

STATE Texas  
PROJECT NO. F-7-R-2, Jobs A-1 and B-5  
PERIOD June 1, 1954 - May 31, 1955

## JOB COMPLETION REPORT

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### TITLE:

Basic survey of and inventory of species of fishes present in, and their distribution in, the Canadian River in Texas, including the following counties: Hartley, Oldham, Potter, Moore, Carson, Hutchinson, Roberts, Hemphill and Lipscomb.

### OBJECTIVES:

1. To gather fundamental data on the above waters in regard to their physical, chemical and biological aspects.
2. To determine the distribution of the species of fishes present and their relative abundance, and the ecological factors influencing their distribution.

### TECHNIQUES:

Basic survey work was done by following the river banks as closely as possible, by car, 4-wheel-drive jeep, or walking, taking samples of the fish populations of the river at scattered points, of every tributary stream that contained water at the time of our visits, and of every impoundment of the tributary streams. The samples of fishes and water were analyzed in the laboratory. Other fundamental data was obtained from the acknowledged sources.

The inventory of species was based on monthly samples of fishes and water from five stations established along the length of the Canadian River in the State of Texas. On a few occasions, data could not be obtained from some stations due to pollution, freezing conditions that prevented seining, or lack of water in the river.

### BACKGROUND:

The arid Texas Panhandle contains a large number of enthusiastic fishermen but almost no appreciable amounts of water suitable for game fishes. In consequence, the lake to be established at the site of the proposed Sanford Reservoir assumes increased importance from the standpoint of fisheries management in Texas.

Previous to the present investigations very little was known of the aquatic biology of the Texas Panhandle. Because the Texas Game and Fish Commission will doubtless be called upon to stock the new lake, when established, with game fishes and perhaps also to manage the sports fisheries, we desired to know: (1) present utilization of the Canadian River in Texas for sports fishing; (2) species of fishes present in the river or ascending the river from downstream as migrants (especially rough fish species that might prove problems in the new lake); (3) populations of game and rough fishes in the tributary streams and tributary stream impoundments that might later reach the new lake as a result of floods, etc; (4) the chemical nature of the water of the river and its tributaries.

Equally important was the detailed study of the industrial pollution of the Canadian River. This has been reported elsewhere (see Completion Report, F-7-R-2, Job C-1, part 1).

In all of our investigations of the Canadian River we have kept in mind the relationship of the data obtained to the proposed Sanford Reservoir. The importance of the proposed lake is suggested by the fact that 153,000 fishing permits are sold each year at Buffalo Lake, the nearest moderately large lake and much smaller than the proposed new lake. The United States Fish and Wildlife Service estimates (A Detailed Report on the Fish and Wildlife Resources for Sanford Reservoir, Canadian River Project, Canadian River, Texas, May, 1954, page 7, made available to us through the kindness of Mr. Karl Kobes, U. S. Fish and Wildlife Service, Amarillo, Texas) not less than 200,000 fisherman days per year for the new lake, and a value of 780,000 dollars for the sports fisheries resource.

The paucity of previous information about the aquatic biology of the Texas Panhandle is emphasized by the fact that two of the common species of fishes living in the Canadian River had never previously been reported as occurring in the state.

#### ACKNOWLEDGMENTS:

We were able to make a moderately thorough basic survey of the Canadian River only because the game wardens of the area served as guides in the more inaccessible areas, giving freely of their time and experience, and sometimes spending days in the field with us. We wish to acknowledge our indebtedness to game wardens P. D. Mosley of Canadian, Starkey Whitehorn of Borger, Lake Black of Amarillo, Cal Lovelace of Vega, and game warden supervisor Jim Maggard of Amarillo. Dr. Carl Gray, Soils Scientist of Midwestern University, Wichita Falls, and the Wichita County Water Improvement Districts, made the many detailed water analyses. Data on water volume were obtained from Mr. John Joerns, United States Geological Survey, Water Resources Branch, Wichita Falls. Other data was obtained from various published and private sources, and by field work.

