Jim Vyvalek

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JOB PROGRESS REPORT

As required by

FEDERAL AID IN FISHERIES RESTORATION ACT

TEXAS

Federal Aid Project No. F-2-15

REGION 2-B FISHERIES STUDIES

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

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D-J Coordinator

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November 12, 1968

Summary

A total of 6,000 rainbow trout was stocked in the tailrace waters of Canyon Reservoir, Comal County, Texas. Creel census methods indicated anglers harvested 3,549 trout, or 59 per cent of the number stocked. Water quality studies and bottom samples taken indicate a suitable habitat for rainbow trout in the tailwaters.

The over-all program was felt to be quite successful and project personnel recommend that the "put and take" fishery be continued.

Job Progress Report

State of Texas

Project No. F-2-15 Name: Region 2-B Fisheries Studies

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

Period Covered: February 1, 1967 to January 31, 1968

Background:

Rainbow trout, Salmo gairdneri, have been purchased by a private concern and stocked, with the assistance of Department personnel in the tailrace waters below Canyon Dam, Comal County, Texas. This action was instigated by the private concern after they 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 30,000 catchable trout which have been donated by the private concern, is nearing its midpoint. Over summer survival of trout from an April 1966 stocking of 10,000 was verified by Texas Parks and Wildlife Department fishery personnel in October 1966. Water quality studies including temperature, dissolved oxygen, carbon dioxide, and alkalinity over the past year indicate suitable trout habitat. Evaluation, through creel census, of this trout fishery was made to determine if the economic and recreational aspects of this program warranted future maintenance.

The Guadalupe River has its origin on the Edwards Plateau in South Central Texas and flows southeastward through steep hills and limestone bluffs that characterize the region. This study was accomplished on a section of the Guadalupe River 12 miles northwest of New Braunfels, Comal County, Texas. The study area begins at the stilling basin of Canyon Reservoir and continues for 10.93 river miles downstream. The stream has a gradient of 2.5 feet per mile, and an average width of about 100 feet, and an average depth of approximately 4 feet. The last 3 figures will vary with the releases from Canyon Reservoir. The stream is clear to slightly murky, and is composed of approximately 50 per cent riffles and 50 per cent pools. The stream bed is predominately gravel and limestone. Some silt deposits are found in the upper reach of the study area and in natural pools and in 5 pools created by low water dams located at various points on the stream section.

Aquatic vegetation was sparse in this section of the river because of floods, but since completion of Canyon Dam conditions have become more favorable for growth of vegetation. Both pre-emergent and emergent species are found with green alga (Chlorophyceae) and bushy pondweed (Najas guadalupensis) the most abundant. Other aquatic plants found in the reach are sago pondweed (Potamogeton pectinatus), parrotfeather (Myriophyllum heterophyllum), cattail (Typha latifolia), yellow water lily (Nuphar sp.), watercress (Nasturtium sp.), southern wild rice (Zizaniopsis miliacea), water primrose (Jussiaea sp.), and muskgrass (Chara vulgaris).

Baldcypress (Taxodium distichum), oak (Quercus sp.), sycamore (Platanus occidentalis), pecan (Carya illinoensis), and cottonwood trees (Populus sp.) are common along the reach.

The bulk of the fish population in this section of the river consists of rough fish; namely, longnose gar (Lepisosteus osseus), gizzard shad (Dorosoma cepedianum), river carpsuckers (Carpiodes carpio), and gray redhorse suckers (Moxostoma congestum). Game fish in the reach are channel catfish (Ictalurus punctatus), flathead catfish, (Pylodictus olivaris), largemouth black bass (Micropterus salmoides), Guadalupe bass (Micropterus treculi), and sunfish (Lepomis spp.). Other species found in the stream include stonerollers (Campostoma anomalum), common mosquitofish (Gambusia affinis), logperch (Percina caprodes), dusky darter (Hadropterus sciera), darters (Etheostoma spp.), and various minnows and shiners (Notropis spp.).

Objectives:

1. To determine the per cent 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.

Procedures:

Approximately 6,000 seven to eight inch rainbow trout were donated for this study by the Lone Star Brewing Company, San Antonio, Texas. 1/ The trout were fin-clipped (right pectoral and left pelvic) by project personnel on a trip in February 1967 to the Amyx Trout Farm, Rockbridge, Missouri. The trout were incubated at the hatchery for 17 days to observe any mortality or disease outbreak. Malachite green was flushed through the raceways 3 times during this period to inhibit disease and fungus. Eleven fish died in the raceways during this period.

1/ As part of a wildlife project, the company has purchased 22,000 fish to date and donated them for this study.

On March 6, 1967 approximately 3,000 fish were stocked in the tailrace waters below Canyon Dam, Comal County, Texas. The remaining 3,000 were stocked on March 10, 1967. Figure 1 illustrates the site of the trout stocking stations on the 10-mile tailrace 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 day. This post card method allowed project personnel to compare 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 check coming 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.

Bottom samples, using a Surber square foot sampler, were collected from 11 stations on the tailrace during periods when the water releases were not so high as to impede sampling. The samples were preserved in 70 per cent alcohol solution and returned to the San Marcos laboratory for identification.

Water quality studies were run weekly on the tailrace in order to determine the continuing suitability of water for trout. Dissolved oxygen, CO_2, alkalinity, and temperature were recorded.

Findings:

As the data from the census were analyzed, it became apparent that there was a significant difference in weekday and weekend fishing, with the latter exhibiting greater fishing pressure and harvest. Consequently, the two were treated separately in the statistical projection of the total harvest.

The catch per man hour was tabulated from the fishermen for which the creel card and the returned post card were available. For the anglers who did not return the post card, an hour use count was derived. Since the creel was run every 2 hours, an extra hour was added to the final time entry made on these cards (i.e. if a John Doe was checked at 2:00 P.M. and was not fishing at 4:00 P.M., it was assumed that he quit at 3:00 P.M.). The total daily catch figure was compiled as follows:

$X = (Y)\ (Z+Q)$ where: X = total daily catch

Y = catch per man hour derived from returned post cards

Z = hours use derived from fishermen returning post cards

FIGURE 1.

