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JOB PROGRESS REPORT

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FEDERAL AID IN FISHERIES RESTORATION ACT

TEXAS

Federal Aid Project No. F-2-R-16

REGION 2-B FISHERIES STUDIES

Job No. E-9: Evaluation of Catchable Rainbow Trout Fishery

Project Leader: Richard L. White

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October 7, 1969

Abstract

A total of 7,000 rainbow trout was stocked in the tailrace waters of Canyon Reservoir, Comal County, Texas in the spring of 1968. Creel census operations indicated an angler harvest of 35 per cent of the number stocked. Water quality studies and bottom sampling indicated the continuance of the area as suitable trout habitat. Fishermen harvest of 3,000 trout stocked in the late fall of 1968 was about 30 per cent.

Despite the per cent harvest being lower than previous years (owing to high water releases from the reservoir hindering fishermen efforts) the fishery was still felt to be quite successful. Project personnel recommend that it be continued.

TEXAS

Federal Aid Project No. F-1-R-10

REGION 1-B FISHERIES STUDIES

Job No. E-9: Evaluation of Cascade Rainbow Trout Fishery

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October 7, 1969

Job Progress Report

State of Texas

Project No. F-2-R-16

Name: Region 2-B Fisheries Studies

Job No. E-9

Title: Evaluation of Catchable Trout Fishery

Period Covered: February 1, 1968 to January 31, 1969

Background:

In April 1966, rainbow trout, Salmo gairdneri, were purchased by the Lone Star Brewing Company, San Antonio, Texas, and stocked with the assistance of project personnel in the tailrace waters below Canyon Dam, Comal County, Texas. This action was instigated by the private concern after they had learned that the Canyon Reservoir Project Report (February 1960 prepared by the Branch of River Basin Studies) indicated the possibility of the trout fishery in the cold tailrace waters below the dam. A 3-year stocking program including approximately 32,000 catchable trout donated by Lone Star Brewing Company ended with the May 1968 stocking of 7,000 fish. Evaluation through creel census of the 1967 stocking indicated a 59 per cent harvest of the trout. The initiation of this trout fishery provided better than 10,000 man hours of fishing in a 7-month period in an area where heretofore it would have been less than 500 man hours for the same period of time. The increased fishing pressure also provided an economic boost of over \$10,000 per year for the immediate area in terms of fishing tackle, bait, food, etc., purchased.

Water quality studies, bottom fauna studies, and monthly sampling of the trout indicated that the tailrace continued to provide suitable trout habitat.

Further background on this project may be found in Job Progress Report E-9, Project No. F-2-R-15, Evaluation of Catchable Rainbow Trout Fishery, 1968.

Objectives:

1. To determine the per cent of return of stocked fish.
2. To determine the length of time a plant of trout contributes to the fishery.
3. To determine the average catch per man hour of fishing.
4. To determine the average catch per fishing trip.
5. To determine the average length of time per fishing trip.
6. To determine the economic factors involved, namely, the value of the returns.
7. To determine through water quality studies the continuance of Canyon Dam Tailwaters to provide suitable trout habitat.

8. To determine through bottom sample studies the available food supply for a trout population.
9. To determine the utilization of available food by the trout.

Procedures:

Approximately 7,000 eight to nine-inch rainbow trout were fin-clipped (right pelvic) by project personnel on a trip in May 1968 to the Amyx Trout Farm, Rockbridge, Missouri. The trout were held at the hatchery for 26 days to observe any mortality or disease outbreak. Malachite green was flushed through the raceways 4 times during this period to inhibit disease and fungus. Twenty-six fish died in the raceways during this period.

On May 27, 1968 approximately 3,500 trout were stocked in the Canyon tailrace and a like number were stocked on May 30, 1968. Figure 1 illustrates the trout stocking stations over the 8.9-mile area.

Creel census operations began immediately and each drop site was checked every 2 hours from dawn until dusk. A creel census card, Figure 2, was filled out on each fisherman and a post card, Figure 2a, was also given to him to fill out and mail in at the end of the fishing day. This post card method allowed project personnel to compile total catch on the fishermen who left the area between creel census rounds. The creel census was conducted for 5 consecutive days and 2 consecutive weekends following each drop, with creel checks every other weekend thereafter.

