JOB COMPLETION REPORT

As required by

FEDERAL AID IN FISHERIES RESTORATION ACT

TEXAS

Federal Aid Project No. F-7-R-12

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

Job No. B-18 Fisheries Reconnaissance

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ABSTRACT

Region I-A1

Reconnaissance surveys were conducted on 8 lakes and 1 river system during this segment. Fish samples, which were collected with seines and standardized gill nets, provided data concerning species composition, physical conditions, food habits, spawning success, parasites and diseases.

Habitat features were noted and in some instances were correlated with population data.

Utilization and fisherman harvest data were limited to lake concessionaire's reports and spot check creel census. This limited data did not show total utilization and harvest but did provide a general idea of the overall fishing success in each lake.

Current and past reconnaissance data are discussed and population trends noted. Management recommendations primarily concerning stocking or rehabilitation are given.

Region I-A2

Reconnaissance surveys were conducted on 19 lakes and 3 river systems in Region 1-A2 this segment.

Examination of data from these surveys revealed that Lakes Aspermont, Crowell City, Stamford and New Anson have excessive rough fish populations and need management.

Lakes J. B. Thomas and Fort Phantom Hill have acceptable fish populations but should be checked to determine if supplemental stocking is necessary.

There is no need for surveying Lakes Abernathy, Old Anson, League Davis, New Hamlin, Old Hamlin, Maxey Park, or McKenzie State Park Lake next segment.

League Davis Lake has a decimated fish population as a result of insecticide pollution from surrounding cotton fields operated by the lake owners.

The Hamlin lakes are very saline and have few fish of any species. Both lakes need management but a study of the lakes problems should precede management.

Old Anson City Lake needs additional fishing pressure.

Justiceburg Lake had a suitable fish population but now it is almost dry and may need salvage work done early in 1965. The lake will need stocking when it refills.

K. N. Clapp Lake was drained and salvage work was done this segment. The lake is being reshaped and landscaped and will need stocking when it refills.

Reese Air Force Base Lake has no fish population. Extensive management is recommended prior to restocking.

Benjamin City Lake was treated and restocked. The survey was made after treatment and undesirable fish were present. This lake should be surveyed in 1965 to determine progress of the stocked fish.

South Lake at Post was renovated and restocked and may need additional management next segment.

White River Reservoir needs more water in its basin. The newly renovated lake was stocked with sufficient fish to populate the lake when full. The expected raise in water level has not come and the fish are showing evidence of crowding and stunting.

The Pease, Brazos, and Wichita River systems in Region 1-A2 produced almost no utilizable fish and it is recommended that they not be surveyed in the future.

JOB COMPLETION REPORT

State of Texas

Project No. F-7-R-12 Name: Fisheries Investigations and Surveys of the Waters of Region I-A

Job No. B-18 Title: Fisheries Reconnaissance (Fisheries Region I-A1)

Period Covered January 1, 1964 - December 31, 1964

Objectives:

To collect representative samples of fish populations from waters where data are needed to determine changes in the balance of species and changes in the conditions of individual species.

To determine basic ecological conditions where not available from previous surveys, or major changes in ecological conditions having important effects on the fish population.

To determine utilization and fish harvest of each concerned water area.

To determine if management, development, or stocking programs are needed, and to recommend such programs as are necessary to improve the fishery.

Techniques Used:

Standard survey gill nets were usually used to sample populations of larger species, but in some cases 100-foot or 300-foot 1/2-inch mesh seines were used to supplement netting samples. Small mesh minnow seines were used to sample stream populations and populations of minnows and other smaller fishes in impoundments. Netting and seining data were tabulated to show the balance of species in terms of percentage composition by number and weight. Average weights and "K" factors were computed for each species to show size and condition. Gonadal development, parasites, and pathological conditions were noted from representative samples of each species which were weighed, measured, and examined in the field. Forage fish samples and predaceous fish stomachs were preserved and processed later in the laboratory.

Physical data recorded during each survey included air temperatures, water temperatures, weather conditions, and turbidity. Notation was made of significant changes in ecological conditions such as water level, vegetation, cover, and plankton abundance.

Determination of utilization and fish harvest was limited to spot-check of creels and information provided by lake concessionaires.

Current and past survey data provided the basis for management recommendations.

Findings:

Reconnaissance data, discussion of specific problems, and recommendations are presented for each lake or stream surveyed. Data for each of the concerned waters in Region I-A1 are presented in the following order: Lake Baylor, Buffalo Lake, Canadian River, Lake Childress, Lake Fryer, Lake McClellan, Lake Pauline, Rita Blanca Lake and Tule Lake. No data were gathered on the Red and Pease Rivers due to a combination of problems including drought, inaccessibility and a shortage or project personnel time.

Lake Baylor

Surveys at Lake Baylor were made in mid-May and early November during this segment. Carp, hybrid carp and black bullheads were the only undesirable species taken, but totaled 77.70 per cent and 69.88 per cent of the total number of fish netted in May and November respectively. The bullhead remained the dominant species taken, averaging 49.66 per cent for the two surveys combined. The channel catfish was the dominant game species taken on both surveys. Tables 1 and 2 give percentage composition by number, weight and average weight of species.

Table 1 Percentage Composition by Number, Weight and Average Weight of Fish Taken from Lake Baylor, May 13, 1964.

Species	Number	Per Cent by Number	Total Weight	Per Cent by Weight	Average Weight
Carp	62	21.60	270.07	69.89	4.36
Carp-goldfish hybrid	2	0.69	6.49	1.68	3.25
Channel catfish	54	18.82	45.67	11.82	0.85
Black bullhead	159	55.40	48.27	12.49	0.30
Flathead catfish	2	0.70	3.64	0.94	1.82
Largemouth bass	1	0.35	8.47	2.19	8.47
White bass	2	0.69	3.26	0.85	1.63
Green sunfish	1	0.35	0.13	0.03	0.13
Orangespotted sunfish	1	0.35	0.09	0.02	0.09
White crappie	3	1.05	0.31	0.09	0.10
Total	287	100.00	386.40	100.00	
Game Fish	64	22.30	61.57	15.93	0.96
Rough Fish	223	77.70	324.83	84.07	1.46

Reconnaissance surveys have been made at Lake Baylor each year since 1961. Table 3, which gives a 4-year history of the fish population as determined from gill netting, shows a significant increase in percentage of game species for 1963. Whether or not this was an actual increase due to recruitment is not known. The 40 per cent decrease in bullheads is believed to be due to predation on the 1962 spawn.

Table 2 Percentage Composition by Number, Weight and Average Weight of Fish Taken from Lake Baylor, November 4, 1964.

	Number	Per Cent by Number	Weight	Per Cent by Weight	Average Weight
Carp	49	29.51	116.62	65.92	2.38
Carp-goldfish hybrid	1	0.61	3.04	1.72	3.04
Channel catfish	20	12.04	15.40	8.71	0.77
Black bullhead	66	39.76	16.62	9.39	0.25
Flathead catfish	2	1.21	9.07	5.13	4.54
Largemouth bass	2	1.20	4.72	2.67	2.36
White bass	16	9.64	9.97	5.64	0.62
Longear sunfish	4	2.41	0.33	0.18	0.08
Bluegill	2	1.21	0.14	0.08	0.07
White crappie	4	2.41	0.98	0.56	0.25
Total	166	100.00	176.89	100.00	
Game Fish	50	30.12	40.61	22.96	0.81
Rough Fish	116	69.88	136.28	77.04	1.17

Table 3 Percentage Composition of Netting Samples Taken from Lake Baylor, 1961 - 1964.

Species	1961	1962	1963	1964
Carp	14.09	3.54	28.00	24.50
Carp-goldfish hybrid	0.00	0.00	0.92	0.66
Channel catfish	12.75	12.77	18.15	16.34
Black bullhead	67.11	78.02	39.69	49.66
Flathead catfish	0.00	0.00	0.62	0.89
White bass	2.02	3.55	5.85	3.97
Largemouth bass	0.00	0.70	0.61	0.66
Green sunfish	0.67	0.00	0.00	0.22
Longear sunfish	0.00	0.00	0.92	0.89
Bluegill	0.67	0.71	0.31	0.44
Orangespotted sunfish	0.00	0.71	0.00	0.22
White crappie	2.69	0.00	4.93	1.55
Game Fish	18.80	18.44	31.39	25.18
Rough Fish	81.20	81.56	68.61	74.82

Lake Baylor is extremely clear and for this reason the sight-feeding white bass and Centrarchids are not represented in netting samples in true proportion. The success of bass fishermen indicates that bass are more abundant than are shown by netting data. Small forage fishes are noticeably lacking in Lake Baylor; therefore, it is reasonable that small bullheads would be heavily preyed upon. Flathead catfish fingerlings (375) stocked in 1962 may have contributed to the reduction of the 1962 year-class of bullheads.

Figure 1 illustrates the results of netting surveys from 1961 to 1964 in terms of yearly changes in the per cent of families of fishes taken by netting. Ameiuridae is divided, with the undesirable bullhead shown separately from

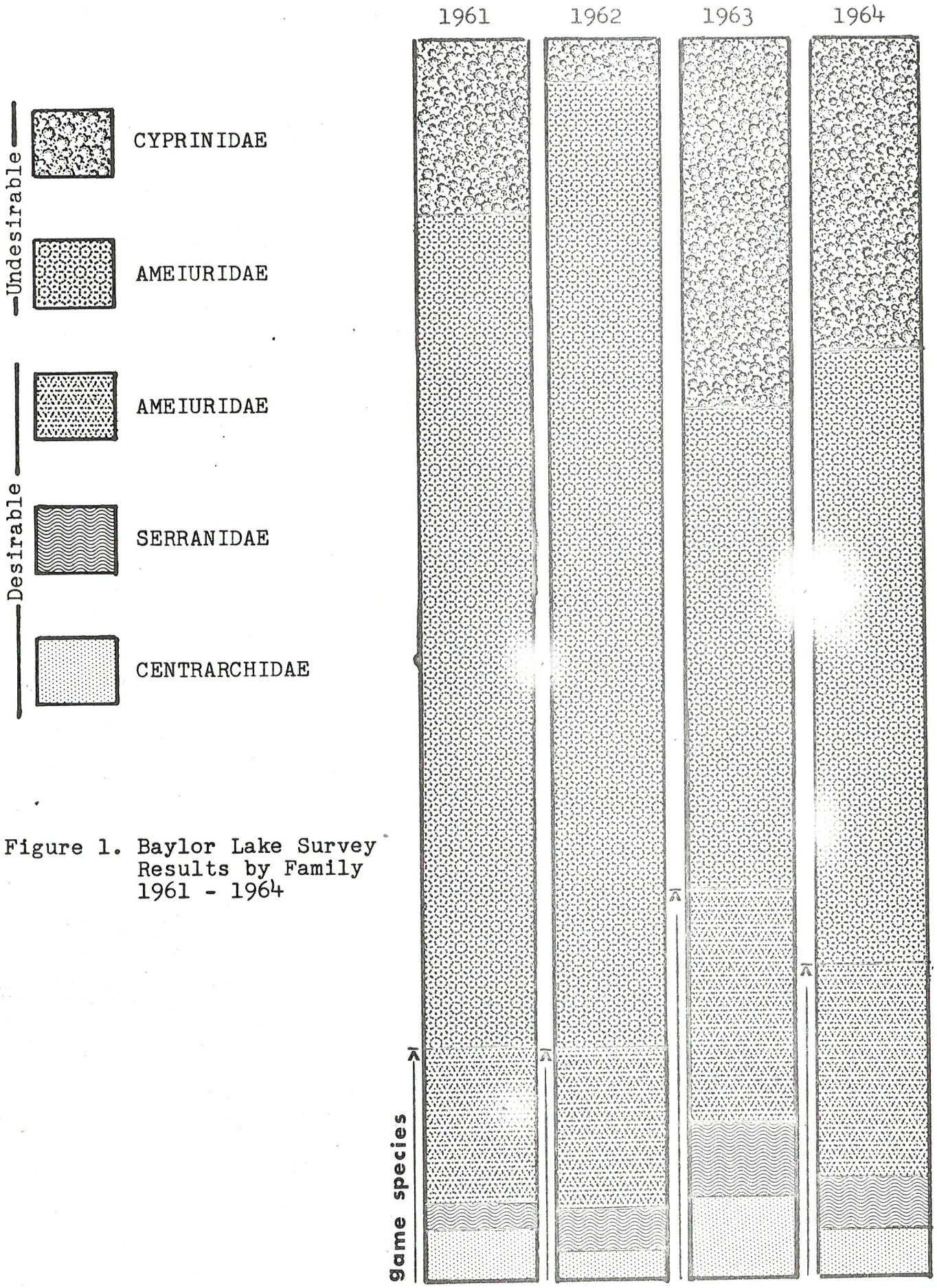

Figure 1. Baylor Lake Survey Results by Family 1961 - 1964

channel catfish and flathead catfish. While this lake has clear water and for other reasons should be ideal for bluegill propagation, they have not increased. It is therefore assumed they are heavily preyed upon by white and largemouth bass.

Seine sample data from 1961 to 1964 are listed in Table 4. Important Cyprinids included the red shiner and the bullhead minnow. Both species significantly increased in the past 2 years. The black bullhead catfish was common in some seine samples but rare or absent in others. The channel catfish was absent or rare in all samples. The family Cyprinodontidae is represented by a single species, the plains killifish. This species is abundant in brackish or salty water of local rivers but is rare in Lake Baylor. The mosquitofish was sometimes locally abundant in the shallows of the lake but has not been an important forage species in this lake because of limited shallow-water habitat. Six Centrarchids have been recorded in Lake Baylor but only three are important. The predaceous largemouth bass and green sunfish were both seasonally abundant in seine samples as was the bluegill. Green sunfish probably are detrimental in Lake Baylor because they compete with largemouth bass for small forage fish. They seldom attain a size greater than 5 inches and thus contribute little to the creel. Their value as a forage species in questionable.

Table 4 Seine Sample Results, Lake Baylor 1961 - 1964 (20-foot one-eighth inch mesh)

Species	June 1961	May 1962	June 1963	Oct. 1963	May 1964	Nov. 1964
CYPRINIDAE						
Golden shiner		2				
Red shiner	1	2	6	406	30	1224
Ghost shiner			2			
Plains minnow			117		1	
Bullhead minnow			5	15		193
Fathead minnow		47				6
AMEIURIDAE						
Channel catfish					1	
Black bullhead		104	1		23	
CYPRINODONTIDAE						
Plains killifish	1			7		2
POECILIDAE						
Mosquitofish		1	1	353		
CENTRARCHIDAE						
Largemouth bass	148		33	5		
Green sunfish	7	202	1	32	2	
Spotted sunfish	4					
Bluegill	1	78	10	80	2	
Orangespotted sunfish		6		7		
Longear sunfish			9			
Sunfish sp.						23
Total	162	442	185	905	59	1448

Reasons for the limited production of forage in Lake Baylor includes such factors as limited shallow areas, limited cover, clear water, heavy predation and decreasing water level. During this segment the lake level dropped below elevation 1985 (less than 130 surface acres) and virtually no marginal cover existed throughout the entire summer and fall. The November seine sample indicates little or no reproduction by species other than the red shiner and the bullhead minnow.

Extensive exposed areas of the lake bed have grown up in smartweed and grasses. When the lake level rises these areas will be flooded and conditions will be better for spawning and survival of forage species.

Figure 2 gives area and capacity curves for Lake Baylor. Lake-bed elevation is 1970 (20 acres in the creek channel), maximum elevation is 2015 (765 acres), and the normal lake elevation ranges between 1995 to 2000 (275 to 375 acres). Maximum volume is slightly over 13,000 acre feet and average volume is between 2,600 and 4,200 acre feet. Figure 3 shows the percentage of the total lake surface that is 5 feet or less and 10 feet or less in depth at various lake elevations. Actual acreage of 5-foot and 10-foot water, as well as total lake surface are also listed. The curves illustrate the rapid decrease in relative proportion of littoral area present as the total lake surface expands. At the normal lake elevation range of 1995 to 2000, the percentage of water less than 5 feet deep ranges from 31 to 26.5 per cent. At the same range in elevations, ten feet or less water ranges from 52.5 to 49 per cent. At greater elevations the percentage of littoral area decreases further.

Contents of preserved stomachs of 132 fish were examined and 87 contained identifiable food (Table 5). Food items were categorized as: fish, insect larvae, adult insect, vegetation, crustacean and other. Insect larvae was the most common food item and occurred in 55 stomachs. Vegetation occurred 43 times, adult insect 24 times, crustaceans 17 times, "other" 16 times and fish 16 times.

Table 5 Frequency of Occurrence of Food Items of Predaceous Species Taken from Lake Baylor, May and November 1964.