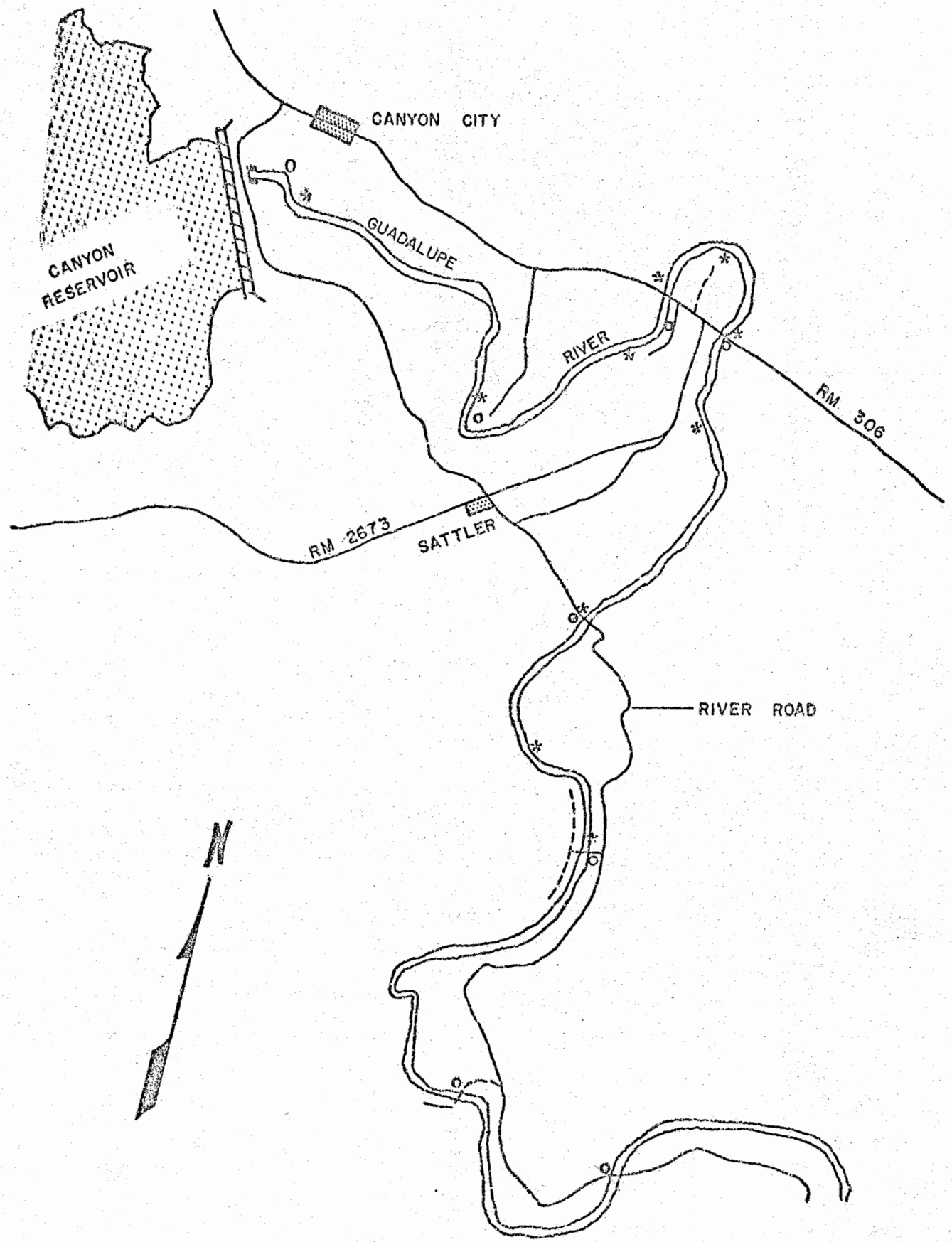

CANYON CITY
CANYON RESERVOIR
GUADALUPE RIVER
RM 306
RM 2673
SATTLER
RIVER ROAD
N
0 ½ 1
* drop sites
o water sample sites

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 FISHED 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)

BOAT ( ) SHORE ( ) PIER ( ) TROLLING ( )
STILL FISHING ( ) CASTING ( ) FLY FISHING ( )
WADE ( )

NUMBER OF FISH CAUGHT WITH:

PLUGS _____ MINNOWS _____ CUTBAIT _____
SPINNERS _____ CRAYFISH _____ OTHERS? _____
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: _____

Q = hours use derived from fishermen not returning post cards

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.

The projected catch of trout on weekends was calculated to be 2,330. 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 1,219. Data and compilations for this projection are given in Tables 2, 2a, and Graph 2.

The sum of these 2 projections, 3,549 fish, reveals an angler harvest of 59 per cent of the 6,000 fish stocked in March 1967. These trout contributed to the fishery approximately 7 months, with some limited catches being recorded as late as September 1967. The decrease in fishing pressure was directly proportional to the increase in days following the stocking. Fly fishermen had fairly uniform success throughout the 7-month period.

The average catch per man hour for the census period was determined by using data from fishermen who had returned the post card. The average catch per man hour for weekends and weekdays was 0.52 and 1.03 respectively. The catch per man hour, similar to the fishing pressure, decreased steadily over the next 5 months.

During the census period, weekend fishermen spent an average of 4.00 hours per trip and harvested 2.12 fish, while the weekday angler averaged 4.22 trout and 4.10 hours per trip. It should be noted that the weekday census covered the 2 weeks immediately following the drop, and harvest was at its maximum. These figures were also obtained from fishermen for whom both the creel card and post card were available.

The data used in the total harvest estimates were that collected through May 1967, but the census was continued into August 1967. 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 collected from March through May was used.

During the period from March through September 1967 there were approximately 1,600 fishermen censused with an economic sheet filled out on every tenth one. The fishermen spent an average of $3.94 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 approximate 2,500 over this period. This represents an economic boost to the area of approximately $10,000 by the trout program.

Table 1

Weekend Trout Creel Census Summary

	Seen on census			Expanded from use counts			
		Catch					
Date	Hours Fished	Total Trout	Catch Per Angler Hour	Use Hours	Total Angler Hours	Total Daily Catch	Mean Daily Cumulative Catch
March 11	428	450	1.05	177	605	635	318
March 12	342	237	0.69	176	518	357	813
March 18	387	229	0.59	159	546	322	1,153
March 19	343	195	0.57	148	491	280	1,454
April 1	242	97	0.40	89	331	132	1,660
April 2	260	61	0.23	92	352	89	1,770
April 15	115	46	0.40	30	145	58	1,844
April 16	108	15	0.14	23	131	18	1,882
April 29	125	34	0.27	105	230	62	1,922
April 30	109	17	0.16	75	184	29	1,967
May 13	139	14	0.10	46	185	18	1,991
May 14	38	3	0.08	37	75	6	2,003
Totals	2,636				3,793	2,006	