#### BASIC SURVEY OF THE CANADIAN RIVER WATERSHED:

The Canadian River originates in the Sangre de Cristo Mountains of New Mexico. One large lake, Conchas Reservoir, is located on the Canadian River in New Mexico. We note with apprehension that gizzard shad, European carp and buffalo fishes occur in Conchas Reservoir, and that a flood might wash these undesirable forms into Sanford Reservoir. The river crosses the northern part of the Texas Panhandle, entering Texas from New Mexico in Oldham County and trending easterly or east-northeasterly to the Oklahoma boundary in Hemphill County. There are no major branches or tributaries of the river in Texas. To the east the Canadian River continues through Oklahoma to the eastern part of the state where it joins the Arkansas River. The combined waters enter the Mississippi in eastern Arkansas.

The Texas Panhandle crossed by the Canadian River belongs ecologically to the Short Grass Plains Biotic District of the Prairie Province. It is an area of sandy soil and rolling, grass-covered hills, generally called the High Plains. These grassy uplands are mostly of Pliocene age, the Ogallala Formation, of soft sandstones, sand deposits, etc.

The Canadian River has cut a valley about thirty miles broad through the High Plains, and about 900 feet deep. On the west the river has cut through the salt Pliocene rocks, exposing the harder Triassic rocks of the Dockum Group from the New Mexico boundary through Oldham and Potter counties. From Potter County to the Oklahoma boundary the river valley

exposes Permian sediments, largely the Quartermaster Formation, with, easterly, some Cloud Chief Formation, both of the Double Mountain Group. The river bed itself is of Quaternary sands, probably derived in large part from the Ogallala sandstones.

The Canadian River is a braided stream with a sandy flood plain varying locally from less than 1,000 feet in width to more than 3,000 feet. Although the drainage area is considerable (19,445 square miles at Amarillo Station; 22,708 sq. mi. at Canadian Station), water flow is highly irregular. In times of heavy rain, the river becomes a raging torrent. Highest estimated discharge was 257,000 cubic feet per second. Many times, and over much of its length, there was no surface flow of water during the past project year. Where there was a surface flow, it was highly unpredictable. Narrow, shifting channels of shallow water might slide sidewise unexpectedly or vanish underground several times during the day. The surface flow might be in one part of the stream bed during the morning, in another part at noon, and in still another place at nightfall. As a result, fishes occur only in the most permanent channels and pools. Much of our collecting was done in pools excavated by the current at the bases of bridge supports. Sometimes we were seining in one part of the river bed while the high winds, characteristic of the region, made the rest of the river bed a raging sandstorm.

In spite of the erratic habits of the Canadian River water, fishes characteristic of the Arkansas River drainage were found at all stations except when the river was dry or polluted by industrial waste. Black bass were taken only in a deep pool near the Oklahoma boundary but channel catfish, black bullhead catfish and green sunfish were taken almost throughout the length of the river. All specimens taken, however, were too small to have attracted fishermen.

Tributary streams, especially of the western part of the river, have braided beds and steep gradients. The streams are usually shallow but fishes are common. The commoner species are shiners, minnows and killifish. Farther east a few streams are larger and have deeper beds. Game fishes occur in these streams. Impoundments of tributary streams form many beautiful small lakes where black bass, sunfishes and other game forms are common. Rough fish species are conspicuous by their absence. Water quality of the river and the tributaries is good. Exception is made of those tributaries carrying industrial waste and of a small pool near Borger where, for reasons not apparent, the water is extremely salty.

In the course of our basic survey of the Canadian River, data was obtained from several points along the river in addition to the established stations that were worked each month. Data was also obtained from numerous tributary streams and the impoundments of tributary streams. In the following paragraphs, sample localities are listed from west to east. The number assigned to each paragraph forms the code for the water sample analyses in Table 1.