In conjunction with the creel census, an economic evaluation sheet, Figure 3, was filled out on every tenth fisherman. This procedure was included to determine what the trout fishery lent to the economy of the immediate area.

Limited bottom sampling was carried out on the tailrace area to determine available food for the trout. High water impeded more extensive bottom sampling. The samples were preserved in 70 per cent alcohol solution and returned to the San Marcos Laboratory for identification.

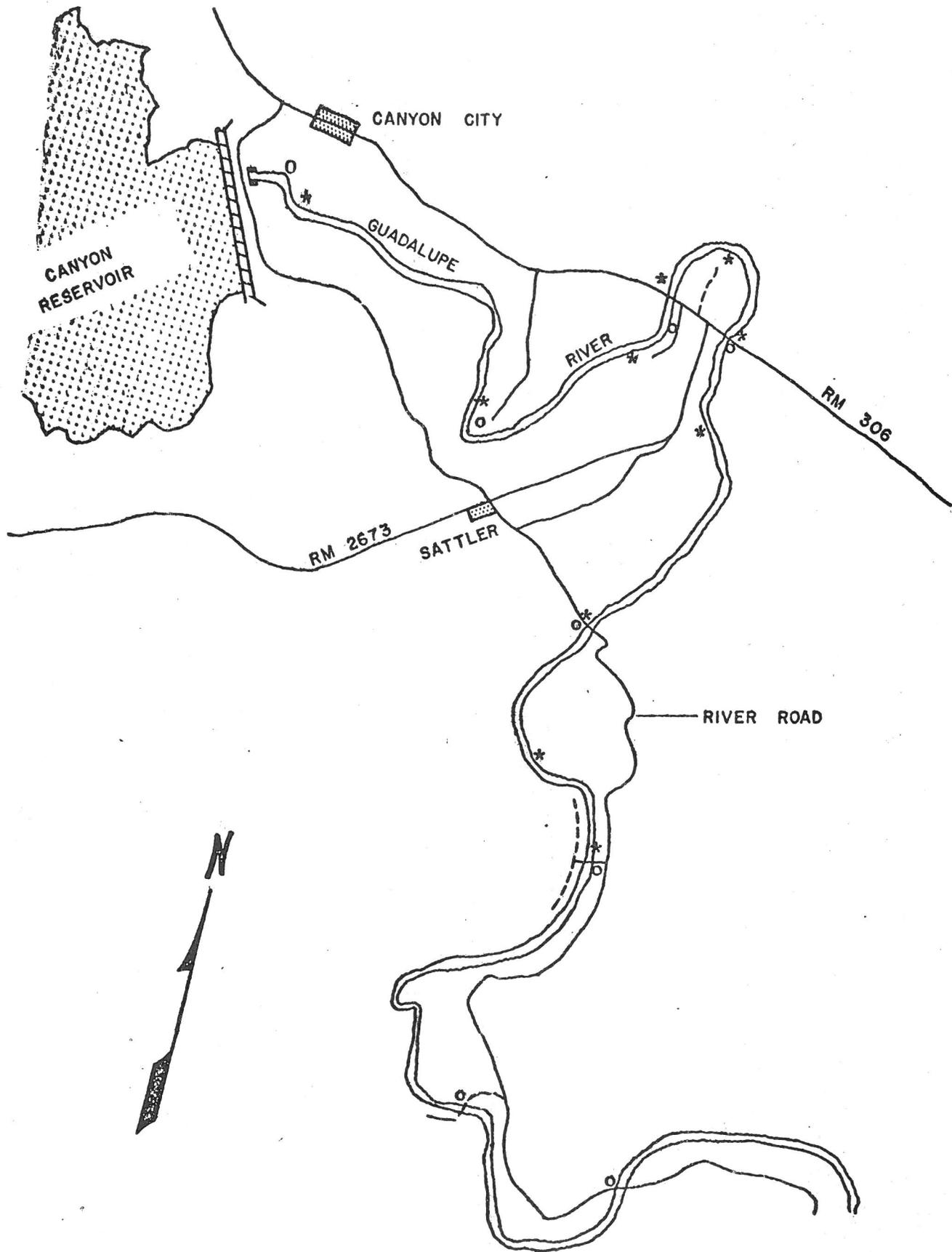
Water quality studies were periodically run on the tailrace in order to determine the continuing suitability of water for trout. Dissolved oxygen, carbon dioxide, alkalinity, and temperature were recorded.