	Species								
	Largemouth bass	Flathead catfish	White crappie	Green sunfish	Bluegill	Longear sunfish	Channel catfish	Black bullhead	White bass
Number examined	3	3	7	1	2	4	44	50	18
Number with food	1	1	4	1	1	4	30	36	9
Food Items:									
Fish	0	1	2	0	0	0	8	3	2
Insect larvae	0	0	2	0	1	3	16	24	9
Insect-adult	1	0	0	1	0	0	15	6	1
Vegetation	0	0	0	0	0	1	17	25	0
Crustacean	0	0	2	0	0	0	1	14	0
Other	0	0	1	0	0	0	9	7	0

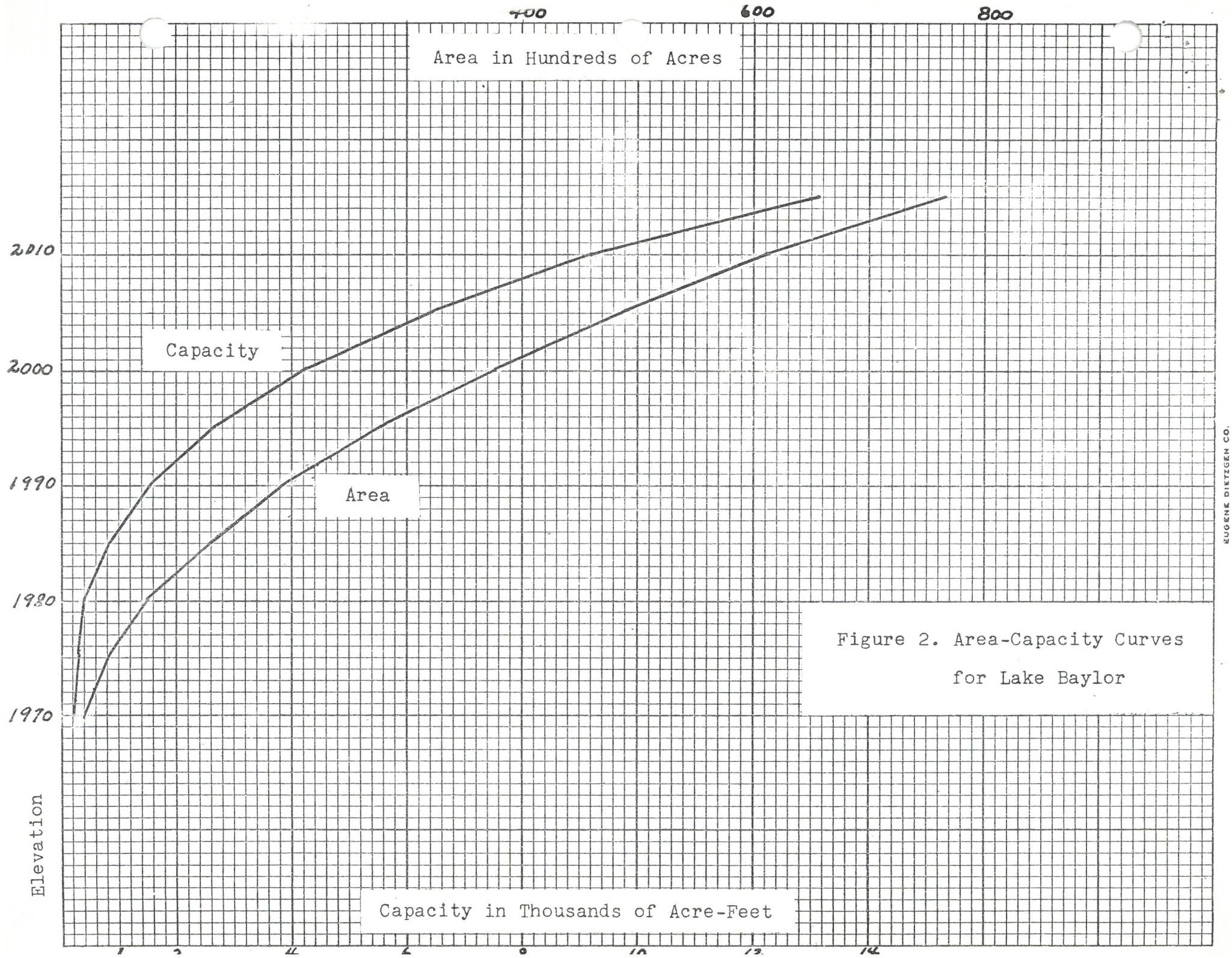

Figure 2. Area-Capacity Curves for Lake Baylor

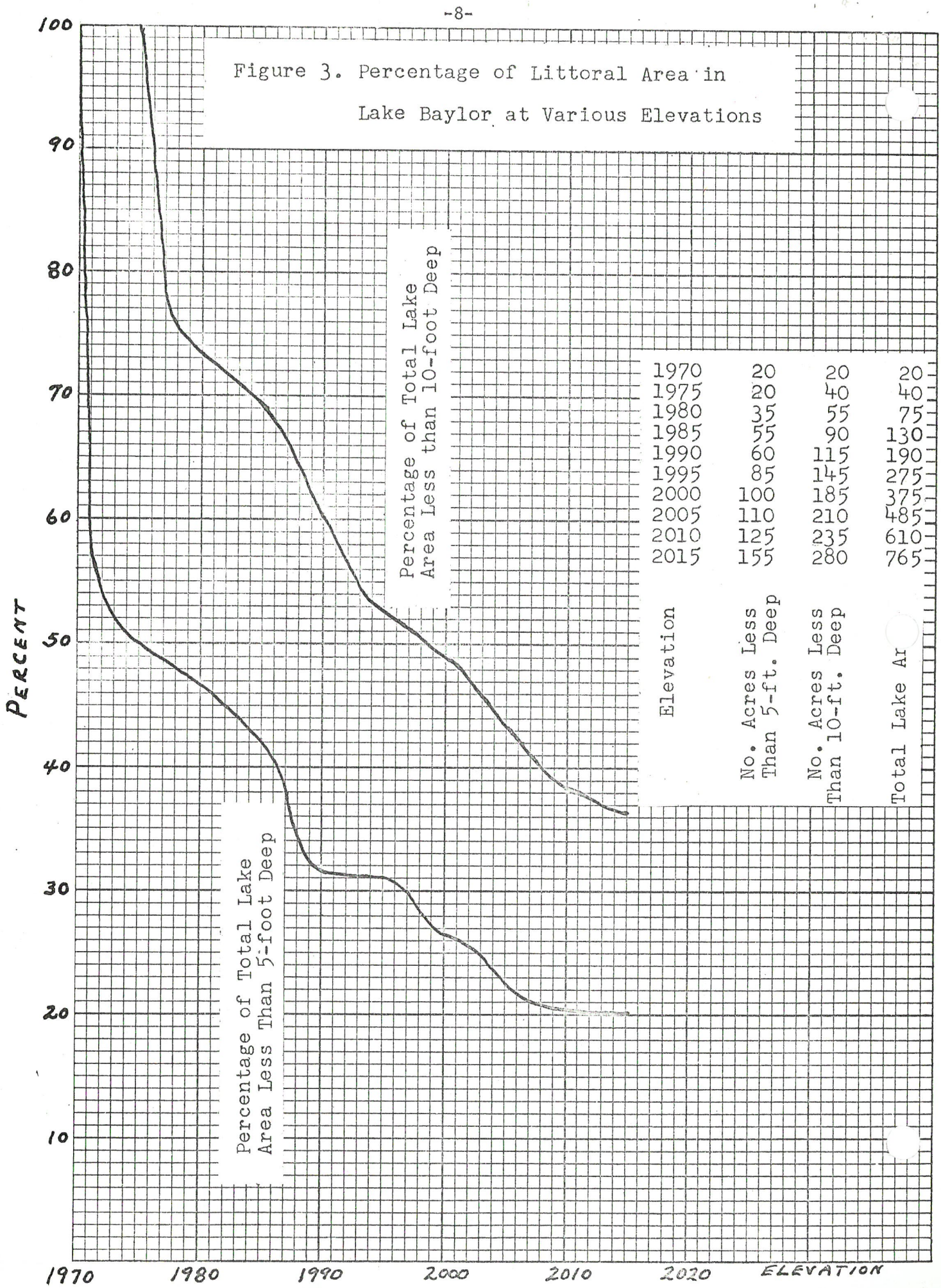

Figure 3. Percentage of Littoral Area in Lake Baylor at Various Elevations

Elevation	No. Acres Less Than 5-ft. Deep	No. Acres Less Than 10-ft. Deep	Total Lake Ar
1970	20	20	20
1975	20	40	40
1980	35	55	75
1985	55	90	130
1990	60	115	190
1995	85	145	275
2000	100	185	375
2005	110	210	485
2010	125	235	610
2015	155	280	765

Species "K" factor averages (Table 6) were below normal to normal. Channel catfish had an average "K" of 1.5 in both May and November which is below normal for this area. Similarly, white crappie, white bass and flathead catfish were apparently in poor condition. Poor physical condition of these species is probably related to food shortages.

Table 6 "K" Factor Range and Average for Species Taken from Lake Baylor May and November 1964.

	Number		Range		Average "K"	
Species	May	Nov.	May	Nov.	May	Nov.
Carp	25	25	2.4-3.8	1.9-3.2	2.8	2.8
Carp-goldfish hybrid	2	1	3.3-3.6	- 3.4	3.5	3.4
Channel catfish	25	20	1.4-1.7	1.2-1.8	1.5	1.5
Black bullhead	25	25	1.9-2.9	2.0-2.6	2.4	2.3
Flathead catfish	2	2	2.0	1.8-2.4	2.0	2.1
White bass	2	16	2.6-2.7	1.8-2.7	2.65	2.5
Largemouth bass	1	2	4.0	2.5-2.6	4.0	2.55
Green sunfish	1	-	3.8	-	3.8	-
Bluegill	0	2	-	3.8-4.0	-	3.9
Orangespotted sunfish	1	-	4.6	-	4.6	-
Longear sunfish	0	4	-	4.3-4.8	-	4.6
White crappie	3	4	2.8	2.4-3.1	2.8	2.7

Buffalo Lake

Fisheries surveys at Buffalo Lake were made on May 27 and November 24, 1964. Tables 7 and 8 give the netting data collected on these dates. The game fish population apparently has remained fairly stable. The white crappie, which is the dominant game species in Buffalo Lake, has steadily declined since a peak population in 1962. White bass and largemouth bass have increased. Channel catfish have failed to show an increase in spite of the fact that about 80,000 fingerlings were stocked in 1963. Table 9 gives the species composition of six netting samples from April 1962 to November 1964. Probably the best year-to-year comparisons can be made from three November surveys since the water temperatures and other conditions were more nearly the same. Carp and goldfish have increased steadily but the black bullhead has decreased steadily.

A surprising feature of the November 1964 survey was that the netting samples included 18.62 per cent white bass. Previously the highest percentage of white bass was less than 2 per cent.

Forage samples taken with a 20-foot one-eighth inch mesh seine are shown in Table 10. The increase in numbers of the golden shiner, red shiner and fathead minnow in November indicates fair reproduction for these species. This does not hold true for any other species, however. Table 11 contains a comparison of yearly composite forage samples, which indicates a steadily increasing population of Centrarchids since 1962. The July 1963 forage sample included a large number of bullhead fry, and the total forage sample for this year was dominated by the bullhead. In 1962 and 1964, however, the bullhead was of minor importance. The families Cyprinodontidae and Poeciliidae, represented by a single species of each, have remained minor in importance.

Table 7 Percentage Composition by Number, Weight, and Average Weight of Fish Taken from Buffalo Lake May 27, 1964.

Species	Number	Per Cent by Number	Total Weight	Per Cent by Weight	Average Weight
Carp	172	17.71	321.75	32.98	1.87
Goldfish	23	2.37	39.85	4.09	1.73
Carp-goldfish hybrid	20	2.06	35.69	3.66	1.78
Carpsucker	1	0.10	0.13	0.01	0.13
Channel catfish	24	2.47	43.18	4.43	1.80
Black bullhead	299	30.79	221.31	22.69	0.74
Flathead catfish	2	0.21	17.49	1.79	8.75
White bass	3	0.31	2.55	0.26	0.85
Largemouth bass	3	0.31	2.49	0.26	0.83
Bluegill	15	1.54	3.40	0.35	0.23
White crappie	409	42.13	287.52	29.48	0.70
Total	971	100.00	975.36	100.00	
Game Fish	456	46.96	356.63	36.56	0.78
Rough Fish	515	53.04	618.73	63.44	1.20

Table 8 Percentage Composition by Number, Weight, and Average Weight of Fish Taken from Buffalo Lake November 24, 1964.

Species	Number	Per Cent by Number	Total Weight	Per Cent by Weight	Average Weight
Carp	75	32.46	316.46	63.61	4.22
Goldfish	8	3.47	12.59	2.53	1.57
Carp-goldfish hybrid	11	4.76	17.58	3.53	1.60
Carpsucker	2	0.86	1.94	0.39	0.97
Channel catfish	2	0.87	5.82	1.17	2.91
Black bullhead	15	6.49	9.90	1.99	0.66
White bass	43	18.62	76.58	15.40	1.78
Largemouth bass	10	4.33	20.54	4.12	2.05
Bluegill	4	1.73	0.32	0.07	0.08
White crappie	61	26.41	35.75	7.19	0.59
Total	231	100.00	497.48	100.00	
Game Fish	120	51.95	139.01	27.94	1.16
Rough Fish	111	48.05	358.47	72.06	3.23

Table 9 Percentage Composition of Netting Samples Taken from Buffalo Lake 1962 - 1964.

Species	Apr. 1962	Nov. 1962	July 1963	Nov. 1963	May 1964	Nov. 1964
Carp	14.73	8.77	27.73	13.84	17.71	32.47
Goldfish	0.26	0.56	4.42	1.64	2.37	3.46
Carp-goldfish hybrid	2.48	1.46	5.83	9.65	2.06	4.76
Golden shiner	0.00	0.14	0.00	0.00	0.00	0.00
River carpsucker	0.13	0.00	0.00	0.00	0.10	0.86
Channel catfish	4.82	0.28	9.54	2.92	2.47	0.87
Black bullhead	64.67	13.65	23.68	27.14	30.79	6.49
Flathead catfish	0.00	0.00	0.00	0.00	0.21	0.00
White bass	0.26	1.39	0.35	1.82	0.31	18.62
Largemouth bass	0.39	0.70	0.00	1.82	0.31	4.33
Green sunfish	1.30	1.04	0.00	0.00	0.00	0.00
Bluegill	4.82	1.88	13.96	4.19	1.54	1.73
Longear sunfish	1.57	0.00	0.17	0.36	0.00	0.00
Hybrid sunfish	0.00	4.04	0.00	0.00	0.00	0.00
White crappie	4.57	66.09	14.32	36.62	42.13	26.41
Game Fish	17.73	75.42	38.34	47.73	46.97	51.96
Rough Fish	82.27	24.58	61.66	52.27	53.03	48.04

Table 10 Percentage Composition by Number of Fish Taken from Buffalo Lake with 20-foot Seine on May 26 and November 23, 1964 (Ten Drags Each Date)

	Number		Per Cent	
Species	May	Nov.	May	Nov.
Carp	4	0	1.04	0.00
Golden shiner	0	31	0.00	14.09
Plains shiner	9	0	2.36	0.00
Red shiner	85	147	22.25	66.81
Sand shiner	13	0	3.40	0.00
Pimephales sp.	1	0	0.26	0.00
Fathead minnow	3	25	0.79	11.37
Black bullhead	31	0	8.11	0.00
Plains killifish	2	3	0.53	1.36
Mosquitofish	2	1	0.52	0.46
Largemouth bass	10	0	2.62	0.00
Green sunfish	41	4	10.73	1.81
Bluegill	147	2	38.48	0.91
Longear sunfish	0	3	0.00	1.37
White crappie	34	4	8.91	1.82
Total	382	220	100.00	100.00

Table 11 Comparison of Yearly Forage Samples from Buffalo Lake 1962-1964 (Collected With 20- or 40-Foot Minnow Seines)

	1962		1963		1964	
	%	No.	%	No.	%	No.
CYPRINIDAE	88.24		13.99		52.82	
Carp		239		6		4
Goldfish		0		0		0
Carp-goldfish hybrid		4		0		0
Golden shiner		2		65		31
Plains shiner		0		0		9
Red River shiner		0		26		0
Red shiner		972		52		232
Sand shiner		0		0		13
Plains minnow		8		0		0
Fathead minnow		658		15		28
Bullhead minnow		1		1		0
Minnow sp.		0		0		1
AMEURIDAE	0.51		59.46		5.15	
Black bullhead		11		701		31
CYPRINODONTIDAE	2.39		1.35		0.83	
Plains killifish		51		16		5
POECILIIDAE	0.28		1.28		0.50	
Mosquitofish		6		15		3
CENTRARCHIDAE	8.58		23.92		40.70	
Largemouth bass		0		36		10
Green sunfish		93		18		45
Bluegill		50		161		149
Orangespotted sunfish		19		5		0
Longear sunfish		8		5		3
White crappie		13		57		38

Predator fishes fed primarily on fish in both May and November. White bass and largemouth bass stomach contents were exclusively fish, a large percentage of which could be identified as small crappie. Large white crappie fed almost exclusively on fish while smaller crappie fed on zooplankton. Both bullhead and channel catfish fed on fish more heavily than usual. Both current and past data show that forage fish in Buffalo Lake are abundant. Table 12 lists the frequency of occurrence of food items for May and November 1964. "K" factor averages show most species to be in good to excellent condition. Table 13 lists "K" factor averages for all 11 species in gill nets. These high "K" factor averages are consistent with past data and reflect continued fertility and high forage production of the lake.