1. River, five miles east of the New Mexico boundary; September 11, 1954. This locality is on the Matador Ranch. The river bed is sandy with scattered rocks. There are some deep holes. Seining took:

- 58 Notropis girardi
- 159 Hybognathus placita (46 mature, 113 fry)
- 20 Hybopsis gracilis (up to 7 inches in length)
- 1 Hybopsis aestivalis
- 23 Fundulus kansae
- 2 Ictalurus punctatus (3 and 4 inches in length)
- 1 Ameiurus melas (7 inches in length)

2. Alamocitas Creek, Oldham County, entering river on south side. September 11, 1954. A relatively deep, clear creek with numerous holes. We seined and caught:

92 Notropis lutrensis  
 287 Pimephales kansae  
 142 Fundulus kansae  
 13 Ameiurus melas (all less than 3 inches in length)  
 13 Lepomis cyanellus (up to 6 inches in length)

3. River, due north of Adrian, at old farm camp of Matador Ranch, Oldham County, September 11, 1954. The river is only moderately wide. There are some few rocks and pools in the stream bed, which is braided sand. Fish were not abundant and we took:

114 Notropis girardi  
 185 Hybognathus placita

4. Boys Ranch Creek, Oldham County, July 29, 1954. Water sample taken January 13, 1955. A small, cold, clear stream that enters the river on the north side, at Tascosa. The creek flows through a wooded canyon with many shallow riffles and small pools. Seining took:

3 Fundulus kansae  
 49 Gambusia affinis

Boys Ranch Lake. A small impoundment on Boys Ranch Creek. We did not seine here but noted bluegill sunfish and black bass taken by fishermen.

5. Fitcher Creek, Potter County, July 28, 1954. A small, clear, cold, spring-fed creek that enters the river on the north side, just west of Amarillo Station. The gradient is steep but the heavy burden of sand braids the channel until there are no pools, and the water forms a narrow rill a few feet wide and not more than three inches deep, through the sand. Seining took only:

14 Fundulus kansae

6. Amarillo Creek, Potter County, August 10, 1954. This large stream is the sewage effluent of the city of Amarillo. It enters the river on the south side just west of Amarillo Station. The water is green with algae. We did not seine.

7. Borger Spring Pool and Creek, Hutchinson County, August 11, 1954. This is a small pool, about 25 feet in diameter, with a small stream leading to the river, on the north side just east of Borger Bridge Station. The pool contains vast numbers of mosquito fish and killifish. Our first water sample showed such a high concentration of salt that we took another sample on September 8, and still another on January 11, 1955. Our seine sample, taken September 8, 1954, contained:

2,000 Gambusia affinis (estimated)  
 9 Fundulus kansae

8. Bent Creek, Hutchinson County, July 14, 1954. A small, narrow creek flowing through a grassy meadow over a sand and gravel bottom to enter the river on the north side. A seine haul took only killifish: 18 Fundulus kansae.

Bent Creek Lake. A lake of about 40 acres located on Bent Creek a short distance from the river. Large sunfish and black bass are abundant here. Some of the sunfish taken in our seine haul were too big to pass the mouth of our sample bottles and were released. The sample saved contained:

- 1 Gambusia affinis
- 7 Micropterus salmoides (1 inch in length)
- 8 Lepomis macrochirus (up to  $\frac{1}{2}$  pound)
- 6 Lepomis microlophus (up to  $\frac{1}{2}$  pound)

9. Adobe creek, Hutchinson County, July 14, 1954. A small creek that was dry at the time of our visit. A dam formed a pond of about two acres in the bed of the stream but drought had greatly reduced its volume. We seined in the remaining water and took:

- 4 Notemigoneus crysoleucas
- 16 Ameiurus melas (averaging one inch in length)
- 1 Fundulus kansae
- 17 Micropterus salmoides (averaging one inch in length)
- 20 Lepomis cyanellus (1 to 4 inches in length)

10. Spring Creek, Hutchinson County, July 28, 1954. A small, clear, swift stream with braided bed, entering the south side of the river about five miles west of White Deer Creek. We seined but took only killifish:

- 38 Fundulus kansae

11. White Deer Creek, Hutchinson County, July 28, 1954. A large, slow moderately deep creek with usually sandy bed but with numerous large pools. In the shallows we found only killifish but in the deeper pools we took:

- 13 Notropis deliciosus
- 202 Notropis lutrensis
- 96 Pimephales promelas
- 10 Ameiurus melas (up to  $\frac{1}{2}$  pound)
- 27 Lepomis cyanellus (1 to 3 inches in length)
- 10 Lepomis megalotis (1 to 3 inches in length)

