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FEDERAL AID IN FISHERIES RESTORATION ACT

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Federal Aid Project No. F-4-R-9

FISHERIES INVESTIGATIONS AND SURVEYS OF THE WATERS OF REGION 2-A

Job No. E-8: Evaluation of Rough Fish and Vegetation
Control Work in Region 2-A

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ABSTRACT

A basic survey and inventory indicated the need for control of the threadfin and gizzard shad in Cleburne State Park Lake. This offered an opportunity to evaluate this technique in terms of increase in fishing pressure and pounds of fish taken per man-hour of fishing.

A Creel Census was made for one year prior to the treatment. It was found that, between November 1, 1960 and October 31, 1961, 5,080 fishermen fished 21,341 hours to catch 11,236 fish weighing 5,142 pounds. The evaluation system used has one pound of fish equal one unit and one man-hour of fishing equal one unit. With this system of evaluation the fishing during this period had a value of 26,483 units.

The shad control work was done on November 27, 1961 when the entire 116 acres was treated with 5 per cent emulsifiable rotenone liquid at a concentration of 6.4 ounces per acre foot. A total kill of shad was obtained along with an estimated 25,000 to 30,000 pounds of carp.

The Creel Census was continued after the kill and was completed on October 31, 1962. During this period 2,984 fishermen fished 11,324 hours to catch 2,399 fish weighing 1,718 pounds. By the use of the unit system described above the value of the fishing between November 1, 1961 and October 31, 1962 was 13,042 units. This is a net loss of 13,441 units.

The cost of the rotenone treatment was \$884.83. Therefore, in addition to the cost of the treatment a further loss of 13,441 fishing units was experienced.

It is believed that bad weather following the shad kill had an adverse effect on the fishing pressure and fishing success. This combined with rumors that all the bass had been killed tended to reduce the fishing trips during this period.

A further complication was the rather sudden growth of aquatic vegetation that followed the removal of the carp which tended to keep the detritus agitated to inhibit light penetration. This excess of vegetation eliminated fishing in the shallow water and made fishing in deep water difficult.

JOB COMPLETION REPORT

State of Texas

Project No. F-4-R-9

Job No. E-8

Name: Fisheries Investigations and Surveys of the Waters of Region 2-A

Title: Evaluation of Rough Fish and Vegetation Control Work in Region 2-A

Period covered: November 1, 1961 through October 31, 1962

Objective:

To evaluate presently used fishery management techniques including selective fish control and aquatic vegetation control, by determining the increase in fishing units (one pound of fish equals one unit and one hour of fishing equals one unit) and the cost per unit of increase.

Techniques used:

A basic survey and inventory of fish species was conducted on Cleburne State Park Lake to determine the physical characteristics of the lake and its watershed. Fish collections were made to determine the species present, their physical condition and relative abundance. All fish captured were identified, weighed, measured and examined to determine sexual development, food habits and coefficient of condition. The lengths and weights were used to determine weight curves, to be applied to the fish caught by fishermen, in order that the pounds of fish taken might be determined.

A creel census was conducted on two successive days of each week. One day was a week day and the other a weekend day or holiday. The data collected was kept separate to determine the week day fishing pressure and success as compared with that on weekends or holidays. The items to be considered in this creel census were: fishing pressure, fishing methods, rate of catch, length of fisherman day, source of fishing pressure and total harvest.

Introduction

Findings:

Cleburne State Park Lake is located on a small tributary to the Brazos River about 12 miles Southwest of Cleburne, Johnson County, Texas. This lake is in a rather hilly cedar covered area and was constructed by the Civilian Conservation Corps in 1937. The shoreline is rather irregular and there is no cultivated land in the watershed. The very clear water reaches a maximum depth of 36 feet and maintains an average depth of 13.29 feet. The bottom is composed of limestone and gravel with a shallow layer of silt and detritus except for the shallow areas where the soil layer appears to be fairly thick.