Findings:

Creel census procedures and compilations used in this report are described in Job E-9, F-2-R-15, Evaluation of Catchable Rainbow Trout Fishery.

The total harvest estimate was obtained by the regression method described by Leslie and Davis (1939) which is based on the principle that population size can be estimated from the day to day decline in catch per unit of effort as the population size decreases. In the application of this method, daily catch per man hour (Y axis) has been plotted against cumulative catch (X axis) of marked fish.

FIGURE 1.



* drop sites
o water sample sites



FIGURE 2.

FISH CENSUS ... PARKS AND WILDLIFE DEPARTMENT

LAKE _____ DATE _____ 19____
 NAME (OPTIONAL) _____ HOURS FISHED: MORNING _____ AFTERNOON _____
 CITY _____ STATE _____ TOTAL HOURS FISHED _____

SPECIES CAUGHT	TOTAL	MARK	BELOW LIST NUMBER FISHES CAUGHT UNDER THEIR NEAREST SIZE																				
			6"	7"	8"	9"	10"	11"	12"	13"	14"	15"	16"	17"	18"	19"	20"	21"	22"	23"	24"	"	"
MARKED TROUT																							
UNMARKED TROUT																							
TAGGED TROUT																							
SUNFISH																							
CATFISH																							
OTHERS																							
TOTAL																							

REMARKS _____

KIND OF FISHING (CHECK) _____ NUMBER OF FISH CAUGHT WITH:
 BOAT [] SHORE [] PIER [] TROLLING [] PLUGS _____ MINNOWS _____ CUTBAIT _____
 STILL FISHING [] CASTING [] FLY FISHING [] SPINNERS _____ CRAYFISH _____ OTHERS? _____
 WADE [] ART. FLIES _____ WORMS _____

FIGURE 2a.

NAME _____
 ADDRESS _____
 NO. TROUT CAUGHT _____ NO. MARKED TROUT _____
 NO. HOURS FISHED _____
 REMARKS:

FIGURE 3.

ECONOMIC INFORMATION FORM FILLED OUT BY CREEL CLERK
ON EVERY TENTH FISHERMAN

Economic Information

State _____ City _____

Main reason for trip _____

Boat: Type _____ Length _____ Motor (hp) _____

Rental fees: Boat \$ _____ Motor \$ _____ Launching \$ _____

License: Yes _____ No _____

Gas and oil purchased for boat: Gallons _____ Cost \$ _____

Meals purchased today: Number _____ Cost \$ _____

Light refreshments purchased for today: Cost \$ _____

Ice for today's trip: Pounds _____ Cost \$ _____

Lodgingplace last night _____ Cost \$ _____

Bait and tackle purchased for today's trip:

Natural bait \$ _____ Artificial lures \$ _____ Hooks \$ _____

Sinkers \$ _____ Line \$ _____ Floats \$ _____

Swivels \$ _____ Dip net \$ _____ Stringer \$ _____

Other \$ _____

Miles traveled today _____

Mileage cost (caluclated) _____

License cost \$ _____

Total trip expenditure \$ _____

Remarks: _____

The projected catch on weekends was calculated to be 1,406 fish. Data and compilations for this projection are given in Tables 1, 1a, and Graph 1.

The projected catch of trout on weekdays was calculated to be 1,017 fish. Data and compilations for this projection are given in Tables 2, 2a, and Graph 2.

The sum of these 2 projections, 2,423 fish, reveals an angler harvest of 35 per cent of the 7,000 fish stocked in May 1968. These trout contributed to the fishery approximately 5 months with some limited catches being recorded as late as November. It should be noted, that there are some carry-overs of fish from one stocking to the next, and "contributing to the fishery" terminates when the catch per man-hour reaches zero for the first time. The decrease in fishing pressure was directly proportional to the increase in days following the stocking.