12. River, at Brainard's Ranch, Hutchinson County, July 14, 1954. The pollution from the refineries at Børger reaches this far downstream for we smelled the mercaptans in deeper pools in mid-channel, and these pools contained no fish. Pools along the base of a cutbank, at slightly higher elevation than the mid-channel pools, held:

- 109 Notropis girardi
- 2 Notropis lutrensis
- 22 Hybognathus placita
- 2 Fundulus kansae
- 10 Gambusia affinis

13. Pat's Creek, Roberts County, July 14, 1954. A small creek on the north side of the river, flowing from pool to pool through masses of bullrush. The pools are deep, mud-bottomed and weed-filled, but the shallows between the pools are white sand. We rotenoned a small pool and saved as a sample:

- 4 Ameiurus melas
- 8 Fundulus kansae
- 22 Gambusia affinis
- 1 Micropterus salmoides (4 inches in length)
- 14 Lepomis cyanellus (2 to 5 inches in length)

14. John's Creek, Roberts County, July 14, 1954. A larger creek that enters the river on the north side. The creek occupies a broad, sandy valley and consists of numerous

deep pools and sandy interpool shallows. We saw one large black bass here, and our seines took:

- 24 Notropis lutrensis
- 12 Notropis deliciosus
- 387 Pimephales promelas
- 12 Gambusia affinis
- 58 Fundulus kansae
- 1 Lepomis cyanellus

15. River, at mouth of Lake Creek, Roberts County, July 14, 1954. The bed of the creek is dry but in pools in front of the dry creek mouth, in the river, we seined and took:

- 1 Notropis lutrensis
- 28 Notropis girardi
- 17 Hybognathus placita
- 61 Gambusia affinis
- 1 Ameiurus melas (4 inches in length)

16. Morgan Creek, Roberts County, July 14, 1954. This is a small creek on the north side of the river, dry at the time of our visit. A dam forms a small pool in the stream bed and this was seined:

- 17 Micropterus salmoides (Averaging about 1 inch in length)
- 26 Lepomis cyanellus (1 to 5 inches in length)

17. River, at mouth of Morgan Creek, Roberts County, July 14, 1954. A narrow, deep pool in the river bed contained a vast number of small fish. One seine drag filled our sample jar and we had to throw many specimens back. Our sample included:

- 264 Hybognathus placita
- 21 Notropis girardi
- 46 Hybopsis gracilis (up to 7 inches in length)
- 1 Hybopsis aestivalis

18. Chicken Creek, Roberts County, July 15, 1954. A small creek that enters the river from the south. It is said to ordinarily run throughout the year but at the time of our visit it was almost dry. A few small pools that remained in the stream bed were seined, resulting in a catch of:

- 2 Pimephales promelas
- 19 Fundulus kansae
- 9 Lepomis cyanellus

19. Horse Creek, Hemphill County, July 14, 1954. This creek is small but has some surprisingly large, deep holes. Some of these were estimated at 20 feet wide and deeper than a man's head. It enters the river from the north, a few miles west of the town of Canadian. Our seine sample included:

- 37 Pimephales promelas
- 6 Ameiurus melas
- 47 Fundulus kansae
- 1 Micropterus salmoides

20. Boggy Creek, Hemphill County, July 13, 1954. A narrow, deep, rather sluggish creek of brownish water flowing in a narrow, rather steep-walled canyon. We seined a wide pool where the water was chest-deep and took:

- 4 Notemigoneus crysoleucas

- 15 Ameiurus melas (2 to 4 inches in length)
- 5 Gambusia affinis
- 1 Micropterus salmoides (6 inches in length)
- 13 Lepomis cyanellus (1 to 3 inches in length)
- 56 Lepomis macrochirus (1 to 4 inches in length)

21. Clear Creek, Hemphill County, July 13, 1954. A narrow, sluggish, cattail-lined stream in a steep, narrow valley. We seined a small lake in the stream valley and took several hundred green sunfishes and black bullheads. About twenty-five of the bullheads averaged one-half pound in weight but most were only a few inches long. Our sample included:

