

JOB COMPLETION REPORT

as required by

FEDERAL AID IN FISHERIES RESTORATION ACT

TEXAS

Federal Aid Project No. F-7-R-11

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

Job No. B-18 Fisheries Reconnaissance

Project Leader: Lonnie Peters

J. Weldon Watson
Executive Director
Parks and Wildlife Department
Austin, Texas

Marion Toole
D-J Coordinator

Eugene A. Walker
Assistant Director, Wildlife

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ABSTRACT

Reconnaissance was done on eleven lakes and five rivers this segment. Lakes surveyed were Baylor, Buffalo, Buffalo Springs, Childress, Fryer, Marvin, McClellan, Pauline, Reese Air Force Base, Stamford, and the White River Reservoir.

Rivers surveyed were the Brazos, Canadian, Pease, Red, and the White River.

Lake Baylor showed a rise in game fish percentage from 1962 to 1963. Data indicate that the carp are not spawning in this lake.

Buffalo Lake showed a small rough fish population percentage increase from 1962 to 1963; however, continuing efforts are being made to curtail their expansion.

Buffalo Springs Lake continues to be a problem, but a separate job description has been written on this lake in an attempt to determine the lake's problems and devise methods of correction.

Lake Childress is in good condition, although a general loss in "K" factor has occurred since 1962.

Lake Fryer needs management, badly, and the best answer would be a chemical renovation of the lake and watershed.

Lake Marvin has a sunfish problem which is linked with its clear water and dense vegetation.

Lake McClellan needs management, but it is recommended that this be postponed until a proposed alteration of the dam and spillway is implemented.

Lake Pauline has produced very good growth in stocked largemouth bass since its renovation last year.

Reese Air Force Base Lake produced good growth in largemouth bass and channel catfish stocked early in the spring.

Lake Stamford shows no major changes and two new species were recorded this year: longnosed gar, Lepisosteus osseus, and redear sunfish, Lepomis microlophus.

The White River Reservoir and watershed were renovated in November.

All rivers surveyed showed practically no fishing potential, and very few localities showed large minnow populations.

JOB COMPLETION REPORT

State of Texas

Project No. F-7-R-11

Name: Fisheries Investigations and Surveys of the Waters of Region 1-A

Job No. B-18

Title: Fisheries Reconnaissance

Period Covered January 1, 1963 - December 31, 1963

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:

On lake surveys, both seines and varying numbers of standard survey gill net units were used. Small fish were seined in water up to four feet deep with a 20-foot one-eighth inch mesh seine or a 40-foot one-fourth inch mesh seine. Deeper water was seined with a 100-foot or a 300-foot one-half inch mesh seine. Where nets were used, they were set in the evening and taken up the next morning from established netting stations. After the fish were removed from the nets, 50 fish (if available) of each species were weighed, measured for standard length and sexed. The remaining fish were counted and weighed to permit computation of percentage composition by numbers and weight. Game or predatory species had their stomachs removed and the stomach and contents were preserved in 10 per cent formalin for food analysis in the laboratory. Physical data collected during the lake surveys included air temperature, water temperature, estimated wind speed and direction, weather conditions, and where pertinent, water chemistry and dissolved oxygen content. In some lakes plankton and bottom samples were taken.

On river surveys, seines were used to make fish collections in almost all cases unless deep pools were located, and then standard survey gill nets were used. Fish that were seined and which were known to be beneficial species were counted and returned to the water. Unidentified species or fish whose identity might be questioned were returned to the laboratory in 10 per cent formalin for identification and counting. Undesirable species were counted but not returned to the water.

Physical data collected during each river survey included air and water temperature, estimated wind velocity and direction, stream or pool width and

depth, rate of flow, vegetation, bank conditions and cover available in the water.

Techniques used in determining major ecological changes were observation of the number, condition, and ratio of fishes collected plus observation of the water level, turbidity, and general condition of the water being surveyed.

Utilization of the waters surveyed and fish harvest were determined by conversation with fishermen and lake concessionaires.

Analysis of present data and comparison with past data is the basis for any management, development, or stocking recommendations.

Findings:

Results of reconnaissance are presented according to data for each lake in alphabetical order, and following the lakes, for rivers in alphabetical order.

Lakes surveyed this year were Baylor, Buffalo, Buffalo Springs, Childress, Fryer, Marvin, McClellan, Pauline, Reese Air Force Base, Stamford, and the White River Reservoir.

Rivers surveyed this year were the forks of the Brazos, Canadian, Pease, Red, and the White River.

Lake Baylor

Lake Baylor was surveyed in June and October 1963. Table 1 shows the results of gill netting in June and Table 2 shows the October results. A comparison of these tables indicates a 15.31 per cent decline in the game fish population during the summer and a corresponding 15.14 per cent rise in the rough fish population. Populations of individual species show variation between June and October in the following manner: carp - 11.29 per cent increase, black bullhead - 3.45 per cent increase, channel catfish - 16.29 per cent decrease and white bass - 0.05 per cent decrease. No largemouth bass were netted in June and two were netted in October. However, clear water and the selectivity against catching largemouth in gill nets may explain this absence of bass in the netting sample. It is known from fisherman success and talking with the concessionaire that there is a good population of largemouth bass in Lake Baylor.

Table 1. Percentage Composition by Number and Weight and Average Weight of Fish Species Taken by 10 Units of Standard Survey Gill Nets from Lake Baylor - June 1963

Species	Number	Per Cent		Per Cent	
		by Number	Total Weight	by Weight	Average Weight
Carp	31	21.67	88.10	54.18	2.84
Carp-goldfish hybrid	1	0.70	0.90	0.56	0.90
Channel catfish	39	27.28	42.74	26.29	1.09
Black bullhead	54	37.76	14.44	8.88	0.26
Flathead catfish	2	1.40	9.27	5.70	4.03
White bass	6	4.19	6.06	3.73	1.01
Longear sunfish	1	0.70	0.07	0.04	0.07
White crappie	9	6.30	1.00	0.62	0.11
Total	143	100.00	162.58	100.00	

Table 1 continued

Game Fish	57	39.86	59.14	36.38
Rough Fish	86	60.14	103.44	63.62
<u>Total</u>	<u>143</u>	<u>100.00</u>	<u>162.58</u>	<u>100.00</u>

Table 2. Percentage Composition by Number and Weight and Average Weight of Fish Species Taken by 12 units of Standard Survey Gill Nets from Lake Baylor- October 23, 1963

Species	Number	Per Cent by Number	Total Weight Pounds	Per Cent by Weight	Average Weight
Carp	60	32.96	222.71	74.06	3.71
Carp-goldfish hybrid	2	1.10	4.81	1.60	2.41
Channel catfish	20	10.99	26.00	8.64	1.30
Black bullhead	75	41.21	19.01	6.33	0.25
White bass	13	7.14	17.98	5.98	1.38
Largemouth bass	2	1.10	8.12	2.70	4.06
Bluegill	1	0.55	0.14	0.04	0.14
Longear sunfish	2	1.10	0.15	0.05	0.08
White crappie	7	3.85	1.78	0.60	0.25
<u>Total</u>	<u>182</u>	<u>100.00</u>	<u>300.70</u>	<u>100.00</u>	
Total Game Fish	45	24.73	54.17	18.01	
Total Rough Fish	137	75.27	246.53	81.99	

The game fish population shows a rise in percentage composition from the 1962 survey in May to the June 1963 survey of 21.43 per cent indicating continuing good fishing for Lake Baylor.

Tables 3 and 4 show seining data. The June survey produced 185 forage-size fish in 12 hauls. It should be noted that plains minnows had recently been placed in the lake by the concessionaire. Thirty-three largemouth bass of fingerling size were seined, indicating that adequate reproduction had occurred in the lake. The lake level had dropped about four feet from June to October and cover was less abundant in October. This allowed more fish to be seined, although minnows are still very scarce due to the lake's abruptly deepening shoreline with little shelving liminal zone. There is little suitable area with cover to allow minnow propagation. The minnow species with the most individuals seined in October was the red shiner with 406.

Table 3. Percentage Composition of Fish Taken in 12 hauls by a 20-foot one-eighth inch Mesh Seine from Lake Baylor, June 1963

	<u>Number</u>	<u>Per Cent</u>
Plains minnow	117	63.24
Bullhead minnow	5	2.70
Red shiner	6	3.24
Ghost shiner	2	1.09
Bullhead catfish	1	0.54
Mosquitofish	1	0.54
Longear sunfish	9	4.86
Bluegill	10	5.41
Green sunfish	1	0.54
Largemouth bass	33	17.84
<u>Total</u>	<u>185</u>	<u>100.00</u>

Table 4. Percentage Composition of Fish Taken in 12 hauls by a 20-foot One-eighth Inch Mesh Seine from Lake Baylor. October 23, 1963.

<u>Species</u>	<u>Number</u>	<u>Per Cent</u>
Red shiner	406	44.86
Bullhead minnow	15	1.65
Killifish	7	0.78
Mosquitofish	353	39.00
Largemouth bass	5	0.56
Green sunfish	32	3.53
Bluegill	80	8.84
Orangespotted sunfish	7	0.78
Total	905	100.00

Examination of the food items in Tables 5 and 6 shows seasonal variation in food. In June the channel catfish consumed much grain, maize, wheat, and some corn. From Table 5 it is apparent that they had little competition for this (probably introduced) food. Potomogeton sp. was next in frequency of occurrence and the black bullheads were competing with the channel catfish. Insects, both larvae and adult, seem to be next in demand for both black bullheads and channel catfish. Microscopic crustaceans were eaten in about the same proportions by channel catfish and black bullheads. White bass preyed on fish (largemouth bass), dragonfly larvae, and Crustacea, and all four crappie had eaten insect larvae.

Table 5. Frequency of Occurrence of Food Items from Predatory Species taken from Lake Baylor - June 1963

<u>Species</u>	<u>Channel Catfish</u>	<u>Black Bullhead</u>	<u>White Bass</u>	<u>Flathead Catfish</u>	<u>Longear Sunfish</u>	<u>White Crappie</u>
Number Examined	39	50	6	2	1	9
Number with food	32	31	6	1	0	4
Food Items - Frequency						
Algae	4	1	1			
Largemouth bass			2			
Black bullhead			1	1		
Corn	1					
Crayfish	2					
Crustaceans	6	6	2			
Dragon fly larvae	3	2	2			1
Fish remains	5	3	1			
Insect larvae	9	21	1			4
Insect remains	5	3				
Maize	14	1				
Mud	2	4				
Mussels	3	3				
Potomogeton	17	10				
Vegetation	1			1		
Wheat	5					
Wood	1	1				

Table 6. Frequency of Occurrence of Food Items from Predatory Species Taken from Lake Baylor by 12 units of Standard Survey Gill Nets. October 23, 1963

Species	Channel Catfish	Black Bullhead	White Bass	Largemouth Bass	Longear Sunfish	White Crappie
Number Examined	21	50	11	2	2	7
Number with food	10	29	8	2	2	3
Food Items - Frequency						
Algae	6	7				2
Daphnia		4				1
Fish remains		3	5	2		1
Insect larvae	1	2	2		2	1
Pocket gopher remains	1					
Mud		17				
Mussels	1				1	
Sand		3				
Vegetation	2	2				

In October, grain is gone as a food item, Potamogeton sp. is missing and algae tops the list as food for channel catfish and is recorded as food for black bullheads. Fish remains occurred in black bullheads, white bass, largemouth bass, and white crappie at this time of the year.

Tables 7 and 8 give "K" factors for the June and October surveys. "K" factors for June show a drop in black bullhead condition, compared to May 1962, from 2.4 to 1.6. Channel catfish remained stable at 1.6 for all three surveys. Data for 1962 do not have enough fish for valid "K" factor comparisons other than with black bullheads and channel catfish, although 5 white bass averaged 2.7 and 5 carp averaged 2.5. In June and October 1963 white bass averaged 2.4 and 2.6 respectively. Almost all carp netted were large and no young have been recorded in seine samples, indicating a lack of successful spawning by carp in Lake Baylor this year.

Table 7. "K" Factor Range and Average for Fish taken from Lake Baylor by 10 units of Standard Survey Gill nets - June 1963.