Table 1a

Mean Daily Cumulative Catch	X^2	Catch Per Hour = Y	XY
318	101,124	1.05	333.90
813	660,969	0.69	560.97
1,153	1,329,409	0.59	680.27
1,454	2,114,116	0.57	828.78
1,660	2,755,600	0.40	664.00
1,770	3,132,900	0.23	407.10
1,844	3,400,366	0.40	737.60
1,882	3,541,924	0.14	263.48
1,922	3,694,084	0.27	518.94
1,967	3,869,089	0.16	314.72
1,991	3,964,081	0.10	199.10
2,003	4,012,009	0.08	160.24

$\Sigma X = 18,777$ $\Sigma X^2 = 32,575,641$ $\Sigma Y = 4.68$ $\Sigma XY = 5,669.10$

$(\Sigma X)^2 = (18,777)^2 = 352,575,729$ $N = 12$

$(\Sigma X)\ (\Sigma Y) = (18,777)\ (4.68) = 87,876.36$

$$\text{Slope of line} = b = \frac{\Sigma XY - \frac{(\Sigma X)\ (\Sigma Y)}{N}}{\Sigma X^2 - \frac{(\Sigma X)^2}{N}}$$

$$= \frac{5,669.10 - \frac{87,876.36}{12}}{35,575,641 - \frac{352,575,729}{12}}$$

$$= \frac{-1,653.93}{3,194,331}$$

$$= -0.000517770$$

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:

$$\bar{X} = \frac{X}{N} = \frac{18,777}{12} = 1,576.65 \qquad \bar{Y} = \frac{Y}{N} = \frac{4.68}{12} = 0.39$$

Table 1a (continued)

$$\bar{Y} = a + bX \text{ or } 0.39 = a + (-0.000517770)\ (1,576.65)$$
$$\text{or } 0.39 = a + (-0.8163420705)$$
$$\text{or } \quad a = 1.206342$$

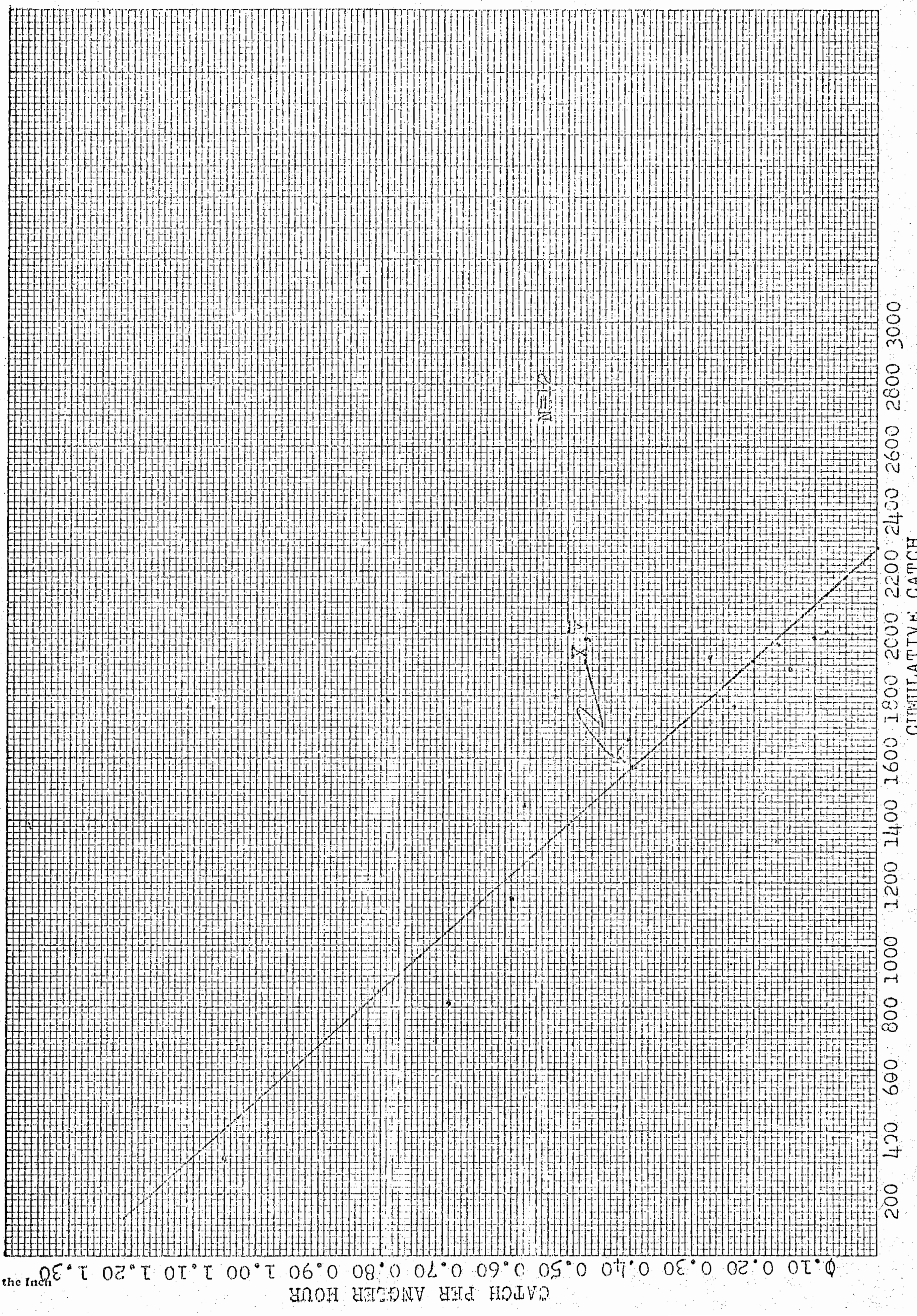
The equation of the line is : $Y = 1.3622167290 + (-0.000517770)\ (X)$
If we set Y (catch per hour) = 0 (which it theoretically will become only when no more fish are to be caught), then:

$$0 = 1,3622167290 + (-0.000517770)\ (X) \text{ then,}$$

$$X = \frac{1.206342}{0.000517770} = 2,330$$

Or X = 2,330 = estimated eventual return of marked fish on weekends.

Graph 1. Weekend Projected Catch.



Graph 1. Regression Line of catch per hour plotted against cumulative catch.