The average catch per man hour for the census period for weekends and weekdays was 0.47 and 0.56 respectively. The catch per man hour decreased steadily over the next few months.

During the census period, weekend fishermen spent an average of 3.84 hours per trip and harvested 1.79 fish, while the weekday angler averaged 2.16 fish and 3.70 hours per trip.

The data used in these projections were collected from May through July, although the census was continued into August 1968. In the regression method employed, it is necessary to use the data which decreases in a rather uniform manner, and for this reason, the data from May through July were used.

During the period from May 30, 1968 through July 28, 1968 there were approximately 1,141 fishermen censused with an economic sheet filled out on every tenth one. The fishermen spent an average of \$4.36 per fishing trip. This figure did not include the cost of gasoline used in making the trip, but rather represents only what the angler spent in the immediate area for bait, tackle, food, ice, etc. Since the census was run on an every-other-weekend basis, it would be valid to assume that the total number of anglers would approximately be 2,000 over this period. This represents an economic boost to the area of approximately \$8,720 by the trout program during the 4-month period.

The fishery provided approximately 6,000 man hours of fishing during the period from May 30, 1968 to July 28, 1968.

On May 26, 1968, a 17-inch, 3-pound rainbow trout with an 11½-inch girth was caught in the fishery by Mr. A. M. Benke of San Antonio, Texas. On June 22, 1968, Mr. Ron Sharp, San Antonio, Texas, landed a 21½-inch, 4 3/4-pound rainbow which had a 13-inch girth. These fish were determined to be from 1 of the 1966 stockings since neither of these fish were fin-clipped in any manner. All of the fish, except the 1966 stockings, had been fin-clipped.

Approximately 3,000 trout from the U. S. Fish and Wildlife Service were stocked in the river on October 21, 1968. Limited creel census operations indicated an approximate harvest of 30 per cent of the fish over the winter months. Inclement weather inhibited the harvest on this particular stocking, but these trout did provide good fishing until early spring.

Table 1

Weekend Trout Creeel Census Summary

Date	<u>Seen on Census</u>			<u>Expanded from Use Counts</u>				
	Hours Fished	Total Trout	Catch	Catch Per Angler Hour	Use Hours	Total Angler Hours	Total Daily Catch	Mean Daily Cumulative Catch
June 1	167	111		0.66	65	232	153	76
June 2	209	135		0.65	166	375	244	275
June 8	128	75		0.59	145	273	161	477
June 9	140	84		0.60	89	229	137	626
June 15	100	43		0.43	81	181	78	734
June 16	110	41		0.37	121	231	86	816
June 29	115	44		0.38	35	150	57	887
June 30	75	10		0.13	131	206	27	930
July 13	56	10		0.18	137	93	17	951
July 14	37	15		0.40	19	56	22	971
July 27	60	7		0.12	66	126	15	990
July 28	63	11		0.18	71	134	24	1009
Totals	1,260	586			1,026			

Table 1a

Mean Daily Cumulative Catch	X ²	Catch Per Hour = Y	XY
76	5,776	0.66	50.16
275	75,625	0.65	178.75
477	227,529	0.59	281.43
626	391,876	0.60	375.60
734	538,756	0.43	315.62
816	665,856	0.37	301.92
887	786,769	0.38	337.06
930	864,900	0.13	120.90
951	904,401	0.18	171.18
971	942,841	0.40	388.40
990	980,100	0.12	118.80
1009	1,018,081	0.18	181.62

$$\Sigma X = 8742 \quad \Sigma X^2 = 7,402,510 \quad \Sigma Y = 4.69 \quad \Sigma XY = 2,821.44$$

$$\Sigma X^2 = 76,422,564 \quad N = 12$$

$$(\Sigma X) (\Sigma Y) = (8,742) (4.69) = 40,999.98$$

$$\begin{aligned} \text{Slope of line} = b &= \frac{\Sigma XY - \frac{(\Sigma X) (\Sigma Y)}{N}}{\Sigma X^2 - \frac{(\Sigma X)^2}{N}} \\ &= \frac{2,821.44 - \frac{3,416.66}{12}}{7,402,510 - \frac{6,368,547}{12}} \\ &= \frac{-595.22}{1,033,963} \\ &= -0.000575668 \end{aligned}$$