Species	Number of fish	Range	Average
Carp	31	1.1-2.9	2.4
Carp-goldfish hybrid	1	3.0	3.0
Channel catfish	39	1.3-1.9	1.6
Black bullhead	50	1.9-3.9	1.6
Flathead catfish	2	1.7-2.7	2.2
White bass	6	2.3-2.7	2.4
Longear sunfish	1	4.7	4.7
White crappie	9	2.3-2.7	2.5

Table 8. "K" Factor Range and Average for Fish taken from Lake Baylor with 12 units of Standard Survey Gill Nets. - October 23, 1963

Species	Number of Fish	Range	Average
Carp	49	1.7-3.6	2.7
Carp-goldfish hybrid	2	3.4-3.6	3.5
Channel catfish	19	1.3-2.2	1.6
Black bullhead	50	1.5-3.2	2.5
White bass	13	2.3-3.0	2.6
Largemouth bass	2	2.9-3.6	3.3
Bluegill	1	3.4	3.4
Longear sunfish	2	4.2-4.5	4.4
White crappie	7	2.4-3.4	2.8

Buffalo Lake

Buffalo Lake was surveyed in July and November 1963. July netting data, given in Table 9, show 566 fish of which 38.34 per cent were game fish. The game fish portion of the fish population is composed of 9.54 per cent channel catfish, 13.96 per cent bluegill, 14.32 per cent white crappie, 0.35 per cent white bass and 0.17 per cent longear sunfish. The rough fish portion of the fish population consists of 27.73 per cent carp, 23.68 per cent black bullheads and 10.25 per cent goldfish and carp-goldfish hybrid.

Table 9. Percentage Composition by Weight and Mean Weight of Fish taken by Gill Net from Buffalo Lake - July 24, 1963.

Species	Number	Per Cent	Total Weight Pounds	Per Cent by Weight	Mean Weight
Carp	157	27.73	468.65	58.57	2.98
Goldfish	25	4.42	41.18	5.15	1.64
Carp-goldfish hybrid	33	5.83	98.78	12.34	2.99
Channel catfish	54	9.54	77.85	9.73	1.44
Black bullhead	134	23.68	68.14	8.52	0.50
White bass	2	0.35	2.44	0.31	1.22
Bluegill	79	13.96	22.84	2.85	0.28
Longear sunfish	1	0.17	0.08	0.01	0.08
White crappie	81	14.32	20.11	2.52	0.24
Total	566	100.00	800.07	100.00	
Game Fish	217	38.34	123.32	15.41	
Rough Fish	349	61.66	676.75	84.59	

In November, 549 fish were collected by gill nets and Table 10 shows that 47.72 per cent of them were game fish. The game fish portion of the fish population is composed of 36.62 per cent white crappie; and largemouth bass, channel catfish, white bass and sunfish species comprise the remaining 11.10 per cent.

Table 10. Percentage composition of Fish Species taken from Buffalo Lake by 12 Units of Standard Survey Gill Nets - November 13, 1963

Species	Number	Per Cent by Number	Total Weight Pounds	Per Cent by Weight	Mean Weight
Carp	76	13.84	242.1	38.05	3.19
Goldfish	9	1.64	18.2	2.86	2.02
Carp-goldfish hybrid	53	9.65	79.5	12.50	1.50
Channel catfish	16	2.92	40.3	6.33	2.52
Black bullhead	149	27.14	104.3	16.39	0.70
White bass	10	1.82	7.9	1.25	0.79
Largemouth bass	10	1.82	2.7	0.42	0.27
Bluegill	23	4.19	5.8	0.91	0.25
Longear sunfish	2	0.36	0.2	0.03	0.10
White crappie	201	36.62	135.2	21.26	0.67
Total	549	100.00	636.2	100.00	
Game Fish	262	47.72	192.1	30.19	0.73
Rough Fish	287	52.28	444.1	69.81	1.55

Comparing July and November, netting data show a 9.38 per cent rise in game fish which can be attributed, for the most part, to the increased crappie population.

Comparison of data from July and November shows a population increase of 1.47 per cent for white bass, 1.82 per cent for largemouth bass, 3.46 per cent for black bullhead and 22.30 per cent for white crappie. The channel catfish population declined 6.62 per cent in number but showed a rise in mean weight, as did all other species except white bass and they were taken in insufficient numbers for a valid comparison.

Comparison with the 1962 netting results shows an increase in game fish from April 1962 to July 1963 surveys and a loss between the two November surveys. There is an increase in all game fish except crappie which were superabundant in two nets in 1962, and this reflects a crappie population decline from 1962 of 29.47 per cent. The channel catfish population increased 2.64 per cent, white bass 0.43 per cent and largemouth bass 1.12 per cent.

All rough fish populations increased from November 1962 to November 1963 by the following percentages: carp - 5.07, carp-goldfish hybrid - 8.19, goldfish - 1.08, and black bullhead - 13.49.

Two-hundred-foot seine sample data collected in April 1962, when compared to three-hundred-foot seine samples collected in July 1963 data in Table 11, reveal a population decline in goldfish of 28.05 per cent and a small decline in largemouth bass and golden shiners. Population increases of 0.51 per cent by carp, 43.79 per cent by black bullheads and 23.36 per cent by white crappie were also indicated by the data collected with the long seines. Red river shiners, plains minnows, fathead minnows and plains killifishes were taken in 1963 while none were taken in 1962.

Table 11. Percentage Composition of Fish taken from Buffalo Lake with a 300-foot Seine - July 24, 1963

<u>Species</u>	<u>Number</u>	<u>Per Cent</u>
Carp	26	1.52
Goldfish	4	0.23
Hybrid (carp-goldfish)	2	0.12
Golden shiner	134	7.86
Red river shiner	1	0.06
Plains minnow	4	0.23
Fathead minnow	6	0.36
Plains killifish	1	0.05
Bullhead catfish	1005	58.95
Largemouth bass	12	0.70
Bluegill	53	3.11
Orangespotted sunfish	1	0.06
Longear sunfish	6	0.35
White crappie	450	26.40
Total	1705	100.00

Seining data collected with a 20-foot and a 40-foot seine in July (Table 12) show a 13.08 per cent forage fish population (omitting sunfish and bullheads). Data from the 20-foot seine sample for November are in Table 13. If small sunfish are included as forage fish, the seine samples show 16.35 per cent forage for July and 80.13 per cent for November. The July figure reflects the terrific number of small black bullheads seined in schools which might also be included as forage, in which case 95.04 per cent forage fish would be shown in the July seining samples.

Table 12. Percentage Composition of Fish taken from Buffalo Lake with a 20-foot one-eighth Inch Mesh and a 40-foot one-fourth Inch Mesh Seine - July 24, 1963

<u>Species</u>	<u>Number</u>	<u>Per Cent</u>
Carp	6	0.67
Golden shiner	47	5.30
Red river shiner	26	2.93
Red shiner	20	2.26
Fathead minnow	15	1.69
Black bullhead catfish	698	78.69
Plains killifish	8	0.90
Largemouth bass	5	0.57
Green sunfish	17	1.91
Bluegill	5	0.57
Orangespotted sunfish	3	0.33
Longear sunfish	4	0.45
White crappie	33	3.73
Total	887	100.00

Table 13. Number and Per Cent of Species of Fish taken from Buffalo Lake with a 20-foot one-eighth inch mesh Seine at 14 Stations. (One drag per station) - November 12 and 14, 1963

<u>Species</u>	<u>Number</u>	<u>Per Cent</u>
Golden shiner	18	6.16
Red shiner	32	10.96
Bullhead minnow	1	0.34
Black bullhead	3	1.03
Killifish	8	2.74
Mosquitofish	15	5.13
Largemouth bass	31	10.62
Green sunfish	1	0.34
Bluegill	156	53.43
Orangespotted sunfish	2	0.68
Longear sunfish	1	0.35
White crappie	24	8.22
Total	292	100.00

Stomach content analysis data in Tables 14 and 15, showed channel catfish and black bullheads to be in direct competition for algae, insects and crustaceans, all of which are short-energy chain foods and enable these fish to do well in almost any fertile lake. Small bluegills and white crappie were also competing for these foods while larger fish ate longer energy chain foods. White crappie and white bass are direct competitors with largemouth bass and each other for the available forage fish species.

Table 14. Frequency of Occurrence of Food Items from Predatory Species from Buffalo Lake - July 24, 1963.

<u>Species</u>	<u>Channel Catfish</u>	<u>Black Bullhead</u>	<u>White Bass</u>	<u>Bluegill</u>	<u>Longear Sunfish</u>	<u>White Crappie</u>
Number Examined	40	50	2	50	1	50
Number with food	26	35	1	25	0	21
Food items - Frequency						
Algae, filamentous	26	33				1
Algae, single celled		34				
Amphipods	14	2				
Aquatic Insects		4				3
Bryozoans		5				
Cladocera				11		
Copepods		3				2
Crayfish	3					
Damsel fly larvae	2	3				
Dragon fly larvae	4	1				1
Fish eggs		4				
Fish hook		1				
Fish remains	8	1	1	1		15
Fish scales	5					
Fly larvae	3	8		3		
Fly pupae		1				

Table 14 continued

Species	Channel Catfish	Black Bullhead	White Bass	Bluegill	Longear Sunfish	White Crappie
Grass seed	2	4				
Vegetation	4	18		9		2
Insects	1			1		
Insect larvae				5		
Insect pupae						1
Rock				1		
Sand grains	1	2		3		
Seed				1		
Turtle vertebrae	1					
Wood				2		

Table 15. Frequency of Occurrence of Food Items from Predatory Species taken from Buffalo Lake by 12 Units of Standard Survey Gill Nets - November 13, 1963

Species	Channel Catfish	Black Bullhead	White Sand Bass	White Largemouth Bass	Bluegill	Longear Sunfish	White Crappie
Number Examined	15	50	10	10	22	2	50
Number with food	4	23	7	8	13	0	45
Food Items - Frequency							
Algae	1	2			9		
Fish remains	4	18	7	7	1		45
Fish scales					2		
Insects	1				7	2	2
Vegetation		4			3		
Wood		3					
Worm					1		

"K" factors improved from July (Table 16) to November 1963 (Table 17), and in general decreased from November 1962 to November 1963. Channel catfish "K" factors rose from 1.7 in 1962 to 1.9 in 1963, white bass from 3.1 to 3.4, and largemouth bass were stable at 2.9. Carp, goldfish, carp-goldfish hybrids, and black bullheads all showed decreases in their "K" factors, which indicates a lessening of basic short-energy chain food supply available per fish. Possibly this shortage is caused by population fluctuation or lake conditions.

Table 16. "K" Factor Range and Average for Fish taken from Buffalo Lake - July 24, 1963

Species	Number of Fish	Range	Average
Carp	50	1.3-3.6	2.8
Goldfish	25	2.1-4.8	3.7
Carp-goldfish hybrid	25	2.0-3.5	3.0
Channel catfish	50	1.5-2.5	1.9
Black bullhead	50	2.1-3.9	2.7
White bass	2	3.1-3.2	3.1
Bluegill	50	4.0-5.8	4.8
Longear sunfish	1	4.4	-
White crappie	50	2.6-3.9	3.2

Table 17. "K" Factor Range and Average for Fish taken from Buffalo Lake by 12 Units of Standard Survey Gill Nets - November 13, 1963

<u>Species</u>	<u>Number</u>	<u>Range</u>	<u>Average</u>
Carp	50	2.0-3.5	2.8
Goldfish	9	4.1-5.8	5.1
Carp-goldfish hybrid	50	2.7-6.5	3.4
Channel catfish	16	1.7-2.2	1.9
Black bullhead	50	1.4-3.3	2.4
White bass	10	3.1-4.0	3.4
Largemouth bass	10	2.5-3.4	2.9
Bluegill	23	3.5-5.1	4.6
Longear sunfish	2	4.3-4.7	4.4
White crappie	50	2.0-5.0	3.7

A ten-foot rise in June caused a halt in an early and heavy crappie harvest. Large numbers of small fish were being caught in deeper areas prior to the lake rise. In the fall, fewer but larger crappie were being taken. Spring fishing was good for channel catfish.

Swarms of black bullhead fry and fingerlings were scooped up in an experimental effort to thin out this species of questionable value and allow growth of those remaining to a more desirable size more quickly.

Tierra Blanca Creek was fenced off and treated with rotenone in an attempt to determine the feasibility of the method as a control of spawning carp in Buffalo Lake, as well as an actual effort to reduce the standing crop of carp.

Buffalo Springs

One survey was made at Buffalo Springs in June 1963, at which time 221 fish were taken from 10 units of standard survey gill nets.

Data in Table 18 show 35.29 per cent of this number were game fish and 64.71 per cent were rough fish. The 64.71 per cent rough fish contained 56.11 per cent black bullheads. Two species, black bullheads and bluegill sunfish, constituted 89.60 per cent of the total fish population sample. The game fish were 33.49 per cent bluegills and 1.80 per cent channel catfish, green sunfish, and orangespotted sunfish. No largemouth bass were netted or seen, although the water was very clear. Clear water might explain why none were caught in the gill nets.