Canadian River

Fisheries reconnaissance surveys on the Canadian River were conducted on June 23 and 24, 1964, in two general areas, the western part of Oldham County and immediately below the Sanford Dam in Hutchinson County. At the time of the survey the river was not flowing so all samples were taken from potholes. The primary purposes of the survey were to determine whether blue catfish had survived from a stocking in December 1963 and what rough species existed in the river.

Table 12 Frequency of Occurrence of Food Items in Stomachs of Fish Taken from Buffalo Lake May 27 and November 24, 1964.

Species	Channel catfish		Black bullhead		Warmouth		Largemouth bass		White crappie		
	May	Nov.	May	Nov.	May	Nov.	May	Nov.	May	Nov.	Total
Number Examined	20	2	6	13	3	32	3	9	52	57	197
Number with Food	15	0	5	6	0	24	2	9	36	40	137
Food Items:											
Fish	10	0	3	3	0	24	2	9	36	31	118
Insect-Adult	1	0	0	1	0	0	0	0	0	8	10
Insect - Larvae	0	0	0	1	0	0	0	0	0	2	3
Crustacean	2	0	0	0	0	0	0	0	0	12	14
Vegetation	3	0	1	1	0	0	0	0	0	0	5
Other	0	0	0	0	0	0	0	0	0	0	0

Table 13 "K" Factor Range and Average for Species Taken from Buffalo Lake in May and November 1964.

Species	Number		"K" Range		Average "K"	
	May	Nov.	May	Nov.	May	Nov.
Carp	24	25	2.3-3.5	2.2-3.0	2.8	2.6
Goldfish	23	8	4.1-6.7	4.4-6.1	5.0	5.1
Carp-goldfish hybrid	20	11	3.0-4.3	2.1-4.2	3.6	3.4
River carpsucker	1	2	1.1	3.1-3.2	1.1	3.15
Channel catfish	24	2	1.6-2.4	2.0-2.1	1.9	2.05
Black bullhead	25	15	1.6-3.0	2.1-3.0	2.5	2.5
Flathead catfish	2	0	1.9-2.3	-	2.1	-
White bass	3	42	2.5-3.1	3.0-4.0	2.9	3.6
Largemouth bass	3	10	2.3-3.2	2.7-4.4	2.8	3.2
Bluegill	15	4	3.4-4.7	4.2-4.6	4.2	4.4
White crappie	25	43	2.8-4.4	2.0-4.5	3.8	3.3

Sanford Dam will impound water to form Meredith Lake. The dam, presently near completion, is located 10 miles northwest of Borger, Texas. Meredith Lake will have a contributing watershed of approximately 9,000 square miles and will impound a maximum of 24,000 acres at service spillway crest. Normal pool will range from about 14,000 to 16,000 surface acres.

Two attempts have been made to establish the blue catfish in the Canadian River prior to impoundment of water in Meredith Lake. In December 1963 approximately 2,000 blue catfish fingerlings (4 inches to 6 inches total length) were distributed along 30 miles of river downstream from the New Mexico line. No blue catfish were recovered on June 23 by seining, and the success of this stocking is doubtful because of adverse conditions that followed. In September 1964, 10,000 blue catfish fingerlings were distributed along the river and in temporary holding ponds near the river. These will be moved to the Meredith Reservoir as soon as sufficient water is impounded.

Rough fish species known to exist in the Canadian River above Sanford Dam include gizzard shad, carp, river carpsucker, white sucker, black bullhead catfish, and yellow bullhead catfish. Carp, gizzard shad, and black bullhead have been seined from the Canadian River in Texas. The carpsucker, white sucker and yellow bullhead are reported present in Conchas Lake, an impoundment on the Canadian River in New Mexico 1/, but have not been recovered from the Canadian River in Texas.

Stocking of Lake Meredith will begin in 1965. Tentatively, fish species to be stocked in Lake Meredith will include game and forage fish native to the Panhandle area. In addition, experimental introduction of walleye, *Stizostedion vitreum*, may be made.

1/ Fisheries Study of Conchas Lake, Federal Aid Project F-22-R-3, Work Plan 2, Job No. B-1 (3) New Mexico Dept. of Game & Fish, March 31, 1962.

Lake Childress

Net and seine samples were collected from Lake Childress on May 15 and November 6, 1964. Netting data are given in Tables 14 and 15. The May survey revealed a dominant black bullhead population (95 per cent), but no other rough species were present. The November survey, however, included 41 per cent white crappie. Of the remaining 59 per cent of the fish netted in November, 57 per cent were black bullheads. It was reported that approximately 80,000 white crappie seined from Amarillo City Lake were transported to and stocked in Lakes Baylor and Childress. Since this stocking was done without prior notification of project personnel, accurate total numbers, sexual development and numbers of different size classes of these crappie are not available.

A 4-year record of netting-survey results is given in Table 16. Channel catfish show a steady decline since 1961. Largemouth bass increased in 1962 but decreased in 1963 and 1964. Bullheads remained stable at 66 to 74 per cent, and the other species fluctuated irregularly. It is encouraging that the carp has not been introduced in Lake Childress. However, an undesirable Cyprinid, the golden shiner, has been introduced.

Table 14 Percentage Composition by Number, Weight, and Average Weight of Fish Taken from Lake Childress, May 15, 1964.

Species	Number	Per Cent by Number	Total Weight	Per Cent by Weight	Average Weight
Black bullhead	214	95.11	55.07	82.84	0.26
Channel catfish	1	0.44	4.54	6.83	4.54
Largemouth bass	1	0.45	2.63	3.96	2.63
Redear sunfish	6	2.66	3.97	5.97	0.66
White crappie	3	1.34	0.26	0.40	0.09
Total	225	100.00	66.47	100.00	
Game Fish	11	4.89	11.40	17.15	1.04
Rough Fish	214	95.11	55.07	82.85	0.26

Table 15 Percentage Composition by Number, Weight, and Average Weight of Fish Taken from Lake Childress, November 6, 1964.

Species	Number	Per Cent by Number	Total Weight	Per Cent by Weight	Average Weight
Golden shiner	1	0.17	0.20	0.15	0.20
Black bullhead	325	56.72	53.00	40.22	0.16
Channel catfish	5	0.87	13.29	10.08	2.66
Largemouth bass	4	0.70	11.82	8.97	2.96
Redear sunfish	2	0.35	1.26	0.96	0.63
Longear sunfish	1	0.17	0.08	0.06	0.08
White crappie	235	41.02	52.12	39.56	0.22
Total	573	100.00	131.77	100.00	
Game Fish	247	43.11	78.57	59.63	0.32
Rough Fish	326	56.89	53.20	40.37	0.16

Table 16 Percentage Composition of Netting Samples Taken from Lake Childress 1961 - 1964.

	Per Cent by Number			
Species	1961	1962	1963	1964
Golden shiner	0.00	0.00	0.00	0.12
Channel catfish	16.66	10.16	4.06	0.75
Black bullhead	73.81	67.80	66.49	67.55
Largemouth bass	4.76	11.87	3.05	0.62
Green sunfish	0.00	5.09	0.51	0.00
Bluegill	4.77	1.69	12.69	0.00
Redear sunfish	0.00	3.39	5.07	1.01
Longear sunfish	0.00	0.00	0.00	0.12
White crappie	0.00	0.00	8.13	29.83

Lake Childress has a notable lack of small forage similar to nearby Lake Baylor. Seasonally, minnows and young of other species are fairly abundant; however, depredation throughout fall and winter drastically reduces the forage and by spring the lack of forage is critical. Table 17 illustrates the fluctuating forage abundance. Note that seining in May 1962 and May 1964 produced almost no forage. The seining effort was approximately equal (8 to 11 drags) on each survey. In May 1964, when only 3 fish were taken, the water was warmer (68° F.) than in November 1964 (57° F.) when 101 fish were taken. Thus cold water does not account for the lack of minnows in shallow areas in May.

Table 17 Twenty-foot Seine Results from Lake Childress 1961 - 1964.

Species	June 1961	May 1962	June 1963	Oct. 1963	May 1964	Nov. 1964
Red shiner	119	0				65
Largemouth bass	60	0	33	12	1	12
Plains killifish	9	0		19	1	11
Green sunfish	6	0	11	83	1	3
Bluegill		0	16	39		
Redear sunfish		0		54		
Black bullhead		0	1	3		
Mosquitofish		0		196		
Longear sunfish		0				1
White crappie		0				9
Total	194	0	61	406	3	101

The larger predator fishes (channel catfish and largemouth bass) in Lake Childress fed on bullhead catfish and crayfish. Sunfish fed primarily on insect larvae. White crappie fed primarily on zooplankton and to a lesser extent on insect larvae. Only 3 out of 17 crappie stomachs contained fish remains. Bullheads fed on a variety of foods including primarily vegetation, zooplankton and insect larvae.

Compared to fish in Lake Baylor, fish in Lake Childress were in better condition. In November "K" factors for channel catfish averaged 1.7, white crappie 3.0 and largemouth bass 2.8. Table 18 gives the "K" factor range and average for both surveys.

Table 18 "K" Factor Range and Average for Species Taken from Lake Childress May and November 1964.

Species	Number		Range		Average "K" Factor	
	May	Nov.	May	Nov.	May	Nov.
Golden shiner	0	1	-	2.0	-	2.0
Channel catfish	1	5	1.9	1.5-2.0	1.9	1.7
Black bullhead	26	25	1.8-2.5	1.7-2.2	2.2	2.0
Largemouth bass	1	4	2.9	2.5-3.0	2.9	2.8
Green sunfish	0	0	-	-	-	-
Bluegill	0	0	-	-	-	-
Redear sunfish	6	2	3.7-4.2	4.0	4.0	4.0
Longear sunfish	0	1	-	4.8	-	4.8
White crappie	3	25	2.7-3.1	2.8-3.7	2.9	3.0

Lake Fryer

Reconnaissance data were collected from Lake Fryer on May 20 and 21 and November 17 and 18, 1964. Netting results are given in Tables 19 and 20. In May, the dominant species, in order of abundance, were black bullhead, carp and white crappie. In November, dominant species were white crappie, black bullhead and carp. The three species combined totaled 94.35 and 96.76 per cent respectively for the May and November surveys. Most white crappie in this lake are stunted and contribute little to the sport fishery.

Table 19 Percentage Composition by Number, Weight, and Average Weight of Fish Taken from Lake Fryer May 21, 1964.

Species	Number	Per Cent by Number	Total Weight	Per Cent by Weight	Average Weight
Carp	120	29.48	123.19	65.58	1.03
Channel catfish	7	1.72	7.57	4.03	1.08
Black bullhead	182	44.72	34.32	18.28	0.19
Largemouth bass	2	0.49	6.81	3.62	3.41
Bluegill	1	0.24	0.48	0.26	0.48
Longear sunfish	13	3.20	1.15	0.61	0.09
White crappie	82	20.15	14.30	7.62	0.17
Total	407	100.00	187.82	100.00	
Game Fish	105	25.80	30.31	16.14	0.29
Rough Fish	302	74.20	157.51	83.86	0.52

Table 20 Percentage Composition by Number, Weight, and Average Weight of Fish Taken from Lake Fryer November 18, 1964.

Species	Number	Per Cent by Number	Total Weight	Per Cent by Weight	Average Weight
Carp	88	23.52	119.40	68.11	1.36
Channel catfish	9	2.41	9.60	5.48	1.07
Black bullhead	109	29.15	19.73	11.25	0.18
White bass	1	0.26	2.00	1.14	2.00
Largemouth bass	2	0.54	13.16	7.51	6.58
White crappie	165	44.12	11.40	6.51	0.07
Total	374	100.00	175.29	100.00	
Game Fish	177	47.33	36.16	20.63	0.20
Rough Fish	197	52.67	139.13	79.37	0.71

Table 21 gives the relative abundance of species in five netting samples from 1962 to 1964. Carp showed major gains in both 1963 and 1964 while crappie showed a major gain in 1962. The relative abundance of bullheads has ranged from 90 per cent in May 1962 to 29 per cent in November 1964.

Table 21 Netting Data from Lake Fryer, 1962 to 1964.

Species	May 1962	Aug. 1962	July 1963	May 1964	Nov. 1964	5-Survey Average
Carp	2.34	5.07	10.58	29.48	23.52	14.20
Channel catfish	2.01	1.61	2.19	1.72	2.41	1.99
Black bullhead	90.30	38.01	36.13	44.72	29.15	47.66
White bass	0.00	0.00	0.00	0.00	0.27	0.05
Largemouth bass	1.34	0.46	0.00	0.49	0.00	0.46
Redear sunfish	0.34	0.23	0.00	0.00	0.00	0.11
Bluegill	0.66	0.00	0.37	0.24	0.00	0.25
Longear sunfish	0.00	0.00	0.00	3.20	0.00	0.64
White crappie	3.01	54.61	50.73	20.15	44.12	34.52

The high turbidity of Lake Fryer promotes natural reproduction of white crappie. Predation on crappie is limited by the small numbers of large predators, and fishermen harvest is limited by the small, undesirable average size of the individual crappie.

"K" factor averages, shown in Table 22, increased slightly as compared to past years, indicating that fish may have been somewhat less crowded.

Table 22 "K" Factor Range and Average for Species Taken from Lake Fryer May 21 and November 19, 1964.

Species	Number		Range		Average	
	May	Nov.	May	Nov.	May	Nov.
Carp	25	25	2.6-3.3	2.1-3.0	2.9	2.7
Channel catfish	7	2	1.5-1.9	1.5-1.8	1.8	1.65
Black bullhead	25	25	2.0-2.9	2.3-3.4	2.4	2.7
White bass	0	1	-	3.7	-	3.7
Largemouth bass	2	2	2.6-3.5	3.2-3.6	3.1	3.4
Bluegill	1	1	5.9	4.5	5.9	4.5
Longear sunfish	13	0	4.6-5.7	-	5.2	-
White crappie	25	14	2.7-3.6	2.7-3.5	3.1	3.0

Food items of fishes taken in May are shown in Table 23. Crappie and longear sunfish were feeding on insect larvae at this time while channel catfish were feeding primarily on fish. Most bullheads had consumed vegetation, but fish and insect larvae were also important items.

Forage species were abundant in the seine samples in May and it was somewhat surprising that crappie were not feeding more heavily on fish. In November the seine sample was greatly reduced in both total number taken and variety of species. Tables 24 and 25 show the results of 10 seine hauls on each date.

Table 23 Frequency of Occurrence of Food Items of Fish Taken from Lake Fryer May 21, 1964.

Species	White crappie	Channel catfish	Black bullhead	Longear sunfish	Total
Number Examined	23	6	24	6	59
Number with Food	20	5	11	3	39
Food Items:					
Fish	2	4	3	0	9
Insect	1	1	0	0	2
Insect Larvae	20	0	4	3	27
Vegetation	0	0	9	0	9
Crustacean	4	2	1	0	7
Other	0	0	0	0	0

Table 24 Percentage Composition by Number of Fish Taken from Lake Fryer May 20, 1964 with 20-foot Seine. (10 drags)

Species	Number	Per Cent
Carp	4	0.25
Red shiner	1196	74.93
Golden shiner	21	1.32
Suckermouth minnow	1	0.06
Fathead minnow	46	2.88
Sand shiner	1	0.07
Mosquitofish	139	8.71
Killifish	17	1.06
Redear sunfish	35	2.19
Black bullhead	7	0.44
Green sunfish	31	1.94
Bluegill	86	5.39
Orangespotted sunfish	10	0.63
Largemouth bass	1	0.06
White crappie	1	0.07
Total	1596	100.00

Table 25 Percentage Composition by Number of Fish Taken from Lake Fryer November 19, 1964 with 20-foot Seine. (10 drags)

Species	Number	Per Cent
Red shiner	275	99.28
Bluegill	2	0.72
Total	277	100.00

Lake McClellan

Lake McClellan was renovated in early October 1964. This was accomplished as a joint project with the U. S. Forest Service, Panhandle National Grasslands. Planning and execution of the renovation and restocking were coordinated through Mr. D. C. Stevens, Supervisor, Panhandle National Grasslands, and Mr. McKirdy, Regional Fisheries Biologist, U. S. Forest Service.