The preliminary net check, made on May 5 and 6, 1960 indicated that there was an excessive population of gizzard and threadfin shad. One gizzard shad was taken that measured 20.5 inches in total length and weighed 5 pounds 9 ounces,

This is believed to be a world record, as the largest specimen of this species previously recorded weighed 3 pounds 7 ounces and was reported from the Ohio River drainage. The presence of the numerous schools of small shad indicated a need for further investigation to determine if a need for control of these species existed.

Netting

A netting program was begun in November 1960 and continued through October 1962. This net sampling showed that the shad population was excessive but the majority were threadfin shad. In addition to the shad there was also an overabundance of small sunfish. Another species in need of control was the carp. A large population of this species was known to inhabit this lake with many specimens in the 10 to 20 pound class.

The dominance of threadfin shad is shown in table 1 where 60.53 per cent of the net catch was made up of this species. Bluegill sunfish provided another 15.43 per cent. Threadfin shad also provided the highest percentage of the total weight with 28.68 per cent followed by carp with 20.95 per cent.

On November 27, 1961 the entire 116 acres of Cleburne State Park Lake was treated with five per cent rotenone liquid at the rate of 6.4 ounces per acre foot of water. A total of 77 gallons of chemical was applied in 1½ hours using two boats equipped with gravity flow drums and one boat with a power spray pump.

There is no way to accurately estimate the number of shad killed as they were picked up for use as trotline bait and many were consumed by birds and animals. One commercial bait dealer picked up 32,500 shad for freezing and later use.

The kill of carp was rather unusual. This species continued to appear at the surface for eight days and an estimated total of 2,500 was taken. These fish weighed from 5 to 20 pounds with the average estimated at 10 pounds. There were no small carp. Carp were picked up as soon as they struggled to the surface and were removed by pickup truck loads to nearby towns for canning by pressure cooker. An estimated 25,000 to 30,000 pounds of carp were removed from the lake.

Net sampling was continued after the rotenone treatment and table 2 shows the results of this netting together with any change in the population resulting from it. The most significant change in the population is the disappearance of shad from the lake. Not one shad has been observed since the rotenone treatment.

Another significant change in the fish population after the treatment was in the average weight of the fish taken by gill nets. With the exception of carp, white crappie and black crappie, all species showed a gain in average weight. The loss of average weight for the carp is due to the kill of many large specimens and the appearance of young of the year carp in the catch for the first time. The number of crappie taken in nets after the treatment was much larger than before the treatment with numerous young of the year crappie taken.

Creel Census

The data presented in table 3 shows that the fishermen checked caught comparatively few fish in November, December, January, February and March during the period preceeding the shad kill. The remaining months produced comparatively high catches with the peak month being July.

An examination of Table 4 shows a rather similar pattern but with a much smaller catch. There is little difference in the number of fish taken in November, May and July following the treatment. A total of 279 fish were caught by the fishermen checked.

Bluegill sunfish led all other species in the catch of the fishermen checked both before and after the selective kill but the positions of the other species are changed. Redear sunfish were second in number before the treatment followed by largemouth bass, white crappie and warmouth in that order. After the selective treatment white crappie proved to be the second most numerous species followed by channel catfish, and largemouth bass with redear sunfish and bullhead catfish next in abundance.

The data included in Table 5 presents the total weight of each species in the catch of the fishermen checked prior to the application of rotenone. Largemouth bass provided the greatest number of pounds despite the fact that they were outnumbered by both redear and bluefill sunfish. Bluegill sunfish, redear sunfish and white crappie follow in that order.

The data recorded in Table 6 gives the weight of each species taken by the fishermen checked during the year following the rough fish control work. The results vary somewhat from those of the previous year. Largemouth bass provided 33.35 pounds but were surpassed by both channel catfish and white crappie with 59.38 and 47.58 pounds respectively. The greatest drop in pounds of fish taken was noted in the redear sunfish. This species provided 187.99 pounds prior to the lake treatment but dropped to 6.62 pounds in the succeeding period.