In the formula $Y = a + bX$, we now have b and can find a by substituting the average values for X and Y in the formula.

$$\bar{X} = \frac{X}{N} = \frac{8742}{12} = 728.5 \quad \bar{Y} = \frac{Y}{N} = \frac{4.69}{12.00} = 0.39$$

$$\bar{Y} = a + b\bar{X} \text{ or } 0.39 = a + (-0.000575668) (728.5)$$

$$\text{or } 0.39 = a + (0.41937414)$$

$$\text{or } a = 0.80937414$$

Table 1a (continued)

The equation of the line is : $Y = 0.8093747 + (-0.000575668) (X)$.

If we set Y (catch per hour) = 0 (which it theoretically will become only when no more fish are to be caught, then:

$$0 = 0.80937414 + (-0.000575668) (X) \text{ then,}$$

$$X = \frac{0.80937414}{0.00057567} = 1,405,968 = 1,406$$

or $X = 1,406 =$ estimated eventual return of marked fish on weekends.

Graph 1

WEEKEND PROJECTED CATCH

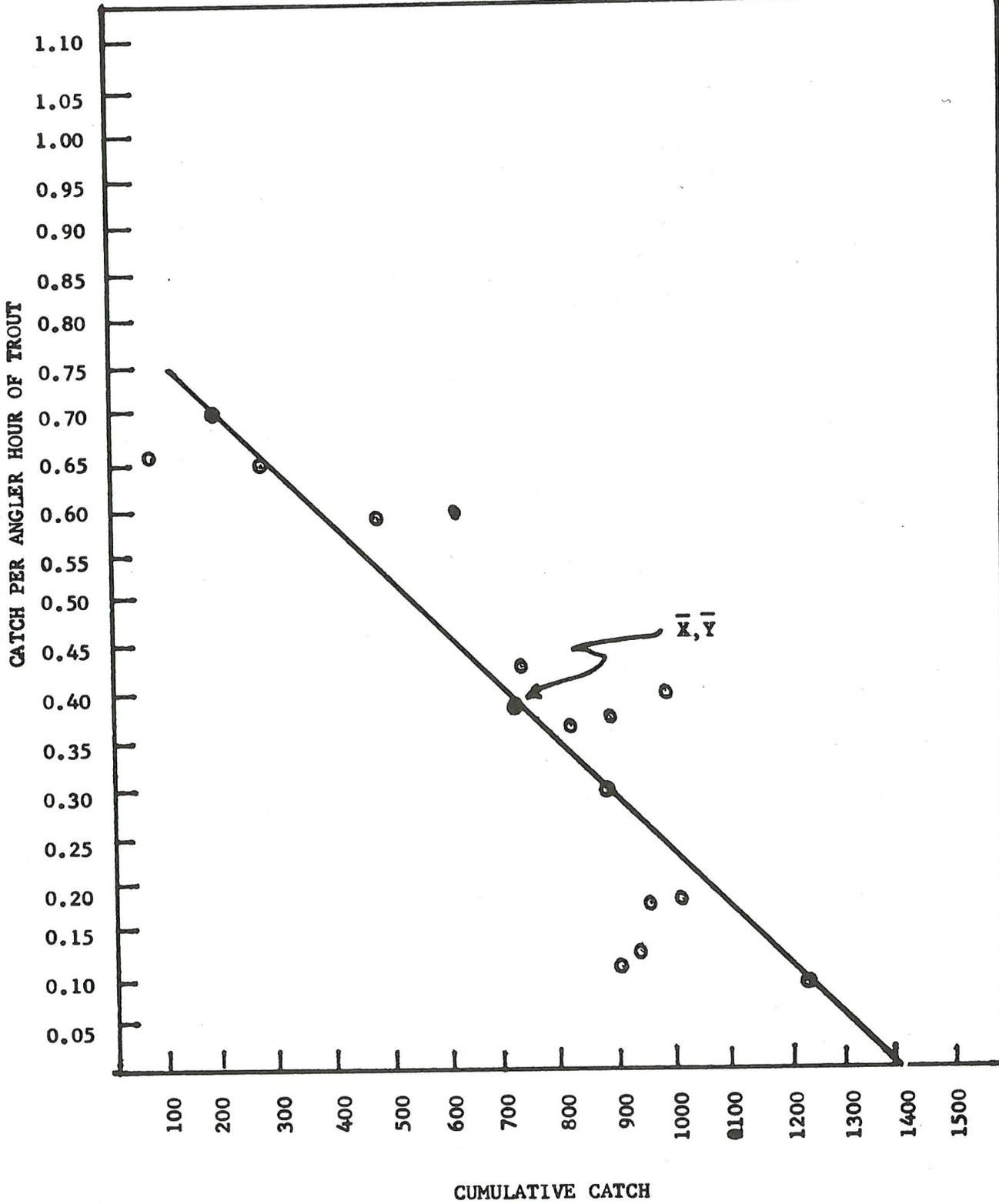


Fig. Regression line of catch per hour plotted against cumulative catch.

Table 2

Weekday Trout Creel Census Summary

Date	<u>Seen on Census</u>			<u>Expanded from Use Counts</u>			
	Hours Fished	<u>Catch</u> Total Trout	Catch Per Angler Hour	Use Hours	Total Angler Hours	Total Daily Catch	Mean Daily Cumulative Catch
May 30	149	106	0.71	155	304	216	108
May 31	85	52	0.61	60	145	88	260
June 3	62	57	0.92	65	127	117	362
June 4	44	41	0.93	60	104	97	469
June 5	47	19	0.40	29	76	30	533
June 6	25	20	0.80	28	53	42	569
June 7	57	25	0.44	19	76	33	606
June 10	49	17	0.35	58	107	39	642
June 11	58	22	0.38	19	77	29	675
June 13	31	21	0.68	37	68	46	736
June 14	49	17	0.35	30	79	28	773