Rotenone, supplied by the Forest Service, was applied at the equivalent rate of 2.5 ppm - 5% powder. Post-treatment surveys indicated that a total kill was achieved. Initial restocking was provided by the Ellis Kansas National Fish Hatchery and consisted of 10,000 fingerling bass (3- to 4-inch total length) 50,000 channel catfish fingerlings (1- to 1½-inch total length) and 20,000 yearling channel catfish (6- to 10-inches total length).

The lake was extremely low at the time of treatment, which reduced toxicant requirements considerably, but hampered treating operations because of extensive shallow flats. Treatment of the main body of the lake began at about 7:30 a.m. and was completed shortly after 12 M. Treatment of marginal shallows and flat areas was completed by 4:00 p.m. An estimated 2,500 spectators witnessed the treatment and many came equipped to capture the distressed fish. As usual, many persons were disappointed at the small numbers of edible fish available.

Reconnaissance data which clearly illustrated the need for this renovation are given in Table 26. Excluding the white crappie which was overabundant, stunted and thus undesirable, the fishery of this lake deteriorated from 10 per cent desirable fish in March 1962 to 6 per cent in March 1964. The last netting survey prior to renovation yielded the data shown in Table 27. Game fish accounted for only 13.68 per cent of the total number taken, and 7.23 per cent were stunted white crappie. Three species of rough fish accounted for 85 per cent of the total weight.

Table 26 Percentage Composition of Netting Samples from Lake McClellan, March 1962 - March 1964.

	Per Cent by Number			
Species	3/1/62	12/11/62	7/7/63	3/24/64
Carp	52.46	29.09	56.17	26.95
River carpsucker	1.64	1.82	0.40	4.88
Channel catfish	4.10	3.64	3.19	5.27
Black bullhead	7.38	50.00	33.86	54.50
Flathead catfish	0.00	0.00	0.00	0.19
White bass	5.73	2.72	0.40	0.59
Largemouth bass	0.82	0.00	0.00	0.19
Bluegill	0.00	1.82	0.80	0.20
White crappie	27.87	10.91	5.18	7.23
Desirable fish*	10.66	8.18	4.38	6.44
Average weight in pound of white crappie	0.08	0.11	0.10	0.32

*Excludes white crappie

Table 27 Percentage Composition by Number, Weight and Average Weight of Fish Taken from McClellan Lake, March 24, 1964.

Species	Number	Per Cent by Number	Total Weight	Per Cent by Weight	Average Weight
Carpsucker	25	4.88	65.66	19.53	2.63
Carp	138	26.95	163.03	48.49	1.18
Black bullhead	279	54.49	55.74	16.58	0.20
Channel catfish	27	5.28	25.79	7.67	0.96
Flathead catfish	1	0.19	3.41	1.01	3.41
White bass	3	0.59	7.32	2.18	2.44
Largemouth bass	1	0.19	3.41	1.01	3.41
Bluegill	1	0.20	0.07	0.02	0.07
White crappie	37	7.23	11.77	3.51	0.32
Total	512	100.00	336.20	100.00	
Game Fish	70	13.68	51.77	15.40	0.74
Rough Fish	442	86.32	284.43	84.60	0.64

Seining data, Table 28, further illustrates the overabundance of white crappie.

Table 28 Tabulation of Fish Taken from Lake McClellan March 23, 1964 with a 100-foot one-half inch Mesh Seine and a 20-foot one-eighth inch Mesh Seine.

Species	Number 100-foot Seine	Number 20-foot Seine
Carp	4	0
Red shiner	0	6
Black bullhead	5	0
Channel catfish	6	0
White bass	2	0
Largemouth bass	2	0
Bluegill	8	20
Orangespotted sunfish	13	7
White crappie	301	1
Total	341	34

Food items are listed in Table 29.

The treatment was planned to coincide with the construction of a new spillway. This work necessitated cutting through the dam, and had the lake level not been lowered by drought it would have been lowered by draining.

Future development work will include stocking of brood stock of several desirable forage species in Lake McClellan prior to the 1965 spawning season. Tentatively, forage species to be stocked will include red shiner, fathead minnow, mosquitofish, Mississippi silversides and bluegill sunfish.

Table 29 Frequency of Occurrence of Food Items in Fish Stomachs Taken from Lake McClellan March 24, 1964.

Species	Channel catfish	Black bullhead	Warmouth	Largemouth bass	Bluegill	White crappie	Total
Number Examined	24	21	3	1	1	24	74
Number with Food	16	18	3	1	0	23	61
Food Items:							
Fish	11	1	3	1	0	10	26
Insect-Adult	1	1	0	0	0	8	10
Insect-Larvae	7	17	0	0	0	13	37
Crustacean	7	16	0	0	0	19	42
Vegetation	2	17	0	0	0	0	19
Other	0	0	0	0	0	0	0

Lake Pauline

Drought conditions, which have prevailed since Lake Pauline was renovated in May 1963, have had serious detrimental effects on the fishery. A gradually receding water level reduced the lake surface about 50 per cent and fish became overcrowded. This, coupled with the fact that additional fish were introduced with water pumped from Groesbeck Creek, produced a situation not conducive to good growth. A shortage of forage existed until late June when sunfish and minnow fry became abundant. By mid-September largemouth bass had attained an average size of 3/4 pound and the lake was reopened to fishing on October 15. The spot-check creel census, on the first and second day after the lake was reopened, indicated an average catch rate of 2.7 fish per hour of fishing. The average hourly bag was 1.0 bass, 0.3 channel catfish, 0.3 sunfish and 0.1 other species. Table 30 summarizes creel data gathered.

Table 30 Summary of Creel Data Taken from Lake Pauline October 15, 16, 1964.

Date	Number creels Checked	Total Hours Fished	Largemouth bass	Channel catfish	White crappie	Blue catfish	Sunfish	Carp	Black bullhead
October 15	94	197	274	20	3	6	122	1	4
October 16	51	217	124	114	0	8	8	3	3
Total	145	414	398	134	3	14	130	4	7

Surveys were made on April 8 and September 17, 1964. Netting data are given in Tables 31 and 32. Carp, which dominated the April netting samples, were almost all age class 0 and could have either been pumped into the lake from Groesbeck Creek or spawned in the lake in 1963. Small shad were abundant in April but did not appear in the netting sample. In September shad (average weight .32 lb.) dominated the net sample. Bluegill and longear sunfish were the most common game species taken.

Table 31 Percentage Composition by Number, Weight, and Average Weight of Fish Taken from Lake Pauline April 8, 1964.

Species	Number	Per Cent by Number	Total Weight	Per Cent by Weight	Average Weight
Carp	183	42.85	125.69	62.77	0.69
Carpsucker	2	0.47	4.42	2.21	2.21
Channel catfish	2	0.47	3.87	1.93	1.94
Blue catfish	1	0.23	0.04	0.02	0.04
Black bullhead	83	19.44	40.71	20.34	0.49
Largemouth bass	39	9.13	16.21	8.09	0.42
Green sunfish	5	1.18	0.54	0.27	0.11
Bluegill	106	24.82	8.25	4.13	0.08
Longear sunfish	5	1.17	0.38	0.19	0.08
White crappie	1	0.24	0.10	0.05	0.10
Total	427	100.00	200.21	100.00	
Game Fish	159	37.24	29.39	14.68	0.18
Rough Fish	268	62.76	170.82	85.32	0.64

Table 32 Percentage Composition by Number, Weight, and Average Weight of Fish Taken from Lake Pauline September 17, 1964

Species	Number	Per Cent by Number	Total Weight	Per Cent by Weight	Average Weight
Shad	271	46.64	85.73	47.85	0.32
Carp	23	3.96	23.04	12.86	1.00
Channel catfish	27	4.64	7.35	4.10	0.27
Blue catfish	13	2.24	6.68	3.73	0.51
Black bullhead	16	2.76	8.68	4.84	0.54
Largemouth bass	31	5.33	22.18	12.38	0.72
Green sunfish	9	1.55	1.49	0.83	0.17
Bluegill	93	16.01	9.31	5.20	0.10
Longear sunfish	86	14.80	6.87	3.83	0.08
White crappie	12	2.07	7.83	4.38	0.65
Total	581	100.00	179.16	100.00	
Game Fish	271	46.64	61.71	34.44	0.23
Rough Fish	310	53.36	117.45	65.56	0.38

The shortage of small forage fish early in the year is evident from stomach analysis data shown in Table 33. In April only 12 of 87 fish stomachs examined contained fish. Insects, insect larvae, and crustaceans were most common. In September the reverse was true, Table 34, with fish occurring 42 times in 83 stomachs examined. Other items were of minor importance.

"K" factors were about normal for most species with few exceptions. In April "K", factors of largemouth bass were low, while in September, those of channel catfish and shad were low.

Table 33 Frequency of Occurrence of Food Items in Fish Stomachs Taken from Lake Pauline April 8, 1964.

Species	Channel catfish	Blue catfish	Black bullhead	Largemouth bass	Green sunfish	Bluegill	Longear sunfish	White crappie	Total
Number Examined	2	1	24	26	4	24	5	1	87
Number with Food	2	1	24	5	4	21	4	1	62
Food Items:									
Fish	2	0	8	0	0	1	0	1	12
Insect-Adult	0	1	0	0	0	0	0	0	1
Insect-Larvae	1	1	20	5	4	10	4	0	45
Crustacean	1	1	2	0	4	19	4	0	31
Vegetation	0	0	18	0	0	0	0	0	18
Other	0	0	0	0	0	0	0	0	0

Table 34 Frequency of Occurrence of Food Items in Fish Stomachs Taken from Lake Pauline September 17, 1964.

Species	Channel catfish	Blue catfish	Black bullhead	Largemouth bass	White crappie	Total
Number Examined	18	13	16	25	11	83
Number with Food	13	9	7	9	10	48
Food Items:						
Fish	9	7	7	9	10	42
Insect-Adult	5	2	0	0	0	7
Insect-Larvae	2	0	1	0	0	3
Crustacean	2	0	0	0	0	2
Vegetation	0	0	0	0	0	0
Other	1	0	0	0	0	1

Rita Blanca Lake

Netting in late April produced only 4 1/2 per cent game species, Table 35, but in mid-November produced 18 per cent game species (Table 36). The relative increase in game species was due to an increase in the catch of white crappie. The black bullhead was extremely abundant in both samples and the golden shiner reappeared in considerable abundance in the November netting samples. In 1961, the population of large adult shiners was essentially eliminated by an anchor-worm, Lernaea sp. A few smaller individuals survived and have since successfully reproduced. They are now barely large enough to stick in 1-inch webbing.

Table 35. Percentage Composition by Number, Weight and Average Weight of Fish Taken from Rita Blanca Lake April 30, 1964.

Species	Number	Per Cent by Number	Total Weight	Per Cent by Weight	Average Weight
Carp-goldfish hybrid	3	0.32	9.92	2.64	3.31
Goldfish	16	1.76	23.56	6.30	1.47
Golden shiner	2	0.22	0.27	0.07	0.14
Black bullhead	849	93.09	166.85	44.56	0.20
Channel catfish	8	0.88	23.16	6.18	2.90
Flathead catfish	11	1.20	138.23	36.91	12.57
Largemouth bass	2	0.22	5.87	1.57	2.94
White crappie	12	1.32	4.01	1.07	0.33
Black crappie	9	0.99	2.59	0.70	0.28
Total	912	100.00	374.46	100.00	
Game Fish	44	4.82	174.13	46.50	3.96
Rough Fish	868	95.18	200.33	53.50	0.23

Table 36 Percentage Composition by Number, Weight and Average Weight of Fish Taken from Rita Blanca Lake November 11, 1964.

Species	Number	Per Cent by Number	Total Weight	Per Cent by Weight	Average Weight
Carp-goldfish hybrid	6	1.45	21.05	8.49	3.51
Goldfish	10	2.43	18.14	7.32	1.81
Golden shiner	29	7.04	4.57	1.85	0.16
Black bullhead	293	71.11	68.19	27.52	0.23
Flathead catfish	5	1.22	87.64	35.38	17.53
Largemouth bass	6	1.45	28.85	11.64	4.81
Bluegill	1	0.25	0.41	0.17	0.41
White crappie	51	12.38	15.42	6.22	0.30
Black crappie	11	2.67	3.47	1.41	0.32
Total	412	100.00	247.74	100.00	
Game Fish	74	17.97	135.79	54.82	1.84
Rough Fish	338	82.03	111.95	45.18	0.33

Although goldfish were not too abundant in netting samples they are abundant in the lake. Their balloon-like body shape and lack of spiney fins makes them difficult to catch in gill nets. The abundance of goldfish is apparent from seine sample data given in Table 37.

Table 37 Seining Results from Rita Blanca Lake, April and November 1964.

Species	100'-½" 3 drags Nov. 13	300'-½" 4 drags Apr. 31	Total	20-foot 1/8" mesh 10 drags Nov. 13	8 drags Apr. 29	Total
Goldfish	188	952	1140			
Carp-goldfish hybrid	10		10			
Golden shiner	8	403	411	3		3
Red shiner				50	595	645
Sand shiner					4	4
Plains minnow				1		1
Bullhead minnow				2		2
Fathead minnow				1736	577	2313
Channel catfish	1	70	71			
Black bullhead	13	628	641			
Plains killifish				6		6
Mosquitofish				1		1
White bass		3	3			
Largemouth bass	6	13	19			
Bluegill	2	3	5	1		1
White crappie	32	70	102	1		1
Black crappie	16	1	17			
Total			2419			2977

The results of seining with 100- and 300-foot seines show the goldfish, bullhead, golden shiner and white crappie to be the dominant species in that order of abundance. The only important forage species taken by 20-foot seine were the red shiner and the fathead minnow.

"K" factors were average or above average for all species. Table 38 lists the "K" factor ranges and averages for 10 species taken by netting.

Table 38 "K" Factor Ranges and Averages for Species Taken from Rita Blanca Lake, April 30 and November 11, 1964.

Species	"K"-Range April	"K"-Range November	"K"-Average April	"K"-Average November
Carp-goldfish hybrid	3.3-3.8	3.4-4.0	3.5	3.7
Goldfish	5.5-10.8	6.4-11.9	6.7	7.8
Golden shiner	2.2-2.3	2.0-2.9	2.35	2.3
Channel catfish	1.8-2.7	-	2.3	-
Black bullhead	1.9-3.2	2.2-3.1	2.4	2.5
Flathead catfish	1.2-2.6	2.1-2.6	2.0	2.3
Largemouth bass	3.3-3.4	3.6-4.5	3.35	4.1
Bluegill	-	5.3	-	5.3
White crappie	3.0-4.1	3.2-4.4	3.5	3.5
Black crappie	3.4-4.0	-	3.7	-

Food items in April are given in Table 39.

Table 39 Frequency of Occurrence of Food Items in Fish Stomachs Taken from Rita Blanca Lake April 30, 1964.

Species	Channel catfish	Black bullhead	Largemouth bass	White crappie	Black crappie	Total
Number Examined	7	25	2	12	10	56
Number with Food	5	23	2	12	9	51
Food Items:						
Fish	4	1	2	1	0	8
Insect-Adult	1	1	0	1	0	3
Insect-Larvae	1	21	0	11	8	41
Crustacean	1	4	0	11	9	25
Vegetation	0	20	0	0	0	20
Other	0	0	0	0	0	0

Channel catfish and largemouth bass fed mostly on fish while bullheads fed on insect larvae and vegetation. Both white and black crappie fed heavily on insect larvae and crustaceans (zooplankton).

The study of flathead catfish growth in Rita Blanca Lake has included release of fish marked in three different ways. Initially, clip-type tags were placed on the operculum. Since many of these tags were lost, tattooing and subcutaneous tags were tried. One flathead was recovered two months after it had been tattooed and tagged with a subcutaneous tag. The tattoo was clearly visible and the subcutaneous tag was in place. There were no signs of infection from either. Another tattooed flathead was recovered six months after having been marked and released; the tattoo number was only faintly visible.

Our conclusions are that neither tattooing nor clip-tagging is a desirable method for marking large flatheads, and any future tagging programs should employ subcutaneous tags. They are easily inserted under the skin, cannot be detached and are easily detected. A slight "bulge" or "ridge" is visible and the tag can be removed through a small incision without injury to the fish.

Tule Lake

Tule Lake was surveyed on March 31 and April 1, 1964. At that time the lake was about 10 feet below spillway elevation and covered only about 30 surface acres. The lake was stocked in 1963 after having been dry for a short period of time. The purpose of this survey was to determine if added stocking was needed.