Data collected on weekdays was recorded separately from that collected on weekend days or holidays in order that any variation due to the day of the week could be considered. These data concerning the creel census during the year prior to the selective treatment are presented in Table 7 and indicate little difference except for heavier fishing pressure on weekends. This was also true after the treatment but to a smaller degree, (Table 8). The weekend fishermen fished a longer day before the treatment than did the week day fisherman but this trend was reversed after the treatment. The average fisherman day during the 1960-1961 creel census was 4.20 hours with weekday fishermen fishing 4.19 hours per day. The 1961-1962 creel census showed an average fisherman day of 3.79 hours with weekday fishermen accounting for 4.48 hours. This indicates that the serious fisherman fished on weekdays while the casual fisherman visited the lake on weekends. This trend is further emphasized by a comparison of the catch in numbers of fishermen, number of fish and pounds of fish taken by fishermen before and after the treatment.

The 1960-1961 census shows that weekend fishermen provided 74.38 per cent of the fishermen checked, fished 74.45 per cent of total hours, and took 75.59 per cent of the total pounds. The 1961-1962 census presents a slightly reduced trend toward the weekend fisherman as 68.30 per cent of the fishermen fished 62.57 per cent of the hours but caught only 42.87 per cent of the total pounds. The fish per man-hour and pounds per man-hour show little variation between the weekday fisherman and the weekend fisherman in the results of the 1960-1961 census. The weekday fisherman caught decidedly more fish per man-hour and more than double the pounds per man hour taken by his weekend counterpart.

In both segments of this creel census the boat fisherman far outnumber the bank fishermen and still fishermen number many more than those using all other methods combined. The trotline fishermen were most numerous on weekdays during the 1961-1962 creel census but other methods showed a tendency toward weekend fishing. The weekend fisherman made up the greater percentage of those using all methods during the 1960-1961 census.

The total number of fishermen using Cleburne State Park Lake is a matter of record. Fishermen are required to obtain a permit before beginning to fish. A total of 5,080 permits were issued between November 1, 1960 and October 31, 1961. Therefore the 1,011 fishermen interviewed represent 19.9 per cent of the total fishermen during the segment. The data from the creel census preceeding the shad kill was expanded to give the total fishing pressure and fishing success by use of this known percentage. The same method was used in connection with the data obtained after the treatment when the 347 fishermen contacted represented 11.63 per cent of the 2,984 permits sold. By application of the known percentage figures to those obtained by contacting the fishermen on the creel census days, and checking his catch, fishing time and fishing methods, the data concerning yield per unit of effort were calculated. In the 1960-1961 census, 5,080 fishermen fished 21,341 hours to catch 11,236 fish weighing 5,142.06 pounds. The catch per man-hour was 0.52 fish weighing 0.24 pounds, (Table 7). The results of the 1961-1962 creel census shows that 2,984 fishermen fished 11,324 hours to catch 2,399 fish weighing 1,718.23 pounds. This is 0.21 fish weighing 0.15 pounds per man-hour fishing, (Table 8).

The source of fishing pressure was largely local during the entire creel census but the number of tourists who fished the lake represented a greater percentage of the fishermen during the second segment. The majority of the fishermen lived within 50 miles of the lake with few coming as much as 100 miles.

The weather during the early Spring was not conducive to good fishing as almost all weekends were windy or cold. This limited the fishing activity and reduced the catch of those who braved the elements. High winds were a limiting factor throughout the summer and greatly reduced the number of persons fishing as well as the catch of those who fished regardless of the weather. Persistent rumors that all the bass and sunfish were killed continued to cause many fishermen to go to other lakes when one fishing trip to Cleburne State Park failed to produce.

A contributing factor to the reduction of the sunfish catch is the decimation of the carp population. Before the chemical treatment the many large carp kept the detritus on the bottom agitated to the point where vegetation growth was not excessive. The removal of the carp allowed the clearing of the water to a degree that permitted light penetration to the bottom in the deeper portions of the lake. This encouraged vegetation growth to the extent that fishing on the bottom was difficult in the deeper areas and was almost impossible in most of the water less than six feet deep.