Table 18. Percentage Composition by Weight and Mean Weight of Fish taken by 10 Units of Standard Survey Gill Nets from Buffalo Springs Lake - June 1963

<u>Species</u>	<u>Number</u>	<u>Per Cent</u>	<u>Total Weight Pounds</u>	<u>Per Cent by Weight</u>	<u>Mean Weight</u>
Golden shiner	19	8.59	3.17	3.56	0.16
Channel catfish	2	0.91	2.81	3.17	1.40
Black bullhead	124	56.11	76.33	85.95	0.61
Green sunfish	1	0.45	0.10	0.11	0.10
Bluegill	74	33.48	6.32	7.11	0.09
Orangespotted sunfish	1	0.46	0.08	0.10	0.08
Total	221	100.00	88.81	100.00	

Table 18 continued

Game Fish	78	35.29	9.31	10.48
Rough Fish	143	64.71	79.50	89.52

In 1962, two surveys were made at the lake, one in April and one in December. If the April data are compared to the survey in 1963 there is a 29.52 per cent increase in game fish and a decrease of 30.52 per cent in rough fish. All data indicate that the bluegill population is increasing and this makes up the major difference in game species percentages. Examination of Table 18 shows that these bluegills are now too small to be attractive to the fisherman. Netting indicated that the channel catfish population remained within 0.04 per cent of last year's sample.

Table 19 shows the results of 11 drags with a 40-foot seine which produced 1,898 fish, of which 1,698 or 89.46 per cent were bluegill sunfish. A high proportion of these bluegills were young-of-the-year about one inch or less in length. The green sunfish represent 5.11 per cent of the seine sample, largemouth bass 3.43 per cent, and golden shiners 0.26 per cent. Seining was done in 1962 with a 20-foot one-eighth inch mesh seine and is not compared with this year's data because the clear water and vegetation cause differential species selectivity between the two seine lengths.

Table 19. Percentage Composition of Fish Species taken in 11 drags of a 40-foot One-fourth Inch Mesh Seine from Buffalo Springs Lake - June 1963

<u>Species</u>	<u>Number</u>	<u>Per Cent</u>
Golden shiner	5	0.26
Red shiner	8	0.42
Mimic shiner	2	0.11
Fathead minnow	16	0.84
Black bullhead catfish	5	0.26
Largemouth bass	65	3.43
Green sunfish	97	5.11
Bluegill	1698	89.46
Longear sunfish	2	0.11
Total	1898	100.00

"K" factor data in Table 20 show a shift between 1962 and 1963 as black bullheads are shown to be in poorer condition in 1963 (2.5 compared to 3.0). Little variation in other species is apparent, except bluegills are also declining in "K" factor from 5.2 to 4.8.

Table 20. "K" Factor Range, Average and Distribution for Fish Species taken from Buffalo Springs Lake - June 1963

<u>Species</u>	<u>Number</u>	<u>Range</u>	<u>Average</u>
Golden shiner	19	2.0-2.9	2.4
Channel catfish	2	1.6-2.6	2.1
Black bullhead	25	0.8-3.4	2.5
Green sunfish	1	4.2	4.2
Orangespotted sunfish	1	4.9	4.9
Bluegill	25	4.0-5.7	4.8

The small amount of data available for food habit analysis are presented in Table 21. Due to lack of volume no comparisons between 1962 and 1963 data are made.

Table 21. Frequency of Occurrence of Food Items from Predatory Species taken from Buffalo Springs Lake - June 1963

Species	Channel Catfish	Black Bullhead	Green Sunfish	Bluegill	Orangespotted Sunfish
Number Examined	2	25	1	1	25
Number with food	2	15	0	0	15
Food Items - Frequency					
Algae		4			
Bluegill	1				
Crustaceans (mostly daphnia)		7			11
Fish remains	1	2			1
Insect larvae		9			6
Insect remains	1				2
Beetle		1			
Mussels		5			1

Fisherman usage of the lake is high, totaling 87,000 visits by fishermen last year as computed from gate receipts. The effect of this pressure on the game fish population is now a matter of pure speculation. However, a job description for a problems study at Buffalo Springs Lake has been submitted, and an important part of this study will be to determine the effects of fishing pressure on the fish population.

Dissolved oxygen and pH tests were run on the lake water in October. Samples were taken in front of the concession area and about 50 yards west of the dam near the center of the lake. Dissolved oxygen readings ran from 3.8 to 7.8 parts per million in water collected from 0 to about 16 feet in depth. Below this depth the D. O. content tapered off in the deeper water to less than 1 part per million and in the deeper water a strong odor of hydrogen sulfide gas was detected. These factors will also be studied in the research next segment.

Lake Childress

Surveys were made of Lake Childress in June and October of 1963. In June 110 fish were taken and 25.45 per cent of them were game fish and the rest were black bullheads. The game fish were channel catfish, green sunfish, redear sunfish, bluegill and white crappie. Bluegill as shown by Table 22 constituted 16.36 per cent of the fish population. No largemouth bass were taken in June although visual observations and discussion with the concessionaire indicate a good largemouth bass population. This year's June percentages of overall game fish population is reduced by 6.75 per cent compared to May of last year, with a 6.53 per cent drop in channel catfish taken in the nets. No second survey was made in 1962, and therefore October figures cannot be compared.

Table 22. Percentage Composition by Weight and Mean Weight of Fish taken by 8 Units of Standard Survey Gill Net from Lake Childress - June 18, 1963

<u>Species</u>	<u>Number</u>	<u>Per Cent</u>	<u>Total Weight Pounds</u>	<u>Per Cent by Weight</u>	<u>Mean Weight</u>
Channel catfish	4	3.63	11.80	35.44	2.95
Black bullhead	82	74.55	18.06	54.25	0.22
Green sunfish	1	0.91	0.11	0.33	0.11
Redear sunfish	1	0.91	0.72	2.16	0.72
Bluegill	18	16.36	1.33	4.00	0.07
White crappie	4	3.64	1.27	3.82	0.31
Total	110	100.00	33.29	100.00	
Game Fish	28	25.45	15.23	45.75	
Rough Fish	82	74.55	18.06	54.25	

The October survey in 1963 shows quite a different percentage distribution of species. This survey was made when the water level was about 18 feet below spillway and a wind kept the water slightly roiled allowing a good netting sample with proportionally less selectivity in species caught. Table 23 shows the netting results for October and black bullheads still constitute the entire undesirable fish population of 56.32 per cent. The game fish portion of the population is composed of the following percentages: largemouth bass 6.90, channel catfish 4.59, and sunfish and crappie 32.19. Almost all game fish collected were of good "keeper" size and this indicates an actual 40.00 per cent harvestable crop of game fish. By weight the game fish population is 75.71 per cent.

Table 23. Percentage Composition by Weight and Mean Weight of Fish taken by Six Units of Standard Survey Gill Net from Lake Childress - October 23, 1963

<u>Species</u>	<u>Number</u>	<u>Per Cent</u>	<u>Total Weight Pounds</u>	<u>Per Cent by Weight</u>	<u>Mean Weight</u>
Channel catfish	4	4.59	11.25	25.34	2.81
Black bullhead	49	56.32	10.78	24.29	0.22
Largemouth bass	6	6.90	10.84	24.43	1.81
Redear sunfish	9	10.35	5.14	11.58	0.57
Bluegill	7	8.04	0.72	1.62	0.10
White crappie	12	13.80	5.65	12.74	0.47
Total	87	100.00	44.38	100.00	
Game Fish	38	43.68	33.60	75.71	
Rough Fish	49	56.32	10.78	24.29	

May 1962, seining data are from a 200-foot seine and show a lower percentage of game fish than the June 1963 20-foot seining data in Table 24.

Table 24. Percentage Composition of Fish Species taken in 10 Drags by a 20-foot One-Eighth Inch Mesh Seine from Lake Childress - June 18, 1963

<u>Species</u>	<u>Number</u>	<u>Per Cent</u>
Black bullhead	1	1.63
Largemouth bass	33	54.10
Green sunfish	11	18.04
Bluegill	16	26.23
Total	61	100.00

June seining produced 54.10 per cent largemouth bass, which were a natural spawn and the other game species taken were sunfish. October seining produced 52.96 per cent forage species, 2.96 per cent largemouth bass, 0.73 per cent black bullheads, and 43.45 per cent sunfish. Data from the October seining are in Table 25.

Table 25. Percentage Composition of Fish Species taken in 11 Drags by a 20-foot one-eighth Inch Mesh Seine from Lake Childress - October 23, 1963.

<u>Species</u>	<u>Number</u>	<u>Per Cent</u>
Black bullhead	3	0.73
Plains killifish	19	4.68
Mosquitofish	196	48.28
Largemouth bass	12	2.96
Green sunfish	83	20.44
Redear sunfish	54	13.30
Bluegill	39	9.61
Total	406	100.00

Comparison of "K" factors for 1962 with June 1963 shows a decline in channel catfish condition factor from 2.1 to 1.6, black bullheads from 2.9 to 2.1 and bluegill from 5.0 to 3.8. Examination and comparison of the figures in Tables 26 and 27 show that fish collected in June and October surveys differ very slightly in "K" factor.

Table 26. "K" Factor Range and Average for Fish Species taken from Lake Childress - June 18, 1963

<u>Species</u>	<u>Number</u>	<u>Range</u>	<u>Average</u>
Channel catfish	4	1.4-1.9	1.6
Black bullhead	50	1.4-5.0	2.1
Green sunfish	1	3.3	-
Redear sunfish	1	4.4	-
Bluegill	18	3.4-4.4	3.8
White crappie	4	2.5-3.2	2.8

Table 27. "K" Factor Range and Average for Fish Species taken from Lake Childress - October 23, 1963

<u>Species</u>	<u>Number</u>	<u>Range</u>	<u>Average</u>
Channel catfish	4	1.5-1.7	1.6
Black bullhead	49	1.6-2.8	2.0
Largemouth bass	6	2.1-3.1	2.6
Redear sunfish	9	3.6-4.1	3.8
Bluegill	7	2.8-4.4	3.7
Crappie	12	2.3-3.5	2.8

Food materials consumed in 1963 are shown in Tables 28 and 29. Examining Table 28 for June, reveals almost no competition between species, and food substances are essentially the same as for May 1962. October stomach analyses reveal more competition, and it is suspected that a larger sample of channel catfish would reveal competition with black bullheads to a greater degree. It is interesting to note that largemouth bass show only two food items and that they are competing with all species taken for insect larvae, and three species for forage fish.

Table 28. Frequency of Occurrence of Food Items of Predatory Fishes taken from Lake Childress by Eight Units of Standard Survey Net - June 18, 1963

Species	Channel Catfish	Black Bullhead	Green Sunfish	Redear Sunfish	Bluegill	White Crappie
Number Examined	4	50	1	1	18	4
Number with Food	1	26	0	1	4	3
Food Items - Frequency						
Algae		16				
Bullhead	1					
Cotton rat	1					
Dragonfly larvae		1		1		
Crustaceans (microscopic)		9			3	2
Insect larvae		4				1
Grasshopper					1	
Mud		5				
Mussels		1				
Plains Minnow						3
Potomogeton		3		1		
Vegetation				1		

Table 29. Frequency of Occurrence of Food Items of Predatory Fishes taken from Lake Childress by Eight Units of Standard Survey Gill Nets - October 23, 1963

Species	Channel Catfish	Black Bullhead	Largemouth Bass	Redear Sunfish	Bluegill	Crappie
Number Examined	4	50	6	9	7	12
Number with Food	4	39	3	9	6	8
Food Items - Frequency						
Algae	2	17		8	2	
Crayfish	1					
Crustaceans (Microscopic)		28			3	3
Eggs		4				
Fish Remains	2	1	2			4
Insect larvae	1	17	2	5	3	1
Insects	3	5			1	1
Mussels		5		7		
Vegetation	2	9		7	2	1
Miscellaneous	3	3				

During the month of October, pH, dissolved oxygen and temperature readings were taken. The water temperature at all depths was 69°F. Dissolved oxygen was 1.3 parts per million at 25 feet, 7.0 parts per million at 12 feet, and 7.2 parts per million at the surface. The pH varied from 8.1 at 25 feet to 8.3 at the surface.

