to Nilan and return. Difference ----------	13,231
Count made on return trip by fishermen automobiles ----------	6,615
Fishermen automobiles to Nilan reservoir (5/15/54 to 9/20/54) ----------	6,615

Difficulty was encountered in obtaining an average count of non-fishermen use recorded on the lower counter but not the upper one. The counters were installed prior to the fishing season in order to obtain a normal traffic count, but during this period an abnormal count was recorded by military vehicles and by local residents driving over

the road to observe a run of spawning fish. The average figure of 25 per day was used and based upon physical counts made and by the best estimates by three ranchers and a ditch rider who were the only factor of importance affecting this count.

The opening of the 1954 fishing season was on May 16. The corrected counts of fishermen automobiles driven to Nilan reservoir as recorded on the car counters for different periods are as follows:

	Car Count
Opening day of 1954 fishing season - May 16, 1954	524
First week of the season (5/17/54 to 5/21/54)	446
Second week end (5/22/54 to 5/23/54)	546
Second week of the season (5/24/54 to 5/28/54)	196
Third week end, Memorial Day (5/29/54 to 5/31/54)	480
Third and fourth weeks and fourth week end (6/1/54 to 6/11/54)	480
Fifth week end (6/12/54 to 6/13/54)	186
Fifth week (6/14/54 to 6/18/54)	85
Sixth week end (6/19/54 to 6/20/54)	175
Sixth week (6/21/54 to 6/25/54)	218
Seventh week and week end (6/26/54 to 7/2/54)	352
Fourth of July week end (7/3/54 to 7/5/54)	183
Period from 7/6/54 to 9/20/54	2,744
Total from May 16, 1954 to September 20, 1954	6,615

Recommendations:

The use of automobile counters in determining fishing pressure can be a very useful method, providing access roads are not too numerous and if non-fishermen car counts can be separated from those made by fishermen. Trailer corrections and other considerations must be made.

No recommendations are offered concerning the immediate management of Nilan reservoir based on these observations, but the fishing pressure figures presented here provide a base in establishing future fishing pressure trends and an economic base in determining future management practices.

Summary:

During 1954, a survey of fishing pressure by the use of mechanical automobile counters was conducted on Nilan reservoir. The 600-acre lake near Augusta in Lewis and Clark county is a new impoundment and draws considerable fishing pressure

from Great Falls and the surrounding area. Physical counts of cars and trailers were made to establish the trailer correction factor. During the period from May 16 to September 20, the counters indicated that 6,615 fishermen automobiles were driven to the reservoir. With this data a base is provided for establishing future fishing pressure trends and economic importance which may be useful in instituting future management measures.

Data and Reports:

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

Prepared by Nels A. Thoreson Approved by _____

Date April 19, 1955

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-4 Job No. II-A

Title of Job: Hatchery Contribution Study

Abstract:

During 1954 an evaluation of the success of hatchery plants of yearling rainbow trout was made in Spring Creek, Fergus County, Montana. Approximately thirty-seven thousand trout were planted, one-half of which were marked by fin clipping. Creel census information was gathered on the stream by wardens, hatcherymen and biologists. Additional information was obtained by voluntary reports turned in by fishermen through a sporting goods store in Lewistown and through Fishermen Logs.

Twenty-eight hundred and thirty fish were contained in the evaluation. The average catch per hour was 1.2. Returns through different sources, though inconsistent, showed a substantial contribution of hatchery fish to the creel.

Eighty-six percent of the fishermen checked for residence were from Fergus County. Data collected was valuable in establishing the number of fish to be recommended for revision of Montana's fish distribution plan.

Objectives:

Substantial numbers of legal-sized rainbow trout are planted annually in Spring Creek near Lewistown, Montana. In an effort to effect the best possible fishery management of this water resource, it is important to possess information concerning the return of the planted fish to the creel.

It was planned to make an evaluation of the results of kokanee fry which have been planted in the North Fork Smith River Reservoir. This study was included in this work plan. Creel census data was collected and a small number of kokanee were found in the catch but a satisfactory appraisal of the success of this introduction could not be made due to the heavy water demands for irrigation during the 1954 season and the fact that the reservoir was drawn nearly dry. Had such an abnormal condition been anticipated, plans would not have been made for this segment of the work plan.

Otter Creek in Cascade and Judith Basin Counties was rehabilitated under Work Plan II of Project No. F-5-R-3. Brown trout were stocked following the coarse fish removal. Under this work plan, a further plant of brown trout was made and observations indicate the establishment of this species in the stream. The stream will be closed to fishing during the 1955 fishing season.

Techniques Used:

During 1954, approximately eighteen thousand seven hundred yearling rainbow trout were marked and planted in Spring Creek, Fergus County, Montana. The left pelvic fin only was clipped on the early season plants. The left pelvic and adipose fins were clipped on approximately six thousand six hundred and fifty planted after July 1. Since about thirty-seven thousand yearling rainbow were planted in the stream during 1954, the marked fish represent approximately one-half of the fish planted.

Creel census information was collected by wardens, hatcherymen and biologists and fishermen made voluntary reports in Fishermen Logs and through a sporting goods store in Lewistown.

Findings:

A total of 2,830 fish were checked on the stream or reported by voluntary means. In checks made on the stream, 1,197 hours were expended in catching 879 fish. Based on these figures, the average catch per hour was 1.2 fish.

The contribution made by hatchery-reared trout in creels checked and by voluntary reports was considerable; however, there was a great amount of variation in the ratios of marked to unmarked fish reported and between the information collected by different census takers. Variation in results of the different persons collecting the information can be explained, at least in part, by the locations where checks were made. Those checking frequently near points of release would show a higher percentage return of marked fish. Voluntary reports made by fishermen at the Lewistown sporting goods store showed that marked rainbow made up 63 percent of the catch while those reporting through Fishermen Logs showed a marked fish contribution of 33 percent.

Because of the variation shown in the data collected, the percentage contribution in the catch made by 1954 hatchery trout will not be presented. The reliability of such a figure would be doubtful. Contribution by marked fish to the creel and the calculated contribution of hatchery fish, although inconsistent, does indicate a substantial percentage of Spring Creek fishermen catches were made up of yearling rainbow planted during 1954.

Rainbow trout dominate the fishery and although brown trout are present they made up only seven percent of the catch in creels checked or reported. Only one whitefish and one brook trout were checked or reported.

Of the fishing parties checked for residence, it was found that 86.6 percent were from Fergus County.

Recommendations:

Because of its physical characteristics, accessibility and nearness to a population center, Spring Creek, Fergus County is an extremely important fishing stream.

This evaluation of hatchery plants made in the stream indicates a considerable contribution to the fishery and "put and take" management should be maintained.

The number of "put and take" fish planted annually should be based upon economic limits and consistent with the number of fishermen deriving benefit.

Information obtained during this study aided in establishing the number of fish to be recommended in the revision of Montana's fish distribution plan.

Summary:

Approximately thirty-seven thousand yearling rainbow trout were planted in Spring Creek, Fergus County during 1954. About one-half of the fish were marked by clipping the left pelvic fin. Returns through different sources, though inconsistent, showed a substantial contribution of hatchery fish in the creel. Rainbow trout dominated in the catch with brown trout contributing approximately seven percent. Of the fishing parties checked for residence, it was found that 86.6 percent were from Fergus County. Data collected was valuable in establishing the number of fish to be recommended in the revision of Montana's fish distribution plan.

Data and Reports:

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

Prepared by Nels A. Thoreson Approved by _____

Date April 30, 1955

F-15-D-1

1955

Development Project

Rehabilitation of Kipp Lake and Adjacent Waters