The system of evaluation used has one pound of fish equal one unit and one man-hour of fishing equal one unit. By this system the unit value of the fishing in Cleburne State Park Lake from November 1, 1960 through October 31, 1961 was 26,483.14 units. By applying the same system to the 1961-1962 data the unit value of fishing for this period was 13,042.23 units. This is a net loss of 13,440.91 units.

The cost of the rotenone treatment of this lake was \$884.83. Therefore, in addition to the cost of the treatment a further loss of 13,440.91 units was experienced.

The above results, if they can be accepted literally tend to indicate that such selective control is a total loss and should not be attempted. This is not entirely correct. There are many extenuating circumstances that must be considered before an accurate evaluation is possible. Adverse weather, misinformation, good fishermen breaking Cleburne State Park Lake fishing habit, and excessive vegetation are among the circumstances.

It is believed that the results of this evaluation may give a somewhat exaggerated picture but in general the picture is true. Selective shad kills do not appear to be successful unless the entire shad population is removed and in order to accomplish this the concentration of rotenone must be high. A high concentration of rotenone will eliminate numerous other fish and, as in the present treatment, a species may be decimated that is performing a useful task although it may be a rough fish species. The alternative to selective control is removal of the entire population and restocking with desirable species.

Prepared by: Leonard D. Lamb
Project Leader

Date: February 14, 1963

Approved by: Marion Toole
Coordinator

John E. Tilton
Regional Supervisor

Table No. 1. The results of Gill Net Collections from Cleburne State Park Lake, November 1, 1960 - October 31, 1961.

Species	Total Number	Per Cent of Total	Total Weight (Lbs.)	Per Cent of Weight	Average Length (mm)	Average Weight (gms)	Number Per		Average
							100 Feet of Net	100 Feet of Net	
									"K" Average
Gizzard shad	3	.30	1.81	.67	223	275	.04	.02	2.03
Threadfin shad	620	60.53	76.70	28.68	140	56	9.93	1.23	2.01
River carpsucker	3	.30	10.80	4.04	421	1635	.04	.17	2.82
Spotted sucker	2	.19	4.93	1.85	360	1120	.03	.08	2.80
Carp	7	.69	56.02	20.95	530	3633	.12	.90	2.37
Channel catfish	4	.39	.59	.22	176	68	.06	.01	1.20
Black bullhead	1	.10	.53	.19	220	245	.02	.01	2.30
Yellow bullhead	25	2.44	11.43	4.28	205	207	.40	.18	2.16
Largemouth bass	28	2.73	28.93	10.82	245	469	.44	.46	2.20
Warmouth	34	3.32	11.44	4.28	153	152	.55	.19	3.71
Green sunfish	5	.49	1.46	.54	149	133	.08	.02	3.68
Redear sunfish	89	8.69	24.50	9.16	152	124	1.42	.39	3.38
Bluegill sunfish	158	15.43	30.42	11.38	124	87	2.53	.49	3.90
Longear sunfish	33	3.22	2.82	1.05	106	38	.53	.04	4.31
White crappie	4	.39	1.94	.73	190	220	.06	.03	2.52
Black crappie	8	.79	3.09	1.16	273	175	.13	.05	2.81
Totals	1,024	100.00	267.41	100.00			16.38	4.27	

Table No. 2 The Results of Gill Net Collections from Cleburne State Park Lake, November 1, 1961 - October 31, 1962.

Species	Total Number	Per Cent of Number	Total Weight (Lbs)	Per Cent of Weight	Average Length (mm)	Average Weight (gms)	Number Per 100 Feet of Net	Pounds Per 100 Feet of Net	"K" Average
River carpsucker	6	1.52	40.99	16.35	463	3104	0.09	0.64	3.14
Carp	34	8.65	36.42	14.53	241	485	0.53	0.56	2.94
Channel catfish	29	7.38	33.19	13.24	284	410	0.45	0.52	1.68
Black bullhead	21	5.35	21.95	8.75	256	453	0.33	0.35	2.71
Yellow bullhead	7	1.78	4.09	1.63	220	265	0.11	0.06	2.38
Largemouth bass	7	1.78	12.83	5.12	297	503	0.11	0.20	2.17
Warmouth	21	5.34	8.17	3.26	162	168	0.33	0.13	3.50
Green sunfish	9	2.29	1.94	.78	157	177	0.14	0.03	3.30
Redear sunfish	27	6.87	10.60	4.23	171	174	0.42	0.16	3.43
Bluegill sunfish	178	45.28	54.47	21.72	129	122	2.78	0.86	4.29
Longear sunfish	3	.77	.52	.21	116	79	0.05	0.01	4.30
White crappie	28	7.12	12.29	4.91	188	183	0.44	0.20	2.73
Black crappie	23	5.87	13.21	5.27	194	217	0.36	0.20	2.69
Total	393	100.00	250.67	100.00			6.14	3.92	