Totals	710	415			1,287		

Table 2a

Mean Daily Cumulative Catch	X ²	Catch Per Hour = Y	XY
362	131,044	0.92	333.04
469	219,961	0.93	436.17
533	284,089	0.40	213.20
569	323,761	0.80	455.20
606	367,236	0.44	266.64
642	412,164	0.35	224.70
675	455,625	0.38	256.50
702	492,804	0.33	231.66
736	541,696	0.68	500.48
773	587,529	0.35	270.55

$$\Sigma X = 6,067 \quad \Sigma X^2 = 3,825,909 \quad \Sigma Y = 5.58 \quad \Sigma XY = 3,188.14$$

$$(\Sigma X)^2 = 36,808,489 \quad N = 10$$

$$(\Sigma X)(\Sigma Y) = (6067)(5.58) = 33,853.86$$

$$\begin{aligned} \text{Slope of line} = b &= \frac{(\Sigma X)(\Sigma Y)}{\Sigma X^2 - \frac{(\Sigma X)^2}{N}} \\ &= \frac{3,188.14 - 3,385.39}{3,825,909 - 3,680,849} \\ &= \frac{-197.25}{145,060.00} \\ &= -0.00135978 \end{aligned}$$

In the formula $Y = a + bX$, we now have b and can find a by substituting the average values for X and Y in the formula.

$$\bar{X} = \frac{\Sigma X}{N} = \frac{6067}{10} = 606.7 \quad \bar{Y} = \frac{\Sigma Y}{N} = \frac{5.58}{10} = 0.558$$

$$\begin{aligned} \bar{Y} = a + b\bar{X} \text{ or } 0.558 &= a + (-0.00135978)(606.7) \\ \text{or } 0.558 &= a + (-0.8249797394) \\ \text{or } a &= 1.38298 \end{aligned}$$

Table 2a (continued)

The equation of the line is: $Y = 1.38298 + (-0.00135978) (X)$.

If we set Y (catch per hour) = 0 (which it theoretically will become only when no more fish are to be caught, then:

$$0 = 1.38298 + (-0.00135978) (X) \text{ then,}$$

$$X = \frac{1.38298}{0.00135978}$$

or $X = 1,017 =$ estimated eventual return of marked fish on weekdays.