Three drags with a 100-foot seine produced 123 fish of which 68 were largemouth bass, 1 was a white crappie and 1 was a bluegill. Small carp were numerous and a few bullhead catfish were taken. Table 40 gives the seining results.

Table 40 Percentage Composition by Number, Weight, and Average Weight of Fish Taken from Tule Lake March 31, 1964 in 3 drags with a 100-foot Seine.

Species	Number	Per Cent by Number	Total Weight	Per Cent by Weight	Average Weight
Carp	48	39.02	4.73	41.45	0.10
Black bullhead	5	4.06	0.06	0.53	0.01
Largemouth bass	68	55.29	6.43	56.35	0.09
Bluegill	1	0.81	0.10	0.88	0.10
White crappie	1	0.82	0.09	0.79	0.09
Total	123	100.00	11.41	100.00	
Game Fish	70	56.91	6.62	58.02	0.09
Rough Fish	53	43.09	4.79	41.98	0.09

Gill netting, Table 41, produced 100 fish of which only 9 were game species. Carp were dominant in the netting sample (86 per cent).

Table 41 Percentage Composition by Number, Weight, and Average Weight of Fish Taken from Tule Lake April 1, 1964. (6 units standard gill net)

Species	Number	Per Cent by Number	Total Weight	Per Cent by Weight	Average Weight
Carp	86	86.00	35.40	87.84	0.41
Black bullhead	5	5.00	1.54	3.82	0.31
Channel catfish	1	1.00	1.74	4.31	1.74
Black bass	6	6.00	1.10	2.72	0.18
Green sunfish	1	1.00	0.43	1.07	0.43
White crappie	1	1.00	0.09	0.23	0.09
Total	100	100.00	40.30	100.00	
Game Fish	9	9.00	3.36	8.33	
Rough Fish	91	91.00	36.94	91.67	

Since only one channel catfish was recovered, added stocking of 3,000 fingerlings was recommended.

Carp, bullheads and largemouth bass all had a wide range in "K" factors and average "K" factors were below normal, Table 42.

Table 42 "K" Factor Ranges and Averages for Species Taken from Tule Lake March 31 and April 1, 1964.

Species	Number	"K" Range	"K" Average
Carp	25	1.7-3.1	2.7
Channel catfish	1	1.8	1.8
Black bullhead	5	1.8-2.6	2.1
Largemouth bass	25	1.8-4.2	2.4
Green sunfish	1	4.6	4.6
White crappie	1	2.8	2.8

Food items, Table 43, were found in 10 fish stomachs and fish occurred in 8 of these. Insect, insect larvae, and crustacean each occurred one time.

Table 43 Frequency of Occurrence of Food Items in Fish Stomachs Taken from Fish from Tule Lake April 1, 1964.

Species	Channel catfish	Black bullhead	Largemouth bass	Green sunfish	White crappie	Total
Number Examined	1	5	22	1	1	30
Number with Food	1	4	4	0	1	10
Food Items:						
Fish	1	3	3	0	1	8
Insect-Adult	0	0	1	0	0	1
Insect-Larvae	0	1	0	0	0	1
Crustacean	0	0	0	0	1	1
Vegetation	0	0	0	0	0	0
Other	0	0	0	0	0	0

Since this lake has a water-supply problem and an extensive rough-fish-infested watershed, maintaining a good sports fishery has been impossible.

Recommendations:

Two lakes discussed above are in need of management. Lake Fryer has an overcrowded fish population dominated by undesirable species. White crappie, the only common game species, are stunted and fishing pressure is not likely to sufficiently reduce their number. A rotenone renovation would be the best management under the existing circumstances. This has been previously recommended but will not be feasible within the next year. If it can be demonstrated to the controlling agency that the present approach (annual stocking of fry and fingerling game fish) is not effective in improving fishing success, it is quite likely the recommended renovation will be approved and carried out.

The second lake in need of management is Rita Blanca Lake. Drought has been the single most important factor contributing to the deterioration of this fishery, and if this lake receives sufficient run-off in 1965 the fishery should improve. However, if the lake does not catch sufficient run-off, a renovation is recommended for 1966.

Lakes Baylor and Childress will be the site of a research job to establish the benefits of stocking largemouth bass fry and channel catfish fingerlings. This research will take a minimum of 4 years and the nature of the research will dictate the type of management applied to these lakes.

Lake McClellan was renovated in October 1964 and management in 1965 should include stocking of forage species and bass fry. Habitat improvement work is presently being done by the U. S. Forest Service.

Buffalo Lake still provides good sport fishing and no management will be needed in 1965. An experimental introduction of northern pike has been approved by the Texas Parks and Wildlife Department and concerned officials of the U. S. Fish and Wildlife Service. This introduction will be made in 1965 provided the pike fry can be procured.

Lake Pauline was renovated in 1963 and now provides good fishing. Management recommendations include only stocking of additional white crappie and a few brood white bass.

Tule Lake will be resurveyed in early 1965 to determine if stocking will be needed. Stocking will probably be withheld unless the lake receives considerable run-off next spring.

Meredith Lake should be stocked with game fish only after it receives sufficient inflow. At the present time the lake contains about 350 surface acres of shallow water. Stocking of native minnows which live and successfully reproduce in reservoirs should be accomplished prior to the stocking of predaceous game species. Since the walleye would be a valuable sport species in Meredith Lake, it is recommended that efforts be made to acquire walleye fry and that they be stocked as soon as possible. After native predaceous species become established the chances for survival and eventual establishment of a walleye fishery would be greatly diminished.

Prepared by Lonnie Peters
Project co-leader

Date April 20, 1965

Approved by Marion Toole
Coordinator

Leo D. Lewis
Regional Supervisor

JOB COMPLETION REPORT

State of Texas

Project No. F-7-R-12 Name: Fisheries Investigations and Surveys of the Waters of Region I-A

Job No. B-18 Title: Fisheries Reconnaissance (Fisheries Region I-A2)

Period Covered January 1, 1964 - December 31, 1964

Objectives:

To collect representative samples of fish populations from waters where data are needed to determine changes in the balance of species, and changes in the condition of individual species.

To determine basic ecological conditions where not available from previous surveys, or major changes in ecological conditions having important effects on the fish population.

To determine utilization and fish harvest of each concerned water area.

To determine if management development or stocking programs are needed and to recommend such programs as are necessary to improve the fishery.

Techniques Used:

Standard survey gill nets and large mesh (specific unit) nets were used in netting operations.

A standard survey gill net at the time of construction, is 150 feet long with six 25-foot sections of progressively larger mesh sizes, beginning at 1 inch square and increasing at 1/2-inch intervals to a mesh size of 3 1/2 inches square. These nets are 8 feet deep with 6-foot vertical tie-downs every 9 feet. These nets shrink about 9 per cent after use. Each net therefore samples a vertical plane area of about 136 square feet per 25-foot section of webbing or 819 square feet total area, after shrinkage. This area is along the bottom of the lake perpendicular to the shoreline with the small mesh shoreward. The nets are rigged and set to remain submerged and follow the bottom contours while fishing.

Large mesh nets (specific nets) are constructed the same as standard survey gill nets except that mesh size is uniform throughout the unit. Mesh sizes may be 3 1/2 or 4 inches square. A unit is 150 feet of new webbing.

Seining was done in all accessible habitat areas and seines of varying lengths and mesh sizes were used. No standard seining units are established.

Inclusive data were taken from 25 fish of each species taken. If less than 25 individuals of a species were taken, data were obtained from each specimen. Data recorded included weight, standard length (measured from the outermost point of the closed mouth to the end of the terminal caudal vertebra), sex and gonadal

development. Stomachs of predatory species were removed and placed in cloth bags and preserved in 10 per cent formalin. The stomachs were later opened in the laboratory and the contents identified.

Fish taken in excess of 25 specimens per species were counted and a total weight determined to allow computation of proportional population percentages by weight and number. Any unusual number of parasites or indications of disease were noted during examination. Condition indexes were calculated for individual fish, and species averages for fish from each body of water surveyed were computed.

Plant types sufficiently abundant to provide cover or problems were noted. Information on fish harvest by sportsmen was not collected due to the extensive operations necessary to obtain valid data. Fisherman or concessionaire comments on fishing in a particular lake were noted if they added to the significance of the data collected.

Lake water level, turbidity, and general physical conditions were noted and temperature measurements made. Unless very unusual conditions were noted, they are not mentioned in this report.

During the first portion of this segment no bottom sampler or plankton net was available. A makeshift plankton net, capable of collecting a rough sample was assembled and used. Analysis equipment was not made available; therefore, only very rough estimates of plankton abundance were possible. Later in the segment, a 9- by 9-inch bottom sampler was received. Bottom samples were examined for animal life, but soil types were not determined.

Lakes surveyed are presented alphabetically. The river surveys are summarized in one section with data from tributaries of a system condensed into one table for each system, with the exception of the Brazos river system. The Clear Fork of the Brazos is presented separately.

Anson City Lake (New)

New Anson City Lake is approximately 7 miles north of Anson in Jones County. Fishing is public with a small admission fee. The small 150 surface-acre lake had a secche disk turbidity of 18 inches when surveyed May 18, 1964. Comparison of last year's data with present data indicates very little population change, but "K" factors indicate that the general condition of the fish population is better this year. There is no vegetation problem and supplemental stocking is not needed. Seining produced channel catfish fingerlings and largemouth bass fingerlings, indicating that reproduction had occurred. The results of seining and netting operations are presented in Table 1.

Bottom samples contained reasonable numbers of insects and invertebrates.

Plankton samples contained abundant forage for fry and minnow production.

Seining produced good forage species in adequate numbers.

The concessionaire reported good catches of channel catfish, largemouth bass and crappie from the lake. However, the percentage of desirable species in the

Table 1 New Anson City Lake, May 18, 1964. Survey Results from 4 Units of Standard Survey Gill Nets and 5 Drags of a 40-Foot One-Fourth Inch Mesh Seine.

	NETTING						SEINING	
Species	No.	Per Cent	Total Weight	Per Cent Weight	Average Weight	Average "K"	No.	Per Cent
Gizzard Shad	22	9.82	2.90	1.34	0.13	1.71	12	2.14
Smallmouth buffalo	1	0.44	15.43	7.14	15.43	3.49		
River carpsucker 1/	60	26.79	102.13	47.25	1.70	3.00		
Carp 1/	15	6.70	56.12	25.97	3.74	2.74		
Red shiner							425	76.03
Bullhead minnow							41	7.33
Fathead minnow							3	0.54
Channel catfish	13	5.80	15.59	7.21	1.20	1.68	4	0.72
Black bullhead 1/	34	15.18	7.36	3.41	0.22	2.76	3	0.53
Flathead catfish	1	0.44	1.34	0.62	1.34	1.95		
Largemouth bass	3	1.34	3.77	1.74	1.26	2.77	11	1.97
Green sunfish	4	1.79	0.56	0.26	0.14	3.40		
Redear sunfish	3	1.34	0.82	0.38	0.27	2.70		
Bluegill	10	4.46	1.07	0.50	0.11	3.48	39	6.98
Orangespotted sunfish							4	0.71
Longear sunfish							14	2.51
White crappie	58	25.90	9.03	4.18	0.16	2.73		
Logperch							3	0.54
Total	224	100.00	216.12	100.00			559	100.00
Desirable Species	92	41.07	32.18	14.89				
1/ Undesirable species	132	58.93	183.94	85.11				

Food Taken:

Species	Food
Channel catfish:	Grain sorghum, fish
Black bullhead:	Decaying vegetation, amphipods, fish
White crappie:	Fish

lake is 41.07 per cent by number and 14.89 per cent by weight. The desirable species netted are not sufficiently large to be considered very desirable by fishermen. This lake should be checked again within the next two years to determine if it needs management.

Anson City Lake (Old)

Old Anson City Lake is approximately 50 surface acres and is located about 3 miles south of Anson in Jones County. Seining is impossible because of bulrushes, *Scirpus* sp., broadleaf pondweed, *Potamogeton nodosus*, muskgrass, *Chara vulgaris*, and filamentous algae, *Spirogyra* sp. Willow, *Salix* sp., line the shoreline. This condition also hampered fishing along 90 per cent of the shoreline.

The results of the survey are presented in Table 2. All species taken are desirable in the proportion represented. The "K" factors were acceptable for all fish except the largemouth bass. Fishermen contacted stated that the average catch consisted of sunfish and an occasional largemouth bass. Five thousand channel catfish fingerlings were recommended on the basis of this survey. The dense population of Centrarchids in the lake almost precludes survival of largemouth bass fry or fingerlings.

Table 2 Old Anson City Lake, May 19, 1964. Survey Results From 3 Units of Standard Survey Gill Nets.

	NETTING					
Species	No.	Per Cent	Total Weight	Per Cent Weight	Average Weight	Average "K"
Golden shiner	2	3.12	0.41	3.99	0.20	1.73
Largemouth bass	1	1.56	0.25	2.43	0.25	1.98
Redear sunfish	5	7.82	1.51	14.70	0.30	4.25
Bluegill	23	35.93	4.07	39.63	0.18	3.98
White crappie	33	51.57	4.03	39.25	0.12	2.41
Total	64	100.00	10.27	100.00		

Desirable species All

Food Taken:

Species	Food
Redear sunfish:	Fish remains
Bluegill:	Filamentous algae
White crappie:	Insects

The Secche Disk reading was 18 inches and turbidity seemed to be due primarily to suspended soil particles. Plankton samples and bottom samples were interpreted to indicate a desirable forage situation in the lake. Conditions observed during the survey indicate that increased fishing pressure would improve the fishing in Old Anson City Lake.

Abernathy Lakes

Three small lakes at Abernathy were surveyed March 5, 1964. Three fish, 2 largemouth bass and 1 black bullhead, were taken with one unit of standard gill net in the south lake. All three fish were of utilizable size. Seining produced 48 red shiners and 1,302 fathead minnows. All were in good condition.

The north lake was too shallow to net and seining produced 57 goldfish, 130 red shiners and 2,920 fathead minnows. This lake was later treated to remove its fish population and was not restocked because it is not permanent water.

The east lake produced 1 small channel catfish, 1 largemouth bass and 1 black bullhead. Seining was unproductive because of steep banks and clear water.

Both the east and south lakes were stocked with largemouth bass taken from K. N. Clapp City Park Lake April 27, 1964. The bass stocked were from 7 to 10 inches in total length. Thirty-one largemouth bass were placed in the east lake and thirty-two in the south lake. Due to water clarity and negative seining results, it was recommended that the fish in the east lake be fed.

Aspermont

Aspermont City Lake was surveyed June 25, 1964. The lake was very low, with a maximum depth of 6 feet and an approximate surface area of 15 acres. It was quite turbid at the time. Bulrush were abundant along the western shoreline and in and along the Tonk Creek entrance channel. Very little other vegetation was present. The lake is dependent on rain for its water supply and drought conditions caused its low level.

Plankton and bottom samples were very poor, possibly due to overabundant shad population and low water conditions.

Netting and seining results are presented in Table 3. These figures indicate poor fish population proportions; however, large gizzard shad are the overbalancing factor. "K" averages were fair. Black bullheads averaged over 1/2 pound and could be considered a utilizable fish in this lake. Age classes one and two largemouth bass were seined and fingerling largemouth bass were also supplementally stocked this year.

The majority of shad taken were large and a die-off of this species had occurred following a recent cold rain. It is possible that many of these shad will not survive winter conditions in the lake with its low water level. A check next spring would determine if the shad population is reduced or if a need for management still exists as it does now.

If winter kill of shad does occur and spring rains enlarge the lake, encouraging spawning of game species, there should be an upswing in the desirable fish population and better fishing in the lake. If these favorable conditions do not occur, however, it is proposed that management by a selective treatment be conducted. Stocking of largemouth bass fingerling and channel catfish should be done following the treatment. No small channel catfish were obtained by seining, therefore, supplemental stocking of the lake with this species in 1965 is indicated if treatment is not done.

Benjamin City Lake

Benjamin City Lake is located about 7 miles west and south of Benjamin in Knox County. It was treated by local individuals without notification of the regional biologist in June 1964. Rains and high water preceded a survey on October 7, 1964. Data from this survey are in Table 4.

These fish were either survivors of the treatment or had come downstream from flooded stock ponds on the watershed. Bottom sampling showed the newly innundated west end to be sterile and 8 diptera larvae were recovered in 1 bottom sample from the east end of the lake. Plankton was moderately abundant.

Table 3 Aspermont City Lake, June 25-26, 1964. Survey Results From 4 Units of Standard Survey Gill Nets and 6 Drags Each With a 20- and a 40-Foot One-Fourth Inch Mesh Seine.