Table No. 3 Number of Each Species Taken from Cleburne State Park Lake by the Fishermen checked During the Creel Census, November 1, 1960 through October 31, 1961.

Species	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Total
Carp								2					2
Channel catfish							1	8	2	3		5	19
Bullhead catfish						2	4	8	28	2	2		46
Largemouth bass	33		8		13	41	49	36	33	90	71	82	456
Warmouth					2	6	14	1	7	1			31
Green sunfish								12	2				14
Redear sunfish						91	89	118	153	58	35	19	563
Bluegill sunfish	2				1	88	172	204	313	60	47	37	924
Longear sunfish						10	1	9		1		1	22
Crappie	2			1	8	9	3		5	14	7	110	159
Total	37		8	1	24	247	333	398	543	229	162	254	2,236

Table No. 4 Number of each species taken from Cleburne State Park Lake by the Fishermen checked during the Creel Census, November 1, 1961 through October 31, 1962

Species	Nov.	Dec.	Jan.	Feb.	March	Apr.	May	June	July	Aug.	Sept.	Oct.	Totals
Carp					1					1	1		3
Channel catfish						4	1	4	11		4	18	42
Bullhead catfish	1			4	1	3	1	2			2	3	17
Largemouth bass	15			1		4	2				5	11	38
Warmouth	2							3	2				7
Green sunfish							1			1			2
Redear sunfish	1						7	5	1	1		2	17
Bluegill sunfish	2						38	8	29	5	2		84
Longear sunfish	1												1
Crappie	24			2		8	1		16	15		2	68
Totals	46			7	2	19	51	22	59	23	14	36	279

Table No. 5. Weight, in Pounds, of Each Species Taken from Cleburne State Park Lake by Fishermen Checked During Creel Census, November 1, 1960 through October 31, 1961.

Species	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Total
Carp								1.00					1.00
Channel catfish							.30	5.20	1.30	1.83		3.48	12.11
Bullheads						2.04	6.03	8.80	32.85	2.74	4.99		57.45
Largemouth bass	22.66		16.29		9.71	32.15	41.93	40.35	26.95	111.92	75.67	55.89	433.52
Warmouth					.73	2.93	5.92	.10	2.05	.29			12.02
Green sunfish								4.80	.68				5.48
Redear sunfish						35.55	28.72	49.31	46.65	14.77	8.47	4.52	187.99
Bluegill sunfish	.40				.34	29.25	41.30	46.14	76.58	11.56	10.99	9.84	226.40
Longear sunfish							.07	1.10		.09		.09	5.00
Crappie	1.14			1.22	15.53	7.20	1.45		2.84	5.92	1.37	50.58	87.25
Totals	24.20	--	16.29	1.22	26.31	112.77	125.72	156.80	189.90	149.12	101.49	124.40	1,028.22

Table 6. Weight in Pounds, of Each Species Taken from Cleburne State Park Lake by the Fishermen Checked During the Creel Census, November 1, 1961 through October 31, 1962