Table 2

Weekday Trout Creel Census Summary

	Seen on Census			Expanded from use counts			
		Catch					
Date	Hours Fished	Total Trout	Catch Per Angler Hour	Use Hours	Total Angler Hours	Total Daily Catch	Mean Daily Cumulative Catch
March 6	50	109	2.18	27	77	168	84
March 7	80	72	0.90	95	175	140	238
March 8	51	32	0.63	10	61	38	327
March 9	27	50	1.85	16	43	80	386
March 10	133	129	0.97	84	217	210	531
March 13	52	74	1.42	52	104	148	710
March 14	55	79	1.44	17	72	104	836
March 15	58	52	0.90	39	97	87	932
March 16	56	32	0.57	40	96	54	1,002
March 17	95	47	0.49	10	105	51	1,055
Totals	657				1,047	1,080	

Table 2a

Meal Daily Cumulative Catch = X	X^2	Catch Per Hour = Y	XY
710	504,100	1.42	1,008.20
836	698,896	1.44	1,203.84
932	868,624	0.90	838.80
1,002	1,004,004	0.57	571.14
1,055	1,113,025	0.49	516.95
$\Sigma X = 4,535$	$\Sigma X^2 = 4,188,649$	$\Sigma Y = 4.82$	$\Sigma XY = 4,138.93$

$(\Sigma X)^2 = (4,535)^2 = 20,566,225$

$(\Sigma X)(\Sigma Y) = (4,535)(4.82) = 21,858.70$

$$\text{Slope of line} = \frac{\Sigma XY - \frac{(\Sigma X)(\Sigma Y)}{N}}{\Sigma X^2 - \frac{(\Sigma X)^2}{N}}$$

$$b = \text{slope} = \frac{4,138.93 - \frac{21,858.70}{5}}{4,188,649 - \frac{20,556,225}{5}} = \frac{4,138.93 - 4,371.60}{4,188,649 - 4,113,245} = \frac{-232.67}{75,404}$$

$b = -0.0030856$

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:

$$\bar{X} = \frac{X}{N} = \frac{4,535}{5} = 907 \qquad \bar{Y} = \frac{Y}{N} = \frac{4.82}{5} = 0.964$$

$\bar{Y} = a + bX$ or $0.964 = a + (-0.0030856)(907)$
or $0.964 = -2.7986392 + a$
or $a = 3.76264$

The equation of the line is: $Y = 3.76264 - 0.0030856X$

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

$0 = 3.7626392 - 0.0030856X$
or $X = 1,219$

Graph 2. Weekday projected catch.

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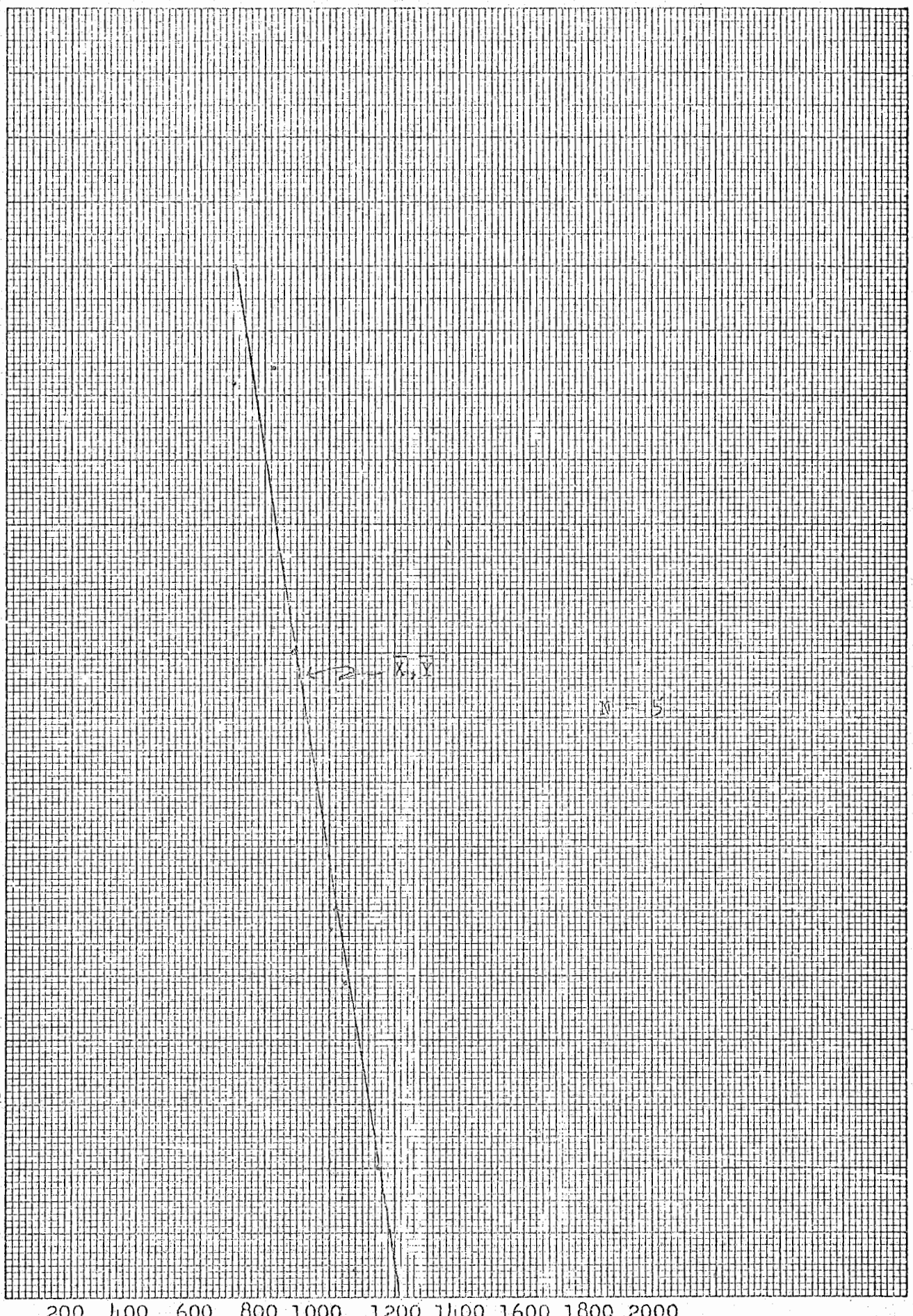
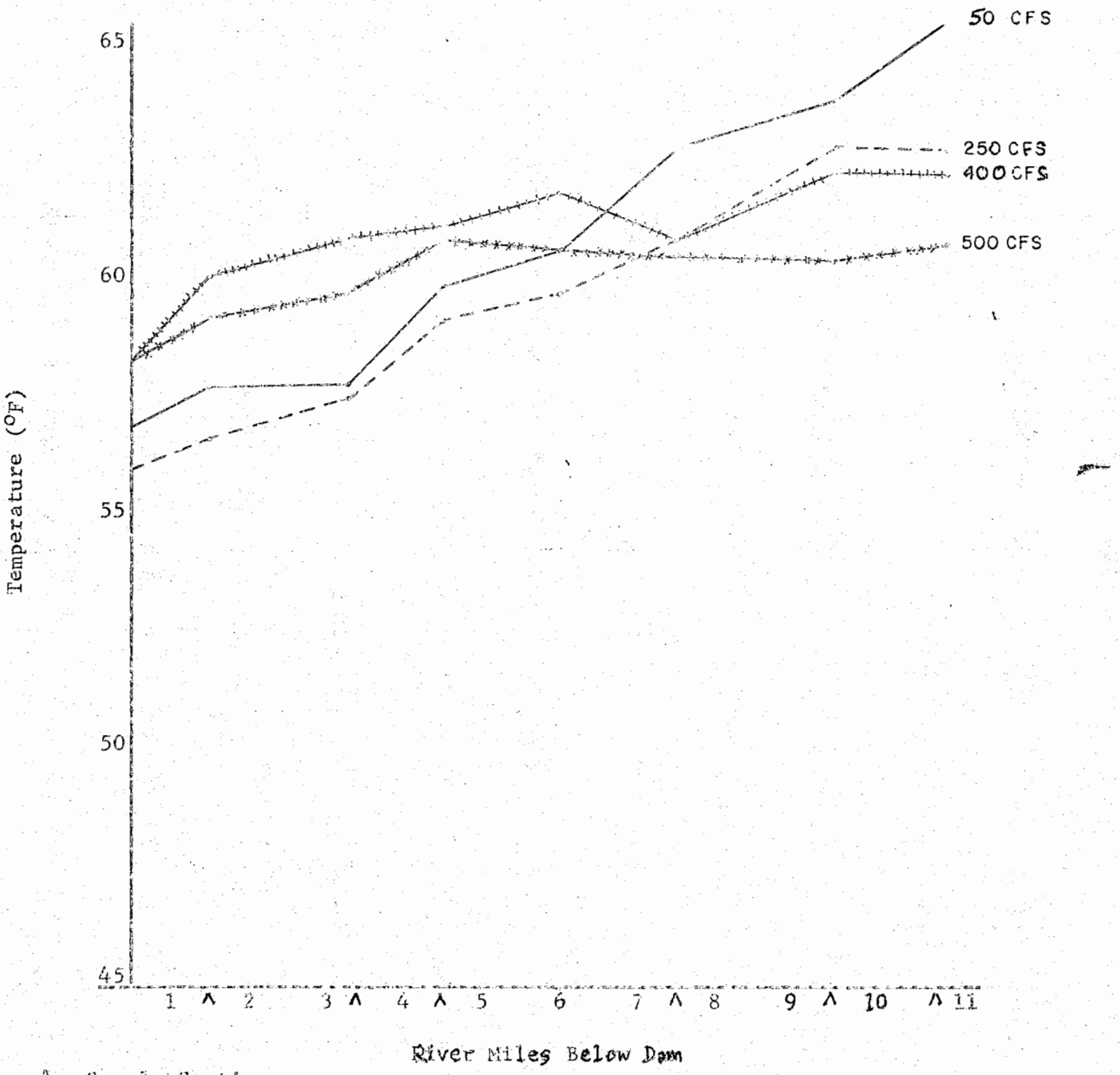