The drop in "K" factors could be caused by low water conditions, restricting the food producing areas of the lake while sufficient vegetation remains inundated to provide ample cover for forage organisms. A rise in water level

during the winter or early spring should bring a rise in "K" factors and excellent fishing next year if the demonstrated population percentage ratios hold over the winter.

Lake Fryer

Lake Fryer was surveyed one time in July 1963 and 274 fish were netted with 53.28 per cent being game fish. However, 50.73 per cent of the fish population were white crappie, average weight 0.13 pound. Gill netting data are in Table 30. No largemouth bass were taken and channel catfish made up 2.19 per cent of the fish population.

Table 30. Percentage Composition by Weight and Mean Weight of Fish taken from Lake Fryer by 10 Units of Standard Survey Gill Nets - July 9, 1963

Species	Number	Per Cent	Total Weight Pounds	Per Cent by Weight	Average Weight
Carp	29	10.58	35.49	46.35	1.22
Channel catfish	6	2.19	3.22	4.21	0.53
Black bullhead	99	36.13	19.24	25.13	0.19
Bluegill	1	0.37	0.07	0.09	0.07
White crappie	139	50.73	18.54	24.22	0.13
Total	274	100.00	76.56	100.00	24.22
Game Fish	146	53.28	21.83	28.51	
Rough Fish	128	46.72	54.73	71.49	
Total	274	100.00	76.56	100.00	

In August 1962, 247 fish were taken and 54.61 per cent of the fish population were white crappie averaging 0.11 pound. Two largemouth bass were taken and they comprised 0.46 per cent of the fish population compared to none in 1963. It is known that some largemouth bass are in the lake because of the concessionaire's report concerning fishing, but none were collected in July 1963. Netting in July 1963 produced 2.19 per cent channel catfish having an average weight of 0.53 pounds, compared to 1.61 per cent with an average weight of 1.58 pounds in 1962. Table 30, giving percentage composition, shows 36.13 per cent black bullheads and 10.58 per cent carp.

Seining with a 20-foot seine in July 1963 produced 7,590 minnows. The large number of minnows can be attributed to a recent spawn in Wolf Creek. Species distribution in Table 31 is calculated from the ratio of adult and easily identifiable young and the total number contains volumetric estimates. Of the total seining sample 97.95 per cent were minnows and 1.61 per cent were sunfish. Total forage-size fish, including sunfish, represented 99.56 per cent of the 20-foot seine collections. Red shiners, sand shiners, and fathead minnows were the numerically dominant species.

August 1962 seine samples had 96.05 per cent minnows and 3.28 per cent sunfish for a total of 99.33 per cent forage-size fish. Red shiners were the most numerous at 89.94 per cent. Both year's surveys indicate good minnow populations.

Table 31. Number and Percentage Composition of Fish Species taken by 10 Drags of a 20-foot Seine from Lake Fryer - July 9, 1963

<u>Species</u>	<u>Number</u>	<u>Per Cent</u>
Golden shiner	156	2.01
Suckermouth minnow	131	1.69
Red river shiner	121	1.56
Red shiner	2652	34.22
Sand shiner	1216	15.70
Fathead minnow	3309	42.70
Channel catfish	12	0.15
Black bullhead	3	0.04
Plains killifish	5	0.07
Green sunfish	11	0.14
Orangespotted sunfish	45	0.58
Longear sunfish	69	0.89
White crappie	19	0.25
Total	7749	100.00

Stomach analysis, data in Table 32, showed insects, Crustacea, vegetation, and fish to be the most frequently eaten foods and they were eaten competitively by channel catfish, black bullheads, and white crappie. Plankton drags in the lake showed Crustacea to be very abundant in July. Seining showed that forage-size fish were abundant and that forage-size white crappie were overabundant.

Table 32. Food Items of Fish Species taken from Lake Fryer - July 9, 1963

<u>Species</u>	<u>Channel Catfish</u>	<u>Black Bullhead</u>	<u>Bluegill</u>	<u>White Crappie</u>
Number Examined	6	43	1	50
Number with Food	6	29	1	43
Food Items - Frequency				
Algae	1		1	
Bryozoa		2		1
Cladocera		13		32
Copepoda		16		23
Crayfish	1	1		1
Diptera larvae	3			7
Egg case	1			
Ephemeroptera larvae		3		1
Fish remains	3			7
Gastropods		2		
Gellatinous Mass (?)		1		
Insects	5	4		8
Leech		1		
Liver (cut bait)	1			
Ostracods		1		1
Roundworms		1		1
Sand			1	
Spider	1			
Vegetation	2	17		4

The body and mouth size of these crappie restricts them to eating small or young fish and this could allow them to prevent game species from expanding by excessive predation on the young game fish.

Examination of 1962 tables showed food consumption to be very much the same as for 1963.

"K" factor data, Table 33, if compared to August 1962 data, showed a decline in condition of channel catfish from 1.7 to 1.6, white crappie from 2.85 to 2.7, and black bullheads from 2.45 to 2.3. Carp remained stable at 2.5 and data for other species were not comparable due to an insufficient number of specimens.

Table 33. "K" Factor Average and Distribution for Fish Species taken from Lake Fryer by 10 Units of Standard Survey Gill Nets - July 9, 1963

<u>Species</u>	<u>Number</u>	<u>Range</u>	<u>Average</u>
Carp	29	2.1-2.9	2.5
Channel catfish	6	1.5-1.7	1.6
Black bullhead	50	1.8-2.9	2.3
Bluegill	1	-	3.9
Crappie	50	2.2-3.3	2.7

Bottom samples were taken at two locations in the lake. One sample was taken at the east end near the dam and one at the inlet of Wolf Creek at the west end of the lake. Slowing currents have deposited considerable organic debris at the mouth of Wolf Creek so that volumetric analysis shows one sixty-fifth of the bottom sediment to one-foot depth to be macroscopic organic detritus. Annelids, diptera larvae, gastropods and ostracods were noted as organisms present. Bottom material from the east end of the lake contains large amounts of silt and negligible amounts of macroscopic organic material or organisms.

The lake was flooded and 7 feet of water flowed over the spillway for several hours on June 15, 1963. A large number of white crappie were left stranded by the receding flood waters and witnesses stated that tubs full of small crappie (approximately the same size as those taken in gill net samples) were picked up after the flood. This crappie kill apparently did not appreciably deplete the excessive crappie population.

Eighty fishing licenses were sold at the concession stand in the month of June 1963; and water skiing is popular in the evenings and on weekends.

This lake needs management in the worst way, but some local people oppose chemical treatment. The excessive bullhead and crappie population prevent other fish from getting ahead, however, the County Commissioners Court and the County Judge are newly installed and seem to be interested in the lake. They implemented spillway alteration, recommended in last year's job completion report, which provides a 24-inch vertical downstream face to prevent fish migration up and over the previously smooth spillway. This should prevent upstream migration of rough fish in normal overflow, but floods of the proportion occurring in June would allow migration upstream by rough fish.

Lake Marvin

Lake Marvin was surveyed in July 1963 and 186 fish were collected as shown in Table 34. Game fish made up 80.11 per cent of the fish collected with sunfish composing 63.98 per cent of the fish population. Many of the bluegill, channel catfish, largemouth bass, and redear sunfish had numerous parasites in the liver and mesenteries of the intestines, however, there seems to be no correlation between parasitized fish and low "K" factors.

Table 34. Percentage Composition by Weight and Mean Weight of Fish taken from Lake Marvin by 6 Units of Standard Survey Gill Net - July 16, 1963

<u>Species</u>	<u>Number</u>	<u>Per Cent</u>	<u>Total Weight Pounds</u>	<u>Per Cent by Weight</u>	<u>Average Weight</u>
Channel catfish	7	3.76	10.13	8.11	1.44
Flathead catfish	4	2.15	62.25	49.85	15.56
Black bullhead	37	19.89	12.04	9.65	0.32
Largemouth bass	18	9.68	29.47	23.60	1.36
Redear sunfish	27	14.52	2.84	2.27	0.10
Bluegill	92	49.46	8.02	6.43	0.08
White crappie	1	0.54	0.11	0.09	0.11
Total	186	100.00	124.86	100.00	
Game Fish	149	80.11	112.82	90.36	
Rough Fish	37	19.89	12.04	9.64	
Total	186	100.00	124.86	100.00	

The entire undesirable fish population was composed of black bullhead catfish.

Comparison with July 1962 data shows a population percentage gain in channel catfish, redear sunfish, bluegill sunfish, and a loss in largemouth bass and black bullheads. Black bullheads were reduced from 38.96 per cent to 19.89 per cent which is a sufficient drop to indicate advantageous predation by the flathead catfish which were stocked for that purpose.

Seining data, in Table 35, showed only 18.42 per cent mosquitofish as a forage species and sunfish as the balance of the sample. Vegetation provides much cover and sunfish spawning was still in progress on the date of survey.

Table 35. Number and Per Cent of Fish Species taken from Lake Marvin by 5 Drags of a 20-foot one-eighth Inch Mesh Seine - July 16, 1963

<u>Species</u>	<u>Number</u>	<u>Per Cent</u>
Mosquitofish	14	18.42
Green sunfish	46	60.52
Redear sunfish	11	14.48
Hybrid (sunfish)	5	6.58
Total	76	100.00

Stomach analyses of predatory species showed competition between all species present for the same foods (Table 36), which indicates a lack of food variety in Lake Marvin. All fish species except the one crappie had eaten fish. All fish species except largemouth bass had eaten crustaceans and all fish except crappie had eaten vegetation, and insects had been eaten by all except largemouth bass.

Table 36. Food Items of Fish Species taken from Lake Marvin by Gill Nets - July 16, 1963

Species	Channel Catfish	Black Bullhead	Largemouth Bass	Redear Sunfish	Bluegill	Longear Sunfish	Crappie
Number Examined	7	36	15	26	16	45	1
Number with Food	6	15	8	16	11	37	1
Food Items - Frequency							
Amphipods	1	1		3	4	7	1
Largemouth bass			1				
Black bullhead			2				
Cladocera						1	
Fish remains	2	1	5	4	3	1	
Insects	1	4		8	5	11	1
Ostracods						1	
Roundworms						1	
Sand						1	
Vegetation	6	12	2	15	8	29	

"K" factors in Table 37 show improvement compared to 1962 data in all species with the four flathead catfish showing a gain from 1.7 to 2.1, redear sunfish from 3.1 to 3.9, and largemouth bass from 2.6 to 2.7. Two flathead catfish had lost their tags and of the two that retained tags, one had lost one-fourth pound in weight and gained two inches in standard length and the other had gained two and three-fourths pounds in weight and one inch in standard length since March 8, 1962.

Table 37. "K" Factor Range and Average for Fish Species taken from Lake Marvin by Gill Nets - July 16, 1963

Species	Number	Range	Average
Channel catfish	7	1.4-1.7	1.5
Black bullhead	37	1.9-3.0	2.4
Flathead catfish	4	1.8-2.4	2.1
Largemouth bass	18	2.4-3.2	2.7
Redear sunfish	27	3.2-4.5	3.9
Bluegill	69	3.1-4.5	3.7
White crappie	1	-	3.2

Lake Marvin was 2 feet below spillway and quite clear in July. A 3-inch Secche Disk was visible to 4 feet 7 inches depth.

Vegetation still constitutes a problem as about one-fourth of the surface was choked with vegetation sufficiently dense to make operation of on outboard motor difficult. Some continuing method of plant control needs to be inaugurated to allow more predation by game species on sunfish and to allow "weed-free" fishing for anglers.

Lake McClellan

Lake McClellan was a special project, Job No. E-6, in 1962 and was surveyed two times, once in March and once in December. In 1963 one survey was made in July when 251 fish were taken by gill nets. Table 38 shows 9.56 per cent of these fish were game fish and 5.18 per cent of the fish population were white crappie and 3.19 per cent, channel catfish.

Table 38. Percentage Composition by Number, Weight and Average Weight of Fish Species taken by Ten Units of Standard Survey Gill Net from Lake McClellan - July 7, 1963

Species	Number	Per Cent	Total Weight Pounds	Per Cent by Weight	Average Weight
Carp	141	56.17	231.71	89.30	1.64
Carp sucker	1	0.40	0.48	0.18	0.48
Channel catfish	8	3.19	5.11	1.97	0.36
Black bullhead	85	33.86	18.17	7.01	0.21
White bass	1	0.40	2.42	0.93	0.40
Bluegill	2	0.80	0.16	0.06	0.08
White crappie	13	5.18	1.41	0.55	0.10
Total	251	100.00	259.46	100.00	
Game Fish	24	9.56	9.10	3.51	
Rough Fish	227	90.44	250.36	96.49	

Carp comprised 56.17 per cent of the fish population with river carpsucker 0.40 per cent and black bullheads 33.86 per cent.