Species	Nov.	Dec.	Jan.	Feb.	March	Apr.	May	June	July	Aug.	Sept.	Oct.	Totals
Carp					3.06					1.25	1.50		5.81
Channel catfish						4.99	1.25	3.60	14.32		8.68	26.54	59.38
Bullhead catfish	1.12			3.65	1.50	3.11	2.00	2.06			2.61	4.42	20.47
Largemouth bass	13.57			.34		4.31	7.93				.87	6.33	33.35
Warmouth	.48							1.57	.68				2.73
Green sunfish							.43			.23			.66
Redear sunfish	.28						2.36	1.52	.87	.34		1.25	6.62
Bluegill sunfish	.43						10.42	2.16	8.13	1.23	.70		23.07
Longear sunfish	.16												.16
Crappie	10.66			2.15			1.31		16.35	11.35		2.59	47.58
Total	26.70			6.14	4.56	15.58	25.70	10.91	40.35	14.40	14.36	41.13	199.83

Table No. 7. A Comparison of Weekdays and Weekend days fishing in Terms of Percentages, together with Calculated Fishing Results Based on the 1960-1961 Creel Census, Cleburne State Park Lake, November 1, 1960 to October 31, 1961

	ACTUAL DATA FROM CREEL CENSUS						CALCULATED* TOTAL
	WEEKDAYS		WEEKEND DAYS		TOTAL	PER CENT	
	NUMBER	PER CENT	NUMBER	PER CENT			
Total Fishermen	259.00	25.62	752.00	74.38	1,011.00	5,080.00*	
Hours fished	1,085.00	25.55	3,162.00	74.45	4,241.00	21,341.00	
Hours in fisherman day	4.19		4.20		4.20	4.20	
Number of fish caught	537.00	24.02	1,699.00	75.89	2,236.00	11,236.00	
Fish per man-hour	0.49		0.53		0.52	0.52	
Pounds of fish caught	271.00	26.52	751.87	73.48	1,023.00	5,142.06	
Pounds per man-hour	0.25		0.23		0.24	0.24	
No. Persons boat fishing	214.00	24.19	671.00	75.81	885.00	4,447.00	
No. Persons bank fishing	45.00	35.72	81.00	64.28	126.00	633.00	
No. Persons casting	50.00	25.13	149.00	74.87	199.00	1,001.00	
No. Persons still fishing	195.00	27.13	524.00	72.87	719.00	3,612.00	
No. Persons trolling	7.00	10.45	60.00	89.55	67.00	335.00	
No. Persons trotlining	7.00	26.93	19.00	73.07	26.00	132.00	

* The fishermen checked during the creel census represented 19.9 per cent of the total number of fishermen using the lake. The total number of fishermen is taken from State Park records.

Table No. 8. A Comparison of Weekdays and Weekend Days in Terms of Percentages, Together with Calculated fishing Results based on the 1961-1962 Creel Census, Cleburne State Park Lake, November 1, 1961 to October 31, 1962.

	ACTUAL DATA FROM CREEL CENSUS						CALCULATED*TOTAL
	WEEKDAYS		WEEKEND DAYS		TOTAL	PER CENT	
	NUMBER	PER CENT	NUMBER	PER CENT			
Total Fishermen	110.00	31.70	237.00	68.30	347.00	2,984.00*	
Hours fished	493.00	37.43	824.00	62.57	1,317.00	11,324.00	
Hours in fisherman day	4.48		3.48		3.79	3.79	
Number of fish caught	113.00	40.50	166.00	59.50	279.00	2,399.00	
Fish per man-hour	0.23		0.20		0.21	0.21	
Pounds of fish caught	114.16	57.13	85.67	42.87	199.83	1,718.23	
Pounds per man-hour	.23		.10		0.15	0.15	
No. Persons boat fishing	106.00	32.51	220.00	67.49	326.00	2,803.00	
No. Persons bank fishing	4.00	19.05	17.00	80.95	21.00	181.00	
No. Persons still fishing	84.00	31.46	183.00	68.54	267.00	2,296.00	
No. Persons casting	11.00	24.44	34.00	75.56	45.00	387.00	
No. Persons trolling	4.00	25.00	12.00	75.00	16.00	138.00	
No. Persons trotlining	11.00	57.89	8.00	42.11	19.00	163.00	

* The fishermen checked during the creel census represented 11.63 per cent of the total number of fishermen using the lake. The total number of fishermen is actual data taken from State Park records.