20 Squares to the Inch

Figure 4

Fall

September 22 - December 21



^ - Sample Station

With the average of 4 hours per fishing trip, this would indicate that the fishery provided 10,000 man hours of fishing during the 7-month period. Prior to the trout fishery, angler hour use in the tailrace would have been less than 500, for the same period of time, with the majority of that being trotline fishermen. The increase in angler hour use or fishermen opportunity is readily apparent and to put it on a percentage basis would provide an astronomical figure of 2,000 per cent increase.

A drop of 3,000 trout in November 1967 provided good fishing through the winter and early spring, but harvest immediately following the drop was inhibited by inclement weather. A creel census was initiated, but because of the sporadic harvest it was felt that the time could be better devoted to other jobs on the project. Tagged fish from this drop showed a growth of 4 ounces and ½ inch per month. By early spring most of the 8-9-inch fish from this stocking were 11-13-inches long.

The results of the bottom sample collections are given in Table 3 of this report. As can be seen, Ephemeroptera and Diptera are readily available in the stream and these two, along with Tricoptera, are most significant in the food demands of rainbow trout. Limited stomach sampling indicated that the preferred diet of the fish seemed to be Tricoptera where available, but with the fluctuation of the water level due to releases, many forms of terrestrial insects were also consumed by the trout. From all indications, the food supply, in the form of inverterbrates, in the Canyon tailrace area is more than adequate for the trout fishery.

Water Quality Characteristics

Eight temperature and water sample stations were established along an 11-mile stretch of the tailwaters. These stations are at intervals of approximately 1¼ miles Trout were stocked as far downstream as water and temperature station No. 6. Weekly temperature and water samples were taken at each station.

Water quality of primary concern, other than temperature, was dissolved oxygen, alkalinity, carbon dioxide, and pH. Turbidity and hydrogen sulfide concentrations were determined as the need arose.