	NETTING						SEINING	
Species	No.	Per Cent	Total Weight	Per Cent Weight	Average Weight	Average "K"	No.	Per Cent
Gizzard shad 1/	159	59.10	111.99	46.88	0.70	2.0	31	4.65
Carp 1/	17	6.32	55.28	23.14	3.25	2.7		
Goldfish							1	0.15
Golden shiner							1	0.15
Spottail shiner							19	2.85
Red shiner							22	3.31
Bullhead minnow							3	0.45
Channel catfish	6	2.23	34.24	14.34	5.70	2.2		
Black bullhead 1/	52	19.33	28.95	12.12	0.56	2.4	5	0.75
Largemouth bass							24	3.60
Green sunfish							1	0.15
Redear sunfish	9	3.35	2.86	1.20	0.32	4.1	58	8.71
Bluegill	13	4.83	2.61	1.09	0.20	4.9	230	34.53
Longear sunfish							44	6.61
White crappie	13	4.84	2.93	1.23	0.23	2.6	227	34.09
Total	269	100.00	238.86	100.00			666	100.00
Desirable fish	41	15.24	42.64	17.85			628	94.10
1/Undesirable fish	228	84.76	196.22	82.15			38	5.90

Food Taken:

Species	Food
Channel catfish:	Shad
Black bullhead:	Roundworm, vegetation, fish, packaged shrimp, pondweed
Redear sunfish:	Vegetation, roots, wood, insect larvae, insect
White crappie:	Crustaceans, insect larvae, insects, fish

Table 4 Benjamin City Lake, October 7-8, 1964. Survey Results From 8 Units of Standard Survey Gill Nets and 7 Drags With a 10-foot One-Eighth Inch Mesh Seine and 6 Drags With a 40-Foot One-Fourth Inch Mesh Seine

	NETTING						SEINING	
Species	No.	Per Cent	Total Weight	Per Cent Weight	Average Weight	Average "K"	No.	Per Cent
Red shiner							26	22.03
Black bullhead	69	100.00	35.61	100.00	0.52	2.2	6	5.08
Mosquitofish							39	33.05
Green sunfish							22	18.65
Bluegill							25	21.19
Total	69	100.00	35.61	100.00			118	100.00
Desirable fish	None						112	94.91
Undesirable Fish	All						6	5.09

Food Taken:

Species	Food
Black bullhead	Algae, vegetation, snails, crayfish, mussels, insects

The recent raise in water level submerged the area, which would normally contain aquatic plants, and flooded pasture land along the western shoreline of the lake.

Black bullheads, bluegill, and green sunfish were present in the seine sample.

The average "K" factor of the bullheads netted was poor but should increase rapidly in the renovated lake.

Three thousand channel catfish, 3,000 largemouth bass, and 3,000 redear sunfish were stocked in the lake after the survey.

This lake should be checked for fish population progress and possible restocking in 1965.

Buffalo Springs Lake

Buffalo Springs Lake is presently the subject of a detailed study and is covered separately under Job D-3.

Crowell City Lake

Crowell City Lake was surveyed on July 21, 1964, and produced the results in Table 5. The undesirable species are apparently overabundant; however, the black bullheads are represented by numerous utilizable specimens and fishermen catch is reported good for largemouth bass. Average "K" factors were poor; however, and game fish of utilizable size were few.

Seining produced numerous largemouth bass fingerlings and no young channel catfish. The lake was later stocked with channel catfish to supplement the population.

Bottom and plankton samples revealed a moderate microfauna and insect population.

Cattails, Typha sp., musk grass, and sago pondweed, Potamogeton pectinatus, were abundant around the periphery of the south and southwestern shoreline and out into the lake. Musk grass and sago pondweed were dense in the shallow water which comprised the peripheral two-thirds of the lake. The lake depends on rain for water and was down about 5 feet below spillway and 3 feet below conservation level at the time of the survey.

Excessive vegetation is providing cover favoring small Centrarchids. Thinning of vegetation in two-thirds of the lake to allow more effective predation by game species would be advantageous.

If spring rains deepen the lake a fertilization program would be beneficial. The appropriate fertilizer for the region should be used and the program should begin in March and terminate in May. This will enrich the bottom fauna and plankton, and shade out aquatic plant growth. This should result in more efficient predation, better growth by game fish, and better fishing by midsummer and fall.

Table 5 Crowell City Lake, July 21-22, 1964. Survey Results From 3 Units of Standard Survey Gill Nets, 11 Drags With a 10-Foot One-Eighth Inch Mesh Seine and 2 Dr. With a 40-Foot One-Fourth Inch Mesh Seine.

	NETTING						SEINING	
Species	No.	Per Cent	Total Weight	Per Cent Weight	Average Weight	Average "K"	No.	Per Cent
Golden shiner 1/	23	26.13	4.02	9.87	0.17	1.8	6	1.76
Channel catfish	1	1.14	1.03	2.54	1.03	1.5		
Black bullhead 1/	47	53.41	28.62	70.33	0.61	2.3	7	2.06
Mosquitofish							1	0.29
Largemouth bass	2	2.27	5.28	12.98	2.64	2/	122	35.89
Green sunfish	4	4.55	0.68	1.67	0.17	3.8	51	15.00
Redear sunfish							11	3.23
Bluegill	2	2.27	0.15	0.37	0.08	3.7	50	14.71
Longear	4	4.54	0.30	0.74	0.08	4.5	15	4.41
White crappie	5	5.69	0.61	1.50	0.12	2.6	1	0.29
Sunfish fry							76	22.36
Total	88	100.00	40.69	100.00			340	100.00
Desirable fish	18	20.45	8.05	19.78			327	96.18
1/Undesirable fish	70	79.55	32.64	80.22			13	3.82

Food Taken:

Species	Food
Black bullhead:	Vegetation, algae, insect larvae, snails.
Largemouth bass:	Fish (black bullhead)
Bluegill:	Insect larvae, pondweed, insects
White crappie:	Crustacea, insects, insect larvae

2/ Largemouth bass had been damaged by turtles in such a manner that "K" factors were unreliable.

Increased fishing pressure and retention of all sunfish caught will also aid in producing better fishing in the lake.

League Davis Lake

Davis Lake is about 10 miles south of Benjamin in Knox County and was surveyed by State Biologist James Wilcox in March 1964. The lake is open to public fishing for a small fee when the fish population is adequate.

The survey revealed an almost completely decimated population of fish, resulting from insecticide contamination from adjacent cotton fields. The lake owners also own and operate the cotton fields. They decided that the fish population status was secondary to a good cotton crop. No further work was attempted, or is recommended, on their lake.

Fort Phantom Hill

Lake Fort Phantom Hill is approximately 5 miles north of Abilene in Jones County. It was surveyed on March 10, 1964, and Table 6 contains the results of the survey. Desirable species represented over 60 per cent by number and over 50 per cent by weight. Utilizable fish were abundant and all that were dissected were in good condition. The average "K" factors were at an acceptable level.

Table 6 Fort Phantom Hill, March 10, 1964. Survey Results from 13 Units of Standard Survey Gill Nets, 8 Units of Specific Nets, 18 Drags of a 20-Foot One-Eighth Inch Mesh Seine, 1 Drag of a 100-Foot One-half Inch Mesh Seine, and 4 Drags With a 60-Foot One-Fourth Inch Mesh Seine.

	NETTING						SEINING	
Species	No.	Per Cent	Total Weight	Per Cent Weight	Average Weight	Average "K"	No.	Per Cent
Gizzard shad 1/	20	6.68	2.28	0.60	0.11	1.7	593	78.64
Smallmouth buffalo 1/	20	6.69	37.83	10.02	1.89	3.4		
River carpsucker	69	23.08	119.86	31.76	1.74	2.8		
Carp 1/	7	2.34	13.88	3.67	1.98	2.7		
Spottail shiner							14	1.86
Red shiner							39	5.17
Bullhead minnow							26	3.45
Channel catfish	58	19.40	63.44	16.81	1.09	1.9		
Black bullhead 1/							1	0.13
Flathead catfish	3	1.00	48.24	12.78	16.08	1.9		
Mississippi silversides							26	3.45
White bass	76	25.42	59.65	15.80	0.78	2.9		
Largemouth bass	9	3.01	26.10	6.92	2.90	2.8	1	0.13
Bluegill	1	0.33	0.09	.02	0.09	4.1	25	3.32
Longear sunfish							23	3.05
White crappie	36	12.05	6.09	1.62	0.17	2.5	2	0.26
Logperch							4	0.54
Total	299	100.00	377.46	100.00			754	100.00
Desirable fish	183	61.21	203.61	53.94			160	21.23
1/ Undesirable fish	116	38.79	173.85	46.06			594	78.77

Food Taken:

Species	Food
Channel catfish:	Algae, fish, insects, vegetation
Flathead catfish:	Fresh water shrimp
Largemouth bass:	Fish
White crappie:	Crustacea, fish, insects

Comparison with survey data from 1963 reveals no significant shift in population percentages from netting and no seining was conducted in 1963.

Seining in 1964 revealed the shad population to be predominately of forage size and produced a majority of desirable forage species. Only one age class 1

largemouth bass were seined, and no channel catfish were seined. However, stocking was not recommended because the date of the survey preceded the spawning season.

No noxious vegetation was present.

The lake is in good condition and needs no management except a check to determine the necessity of supplemental stocking of game species in 1965.

Hamlin Lake (New)

New Hamlin Lake is several miles south of Hamlin in Jones County. Its fish population has a majority of game species and the concessionaire and fishermen said fishing was quite good.

Data from this year's survey are presented in Table 7. The average bullheads were slightly small to be attractive to fishermen. All game fish except bluegill have quite utilizable sizes. Comparison of present data with data from 1960 indicates that the number of game fish has increased and their condition has improved.

Table 7 Hamlin Lake (New), May 22, 1964. Survey Results from 4 Units of Standard Gill Nets and 4 Drags with a 40-Foot One-Fourth Inch Mesh Seine and 1 Drag With a 20-Foot One-Fourth Inch Mesh Seine.

	NETTING						SEINING	
Species	No.	Per Cent	Total Weight	Per Cent Weight	Average Weight	Average "K"	No.	Per Cent
Gizzard shad 1/	114	29.68	20.79	11.06	0.18	1.57	211	35.58
Golden shiner							41	6.91
Red shiner							49	8.26
Bullhead minnow							19	3.21
Channel catfish	26	6.77	15.50	8.24	0.60	1.85	16	2.70
Black bullhead 1/	62	16.15	11.27	6.00	0.18	2.54	24	4.04
Largemouth bass	3	0.78	10.27	5.46	3.42	2.80	20	3.38
Warmouth	1	0.26	0.39	0.21	0.39	3.10	2	0.33
Green sunfish	1	0.26	0.12	0.06	0.12	3.97		
Bluegill	15	3.91	1.26	0.67	0.08	3.79	140	23.61
White crappie	162	42.19	128.36	68.30	0.79	3.60	68	11.47
Logperch							3	0.51
Total	384	100.00	187.96	100.00			593	100.00
Desirable fish	208	54.17	155.90	82.94			569	99.96
1/Undesirable fish	176	45.83	32.06	17.06			24	0.04

Food Taken:

Species	Food
Channel catfish	Crayfish, crappie
Black bullhead	Algae, vegetation, insects, fish
Crappie	Insects, fish

Seining produced over 90 per cent desirable fish of a forage size and indicated that adequate game fish spawning had occurred. The lake had a secche disk turbidity of 8 inches and yielded good bottom fauna and zooplankton samples.

No noxious vegetation was present and none reported by fishermen. Brushy shorelines made seining difficult. The most abundant plant was willow.

The lake is presently in excellent condition and no management is needed.

Hamlin Lakes (Old)

Both Old Hamlin Lakes are 3 to 5 miles west of Hamlin in Fisher County. The upper lake covers approximately 70 surface acres and the lower lake about 30 surface acres. They are situated in series with a small dam separating them. The water from the upper lake's spillway falls about 10 feet through the air to conservation level of the lower lake. They are quite similar in many aspects and are considered together in this report.

Both lakes are quite saline and no bottom microfauna or zooplankton were obtained from either. No aquatic vegetation problem exists, although willows and bulrush are abundant along the shoreline.

Bottom samples smelled strongly of hydrogen sulfide, and it is possible that thermal stratification occurs and a toxic layer of noxious gases exist at times in the lakes. The salinity of the lakes suggests that the possibility of introducing salt water species should be investigated.

Both lakes have been stocked with channel catfish and largemouth bass in the past with evident poor survival. Examination of gill net sampling and seining data, shown in Tables 8 and 9, reveals a poor fish population. Shad are eating unicellular algae and numerous crayfish were netted and seined.

Shortly before the survey, a broken oil pumpline spread about five thousand gallons of crude oil on the surface of the upper lake. The pollutant was cleaned up and an observer reported that it had caused only a slight fish kill which was not in evidence at the time of the survey.

The presence of New Hamlin Lake, very near to Hamlin, provides good fishing without need for the Old Hamlin Lakes.

Management should be withheld pending a study of the lakes.

J. B. Thomas

Lake J. B. Thomas is located about 19 miles southwest of Snyder and lies partly in Borden County and partly in Scurry County. The lake was surveyed March 31 through April 2, 1964. The seining and netting samples indicated a good fish population. All seined fish were of a utilizable forage size and condition indexes, as well as visual evidence, revealed a healthy population. Netted shad were approximately 90 per cent forage size. They are classified as undesirable but they could be considered desirable from the standpoint of forage as many fish were feeding on shad.

Table 8 Old Hamlin Lake (Upper), May 21, 1964. Survey Results From 3 Units of Standard Survey Gill Net and 4 Drags of a 20-Foot One-Eighth Inch Mesh Seine and 1 Drag With a 40-Foot One-Fourth Inch Mesh Seine

	NETTING						SEINING	
Species	No.	Per Cent	Total Weight	Per Cent Weight	Average Weight	Average "K"	No.	Per Cent
Gizzard ~~shad~~	72	98.63	12.47	90.42	0.17	2.08		
Red shiner							20	54.05
Plains killifish							9	24.32
Red River pupfish							8	21.63
Largemouth bass	1	1.37	1.32	9.58	1.32	2.51		
Total	73	100.00	13.79	100.00			37	100.00

Food Taken:

Species	Food
Shad	Unicellular algae
Largemouth bass	Crayfish

Table 9 Old Hamlin Lake (Lower), May 21, 1964. Survey Results from 2 Units of Standard Survey Gill Nets and 5 Drags of a 20-Foot One-Eighth Inch Mesh Seine

	NETTING						SEINING	
Species	No.	Per Cent	Total Weight	Per Cent Weight	Average Weight	Average "K"	No.	Per Cent
Gizzard shad	20	36.36	2.56	4.69	0.13	1.62		
Smallmouth buffalo	1	1.82	0.72	1.32	0.72	2.94		
River carpsucker	11	20.00	22.10	40.52	2.00	2.81		
Carp	15	27.27	27.19	49.85	1.81	2.47		
Silver chub							3	2.29
Red shiner							120	91.60
Black bullhead	7	12.73	1.22	2.24	0.17	2.03		
Green sunfish							2	1.52
Bluegill							4	3.06
Longear sunfish							2	1.53
Freshwater drum	1	1.82	0.75	1.38	0.75	3.07		
Total	55	100.00	54.54	100.00			131	100.00

Desirable fish (Unique situation makes almost any fish which will survive desirable although all fish listed fit in an undesirable category)

Undesirable fish

Food Taken:

Species	Food
Black bullhead	Filamentous algae, insect larvae, fish

The purpose of the survey was to determine if a marginal selective treatment was needed at the lake. It was decided, based on the conditions evidenced by the survey, that treatment was not necessary. Overall conditions had altered favorably between the time of the last survey in 1963 and the present survey. No one figure altered greatly, but an accumulation of 3 to 20 per cent changes in relative game fish and rough fish proportions produced the more desirable percentages in Table 10. Percentage comparisons between the 2 years' survey results show that desirable species increased from 27.98 per cent by number in 1963 to 50.54 per cent in 1964. Undesirable species decreased from 72.02 per cent by number in 1963 to 49.46 per cent in 1964. Desirable species increased from 46.52 per cent to 63.07 per cent by weight and undesirable species decreased from 53.48 per cent to 36.93 per cent.

Another survey to determine population proportions would be advisable within the next two years.

Justiceburg City Lake

Justiceburg City Lake is the community water supply and is located about 4 miles southeast of Justiceburg. It was surveyed on March 18, 1964, and the survey yielded the data in Table 11. The lake was low at the time of the survey and contained abundant filamentous algae, sago pondweed, and some muskgrass. Seining was not too difficult as the lowered water level presented some areas comparatively free of vegetation.

The desirable fish population overbalances the undesirable population by weight, but individual fish size was small. At the time the lake was surveyed, the water level was low and it has continued to recede. At the present time (December 1964) it is in critical condition. If the lake dries up it should be stocked immediately following its filling. Supplemental stocking of channel catfish and largemouth bass fingerlings would be advantageous if it fills before drying up, because the present low water level will cause extreme alterations in its fish population.