Seining with a 20-foot seine (Table 39) produced 345 fish of which number 65.51 per cent were minnows, 20.29 per cent sunfish and 14.20 per cent were channel catfish, white bass and largemouth bass.

Table 39. Number and Per Cent of Fish Species taken by Eight Drags of a 20-foot one-eighth Inch Mesh Seine from Lake McClellan - July 7, 1963

Species	Number	Per Cent
Red river shiner	4	1.15
Red shiner	174	50.44
Plains shiner	2	0.58
Bullhead minnow	43	12.46
Channel catfish	4	1.16
Plains killifish	2	0.58
Mosquitofish	1	0.29
White bass	1	0.29
Largemouth bass	35	10.15
Orangespotted sunfish	67	19.42
Bluegill	2	0.58
Longear sunfish	1	0.29
White crappie	9	2.61
Total	345	100.00

Stomach analyses produced the data in Table 40 which shows a fairly wide variety of foods present and no concentrated food competition. "Fish scales" are listed separately on several tables in this report due to the fact that the scales in the stomach came from fish much larger than the owner of the stomach. Bryozoa and other microscopic organisms were observed to be attached to some of the scales and these organisms, rather than the scales, could constitute the reason for their ingestion.

Table 40. Food Items of Predatory Species taken by Ten Units of Standard Survey Gill Nets from Lake McClellan - July 7, 1963

Species	Channel Catfish	Bullhead Catfish	White Bass	Bluegill	Crappie
Number Examined	8	50	1	2	11
Number with Food	5	33	1	2	10
Food Items - Frequency					
Amphipods		6			1
Cladocera		17		2	8
Copepoda				1	
Crayfish					1
Filamentous Algae	2	5			1
Fish remains	5		1		3
Fish scales	1	10			1
Insect larvae	3	12		2	1
Insect remains				1	1
Mayfly larvae		7			1
Odonota larvae	1				1
Ostracods		1			
Sand grains	1	2		1	
Spider	1				
Vegetation		11			
Watermelon meat	1				

"K" factors are not contained in last year's data and cannot be compared; however, they are low this year for some species as shown in Table 41.

Table 41. "K" Factor Range and Average for Fish Species taken from Lake McClellan- July 7, 1963

Species	Number	Range	Average
Carp	50	1.9-3.1	2.4
Carp sucker	1	-	2.9
Channel catfish	8	1.3-1.9	1.5
Black bullhead	50	1.7-2.9	2.1
White bass	1	-	3.6
Bluegill	2	3.1-3.3	3.2
White crappie	13	2.2-3.0	2.5

The water level was 9 feet below spillway when the 300-foot-seine sample was collected in July, and 673 fish were collected. Data in Table 42 show that 20.80 per cent of the sample were rough fish, 77.42 per cent were game fish with white crappie 46.36 per cent, sunfish 15.61 per cent, channel catfish 13.67 per cent, and white bass 1.78 per cent. Minnows constituted 1.78 per cent of the seine sample.

Examination of the gill netting data (Table 38) shows that Lake McClellan is still in need of management as a 90.43 per cent rough fish population indicates. However, any remedial measures should await the completion of the project to raise the level of the dam and spillway. This project is intended to raise the reservoir level about 5 feet (14 feet above the level during this survey) and should be

preceded by some type of chemical or biological population control. At the time of the survey it was estimated that bids for the project would be let sometime in May 1964.

Table 42. Fish taken from Lake McClellan in 3 drags of a 300-foot one-half Inch Mesh Seine. - July 18, 1963

<u>Species</u>	<u>Number</u>	<u>Per Cent</u>
Carp	26	3.86
Golden shiner	11	1.63
Red shiner	1	0.15
Channel catfish	92	13.67
Black bullhead	114	16.94
White bass	12	1.78
Bluegill	11	1.64
Orangespotted sunfish	79	11.74
Longear sunfish	15	2.23
White crappie	312	46.36
<u>Total</u>	<u>673</u>	<u>100.00</u>

Lake Pauline

Lake Pauline was surveyed five times during this segment. The first two surveys were made on January 10 and April 2, 1963, prior to a rotenone treatment May 2, 1963. These surveys are illustrated in data in Tables 43, 44, 45, 46, 47, 48, 49 and 50. Examining the netting data, Tables 43 and 47 show a rough fish population of 81.25 per cent in January and 94.90 per cent in April.

Table 43. Percentage Composition by Weight and Mean Weight of Fish taken from Lake Pauline by Ten Units of Standard Survey Nets - January 10, 1963

<u>Species</u>	<u>Number</u>	<u>Per Cent</u>	<u>Total Weight Pounds</u>	<u>Per Cent by Weight</u>	<u>Mean Weight</u>
Gizzard shad	6	3.75	1.65	0.75	0.27
River carpsucker	73	45.62	163.70	75.29	2.24
Carp	30	18.75	13.14	6.05	0.43
Channel catfish	1	0.63	1.14	0.52	1.14
Black bullhead	16	10.00	2.79	1.28	0.17
White bass	6	3.75	7.07	3.25	1.17
Largemouth bass	6	3.75	13.71	6.31	2.28
White crappie	17	10.62	11.56	5.32	0.68
Freshwater drum	5	3.13	2.67	1.23	0.53
<u>Total</u>	<u>160</u>	<u>100.00</u>	<u>217.43</u>	<u>100.00</u>	
Game Fish	30	18.75	33.48	15.40	
<u>Rough Fish</u>	<u>130</u>	<u>81.25</u>	<u>183.95</u>	<u>84.60</u>	

Table 44. Number and Per Cent of Fish Species taken from Lake Pauline by 20-foot One-eighth Inch Mesh Seine - January 8, 1963

<u>Species</u>	<u>Number</u>	<u>Per Cent</u>
Gizzard shad	693	5.04
River carpsucker	1	0.00 <u>1/</u>
Carp	40	0.29
Red shiner	12548	91.29
Plains minnow	61	0.44
Bullhead minnow	87	0.64
Fathead minnow	1	0.00 <u>1/</u>
Plains killifish	3	0.03
Red river pupfish	1	0.00 <u>1/</u>
Mosquitofish	140	1.02
Largemouth bass	1	0.01
Green sunfish	14	0.10
Bluegill	145	1.05
Orangespotted sunfish	1	0.01
Freshwater drum	10	0.08
Total	13746	100.00

1/ Less than 0.01 per cent.

Table 45. Food Items of Fish taken from Lake Pauline by Ten Units of Standard Survey Gill Nets - January 10, 1963

<u>Species</u>	<u>Channel Catfish</u>	<u>Black Bullhead</u>	<u>White Bass</u>	<u>Largemouth Bass</u>	<u>White Crappie</u>	<u>Freshwater Drum</u>
Number Examined	1	16	7	6	17	4
Number with Food	1	10	5	4	13	0
Food Items - Frequency						
Algae		2				
Crustaceans		1				
Fish remains		4	2	1	2	
Drum			1			
Shad	1	3	1	3	11	
Insects		1	1			
Vegetation	1				1	
Other		3			1	

Table 46. "K" Factor Range and Average for Fish taken from Lake Pauline by Ten Units of Standard Survey Gill Nets - January 10, 1963

<u>Species</u>	<u>Number</u>	<u>Range</u>	<u>Average</u>
Shad	6	1.0-1.9	1.5
River carpsucker	51	1.3-3.2	2.4
Carp	30	1.4-3.1	2.6
Channel catfish	1	1.5	1.5
Black bullhead	16	1.8-2.4	2.1
White bass	6	2.9-3.6	3.1
Largemouth bass	6	2.7-4.3	3.1
Crappie	17	2.6-3.4	3.2
Freshwater drum	5	1.8-2.6	2.5

Table 47. Percentage Composition by Weight and Mean Weight of Fish taken from Lake Pauline by Ten Units of Standard Survey Nets - April 2, 1963

Species	Number	Per Cent	Total Weight Pounds	Per Cent by Weight	Mean Weight
Shad	111	37.75	20.60	6.31	0.18
River carpsucker	126	42.86	275.45	84.43	2.18
Carp	27	9.18	11.09	3.39	0.41
Channel catfish	1	0.34	1.66	0.51	1.66
Black bullhead	14	4.76	2.21	0.68	0.15
White bass	9	3.06	12.97	3.98	1.44
Bluegill	2	0.68	0.24	0.07	0.12
Longear sunfish	1	0.34	0.07	0.02	0.07
White crappie	2	0.68	1.57	0.48	0.78
Freshwater drum	1	0.35	0.40	0.13	0.01
Total	294	100.00	326.26	100.00	
Game Fish	15	5.10	16.51	5.06	
Rough Fish	279	94.90	309.75	94.94	

Table 48. Number and Per Cent of Fish Species taken from Lake Pauline with a 20-foot One-eighth Inch Mesh Seine - April 2, 1963

Species	Number	Per Cent
Shad	10	1.87
Carp	7	1.31
Red shiner	291	54.60
Parrot minnow	131	24.58
Plains killifish	1	0.19
Mosquitofish	1	0.18
Largemouth bass	2	0.38
Green sunfish	39	7.32
Bluegill	49	9.19
Freshwater drum	2	0.38
Total	533	100.00

Table 49. Food Items of Predatory Fish Species taken from Lake Pauline by Ten Units of Standard Survey Gill Nets - April 2, 1963

Species	Channel Catfish	Black Bullhead	White Bass	Bluegill	Longear Sunfish	White Crappie
Number Examined	1	13	9	2	1	5
Number with Food	1	11	3	2		1
Food Items - Frequency						
Crustaceans		2		2		
Fish remains	1	5	3			1
Insect larvae		4	1			
Insect remains		4				
Mud		3				
Vegetation	1	4				

Table 50. "K" Factor Range and Average for Fish Species taken by Gill Nets From Lake Pauline - April 2, 1963

<u>Species</u>	<u>Number</u>	<u>Range</u>	<u>Average</u>
Gizzard shad	50	1.6-2.4	2.1
River carpsucker	50	2.4-4.0	3.1
Carp	26	2.3-3.3	2.7
Channel catfish	1	2.0	2.0
Bullhead catfish	14	2.2-2.5	2.3
White bass	9	2.8-3.1	3.0
Bluegill	2	3.9-4.2	4.1
Longear sunfish	1	4.7	4.7
White crappie	2	2.9-3.1	3.0
Freshwater drum	1	2.1	2.1

Seining data for January show 5.41 per cent rough fish, 93.42 per cent minnows, and 1.17 per cent game fish. Data for April show 3.56 per cent rough fish, 79.55 per cent minnows, and 16.89 per cent game fish.

Stomach analyses for January and April revealed that the fish population was feeding primarily on fish. This might indicate a lack of other food types due to over-crowding and feeding on short-energy chain food organisms by the rough species.

All species with comparable "K" factors, Tables 46 and 50, show a rise in condition from January to April which is possibly explainable by the approach of spawning season and warmer weather.

The next survey (data in Tables 51, 52, 53 and 54) was made on May 8, 1963, six days after the treatment and this survey produced only nine black bullheads.

Table 51. Percentage Composition by Weight and Mean Weight of Fish taken from Lake Pauline by Twelve Units of Standard Survey Nets. - May 8, 1963

<u>Species</u>	<u>Number</u>	<u>Per Cent</u>	<u>Total</u>	<u>Per Cent</u>	
			<u>Weight</u> <u>Pounds</u>	<u>by</u> <u>Weight</u>	<u>Mean</u> <u>Weight</u>
Black bullhead	9	100.00	2.03	100.00	2.25
Total	9	100.00	2.03	100.00	2.25

Table 52. Number and Per Cent of Species of Fish taken from Lake Pauline by 20-foot One-eighth Inch Mesh Seine - May 9, 1963

<u>Species</u>	<u>Number</u>	<u>Per Cent</u>
Red shiner	54	96.42
Gambusia	2	3.58
Total	56	100.00

Table 53. Food Items of Fish taken from Lake Pauline by Six Standard Survey Gill Nets - May 9, 1963

<u>Species</u>	<u>Black bullhead</u>
Number Examined	9
Number with Food	8
Food Items - Frequency	
Crustaceans	1
Insect larvae	11
Insects	1
Other	1

Table 54. "K" Factor Range and Average for Fish taken from Lake Pauline by Twelve Units of Standard Survey Nets - May 8, 1963

<u>Species</u>	<u>Number</u>	<u>Range</u>	<u>Average</u>
Black bullhead	9	2.3-3.0	2.6

Table 52 shows that the 20-foot seines took 54 red shiners and 2 mosquito-fish. The black bullheads had been feeding on algae, insects, and vegetation as shown in Table 53.