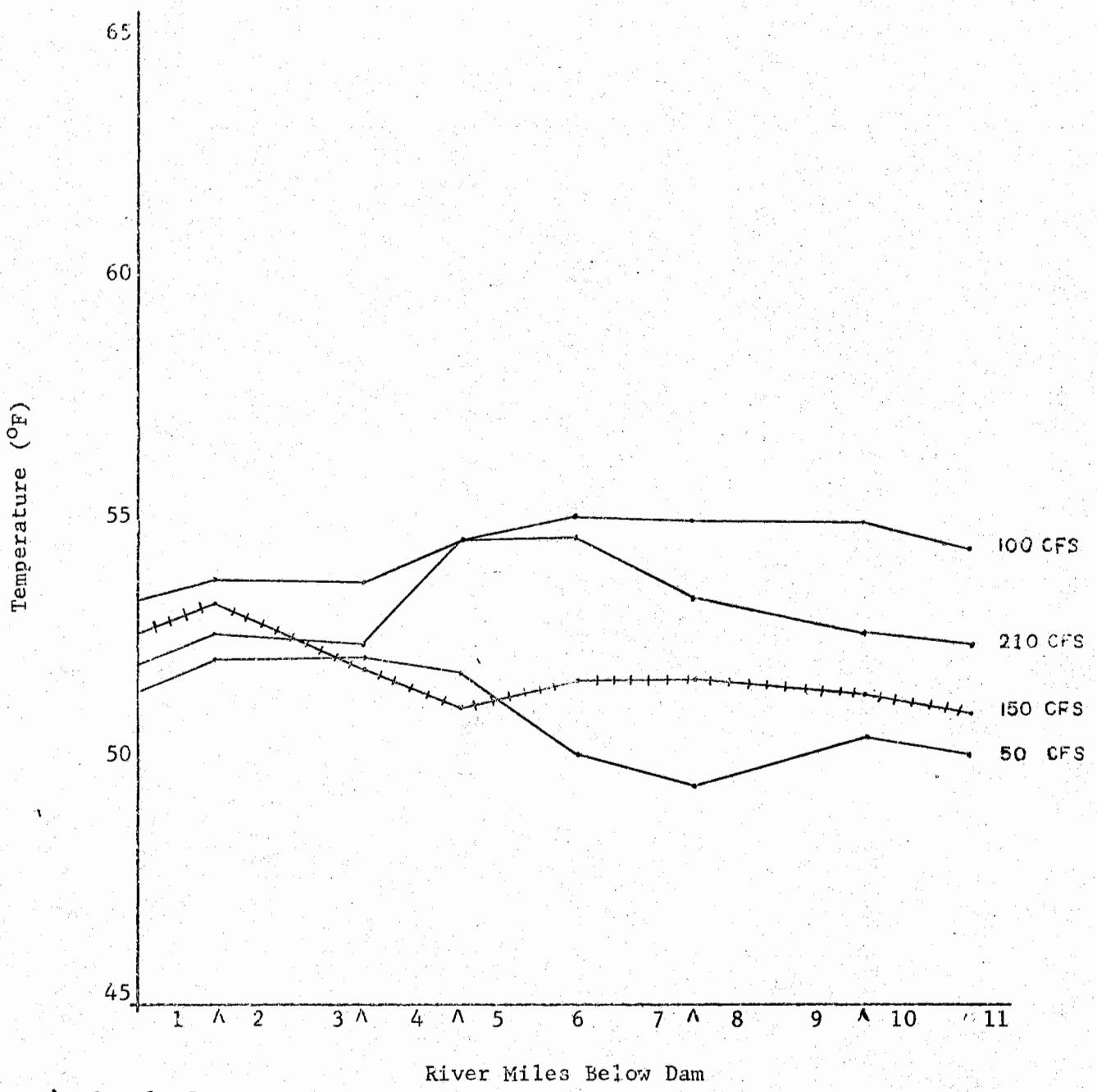
The average temperature by season and flow is illustrated in Figures 4 through 7. These figures portray the seasonal fluctuations of temperatures at low flows as well as the almost stable temperature readings at high flows regardless of atmospheri temperature. An over-all annual average temperature at each station regardless of season or flow is illustrated in Figure 8.

Dissolved oxygen concentrations fluctuated very little throughout the entire trout area. A high of 13.0 ppm was recorded at station Nos. 4, 5, and 6 in mid-April 1967. This occurred when the water release was the highest recorded since impoundment. A low of 7.0 ppm was recorded in mid-May 1967. This occurred just shortly after the release gates had been closed for repair. Normally, dissolved oxygen concentrations ranged from 8.0 to 10.00 ppm.