K. N. Clapp City Park Lake

This lake, located in Lubbock, was not surveyed because it was being drained in order to alter its basic shape and to landscape the shoreline. However, on April 27, 1964, its remnant water, about one-half acre foot, was seined to salvage the remaining fish.

Approximately eight tubs full of sunfish were seined and given to spectators.

Approximately 300 largemouth bass were obtained. Twenty-seven largemouth bass averaging 1.33 pounds in weight and 2.3 average "K" factor were tagged and transferred to Maxey Park Lake in Lubbock. Seventy-seven other largemouth bass of equal size were transferred without tagging.

Sixty-three of the remaining largemouth bass were stocked in Abernathy Lakes at Abernathy and the remaining smaller fish were given to landowners who wished to stock their ponds.

Table 10 J. B. Thomas Lake, March 31 through April 2, 1964. Survey Results From 10 Units of Standard Survey Gill Nets and 4 Units of Specific Gill Nets, 12 Drags With a 20-Foot One-Fourth Inch Mesh Seine and a 40-Foot One-Fourth Inch Mesh Seine

	NETTING						SEINING	
Species	No.	Per Cent	Total Weight	Per Cent Weight	Average Weight	Average "K"	No.	Per Cent
Gizzard shad 1/	68	18.68	10.10	2.48	0.15	1.4	283	74.08
River carpsucker 1/	88	24.17	112.07	27.58	1.27	2.4		
Carp 1/	20	5.50	27.35	6.73	1.37	2.4		
Golden shiner 1/	1	0.27	0.20	0.05	0.20	2.3	3	0.78
Spottail shiner							83	21.73
Plains minnow							1	0.26
Bullhead minnow							6	1.57
Channel catfish	35	9.62	30.08	7.40	0.86	1.6		
Flathead catfish	8	2.19	124.99	30.75	15.62	2.0		
White bass	64	17.59	41.88	10.31	0.65	2.6		
Largemouth bass	18	4.94	52.42	12.90	2.91	2.5	2	0.53
Green sunfish							1	0.26
Redear sunfish	5	1.38	0.60	0.15	0.12	3.3	1	0.26
Bluegill	10	2.74	0.95	0.23	0.10	3.7		
Longear sunfish							1	0.26
White crappie	44	12.09	5.37	1.32	0.12	2.3		
Freshwater drum 1/	3	0.83	0.38	0.10	0.13	1.7	1	0.27
Total	364	100.00	406.39	100.00			382	100.00
Desirable fish	184	50.54	256.29	63.07			95	24.87
1/ Undesirable fish	180	49.46	150.10	36.93			287	75.13

Food Taken:

Species	Food
Channel catfish	Algae, fish, insect larvae, insects
White bass	Fish, insect larvae
Largemouth bass	Fish
Sunfish	Algae, insect larvae, vegetation
White crappie	Crustacea, fish, insect larvae, insects
Freshwater drum	Insect larvae

Table 11 Justiceburg Lake, March 18, 1964. Survey Results From 4 Units of Standard Survey Gill Nets and 6 Drags With a 20-Foot One-Fourth Inch Mesh Seine

	NETTING						SEINING	
Species	No.	Per Cent	Total Weight	Per Cent Weight	Average Weight	Average "K"	No.	Per Cent
Golden shiner 1/	39	61.90	7.36	36.47	0.19	1.8		
Red shiner							1	0.76
Channel catfish	2	3.17	1.32	6.54	0.66	2.0		
Largemouth bass	4	6.35	7.29	36.12	1.82	2.6	5	3.85
Green sunfish	1	1.59	0.39	1.94	0.39	3.6	6	4.62
Bluegill	5	7.94	0.46	2.27	0.09	3.6	118	90.77
White crappie	12	19.05	3.36	16.66	0.28	2.6		
Total	63	100.00	20.18	100.00			130	100.00
Desirable fish	24	38.09	12.82	63.56			130	100.00
1/Undesirable fish	39	61.91	7.36	36.44				

Food Taken:

Species	Food
Channel catfish	Insect larvae
Largemouth bass	Fish remains, algae
Green sunfish	Mussels, algae
Bluegill	Crustacea, mussels, insect larvae, vegetation
White crappie	Insect larvae, crustacea, fish

Maxey Park Lake

Maxey City Park Lake in Lubbock was surveyed January 28, 1964. The lake water level was low when surveyed and no vegetation was encountered. The lake fluctuates considerably in water level and it is not fished too heavily, although it provides recreation for a few residents near the lake.

Black bullheads and largemouth bass were the only fish netted, as shown in Table 12. Although black bullheads are generally undesirable the majority netted were of utilizable size and possibly desirable in this lake. Seining produced fish which were all of forage size and "K" factor averages were acceptable.

One hundred and four largemouth bass were placed in Maxey Park Lake on April 27, 1964, just before a junior fish rodeo, and no work has been done there since.

Considering the black bullheads as acceptable in the lake, it needs no management at the present time.

Table 12 Maxey Park Lake, January 28, 1964. Survey Results From 3 Units of Standard Survey Gill Nets and 3 Drags of a 20-Foot One-Eighth Inch Mesh Seine

	NETTING						SEINING	
Species	No.	Per Cent	Total Weight	Per Cent Weight	Average Weight	Average "K"	No.	Per Cent
Red shiner							10	32.25
Bullhead minnow							9	29.04
Black bullhead 1/	237	97.13	64.92	94.23	0.27	2.3		
Largemouth bass	7	2.87	3.97	5.77	0.57	3.3		
Bluegill							12	38.71
Total	244	100.00	68.89	100.00			31	100.00
Desirable fish	7	2.87	3.97	5.77			31	100.00
1/Undesirable fish	237	97.13	64.92	94.23				

Food Taken:

Species	Food
Black bullhead	Fish, algae, crustacea, insect remains
Largemouth bass	Fish

McKenzie State Park Lake

McKenzie Lake produced no game fish except sunfish when it was surveyed March 27, 1964. Table 13 contains the data from this survey. No fishing is allowed on this lake except on Labor Day and the Fourth of July.

Table 13 McKenzie State Park Lake, March 27, 1964. Survey Results from 4 Units of Standard Survey Gill Nets and 5 Drags each with a 20-Foot One-Fourth Inch Mesh and 40-Foot One-Fourth Inch Mesh Seine

	NETTING						SEINING	
Species	No.	Per Cent	Total Weight	Per Cent Weight	Average Weight	Average "K"	No.	Per Cent
Fathead minnow							160	64.77
Black bullhead	274	97.50	86.23	97.99	0.31	2.4	2	0.81
Mosquitofish							9	3.65
Green sunfish	4	1.43	1.40	1.59	0.35	4.0	76	30.77
Bluegill	3	1.07	0.37	0.42	0.12	3.1		
Total	281	100.00	88.00	100.00			247	100.00
Desirable fish	7	2.50	1.77	2.02			245	99.19
Undesirable fish	274	97.50	86.23	97.98			2	0.81

Food Taken:

Species	Food
Black bullhead	Frog, fish remains, crustacea, insect larvae, algae, seeds, black bullhead, bread
Bluegill	Bread, dragon fly larvae, pondweed, insect larvae, feather

It had a very healthy and abundant population of black bullheads which averaged 0.32 pounds each. Individuals over 1½ pounds were common in the sample, however. Classification of the black bullhead as undesirable here is purely arbitrary, and since it is the only large fish living in the water it is actually desirable. Bullheads attract picnickers to feed bread to them as a manner of enjoying their presence since no fishing is allowed. Fishermen catch large strings of bullheads on Labor Day and the Fourth of July.

McKenzie Lake produces a dense growth of unicellular algae during the summer which contributed to a small die off of black bullheads and sunfish in July. The die off was attributed to extremely high water temperatures and dissolved oxygen levels. Water temperature of 90° F. and dissolved oxygen of 17.5 ppm and dissolved carbon dioxide were disclosed by limited water analysis.

No management is recommended for this lake due to its unique fishing regulations.

Reese Air Force Base Lake

Reese Air Force Base Lake is an end recipient of treated sewage from a Hays contact aeration plant and two small 1/4-acre "shock load" oxidation ponds. The first pond is aerated by compressed air from 1,500 feet of perforated plastic tubing weighted in a grid on the bottom of the pond. The second pond is unaerated and supplies water to the main lake which is broad and shallow and densely populated with algae.

Reese Lake was surveyed once in January by 3 drags of a 300-foot seine. This was done as an investigation of a fish kill noticed when the lake thawed after freezing over. Only 2 channel catfish, 3 largemouth bass, 2 fathead minnows, and 7 goldfish were taken alive. All other fish observed or seined were dead. Numerous neoteinic tiger salamanders, *Ambystoma tigrinum*, were captured and all females were gravid.

On June 16, 1964, 5 units of standard survey nets were set and only 4 black bullheads, 4 goldfish and 200 salamanders were caught. The bullheads were in good condition with average "K" factors of 2.6. The goldfish were fat with a "K" factor average of 4.7. Table 14 contains the data from this survey.

Table 14 Reese Air Force Base Lake, June 16, 1964. Survey Results From 5 Units of Standard Survey Gill Nets and 8 Drags With a 40-Foot One-Fourth Inch Mesh Seine

	NETTING						SEINING	
Species	No.	Per Cent	Total Weight	Per Cent Weight	Average Weight	Average "K"	No.	Per Cent
Goldfish	4	50.00	2.61	66.92	0.65	4.7		
Fathead minnow							2	100.00
Black bullhead	4	50.00	1.29	33.08	0.32	2.6		
Total	8	100.00	3.90	100.00			2	100.00

Later in the summer the lake became practically dry and seining the remaining water produced only goldfish and salamanders.

In November, fall rains filled the lake. Live caged fish were left in the lake overnight on two different occasions to test toxicity of the water to fish. An impending encephalitis epidemic had caused spraying of the area with DDT. Less than 50 per cent of the test fish were alive after 24 hours and all were distressed. The Hays plant had also had equipment failure several times during the previous month, thus lowering the water quality.

It is recommended that the lake be drained and allowed to remain dry for at least two weeks in the summer of 1965 before being filled and restocked. Proper operation of the Hays plant should be maintained to prevent raw sewage from entering the first oxidation pond. Doubling the aeration in the first pond is now in progress and this will aid in producing better quality water at pond No. 2, where algae begins conversion of some of the excess organic materials remaining. Two areas of the main lake were deepened during low water conditions this summer and aeration devices are installed in one deepened area. This will aid in preventing freeze-over during the winter.

When the above recommendations are completed, caged live fish tests of the water should again be made, and stocking with largemouth bass and channel catfish should again be attempted if the test results are affirmative.

South Lake

South Lake at Post was surveyed three times in 1964, twice by seine survey and once by gill net. The lake was treated with rotenone at a rate of 1.7 ppm of 5 per cent rotenone powder on April 16, 1964.

Results of the pre-treatment 100-foot seine survey are presented in Table 15. These data compare very closely with a 1963 survey by State Biologist James Wilcox. The data from the two surveys were used as criteria for treatment. Visual observation of the emaciated condition of many of the fish taken emphasized the poor average "K" factor.

The seine survey of July 6, 1964, is combined in Table 16, with the netting survey made nine days later. Examining these data reveals that an incomplete kill was obtained by the treatment. All survivors are considered as undesirable because of their deleterious effect on the newly stocked population of largemouth bass. The new population is represented by the 71 largemouth bass seined on July 6, 1964. Their average "K" factor of 4.5 indicates good condition. They had grown rapidly since stocking; however, the presence of large largemouth bass and green sunfish will reduce their numbers considerably. The lake's plankton content was much better 3 months after treatment than it was before.

More bottom organisms were present after treatment than before treatment. Quick gains in "K" factors can be observed by comparing the condition indexes from Tables 15 and 16.

Ten thousand channel catfish were stocked in the lake on October 14, 1964. It is expected that the stocked bass population and larger survivors of the renovation will reduce this number considerably during low water conditions this winter. The fish population should be checked the first part of 1965 and, possibly, some channel catfish removed by seining if they appear to be too numerous or in poor condition.

Table 15 South Lake, March 18, 1964. Survey Results From 3 Drags with a 300-Foot One-Half Inch Mesh Seine

	SEINING					
Species	No.	Per Cent	Total Weight	Per Cent Weight	Average Weight	Average "K"
Goldfish 1/	5	0.34	4.49	11.15	0.90	4.9
Golden shiner 1/	79	5.39	1.78	4.42	0.02	2.0
Red shiner	14	0.95	0.03	0.08	0.00	
Fathead minnow	104	7.10	0.76	1.89	0.01	
Bullhead minnow	1	0.07				
Channel catfish	8	0.55	0.16	0.39	0.02	
Black bullhead 1/	158	10.78	14.99	37.25	0.01	1.9
Largemouth bass	3	0.21	5.35	13.29	1.78	2.5
Green sunfish 1/	872	59.52	10.09	25.07	0.01	3.2
Bluegill 1/	221	15.09	2.60	6.46	0.01	3.0
Total	1,465	100.00	40.25	100.00		
Desirable fish	130	8.87	6.30	15.65		
1/Undesirable fish	1,335	91.13	33.95	84.35		

Food Taken:

Species	Food
Black bullhead	Seeds, worms, insect larvae, crustacea
Largemouth bass	Insects
Green sunfish	Insect larvae, fish
Bluegill	Worms, insects, insect larvae, fish, algae, vegetation

Table 16 South Lake, July 15, 1964. Netting Results From 4 Units of Standard Survey Gill Nets, Combined With July 6, 1964, Seining Results From 11 Drags of a 10-Foot One-Eighth Inch Mesh Seine, 4 Drags of a 100-Foot One-Half Inch Mesh Seine, and 5 Drags With a 5-Foot One-Sixteenth Inch Mesh Seine

	NETTING						SEINING	
Species	No.	Per Cent	Total Weight	Per Cent Weight	Average Weight	Average "K"	No.	Per Cent
Goldfish	15	34.09	19.03	74.74	1.27	5.1		
Golden shiner							7	1.05
Red shiner							30	4.52
Bullhead minnow							16	2.41
Fathead minnow							307	46.23
Black bullhead	24	54.54	4.03	15.83	0.17	2.2	154	23.19
Largemouth bass	1	2.27	1.87	7.34	1.87	2.9	71	10.70
Green sunfish							72	10.84
Bluegill	3	6.82	0.42	1.65	0.14	4.8	6	0.90
White crappie	1	2.28	0.11	0.44	0.11	2.9	1	0.16
Total	44	100.00	25.46	100.00			664	100.00
Desirable fish							424	63.86
Undesirable fish	44	100.00	25.46	100.00			240	36.14

Table 16 continued.

Food Taken:

Species	Food
Black bullhead	Snails, algae, insects, crustacea, insect larvae, vegetation
Bluegill	Crustacea

It is recommended that fishing be allowed in this lake without restrictions, except those provided by existing game laws.

Stamford

Lake Stamford is approximately 15 miles northeast of the town of Stamford. This large lake, turbid with red clay and silt, was surveyed on June 22-23-24, 1964. Its fish population as represented by netting and seining samples is close to a critical condition. Survey data may be examined in Table 17. Fish condition was only fair, and this is reflected in the average "K" factors. Average "K" factors for smallmouth buffalo, river carpsucker, channel catfish, flathead catfish, white crappie, and drum are down from 0.1 to 0.4 from last year's average. The per cent by number of channel catfish is up, however, from 3.95 per cent in 1963 to 13.24 per cent in 1964. The average weight of channel catfish is up from 0.45 pounds in 1963 to 0.51 pounds in 1964. The survey was made in the same month and nets were set in the same locations last year. Therefore, the indications of a general unfavorable trend in fish population conditions and individual fish fitness should be valid.

The majority of the sunfish were too small to be attractive to fishermen. The average crappie weighed slightly in excess of 1/4 pound. Shad are not too numerous or too large. They were frequently taken as food by gar, flathead catfish, drum, and crappie. No largemouth bass were taken by nets and only one was taken by seine. This indicates a lack of largemouth bass reproduction. The average channel catfish weight of 1/2 pound was fairly uniformly represented in the netting samples by the individual fish.

Zooplankton and bottom samples were almost barren of animal life.

The only plants found in general abundance were smartweed, Polygonum sp., which were around most of the lake periphery. Cattails were abundant in some coves and some shallow areas, and bulrush occurs in some areas. None are sufficiently abundant to be problematic, except possibly the smartweed in some restricted areas. Willow occurs in many areas on and along the shore.