"K" factors, (Table 54) changed from 2.3 in April to 2.6 in May for the black bullheads. Black bullheads taken in the post treatment survey were evidently in good condition to be moving and feeding actively so soon after treatment. The surviving fish would naturally be the most powerful and in the best condition which would be reflected in the good "K" factors shown in post treatment collections.

A July survey produced 74 fish; 24 carp, 48 black bullheads and 2 longear sunfish as shown in Table 55.

Table 55. Percentage Composition by Weight and Mean Weight of Fish taken from Lake Pauline by Four Units of Standard Survey Gill Net - July 2, 1963

<u>Species</u>	<u>Number</u>	<u>Per Cent</u>	<u>Total</u> <u>Weight</u>	<u>Per Cent</u>	
				<u>by</u> <u>Weight</u>	<u>Mean</u> <u>Weight</u>
Carp	24	32.43	30.77	74.52	1.28
Black bullhead	48	64.86	10.39	25.16	0.21
Longear sunfish	2	2.71	0.13	0.32	0.06
Total	74	100.00	41.29	100.00	
Game Fish	2	2.70	0.13	0.31	
Rough Fish	72	97.30	41.16	99.69	

Feeding of black bullheads (Table 56) again concentrated on insect larvae and insects with crustaceans bringing up second place.

Seine samples, with 20-foot seines (Table 57) took 14 young carp, 95 minnows, 23 largemouth bass (which had been stocked in May) and 171 sunfish.

Table 56. Food Items of Fish taken from Lake Pauline by Four Units of Standard Survey Gill Nets - July 2, 1963

<u>Species</u>	<u>Black Bullhead</u>	<u>Longear Sunfish</u>
Number Examined	48	2
Number with Food	37	
Food Items - Frequency		
Crustaceans	11	
Fish remains	1	
Insect larvae	30	
Insects	10	
Vegetation	6	
Other	3	

Table 57. Number and Per Cent of Species of Fish taken from Lake Pauline by a 20-foot one-eighth Inch Mesh Seine - July 2, 1963

<u>Species</u>	<u>Number</u>	<u>Per Cent</u>
Carp	14	4.62
Red shiner	69	22.77
Bullhead minnow	1	0.33
Mosquitofish	25	8.25
Largemouth bass	23	7.59
Green sunfish	7	2.31
Bluegill	164	54.13
<u>Total</u>	<u>303</u>	<u>100.00</u>

Table 58. "K" Factor Range and Average for Fish taken from Lake Pauline by Four Units of Standard Survey Nets - July 2, 1963

<u>Species</u>	<u>Number</u>	<u>Range</u>	<u>Average</u>
Carp	24	1.3-3.3	2.9
Black bullhead	48	2.1-3.1	2.4
Largemouth bass	21	1.7-3.0	2.4
Longear sunfish	2	4.4-4.5	4.4

In October a seine survey using a 100-foot seine produced the data listed in Tables 59, 60 and 61. These data show that 252 fish were taken and only 1.58 per cent were rough fish, and largemouth bass made up 26.19 per cent with sunfish comprising the rest.

Table 59. Number and Per Cent of Fish taken from Lake Pauline by 5 Drags of a 100-foot One-half Inch Mesh Seine - October 24, 1963

<u>Species</u>	<u>Number</u>	<u>Per Cent</u>
Carp	4	1.58
Largemouth bass	66	26.19
Green sunfish	15	5.96
Bluegill	27	10.71
Longear sunfish	140	55.56
<u>Total</u>	<u>252</u>	<u>100.00</u>
Game Fish	248	98.42
Rough Fish	4	1.58

Table 60. Food Items of Fish taken from Lake Pauline by a 40-foot and a 100-foot Seine - October 24, 1963

Species	Largemouth Bass
Number Examined	6
Number with Food	5
Food Items - Frequency	
Algae	1
Back Swimmer (beetle)	1
Fish remains	4
Sunfish	1

Table 61. "K" Factor Range and Average for Fish taken from Lake Pauline by 40-foot One-eighth Inch Mesh and 100-foot One-half Inch Mesh Seines - October 24, 1963

<u>Species</u>	<u>Number</u>	<u>Range</u>	<u>Average</u>
Carp	4	2.9-3.2	3.0
Largemouth bass	66	1.9-2.9	2.4
Green sunfish	9	2.7-3.9	3.5
Longear sunfish	5	4.6-5.0	4.7
Bluegill	2	3.2-3.3	3.3

One drag with a 40-foot seine (Table 62) produced 1,032 fish of which 97.19 per cent were sunfish fry and fingerlings.

Table 62. Number and Per Cent of Fish taken from Lake Pauline by One Drag of a 40-foot One-fourth Inch Mesh Seine - October 24, 1963

<u>Species</u>	<u>Number</u>	<u>Per Cent</u>
Red shiner	25	2.42
Bullhead minnow	4	0.39
Sunfish (sp.) fry	1003	97.19
Total	1032	100.00

"K" factors of the fish had improved since July for carp, 2.9 to 3.0 and longear sunfish 4.4 to 4.7, but the largemouth bass remained at 2.4. Largemouth bass specimens taken into the laboratory and examined were fat and in good condition, and it is believed that their relatively low "K" factor is a reflection of their rapid growth. All but six of the largemouth bass were returned to the water. Those kept were a representative sample consisting of the two largest, two medium, and two smallest taken.

Stomach analysis revealed that largemouth bass had been feeding mainly on fish.

Although channel catfish had been recently stocked in the lake, none were collected.

Reese Air Force Base Lake

Reese Lake was an oxidation pond for disposal of the effluent from the base sewage disposal plant when Reese Air Force Base sportsmen and officials expressed a desire to develop a fishery in the lake and the Parks and Wildlife Fisheries Department (then Game and Fish Commission) was contacted. Following the advice provided by Mr. Leo Lewis, the Air Force personnel did considerable work on the lake by constructing two small oxidation ponds and installing aeration devices. When this preliminary work was finished, the lake was stocked with redear sunfish, largemouth bass, and channel catfish early in 1963.

In October 1963, a 300-foot seine was used in a survey of the lake. Six fish were taken from the lake along with numerous neotenic tiger salamanders, Ambystoma tigrinum. The fish were in good condition. Two largemouth bass weighed over one-half pound each, three channel catfish weighed over one-half pound each, and one redear sunfish weighed 0.17 pound. Tables 63, 64 and 65 present the data taken.

Table 63. Number and Per Cent of Fish taken from Reese Air Force Base Lake by 2 Drags of a 300-foot one-half Inch Mesh Seine - October 8, 1963

<u>Species</u>	<u>Number</u>	<u>Per Cent</u>
Channel catfish	3	50.00
Largemouth bass	2	33.34
Redear sunfish	1	16.66
<u>Total</u>	<u>6</u>	<u>100.00</u>

Table 64. "K" Factor for Fish taken from Reese Air Force Base Lake - October 8, 1963

<u>Species</u>	<u>Number</u>	<u>Range</u>	<u>Average</u>
Channel catfish	3	1.7-1.7	1.7
Largemouth bass	2	3.0-3.4	3.2
Redear sunfish	1	1.9	1.9

Table 65. Food Items of Fish from Reese Air Force Base Lake - October 8, 1963

<u>Species</u>	<u>Channel Catfish</u>	<u>Largemouth Bass</u>	<u>Redear Sunfish</u>
Number Examined	3	2	1
Number with Food	2	2	
Food Items - Frequency			
Insects	2	2	
Vegetation		1	
Other	1		

More detailed work will be done in the future on this lake in attempts to determine methods of further improving the water quality and fishery.

Lake Stamford

In 1962, work at Lake Stamford was done under Job No. B-19, entitled "Inventory of Species Present in Lake Stamford". Under this job the lake was surveyed six times and the final accumulation of data for the year showed a game fish population of 42.19 per cent made up of channel catfish, 12.54 per cent, flathead catfish, 1.74 per cent, largemouth bass, 1.41 per cent, sunfish, 0.50 per cent, and white crappie, 26.00 per cent.

The rough fish taken were shortnose gar, gizzard shad, smallmouth buffalo, river carpsucker, carp, black bullhead; and freshwater drum. River carpsucker comprised 32.06 per cent of the total population.

In 1963, one survey was made in June when 507 fish were taken (Table 66). Game fish comprised 28.80 per cent of the collection with channel catfish comprising 3.95 per cent, flathead catfish 1.18 per cent, bluegill 0.99 per cent, and white crappie 22.68 per cent. This represents a 13.39 per cent decrease in game fish population and a corresponding rise in the rough fish population due to the following factors: (1) A decline of 8.59 per cent in channel catfish, (2) the failure to net any largemouth bass in June, and (3) a rise in river carpsucker percentage.

Table 66. Percentage Composition by Number and Weight and Mean Weight of Fish Taken from Lake Stamford by 14 Units of Standard Survey Gill Net - June 25, 1963

Species	Number	Per Cent	Total Weight Pounds	Per Cent by Weight	Mean Weight
Longnose gar	1	0.19	4.85	0.67	4.85
Shortnose gar	1	0.20	3.66	0.51	3.66
Gizzard shad	3	0.59	0.31	0.04	0.10
Smallmouth buffalo	12	2.37	51.98	7.23	4.33
River carpsucker	194	38.26	325.95	45.30	1.68
Carp	51	10.06	128.96	17.93	2.52
Channel catfish	20	3.95	9.46	1.31	0.47
Flathead catfish	6	1.18	26.67	3.71	4.44
Bluegill	5	0.99	0.41	0.06	0.08
White crappie	115	22.68	18.80	2.61	0.16
Freshwater drum	99	19.53	148.38	20.63	1.49
Total	507	100.00	719.43	100.00	
Game Fish	146	28.80	55.34	7.69	
Rough Fish	361	71.20	664.09	92.31	

Table 67 presents seining data for June 1963, and shows a percentage loss from July 1962 of 12.24 per cent for red shiners, 25.03 per cent for Mississippi silversides, and a gain of 9.46 per cent for white crappie and 27.04 per cent for shad; however, many shad taken in June 1963 were fry which had recently been spawned. Carp and black bullheads represented only 0.42 per cent of the seine sample.

Table 67. Number and Per Cent of Species of Fish taken from Lake Stamford by 14 Drags of a 20-foot one-eighth Inch Mesh Seine - June 25, 1963

<u>Species</u>	<u>Number</u>	<u>Per Cent</u>
Gizzard shad	554	47.18
Carp	4	0.34
Bullhead minnow	29	2.48
Red shiner	110	9.36
Golden shiner	4	0.35
Black bullhead	1	0.08
Mosquitofish	23	1.96
Mississippi silversides	234	19.93
Largemouth bass	11	0.94
Orangespotted sunfish	2	0.17
Green sunfish	1	0.08
Longear sunfish	38	3.24
Bluegill	44	3.75
Redear sunfish	1	0.08
White crappie	118	10.06
Total	1174	100.00

"K" factors, in Table 68, compared to last year's average "K" factors show variations as follows: shad lost 0.5, smallmouth buffalo gained 0.15, river carpsucker lost 0.20, carp lost 0.15, channel catfish gained 0.2, flathead catfish lost 0.4, white crappie and freshwater drum remained the same. Other fish were not collected in sufficient numbers to be valid comparisons.

Table 68. "K" Factor Range and Average for Fish taken from Lake Stamford - June 25, 1963

<u>Species</u>	<u>Number</u>	<u>Range</u>	<u>Average</u>
Longnose gar	1	0.6 -	0.6
Shortnose gar	1	0.7 -	0.7
Gizzard shad	3	1.4-1.5	1.5
Smallmouth buffalo	12	3.2-4.5	3.8
River carpsucker	50	2.0-3.0	2.5
Carp	51	1.7-2.9	2.5
Channel catfish	20	1.4-3.8	1.9
Flathead catfish	6	1.8-2.0	1.9
Bluegill	5	3.9-5.0	4.1
White crappie	50	2.2-3.4	3.0
Freshwater drum	37	2.2-3.4	2.7

Stomach analysis data in Table 69 reveal that channel catfish were feeding on algae, Crustacea, fish and insects in June, while flathead catfish fed more on fish. White crappie fed on crustaceans, fish and insect larvae and freshwater drum fed mainly on fish.