Figure 5

Winter

December 21 - March 21

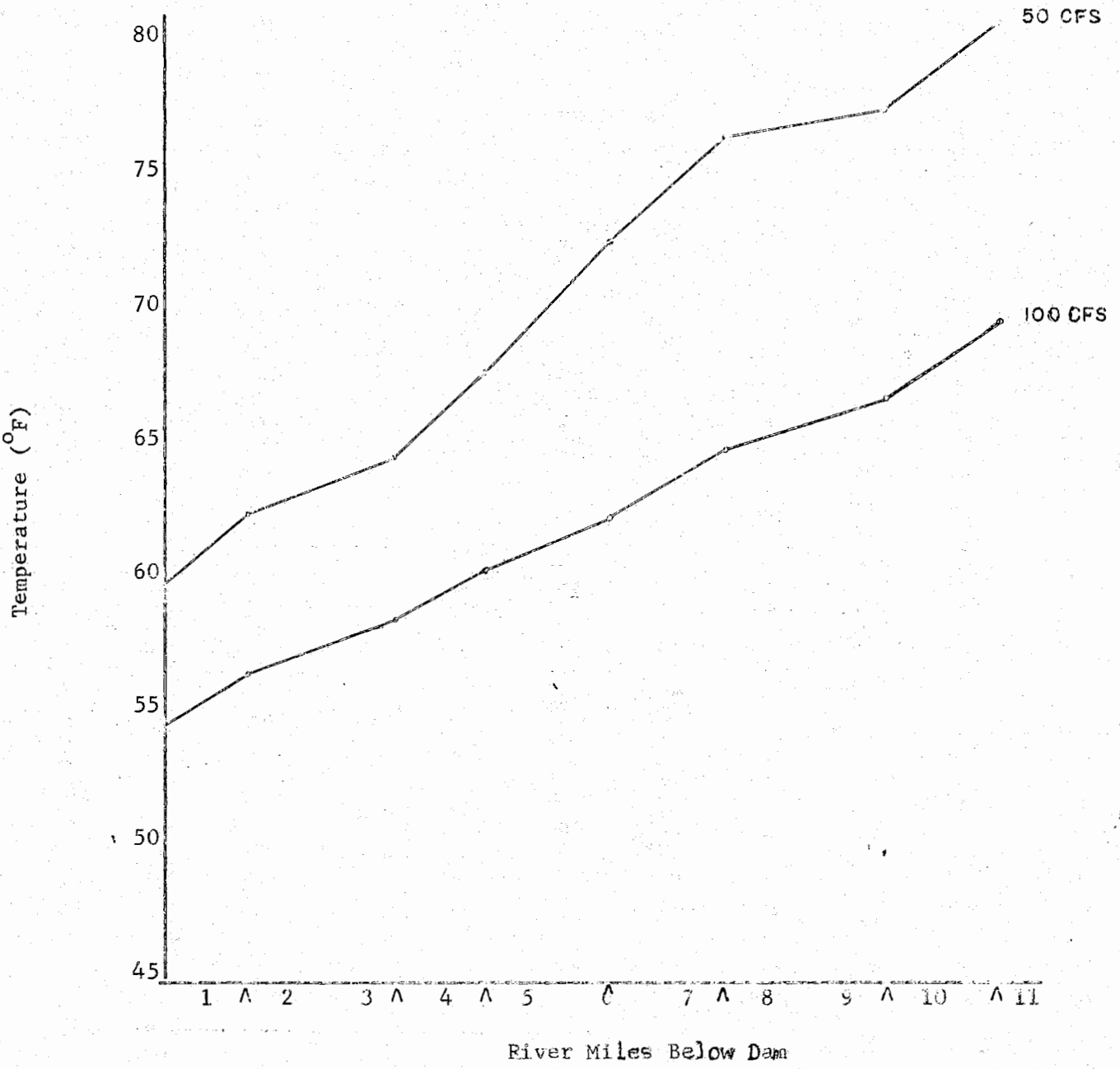


^ - Sample Station

Figure 6

Spring

March 21 - June 21

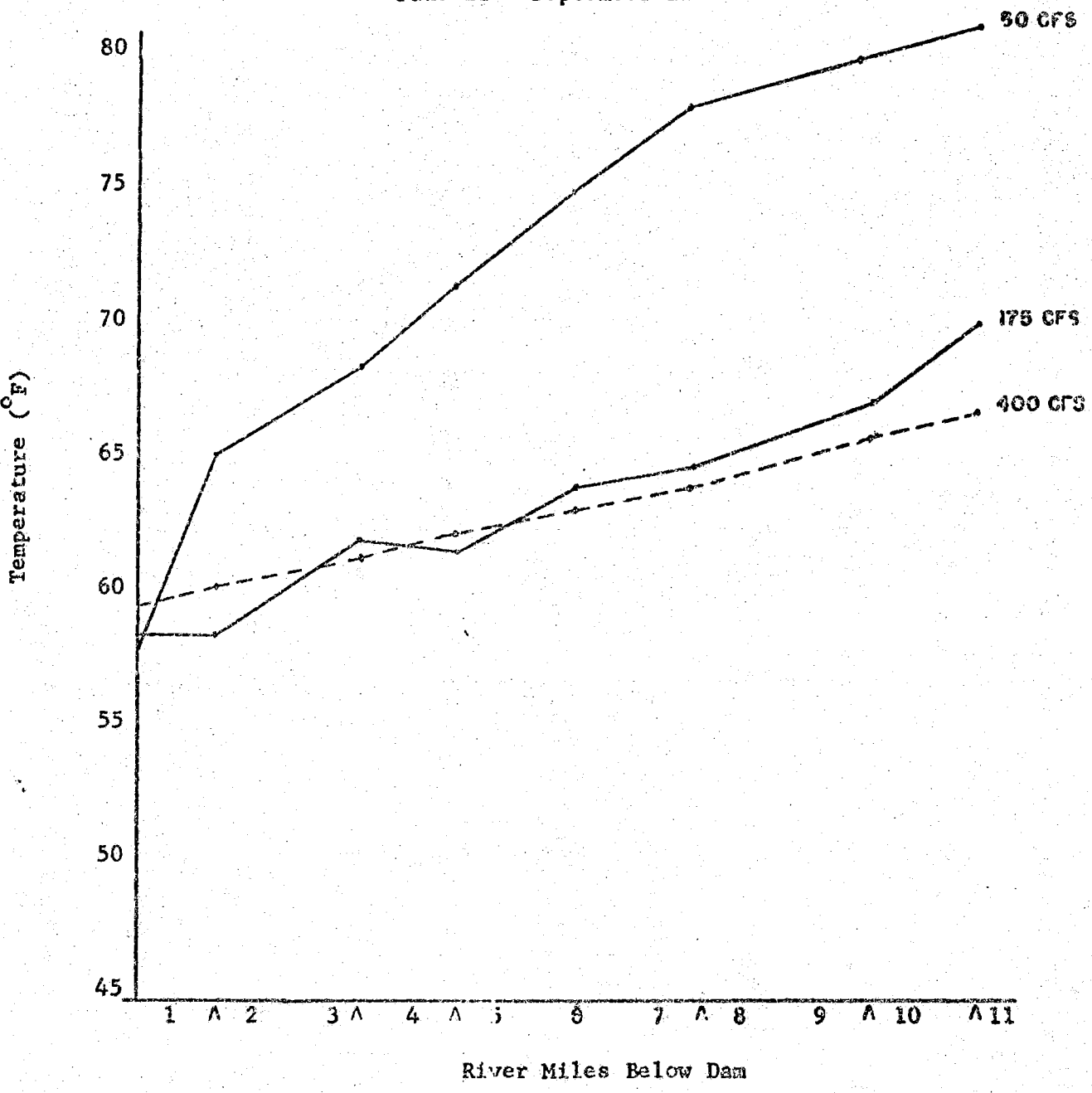


^ - Sample Station

Figure 7

Summer

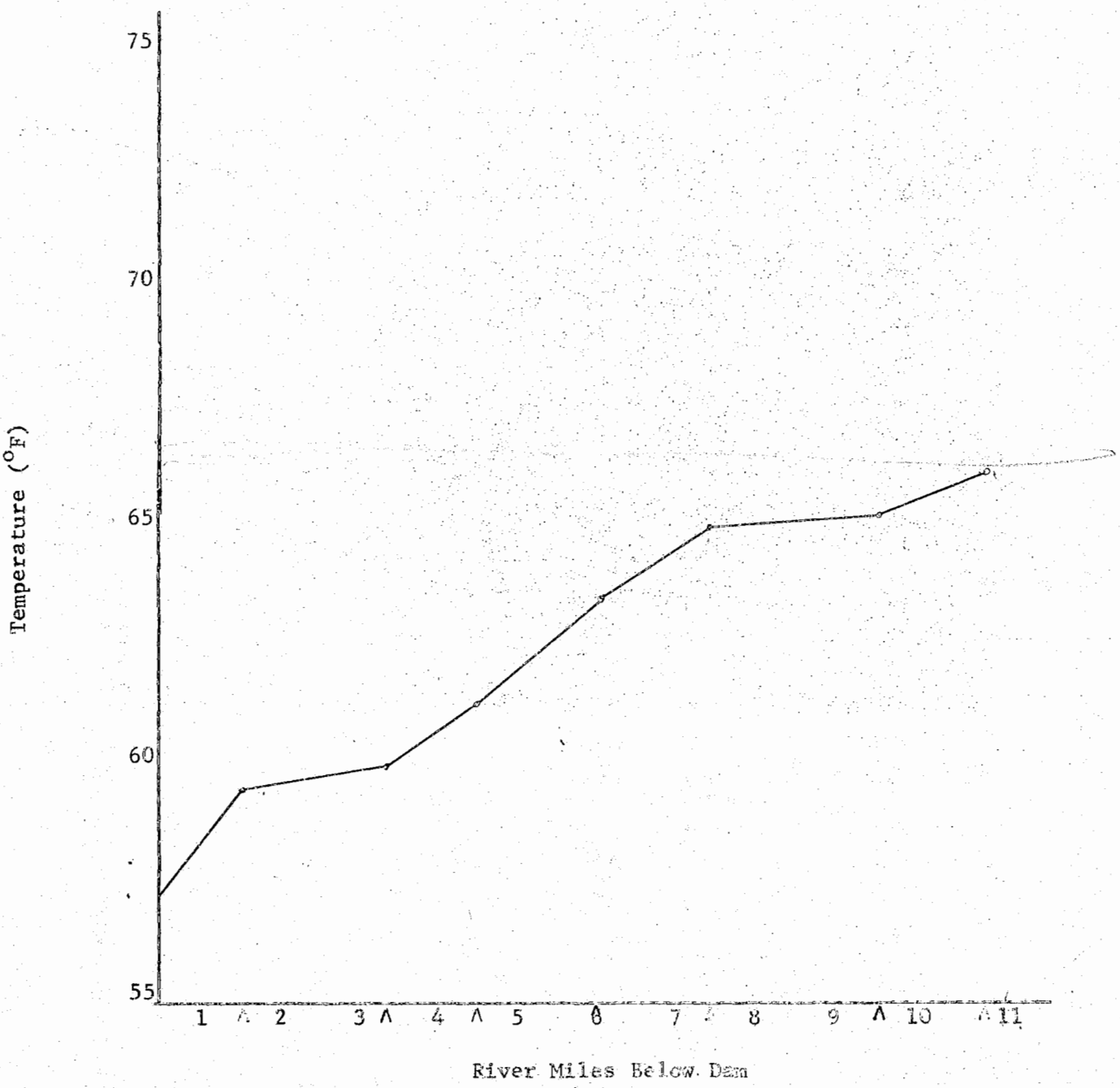
June 21 - September 22



∧- Sample Station

Figure 8

Average Annual Temperature (^{o}F) of Release Waters at all Flows



Λ = Sample Station

Total alkalinity ranged from 171.0 ppm to 222.0 ppm. Rate of water flow or season had little affect.

Carbon dioxide concentrations ranged from 5.0 ppm to 0.00 ppm. The high readings usually occurred at low flows in the long deeper pools. Lower concentrations were recorded as the flow increased. pH ranged from 7.4 to 7.8.

Excessive turbidity was encountered only when heavy rainfall was experienced on the trout area. The gradient of the stream plus the amount of release water eased this situation in a short period of time.

Hydrogen sulfide, in trace amounts, was encountered at station No. 1. This occurred during July and August 1967 after the lake proper had thermally stratified. The concentration of H_2S never exceeded 0.1 ppm.

The water quality studies indicate that the tailrace area will provide suitable trout habitat during most years. There is the possibility of severe droughts occurring periodically which might affect the lower reaches of the present trout fishery, but these conditions can be overcome by alteration of stocking procedures. Temperature of the water would be affected most by a cutback in the releases from Canyon Dam, while dissolved oxygen seems to vary imperceptibly with different releases.

Discussion:

After carefully viewing all aspects of the trout fishery, project personnel were completely satisfied with the results of the program to date. The inexperience of the staff with coldwater fisheries provided many avenues of error, with constant reference to the trout literature available. It is felt that by running the creel census on every weekend rather than alternate weekends, better harvest figures will be attained. Fishermen interest is very high immediately following the stocking, with the fly fishermen enjoying their angling as the trout settle down and become somewhat more difficult to creel. Fishermen access poses a problem in some areas, but the landowners have been very considerate in most cases allowing the fishermen entrance to the river.