This lake should be checked with nets in 1965, and if the population proportions have not improved, a heavy marginal treatment of the lake is recommended. Fingerling largemouth and channel catfish should be stocked immediately after the toxic conditions cease following the treatment. The treatment should be done in the fall to take advantage of colder weather for stocked fish to become acclimatized and to insure having the proper fish sizes available from the hatchery for stocking. Stocking in the fall would also allow the stocked game fish to harvest the rough

Table 17 Stamford Lake, June 22-24, 1964. Survey Results From 14 Units of Standard Survey Gill Nets and 4 Units of Specific Nets and 5 Drags With a 20-Foot One-Fourth Inch Mesh, 5 Drags With a 40-Foot One-Fourth Inch Mesh, and 7 Drags With a Fry Seine

	NETTING						SEINING	
Species	No.	Per Cent	Total Weight	Per Cent Weight	Average Weight	Average "K"	No.	Per Cent
Shortnose gar 1/	5	1.10	12.90	1.66	2.58	0.7		
Gizzard shad 1/	3	0.66	0.35	0.04	0.12	1.7	593	70.93
Smallmouth buffalo 1/	26	5.74	106.64	13.74	4.10	3.5		
River carpsucker 1/	244	53.86	387.76	49.94	1.59	2.4		
Carp 1/	29	6.41	56.83	7.32	1.96	2.5		
Golden shiner							1	0.12
Red shiner							77	9.21
Bullhead minnow							13	1.55
Channel catfish	60	13.24	30.42	3.91	0.51	1.5	2	0.24
Black bullhead							3	0.36
Flathead catfish	13	2.87	90.76	11.69	6.98	1.8		
Mosquitofish							4	0.48
Mississippi silverside							32	3.83
Largemouth bass							1	0.12
Warmouth							1	0.12
Green sunfish							1	0.12
Redear sunfish							1	0.12
Bluegill	9	1.99	0.80	0.11	0.09	4.0	26	3.11
Longear sunfish	1	0.22	0.07	0.01	0.07	5.3	25	2.99
White crappie	40	8.83	13.94	1.79	0.35	2.7	49	5.86
Freshwater drum 1/	23	5.08	75.96	9.79	3.30	2.6	7	0.84
Total	453	100.00	776.43	100.00			836	100.00
Desirable fish	123	27.15	135.99	17.51			232	27.75
1/Undesirable fish	330	72.85	640.44	82.49			604	72.25

Food Taken:

Species	Food
Shortnose gar	Shad
Channel catfish	Insects, fish, insect larvae, grain, algae, vegetation
Flathead catfish	Fish, insects
Bluegill	Fish, algae, flatworms
White crappie	Fish, insects
Freshwater drum	Fish (shad), crustacea, insects, insect larvae

fish spawn in the spring. Supplemental spring stocking of fingerling bass during the spawning season of rough species would be advantageous following the marginal treatment and would also prove valuable if the treatment is not attempted.

Towle Park Lake

Towle Park Lake in Snyder was not surveyed this year due to lack of time.

White River Reservoir

White River Reservoir is located approximately 19 miles southeast of Crosbyton on the White River in Crosby County. It was surveyed four times in 1964 as a follow up and evaluation to the treatment with rotenone described under Project No. F-14-D-7, Job No. 16A-48 which is abstracted below.

"Treatment of the White River Lake Basin and watershed was begun November 21, 1963, and completed November 23, 1963.

"Stocking with 44,700 channel catfish, 5,000 largemouth bass and 557 blue catfish was completed January 6, 1965.

"When the post treatment survey of January 21, 1964, is compared to pre-treatment surveys, a 100 per cent eradication of carp, largemouth bass, channel catfish, sunfish and minnows is indicated in both the river channel and the lake basin. Also, eradication of 100 per cent of the black bullhead population in the river channel and more than 80 per cent in the lake basin is indicated. Additional surveys will be made to check the validity of these figures."

These additional surveys were made and resulting data are presented in tabular form in Tables 18, 19, 20, 21 and 22. Perusal of these tables shows the carp population still absent, continued evidence of 100 per cent kill of this species.

Black bullheads in the netting samples in April were no more numerous than in January. The channel catfish captured in April were some of the fish stocked in the lake and the two species were all that were captured. The water was exceptionally clear and vegetation was not present at the time. Zooplankton was abundant and individual specimens were large.

On April 16, 1964, approximately four gallons of minnows were seined from South Lake at Post and stocked in White River Reservoir. Species stocked were bullhead minnow, red shiner, and fathead minnow. On May 8, 1964, one hundred thousand additional largemouth bass fry were stocked.

These stocked fish and minnows appear in the survey made in July as shown in Table 20. The largemouth bass recovered by netting in July were probably some of the fish stocked last fall and averaged over 1/2 pound. The largemouth bass recovered by seining had been in the lake only 64 days. Their average weight when stocked was 0.11 grams. They averaged 18 mm long and had an average "K" factor of 1.9. When recovered, their average length was 109 mm, weight 45 grams and "K" 3.5. This is an increase of 409 times in bodyweight in 64 days.

Channel catfish recovered in July were those stocked in December 1963, whose standard length averaged 101.6 mm and in January 1964, whose standard length and weight averaged 96.66 mm and 14.22 grams. The catfish taken in July had an average length of 215 mm, weight of 213.2 grams and average "K" of 1.9. Considering the longest period of time for which they could have been stocked, 6 months, they had increased bodyweight 14.99 times to an average of 0.47 pound.

Table 18 White River Reservoir, January 21, 1964. Survey Results From 12 Units of Standard Survey Gill Nets and 3 Drags of a 20-Foot One-Eighth Inch Mesh Seine

	NETTING						SEINING	
Species	No.	Per Cent	Total Weight	Per Cent Weight	Average Weight	Average "K"	No.	Per Cent
Channel catfish	1	25.00						
Black bullhead	3	75.00	0.48	100.00	0.16	2.5		
Total	4	100.00	0.48	100.00				
Desirable fish	1	25.00						
Undesirable fish	3	75.00	0.48	100.00				

Food Taken:

Species	Food
Channel catfish	Not worked
Black bullhead	Worms, fly larvae, back swimmer

Table 19 White River Reservoir, April 15, 1964. Survey Results From 12 Units of Standard Survey Gill Nets and 6 Drags With a 40-Foot One-Eighth Inch Mesh Seine

	NETTING						SEINING	
Species	No.	Per Cent	Total Weight	Per Cent Weight	Average Weight	Average "K"	No.	Per Cent
Channel catfish	2	40.00	0.23	14.11	0.12	1.8		
Black bullhead	3	60.00	1.40	85.89	0.47	2.5		
Total	5	100.00	1.63	100.00				
Desirable fish	2	40.00	0.23	14.11				
Undesirable fish	3	60.00	1.40	85.89				

Food Taken:

Species	Food
Channel catfish	Empty
Black bullhead	Crustacea

Table 20 White River Reservoir, July 22, 23, 1964. Survey Results From 12 Units of Standard Survey Gill Nets, 12 Drags With a 10-Foot One-Eighth Inch Mesh Seine, 2 Drags With a 20-Foot One-Fourth Inch Mesh Seine and 4 Drags With a 40-Foot One-Fourth Inch Mesh Seine

	NETTING						SEINING	
Species	No.	Per Cent	Total Weight	Per Cent Weight	Average Weight	Average "K"	No.	Per Cent
Red shiner							155	51.15
Bullhead minnow							2	0.66
Fathead minnow							57	18.81
Channel catfish 2/	73	82.95	5.12	38.72	0.07	1.9		
Black bullhead 1/	13	14.77	6.84	51.74	0.53	2.4	2	0.66
Plains killifish							1	0.33
Mosquitofish							16	5.28
Largemouth bass	2	2.28	1.26	9.54	0.63	2.8	59	19.47
Green sunfish							3	0.99
Bluegill							2	0.66
Sunfish fry							6	1.99
Total	88	100.00	13.22	100.00			303	100.00
Desirable fish	75	85.23	6.23	48.26			301	99.34
1/Undesirable fish	13	14.77	6.84	51.74			2	0.66

2/ Eleven channel catfish were worked up to obtain average weights and "K" factors. The other 62 were released back into the lake.

Table 21 White River Reservoir, September 15, 1964. Survey Results From 2 Units of Standard Survey Gill Nets, 2 Drags of a 10-Foot One-Eighth Inch Mesh Seine, 10 Drags of a 20-Foot One-Fourth Inch Mesh Seine, 2 Drags of a 40-Foot One-Fourth Inch Mesh Seine and 3 Drags of a 100-Foot One-Half Inch Mesh Seine

	NETTING						SEINING	
Species	No.	Per Cent	Total Weight	Per Cent Weight	Average Weight	Average "K"	No.	Per Cent
Red shiner							664	35.50
Plains minnow							4	0.22
Fathead minnow							766	40.96
Channel catfish	54	73.97	29.24	86.50	0.54	1.6	2	0.11
Black bullhead 1/	16	21.92	4.13	12.22	0.26	2.3	1	0.05
Plains killifish							20	1.07
Mosquitofish							279	14.92
Largemouth bass	1	1.37	0.22	0.65	0.22	2.5	52	2.78
Green sunfish	2	2.74	0.21	0.63	0.10	4.1	80	4.28
Longear sunfish							2	0.11
Total 2/	73	100.00	33.80	100.00			1,870	100.00
Desirable fish	57	78.08	29.67	87.78			1,869	99.94
1/Undesirable fish	16	21.92	4.13	12.22			1	0.06

Table 21 continued.

Food Taken:

Species	Food
Channel catfish	Insects, insect larvae, vegetation, algae, crayfish, snails, crustacea
Black bullhead	Algae, crustacea, snails, insect larvae, vegetation
Largemouth bass	Insect larvae, crustacea, insect, spider
Green sunfish	Crustacea, fly larvae, snails

2/ This total does not include fish taken and released on the second day of the the survey. Percentages by number altered to those listed below if both days figures are used.
Channel catfish - 70.80%, black bullhead - 22.98%, largemouth bass - 1.25% and green sunfish - 4.97%

Table 22 White River Reservoir, September 15, 1964. Largemouth Bass Taken by Artificial Lures

Species	No.	Total Weight	Average Weight	Average "K"
Largemouth bass	19	1.62	0.09	2.2

Red shiners and fathead minnows had reproduced tremendously. Green sunfish, bluegill, and sunfish fry appeared in the July survey. They were not stocked by department personnel, consequently, they were survivors of the treatment or were contaminants by other means. Plains killifish and gambusia were not yet abundant, but were beginning to appear. Bullheads were more numerous than in June, and all fish were healthy and active. Sunfish were still scarce and their sizes small.

Plankton samples revealed very abundant plankton, but bottom sampling showed the bottom to be quite sterile of aquatic organisms. Plants appearing were sago pondweed and filamentous algae.

The survey in September produced more fish of all species in the nets except largemouth bass. Due to their absence from the nets, fishing with spinners was used to catch 19 largemouth bass. Data from these bass are given in Table 22. They have average weights and "K" factors which are less than those shown for the July survey. This indicates that crowding is occurring in the lake. All largemouth bass examined had numerous parasites in their livers.

The fish were stocked in sufficient numbers to adequately populate a full lake in expectation of rises in water level. In September the lake had not yet caught sufficient water to raise its level above that when the fish were stocked. If these rises do not come, the largemouth bass will continue the stunting which apparently has already begun.

The channel catfish recovered in September had an average length of 244.4 mm, weight 244.9 gm (0.54 pounds) and average "K" factor of 1.6. This is a 29.4 mm

average length increase, 31.7 grams average weight increase and 0.30 average "K" factor decrease. Thus the channel catfish are growing in weight as well as length, but their growth has slowed down; and although it does not necessarily follow that "K" factor average should decrease, it has. This is interpreted as indicating the beginning of crowding and stunting in the catfish population. All channel catfish examined were healthy and free of parasites with one or two exceptions. The sunfish were larger and minnows were more abundant in September than in July. Black bullhead population percentages had dropped slightly, but remained reasonably near the same as in the July survey although they too showed average "K" factor loss. This is considered as an additional indication of crowding and stunting of the fish population in the lake.

Plankters were still abundant and no measurable change had occurred in bottom fauna. Plants were increasing in density, especially sago pondweed.

None of the blue catfish stocked in the lake have yet been recovered.

In view of the indications of crowding and stunting, fishing should be allowed immediately after the majority of the largemouth bass population attains a legal length, provided the lake does not catch water. If the water level rises to or approaches conservation level, however, the stunting should cease and opening the lake to fishing would not be so urgent.

Seining was done in the White River on the Bridwell Ranch in July. Minnows, some of which were stocked by fisheries personnel, and largemouth bass, also stocked, are listed in Table 23. Listed also are several sunfish and one bullhead which were not stocked.

Carp were not collected from the river, again indicating 100 per cent eradication of this species.

River Surveys

The rivers in Region I-A2 have little flowing water. Only near the eastern border of the region in Foard, Haskell, Knox, and Jones Counties was sufficient flowing water present to support a fish population. The remaining river areas surveyed contained only isolated pools supplied by subterranean flow or broad, sandy river bed with limited areas of exposed flow.

Public access to pools on the watercourses is limited due to the necessity of crossing private land. This results in a very limited amount of available public fishing water, and the fish present are of little value as almost no utilizable fish were taken during this survey.

It was impossible, because of lack of time and equipment, to survey these rivers by traveling their watercourses. Consequently, they were surveyed by seining where access by highway was possible.

Data from individual fish populations at individual stations and for river system tributaries are lumped into total river system percentages and presented in Tables 24, 25 and 26. Individual station data are on file in the Slaton office.

Table 23 Data Collected From the White River on the Bridwell Ranch by Seining - July 23, 1964

Species	Number	Per Cent
Red shiner	108	13.70
Fathead minnow	108	13.71
Bullhead catfish	1	0.12
Plains killifish	56	7.11
Mosquitofish	32	4.06
Largemouth bass	9	1.14
Green sunfish	251	31.86
Bluegill	105	13.32
Longear sunfish	1	0.13
Sunfish fry	117	14.85
Total	788	100.00

Game fish 61.29 per cent
Rough fish 0.13 per cent
Minnows 38.58 per cent

Table 24 Number and Per Cent Taken by Seining From the Pease River System - July 9 and 10, 1964

Species	Number	Per Cent
Plains minnow	1	0.29
Plains killifish	45	13.23
Red River pupfish	294	86.48
Total	340	100.00

Game fish 0.00 per cent
Rough fish 0.00 per cent
Minnows 100.00 per cent

Table 25 Number and Per Cent of Fish Collected From the Brazos River System by Seining - July 1964

Species	Number	Per Cent
Gizzard shad	25	1.16
River carpsucker	7	0.33
Carp	1	0.04
Speckled chub	1	0.05
Sharpnose shiner	229	10.66
Red shiner	31	1.45
Plains minnow	1,084	50.49
Black bullhead	3	0.14
Plains killifish	89	4.14
Red River pupfish	610	28.41
Mosquitofish	50	2.33
Largemouth bass	1	0.05
Green sunfish	5	0.23
Bluegill	2	0.10
Orangespotted sunfish	5	0.23
Freshwater drum	1	0.05
Minnow fry	3	0.14
Total	2,147	100.00

Game fish 0.60 per cent Rough fish 1.72 per cent Minnows 97.68 per cent

Table 26 Number and Per Cent of Fish Taken by Seining From the Wichita River System - July 9, 1964

Species	Number	Per Cent
Red River shiner	8	1.21
Red shiner	16	2.44
Plains minnow	4	0.61
Plains killifish	167	25.46
Red River pupfish	63	9.60
Green sunfish	31	4.73
Longear sunfish	1	0.15
Minnow fry	366	55.80
Total	656	100.00

Game fish 4.87 per cent
Rough fish 0.00 per cent
Minnows 95.13 per cent

The Clear Fork of the Brazos River is presented separately since its juncture with the Brazos River is approximately 90 river miles from the boundary of Region 1-A2 and its fish population differs considerably from the rest of the Brazos River system in this region. Its population as represented by a seine survey of 8 stations is totaled in Table 27. There was more water in this river than any other river surveyed and probably it provides the most, if not the only, public fishing of all the rivers in Region 1-A2.

It is recommended that the stream surveys be omitted in the next segment in Region 1-A2.

Table 27 Number and Per Cent of Fish Collected from 8 Seining Stations on the Clear Fork of the Brazos River - July 8, 1964

Species	Number	Per Cent
Longnose gar	2	0.08
Gizzard shad	20	0.80
River carpsucker	1	0.04
Red shiner	1,094	44.15
Bullhead minnow	57	2.30
Fathead minnow	14	0.57
Channel catfish	1	0.04
Black bullhead	48	1.93
Mosquitofish	1,094	44.15
Largemouth bass	1	0.04
Warmouth	1	0.04
Green sunfish	30	1.21
Bluegill	10	0.41
Orangespotted sunfish	1	0.04
Longear sunfish	92	3.71
White crappie	12	0.49
Total	2,478	100.00

Game fish 5.97 per cent
Rough fish 2.82 per cent
Minnows 91.21 per cent