Comparing the data from June 1963, to monthly data for May and July 1962, and the composite yearly data to monthly data for May and July 1962, it appears that no major change has taken place in the fish population in Lake Stamford.

Table 69. Food Items of Fish taken from Lake Stamford - June 25, 1963

Species	Channel Catfish	Flathead Catfish	Bluegill	White Crappie	Freshwater Drum
Number Examined	20	6	1	50	13
Number with Food	11	4		35	8
Food Items - Frequency					
Algae	3			2	
Crustacea	3	1		18	
Fish remains	2	3		19	8
Insect larvae				17	1
Insect remains	2	1			
Vegetation	1				
Other	1	1			

May 1962, June 1963, and July 1962 netting data correlate as well as if they had been taken the same year. There are some fluctuations, but they seem to cancel between May and July. Two new species are recorded from Lake Stamford this year; longnose gar, Lepisosteus osseus, and redear sunfish, Lepomis microlophus.

White River Reservoir

The White River Reservoir was surveyed twice in 1963 prior to a renovation treatment of the basin and watershed. White River Lake is newly impounded and was completed ahead of schedule, imposing a time deadline for effective treatment which forbade conducting a basic survey; however, during reconnaissance as much material as possible was collected.

The first survey of the basin was done at a period of relatively high water; soon after a spring flood washed out a small section of the then incomplete dam. The fish in the reservoir at that time were those which were in the small riverbed pools which had been present at the beginning of construction, plus those few which were brought down by the flood waters. Due to these conditions only two fish were taken in June with 1,800 feet of standard survey gill nets; one carp and one black bullhead. The data from the June netting are in Tables 70 and 71.

Table 70. Percentage Composition by Number, Weight, and Mean Weight for Fish taken from White River Reservoir by 12 Units of Standard Survey Gill Nets - June 12, 1963

Species	Number	Per Cent	Total Weight Pounds	Per Cent by Weight	Mean Weight
Carp	1	50.00	0.17	15.60	0.17
Black bullhead	1	50.00	0.92	84.40	0.92
Total	2	100.00	1.09	100.00	

Table 71. "K" Factors for Carp and Bullhead from White River Reservoir - June 12, 1963

Species	Number	Range	Average
Carp	1	2.5	2.5
Black bullhead	1	2.6	2.6

Seining in June (Table 72), produced 336 fish of two species, fathead minnows and plains killifish, which are abundant in the White River itself, in about the same proportions as demonstrated in the new lake basin.

Table 72. Number and Per Cent of Fish Species taken from White River Reservoir by 8 Drags of a 20-foot one-eighth Inch Mesh Seine - June 12, 1963

<u>Species</u>	<u>Number</u>	<u>Per Cent</u>
Fathead minnow	17	5.06
Plains killifish	319	94.94
Total	336	100.00

At this same time, nets were set in large pools in the White River, due east of Crosbyton, and produced large carp and black bullheads in abundance; however, these data were insufficient to justify a renovation.

The second survey was made in September. In this survey 51 fish were taken and 47 of them were rough fish, with one channel catfish and one largemouth bass and two green sunfish as the only game fish collected. Many of the carp were young-of-the-year and in good condition. Table 73 presents the netting data for the September survey.

Table 73. Percentage Composition of the Fish Population in the White River Reservoir as Shown by 12 Units of Standard Survey Gill Nets - September 11, 1963

<u>Species</u>	<u>Number</u>	<u>Per Cent</u>	<u>Total Weight Pounds</u>	<u>Per Cent by Weight</u>	<u>Average Weight</u>
Carp	25	49.01	39.32	72.49	1.57
Channel catfish	1	1.97	2.15	3.96	2.15
Black bullhead	22	43.13	12.22	22.53	0.56
Largemouth bass	1	1.96	0.42	0.78	0.42
Green sunfish	2	3.93	0.13	0.24	0.07
Total	51	100.00	54.24	100.00	
Rough Fish	47	92.16	51.54	95.02	1.10
Game Fish	4	7.84	2.70	4.98	0.68

Seining data are shown in Table 74, in which all of the carp are young-of-the-year and no adult black bullheads were taken. The small fish population had altered since April, producing a population ratio of 13.27 per cent sunfish, 77.37 per cent forage fish, and 9.36 per cent rough fish. No young largemouth bass or channel catfish were taken, indicating that no spawn of game fish occurred in the lake basin in 1963.

Table 74. Percentage Composition of the Fish Population in the White River Reservoir as Shown by 100-foot, 40-foot and 20-foot Seine Samples - September 11, 1963

<u>Species</u>	<u>Number</u>	<u>Per Cent</u>
Carp	55	4.05
Red river shiner	6	0.44
Red shiner	72	5.31

Table 74 continued

<u>Species</u>	<u>Number</u>	<u>Per Cent</u>
Bullhead minnow	559	41.19
Black bullhead	72	5.31
Plains killifish	1	0.07
Mosquitofish	412	30.36
Green sunfish	157	11.57
Longear sunfish	23	1.70
<u>Total</u>	<u>1357</u>	<u>100.00</u>

"K" factors for fish from the White River Lake are shown in Table 75. These fish show 0.1 "K" factor improvement during the summer compared to the fish taken in June.

Table 75. "K" Factor Range and Average for Fish Species taken from the White River Reservoir - September 11, 1963

<u>Species</u>	<u>Number</u>	<u>Range</u>	<u>Average</u>
Carp	25	2.1-3.6	2.6
Channel catfish	1	-	2.4
Black bullhead	22	2.2-3.2	2.7
Largemouth bass	1	-	3.2
Green sunfish	2	3.4-3.6	3.5

Stomach contents data (Table 76), indicate that there is still a lack of variety in forage for larger fish in the White River Reservoir and none of the stomachs contained aquatic insects or larvae.

Plankton samples (qualitative only) showed numerous Cladocera and Copepoda. Two bottom samples in the deep end of the lake near the dam produced about 1 part in 48 parts macroscopic organic material such as grass roots, leaves, and small sticks, and no indication of aquatic benthic plant or animal organisms. The silt content was high, with sand and black mud making up the bulk of the material. No furnace tests to determine organic content have been made.

Table 76. Food Items of Fish taken from White River Reservoir - September 11, 1963

<u>Species</u>	<u>Channel Catfish</u>	<u>Black Bullhead</u>	<u>Largemouth Bass</u>	<u>Green Sunfish</u>
Number Examined	1	23	1	1
Number with Food	1	12	1	
Food Items - Frequency				
Algae		6	1	
Crayfish		1		
Fish remains	1	10		
Insect larvae			1	
Insects		1		
Other		2		

A chemical water analysis was made by the Texas State Health Department laboratories in Austin from three water samples taken on September 11, 1963.

One sample was from the White River channel east of Crosbyton and two miles south of U. S. 82, one from the upper end of the lake, and one near the dam. All samples were turbid and within the required chemical tolerances for drinking water. Minerals in solution in the basin averaged as listed in Table 77.

Table 77. Results of Water Analysis on the Water from White River Reservoir - September 11, 1963

<u>Substance</u>	<u>Amount present in Parts Per Million</u>
Magnesium	17.50
Calcium	19.00
Iron	0.09
Manganese	0.01
Sodium	141.00
Carbonate	7.50
Bicarbonate	200.00
Sulphate	80.50
Chloride	119.50
Fluoride	1.40
Nitrate	0.40
pH 8.6 and Specific Conductance Microhms / cm.	948

Fish population changes, benthic changes, and environmental changes will be followed closely in reconnaissance the next few years.

Double Mountain Fork of the Brazos River

The Double Mountain Fork of the Brazos River was surveyed on October 9 and 10, 1963. Stations were established at highway crossings and data concerning the current, depth, vegetation, and cover were taken at each station along with the seine samples. Eleven stations were worked, beginning on Farm Road 400, below Buffalo Springs Lake, and ending at the bridge on Farm Road 267, about 7 miles north of Munday.

Drags at each stop varied from one, where only one small pool existed, to six where large pools and good cover made seining conditions difficult. A sincere effort was made to collect a representative sample of the fish population from each collecting site.

Table 78 represents the results from each collecting station and total and per cent by species for the entire survey. Examination of the table shows irregular distribution of species from locality to locality and this is reflected in the riverbed and environment.

The first collection was made in a stretch of pools and riffles of permanent water below the Buffalo Springs dam, and this collection produced more species than collections at any other locality. The next collecting station was an area of wide sandy riverbed and little surface water with only three shallow puddles with no vegetation and turbid water.

Table 78. Number and Per Cent of Fish Species Collected from the Double Mountain Fork of the Brazos River with 20-foot One-eighth Inch Mesh, 40-foot One-fourth Inch Mesh and 100-foot One-half Inch Mesh Seines - October 9 and 10, 1963

Species	Station Numbers and Number of Fish Captured per Station											Total	Per Cent
	1	2	3	4	5	6	7	8	9	10	11		
Longnose gar											4	4	0.04
Gizzard shad					4			1	36	48	2	91	1.14
River carpsucker	1		3	10		4	30	53	7	18	3	129	1.60
Sharpnose shiner			488	199	191	775	102	77	3		69	1904	23.70
Golden shiner	30											30	0.38
Speckled chub				1			1					2	0.02
Red river shiner					470	91	136	2	201	7		907	11.29
Red shiner	607		69	62		78		2			1	819	10.19
Plains minnow		3	94	84	304	35	149	197	2035	465	168	3534	43.99
Fathead minnow	126							2	1			126	1.57
Channel catfish											5	8	0.10
Black bullhead	202									2		204	2.54
Plains killifish	19		6			26						51	0.63
Mosquitofish	162					7				4	5	178	2.22
Largemouth bass	19				1			1				21	0.26
Green sunfish	4			1	4	1				1		10	0.13
Bluegill	7											10	0.12
Orangespotted sunfish		2							1			2	0.03
Drum											4	4	0.05
Total	1177	5	660	357	974	1017	422	333	2283	545	261	8034	100.00

Channel catfish and largemouth bass make up 0.36 per cent of the river fish population from Lubbock County to Haskell County and sunfish add 0.30 per cent to a total of 0.66 per cent game species, with the majority of the fish small and uninteresting to fishermen. Minnows and shiners comprise 93.97 per cent of the population and rough species 5.37 per cent. Water scarcity precludes any need of management except for minnow seining control.

Canadian River

The Canadian River was surveyed one time in July 1963 when seven stations, from near the New Mexico border to the east of the town of Canadian, were seined with a 40-foot one-fourth inch mesh seine, and netted with 2 units of standard survey gill net. The double-unit net was set in a deep hole for a period of only 2 hours in an attempt to sample the population of larger fish.

Table 79 presents the data collected by stations and shows the fish population to be 99.24 per cent minnows and shiners, 0.61 per cent channel catfish, largemouth bass, and sunfish, and only 0.15 per cent rough fish. Of the 99.24 per cent minnows and shiners, 75.08 per cent were plains minnows.

The collection stations in Table 79 are listed by number as follows: No. 1 is west of the Tascosa bridge, No. 2 is at the Tascosa bridge, No. 3 is at the Dumas bridge, No. 4 is at the Canadian River Dam, No. 5 is on the Big Bull Ranch, No. 6 is north of Pampa, and No. 7 is at the Canadian bridge.

Pease River System

The Pease River System, composed of the North Pease, Main Pease, and South Pease and their respective tributaries was surveyed in August 1963. Collections were made at the following localities: (1) Quitaque Creek south of Turkey, (2) 2 miles north of Whiteflat on Highway 70, (3) 20 miles southwest of Childress on Highway 94, (4) 13 miles south of Childress on Highway 62, (5) 15 miles south of Childress on Highway 62, (6) 1 mile south of Roaring Springs on Highway 70, (7) 12 miles north of Paducah on Highway 83, (8) 26 miles north of Paducah on Farm Road 104, (9) 8 miles north of Crowell on Highway 283. Bridge crossings not listed were dry riverbed localities.

Three collections were made on tributaries (asterisks on Table 80), and 47.38 per cent of the total number of fish taken came from a spring pool on the first tributary seined. It produced fishing size sunfish and black bullheads.

The rest of the system was almost all shallow water, sandy bed, minnow-producing stream, or dry riverbed. Rough fish were 0.16 per cent of the population, 98.21 per cent were minnows and shiners, and 1.63 per cent were game fish. At no locality were minnows found in excessively dense populations.

Red River System

The Red River System consists of three widely separated branches, the North Fork, Salt Fork, and Prairie Dog Town Fork. The North Fork was surveyed on October 2, 1963 and nine stations, beginning near the Oklahoma border and working west to Lefors, were checked, but only four had water and were seined.