Graph 2

WEEKDAY PROJECTED CATCH

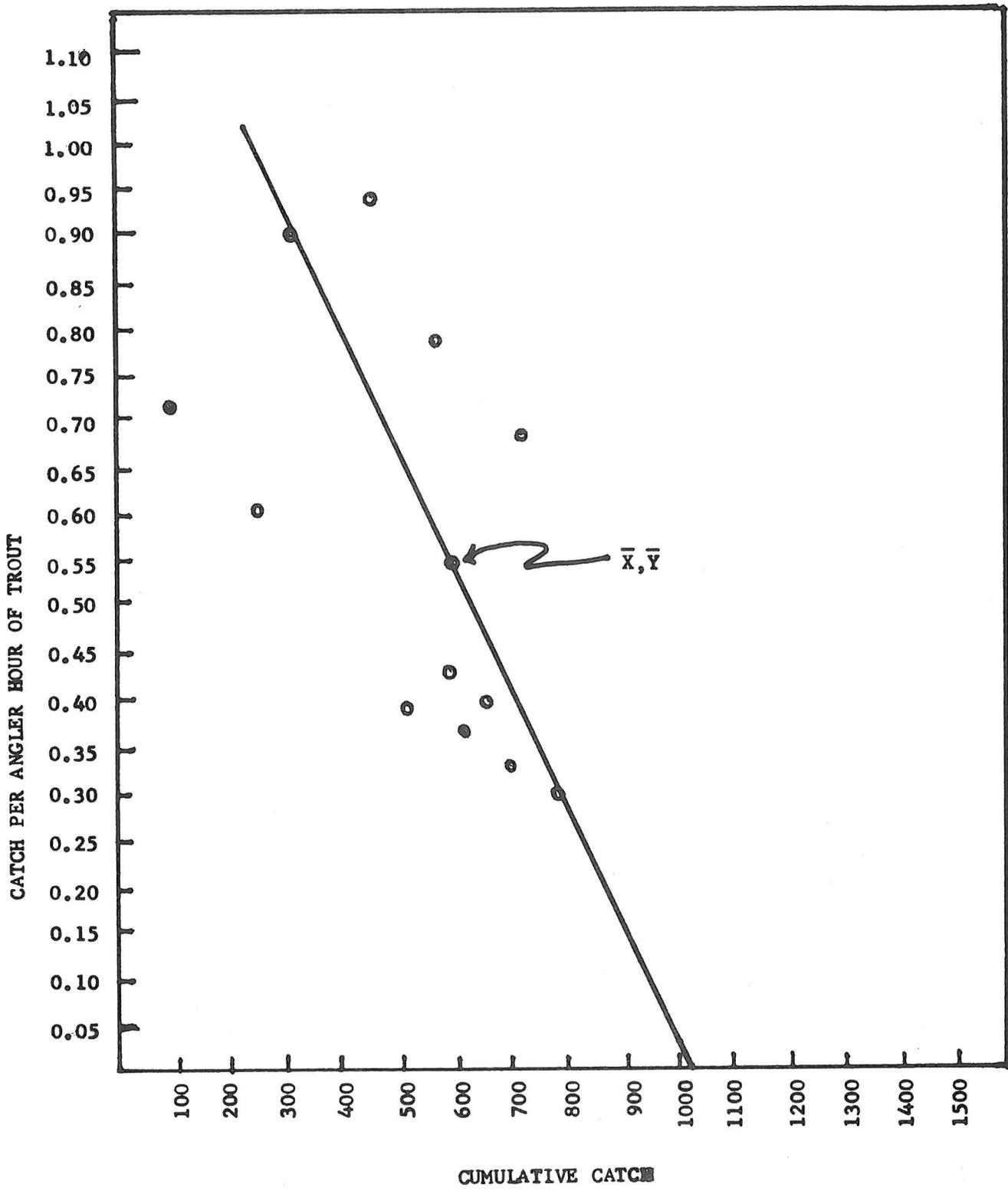


Fig. Regression line of catch per hour plotted against cumulative catch.

Limited bottom sampling, owing to high water releases, revealed continuing availability of Ephemeroptera, Diptera, and Tricoptera as a source of food for the rainbow trout in the fishery.