With the excellent harvest, available food, and water quality available, the experimental trout fishery is most encouraging.

Recommendations:

Because of the success of the trout fishery to date, it is recommended that this program be continued for another segment.

Prepared by: Richard L. White, Project Leader — Approved by: Marion Toole, Coordinator

Date: November 13, 1968 — FRED G. LOWMAN, Inland Fisheries Supervisor

Table 3

Canyon Tailwater Bottom Samples

Total Number of Animals Per Month

Fauna	May 1967	June 1967	July 1967	Aug. 1967	Sept. 1967	Dec. 1967	Jan. 1968	Feb. 1968	Total
Mayflies Ephemeroptera	758	142	9	155	249	97	20	96	1,526
Segmented roundworms Oligochaeta 1/	16	17	4	7	17	18	23	18	120
Flies Diptera	299	92	3	61	201	540	240	62	1,498
Caddisflies Tricoptera	34	17	175	28	41	57	14	33	339
Beetles & Beetle Larvae Coleoptera	108	221	9	306	96	32	23	19	19
Flatworms Turbellaria	95	95	24	31	250	7	5	8	515
Freshwater mussels Pelecypoda 1/	6	62	119	0	29	35	31	32	314
Snails Gastropoda 1/	76	62	173	71	83	35	34	47	581
Dragonflies and Damselflies Odonata	12	7	6	16	11	1	2	9	64
Stoneflies Plecoptera	51	4	9	6	27	9	0	5	111
Water mites Hydrachnidae 3/	1	0	0	0	0	0	0	0	1
Unsegmented roundworms Nematoda 2/	3	0	0	0	4	1	0	0	8

Table 3 (continued)

Fauna	May 1967	June 1967	July 1967	Aug. 1967	Sept. 1967	Dec. 1967	Jan. 1968	Feb. 1968	Total
Scuds and side-swimmers Amphipoda	7	0	0	0	0	0	1	3	11
Roundworms Annelida 2/	1	0	0	0	0	0	0	0	1
Crayfish Decapoda	5	0	0	0	1	0	0	0	6
Freshwater sponges Spongillidae 3/	1	0	0	0	0	0	0	0	1
Leeches Hirudinea	1	2	0	1	2	1	0	1	8
Dobsonflies Megaloptera	2	0	0	22	2	0	0	0	26
Water striders Hemiptera	0	5	1	0	19	10	0	0	35
Darter Etheostoma sp.	0	0	0	0	0	1	0	0	1
Mollusca eggs	0	2	1	0	1	1	0	0	5
Fish eggs	0	0	0	0	0	14	0	1	15
Total Displacement in Cubic Centemeters	6.13	4.13	4.29	6.19	5.06	3.69	2.22	2.59	5,265

1/ Class
2/ Phylum
3/ Family

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