Table 79. Number and Per Cent of Species Collected by a 40-foot one-fourth Inch Mesh Seine and 2 Units of Standard Survey Gill Net on the Canadian River - July 17, 1963

Species	Station and Number of Fish per Station							Total	Per Cent
	1	2	3	4	5	6	7		
Shad				2				2	0.03
Carp		1						1	0.02
Silver chub		428	110	75	6		13	632	11.91
Speckled dace	2	22		2				26	0.49
Plains shiner	170							170	3.20
Red river shiner	8	5						5	0.09
Red shiner		5	22	15				50	0.95
Mimic shiner			7	15		1	26	49	0.92
Ghost shiner		23		3	7		179	212	3.99
Plains minnow	1061	30	1564	765	115	336	114	3985	75.08
Bullhead minnow			4					4	0.07
Fathead minnow			8	7	2	2	11	30	0.57
Channel catfish	2	3						5	0.09
Black bullhead		4		1				5	0.10
Plains killifish			50	13			9	72	1.35
Mosquitofish			9	19		5		33	0.63
Largemouth bass				1				1	0.02
Green sunfish	1	2	6	16			1	26	0.49
Total	1244	523	1780	934	130	344	353	5308	100.00

Table 80. Number and Per Cent of Fish Species by Station and Total for the Pease River System taken by 20-foot one-eighth Inch Mesh and 40-foot one-fourth Inch Mesh Seines - August 21, 1963

Station Species	North Pease River				South Pease	Main Pease	Total	Per Cent
	(1* 2*)	3	4	5*)	(6 7)	(8 9)		
Shad						1	1	0.04
Red river shiner		55				12	88	3.57
Red shiner	604	32	18	39	5	21	1150	46.69
Sand shiner	12	11			4	6	41	1.66
Plains minnow	146	85	36		13		340	13.81
Bullhead minnow							5	0.20
Fathead minnow	11	10	3			7	31	1.26
Black bullhead	3						3	0.12
Plains killifish	383	26	1	30	2	109	647	26.27
Red river pupfish	1	9	17		52	22	102	4.14
Mosquitofish							15	0.61
Largemouth bass							4	0.16
Green sunfish	6	3		1			6	0.65
Bluegill	1				4		15	0.82
Total	1167	58	75	40	80	158	2463	100.00

*tributaries of River Branch where listed

All species taken northeast of Shamrock were game species and sunfish, except for black bullheads, which, due to water scarcity are possibly fair game there.

Table 81, shows the data for collections on the North Fork of the Red River. The data reflects the fact that from about 8 miles northwest of Shamrock to its headwaters, the Red River is intermittent in condition, from small flow in the morning to dry with potholes in the afternoon. It varies between surface and subsurface flow. At station No. 4, just east of Lefors, Technician Ronald Meletti first observed red river pupfish, Cyprinodon rubrofluviatilis, and plains killifish, Fundulus kansae, burrowing into the sand when frightened. The river here has a wide sandy bed and no cover. These species were then observed burrowing into the sand by all three members of the survey crew. The tiny fish would suddenly upend, head downward, then with violent wriggling motions literally bore a hole into the sand and disappear.

Table 81. Number and Per Cent of Fish Species taken in the North Fork of the Red River with a 20-foot One-eighth Inch Mesh and a 40-foot One-fourth Inch Mesh Seine - October 2, 1963

Station Number	1	2	3	4	Total	Per Cent
<hr/>						
Species						
Fathead Minnow			4		4	0.32
Plains minnow			41	5	46	3.69
Red river shiner			1		1	0.08
Black bullhead	1				1	0.09
Plains killifish		108	170	519	797	64.06
Red river pupfish			33	191	224	18.01
Mosquitofish	1		3		4	0.32
Largemouth bass	18				18	1.45
Warmouth	5				5	0.40
Redear sunfish	11				11	0.88
Bluegill	90				90	7.24
Longear sunfish	20				20	1.61
Green sunfish	9		2		11	0.88
White crappie	12				12	0.97
<hr/>						
Total	167	108	254	715	1244	100.00
<hr/>						
Game 13.43%	Rough 0.09%		Minnow 86.48%			
<hr/>						

The Salt Fork of the Red River was surveyed on October 1, 1963. Seven stations yielded fish, and data collected is presented in Table 82 by stations, beginning northeast of Claude and progressing downriver. Game fish are practically non-existent in this stream, which also has intermittent flow, and those few game fish taken were sunfish and black bullheads which were too small for utilization. Minnows were numerous in some localities.

The Prairie Dog Town Fork of the Red River lies to the south of the other two forks and its population distribution is presented in Table 83 by number of fish per station; beginning at Palo Duro Canyon State Park and working down at highway crossings to the last station north of Childress on Highway 62.

Table 82. Number by Station and Number and Per Cent for Fish Species from the Salt Fork of the Red River, Collected by 20-foot One-eighth Inch Mesh Seine - October 1, 1963

Station	1	2	3	4	5	6	7*	Total	Per Cent
Speckled dace					1			1	0.02
Fathead minnow	1				1			2	0.05
Bullhead minnow		2			3			5	0.11
Plains minnow		5	1		391	1024		1421	33.47
Red shiner	248	9	1	104	390	62	83	897	21.13
Red river shiner		12		7				19	0.44
Sand shiner					1			1	0.03
Black bullhead					1			1	0.02
Plains killifish	383	114	108	281	50	135	553	1624	38.25
Red river pupfish		5		59	42		6	112	2.64
Mosquitofish				126	5			131	3.08
Orangespotted sunfish			3					3	0.07
Bluegill		1			1			2	0.05
Green sunfish				26	1			27	0.64
Total	632	148	113	604	886	1221	642	4246	100.00

Game fish 0.76% Rough fish 0.02% Minnow pop. 99.22%

* Tributary of the Red River (Elm Fork of the Red just above Wellington)

Table 83. Number of Fish Species by Collection and Total Number and Per Cent for the Prairie Dog Fork of the Red River - October 21, 1963

Species	1	2	3	4	5	6	7*	8	9*	10	11	12	Total	Per Cent
Carp	1	2											3	0.04
Red river shiner	60	298	488	125	190	26	2768	12	450		27		705	9.43
Red shiner	134	75	118	42	204			7	3				4190	56.07
Plains minnow	5	38	166	35	34		111		197				770	10.30
Bullhead minnow	30	1	144				16	1					316	4.23
Fathead minnow		1	25				13						264	3.53
Channel catfish	2	1	2				1						39	0.52
Black bullhead	15	14	24	18	37	104		31	7	13	4	24	291	0.08
Plains killifish			22			59		252	96			416	845	3.90
Red river pupfish								3	2				12	11.31
Mosquitofish													3	0.16
Largemouth bass		1	1				1						3	0.04
Green sunfish							24						24	0.32
Longear sunfish		1					3						4	0.05
White crappie		1											1	0.02
Total	247	430	992	220	906	189	2937	306	755	13	38	440	7473	100.00

* Number 7, Tule Creek - contains volumetric estimates of numbers

* Number 9, contains volumetric estimates

Game Fish 0.95% Rough Fish 0.12% Minnows 98.93%

Collections were made with a 20-foot seine and, in some of the tub-sized puddles in the drying river bed, a dip net. Collections 1 through 7 and 9 through 12 were made with the 20-foot seine, and 8, 10, and 11 were made with a dip net. Collections one through five were made in Palo Duro State Park at about one-half miles to one mile intervals at and between water crossings. The river itself, off of the Palo Duro Park region produced no game fish, and the majority of the stations produced only minnows. Many stations had very salty water as determined by taste and visual observation of white residue on the sand flats and margins of the water.

For practical purposes, public fishing in this river would be futile.

White River

The White River is a tributary of the Salt Fork of the Brazos River entering it about 20 miles east of Post, with headwaters just east of the New Mexico border above Farwell.

This river was surveyed twice in 1963, once in June and once in September, in conjunction with a proposed treatment of the White River Reservoir and watershed which was carried out in November 1963.

On June 12, 1963, four units of standard survey gill nets were set in the small reservoir above Highway 82, about 5 miles east of Crosbyton, and only 39 fish were taken; with game fish totaling 33.33 per cent and rough fish 66.67 per cent. Tables 84, 85, 86 and 87 show the population percentage composition, "K" factors, and food items. Almost all fish were in poor condition and fish, Crustacea, and insects were frequent food items.

Seining in June produced 303 fish with 2.64 per cent rough, 76.57 per cent minnow, and 20.79 per cent game species of forage size.

Table. 84. Percentage Composition by Number, Weight, and Mean Weight of Fish Species taken from the White River East of Crosbyton by 4 Units of Standard Survey Gill Net - June 12, 1963

Species	Number	Per Cent	Total Weight Pounds	Per Cent by Weight	Mean Weight
Carp	3	7.69	7.14	33.41	2.38
Black bullhead	23	58.97	11.49	53.76	0.49
Largemouth bass	2	5.13	1.31	6.13	0.65
Green sunfish	9	23.08	1.21	5.67	0.13
Bluegill	1	2.56	0.09	0.42	0.09
Longear sunfish	1	2.57	0.13	0.61	0.13
Total	39	100.00	21.37	100.00	
Game Fish	13	33.33	2.74	12.82	
Rough Fish	26	66.67	18.63	87.18	

Table 91. Food Items From Fish taken from the White River on the Bridwell Ranch East of Crosbyton. September 11, 1963

Species	Channel Catfish	Black Bullhead	Largemouth Bass	Green Sunfish
Number Examined	1	47	2	4
Number with Food	1	25	1	4
Food Items - Frequency				
Algae		13		
Fish remains	1	7	1	1
Insect larvae		1		1
Insects	1	1		3
Vegetation	1		1	
Other		9		1

The September rough fish population was 90.66 per cent of the total as shown in Table 88. The composite seine sample showed rough fish as 13.66 per cent, minnows 15.86 per cent, and game fish 70.48 per cent. These game fish were almost all fry, fingerlings, or forage-sized fish, including 131 small, probably stunted, longear sunfish. Again almost all fish collected were in poor condition as "K" factors, as well as observation, indicate.

A Checklist of Species Represented in Collections from
Reconnaissance in 1963

Shortnosed Gar	<u>Lepisosteus platostomus</u>
Longnosed Gar	<u>Lepisosteus osseus</u>
Gizzard Shad	<u>Dorosoma cepedianum</u>
Smallmouth Buffalo	<u>Ictiobus bubalus</u>
River carpsucker	<u>Carpiodes carpio</u>
Carp	<u>Cyprinus carpio</u>
Goldfish	<u>Carassius auratus</u>
Carp-Goldfish Hybrid	<u>Cyprinus-Carassius</u>
Golden Shiner	<u>Notemigonus crysoleucas</u>
Silver Chub	<u>Hybopsis storeiana</u>
Speckled Chub	<u>Hybopsis aestivalis</u>
Suckermouth Minnow	<u>Phenacobius mirabilis</u>
Sharpnose Shiner	<u>Notropis oxyrhynchus</u>
Red River Shiner	<u>Notropis bairdi</u>
Red Shiner	<u>Notropis lutrensis</u>
Sand Shiner	<u>Notropis stramineus</u>
Mimic Shiner	<u>Notropis volucellus</u>
Ghost Shiner	<u>Notropis buechanani</u>
Plains Minnow	<u>Hybognathus placita</u>
Bullhead Minnow	<u>Pimephales vigilax</u>
Fathead Minnow	<u>Pimephales promelas</u>
Channel Catfish	<u>Ictalurus punctatus</u>
Black Bullhead	<u>Ictalurus melas</u>
Flathead Catfish	<u>Pylodictis olivaris</u>
Plains Killifish	<u>Fundulus kansae</u>
Red River Pupfish	<u>Cyprinodon rubrofluviatilis</u>
Mosquitofish	<u>Gambusia affinis</u>

Mississippi Silversides
White Bass
Largemouth Bass
Warmouth
Green Sunfish
Redear Sunfish
Bluegill
Orangespotted Sunfish
Longear Sunfish
White Crappie
Freshwater Drum

Menidia audens
Roccus chrysops
Micropterus salmoides
Chaenobryttus gulosus
Lepomis cyanellus
Lepomis microlophus
Lepomis macrochirus
Lepomis humilis
Lepomis megalotis
Pomoxis annularis
Aplodinotus grunniens

Prepared by G. G. Henderson, Jr.
Asst. Project Leader
Date June 2, 1964

Approved by Marion Toole
Coordinator
Leo D. Lewis
Regional Supervisor