Water quality studies continued to reveal suitable conditions for rainbow trout in the fishery. Dissolved oxygen readings ranged from 8-12 ppm throughout the area during 1968. The temperature ranged from a minimum of 49° F. at the first drop site in February to a maximum of 68° F. at the last drop site in July. During 1968 the average temperature at the head of the fishery was 56° F. and 59° F. at the lower end of the area.

Although the water temperature downstream is somewhat affected by the releases from the dam, the dissolved oxygen varies imperceptibly with different release rates.

Discussion:

The total harvest of trout by fishermen during 1968 was down some 24 per cent from the previous year. This decrease in harvest is attributed to the magnitude of the releases from the dam during and following the spring stocking. Releases of 600 to 100 cfs made the tailrace waters quite turbulent and swift, and although the fish were not affected, the high water flow did hinder anglers efforts. Prime bank fishing areas were also inundated by the high water release, and wade fishing was all but impossible owing to the velocity of the water. Future stockings will be scheduled so that this detrimental aspect can be avoided. The decrease in angler harvest this year as compared to 1967 can also be attributed to the fact that there was no daily bag limit in 1967, whereas this year the daily bag limit was set at 5. In 1969 the bag limit will probably be raised to 10 per day.

Fisherman access to the fishery area continues to be a problem, however, the stockings are being made in areas where access exists. This does, however, eliminate some areas which would be prime habitat and fishing sites. A study has been made of the areas which would be most suitable for acquisition and development into fishing areas.

The 2 large trout harvested during 1968, supplemented by numerous catches of 1½ to 2-pound trout, point out the ability of the fish to thrive in the Canyon Lake Tailrace. In the samplings of the population with electrofishing gear, project personnel have noted that almost all of the fish collected are in peak condition.

Recommendations:

Because of the success of the program to date, it is recommended that this job be continued for another segment. It is also recommended that definite aims be set to alleviate the access problem which exists on the fishery.

Prepared by: Richard L. White
Project Leader

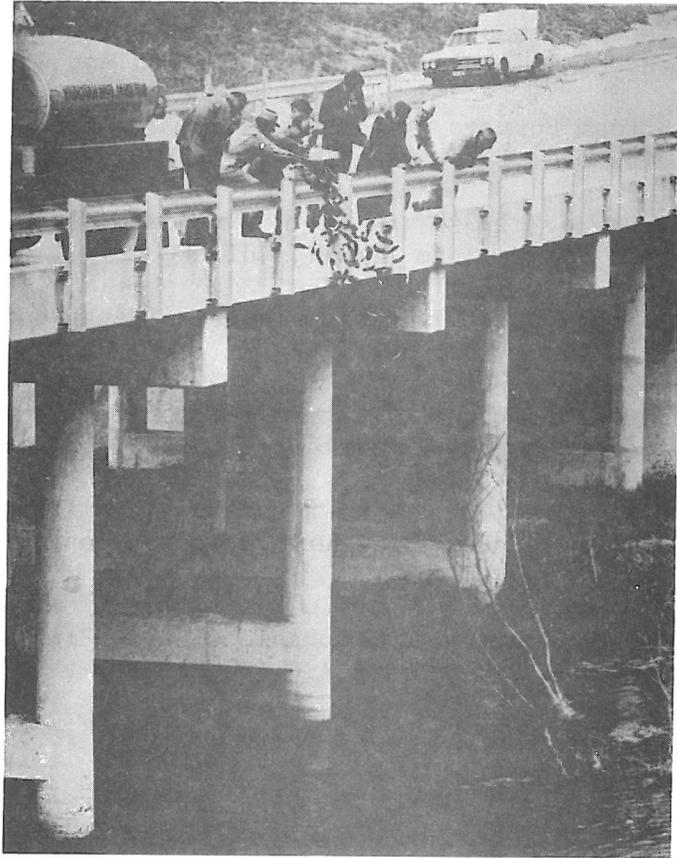
Approved by: Marion Toole
Coordinator

Date: October 7, 1969

RICHARD L. WHITE
Inland Fisheries Supervisor



Four-pound twelve-ounce trout on the right was stocked two years ago. At the time of its stocking it was the same size as the fish on the left.



Project personnel stocking rainbow trout in the tailrace waters of Canyon Lake.

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