- 1 Notropis lutrensis
- 2 Notropis deliciosus
- 25 Ameiurus melas (less than 3 inches in length)
- 43 Lepomis cyanellus (less than 3 inches in length)
- 3 Lepomis microlophus (about 3 inches in length)
- 1 Chaenobryttus coronarius (3 inches in length)

Lake Marvin, Hemphill County. A public fishing lake, under U. S. Fish and Wildlife Service control. Black bass and bluegill sunfish are abundant. Channel catfish are also said to be present but we saw none. A fish census was not made here.

Lake on Big Bull Ranch, Hemphill County. A moderately large lake, about one-half the size of Lake Marvin, containing black bass, bluegill sunfish, green sunfish, and some large channel catfish. We examined a channel catfish of about four pounds weight taken by a fisherman. A complete fish census was not made here.

22. River at Deep Hole, Hemphill County, July 13, 1954. A deep hole in the sandy river bed, now only 20 feet wide, 40 feet long and six feet deep. A few years ago this hole was formed by a whirlpool at time of high water or a blowout in the sandy river bed. Three years ago it is said to have been over 100 feet long, 40 feet wide, and 20 feet deep. Black bass up to three pounds in weight have been taken here. Our seine drags took:

- 8 Notemigoneus crysoleucas
- 5 Gambusia affinis
- 3 Micropterus salmoides (4 to 7 inches in length)
- 1 Lepomis cyanellus
- 1 Lepomis macrochirus
- 28 Lepomis microlophus

23. River, at Oklahoma boundary, in Hemphill County, Texas, July 13, 1954. Here the river bed has a shale wall on the north side. The shale is soft and where the river strikes it, a small, deep, narrow pool has eroded into the shale. The river bed seems more muddy here than farther west. Our seines took:

- 4 Notropis lutrensis
- 57 Notropis girardi
- 246 Hybognathus placita
- 11 Hybopsis gracilis
- 4 Gambusia affinis
- 1 Fundulus kansae
- 1 Lepomis cyanellus
- 3 Lepomis macrochirus

TABLE I. WATER ANALYSES AT SAMPLE LOCALITIES

no.	date	Ca.	Na.	Cl.	SO <sub>4</sub>	CO <sub>3</sub>	HCO <sub>3</sub>	Total	pH
1.	9/11/54	246	637	1092	268	15	194	2,452	8.78
2.	9/11/54	62	36	21	35	9	188	351	8.48
3.	9/11/54	136	201	251	241	12	186	1,027	8.79
4.	7/29/54	90	18	5	5	-	295	413	8.40
5.	7/28/54	60	7	5	9	-	159	251	8.10
6.	8/10/54	118	174	154	71	none	468	985	7.60
	1/12/55	184	120	99	105	none	580	1,088	7.91
7.	8/11/54	5447	3636	13685	1446	-	903	25,117	6.85
	9/8/54	5352	3825	462	791	6	60	24,811	7.92
	1/11/55	4712	3621	12816	1432	none	122	22,703	7.55
8.	7/14/54	100	23	47	23	21	214	429	8.20
9.	7/14/54	81	63	90	84	17	116	451	8.60
10.	7/28/54	63	15	31	18	-	124	267	8.23
11.	7/28/54	52	33	34	6	-	143	287	8.30
12.	7/14/54	87	18	41	40	11	171	368	8.30
13.	7/14/54	130	23	45	80	11	257	546	8.15
14.	7/14/54	86	2	22	39	6	168	323	8.25
15.	7/14/54	85	25	48	34	30	142	364	8.45
16.	7/14/54	184	15	280	49	none	58	586	7.75
17.	7/14/54	190	9	130	41	17	174	561	8.15
18.	7/14/54	195	66	244	32	-	298	844	8.00
19.	7/14/54	109	80	136	19	27	234	605	8.50
20.	7/13/54	65	10	5	10	21	165	276	8.40
21.	7/13/54	80	50	43	17	20	240	450	8.00
22.	7/13/54	151	48	62	12	24	231	467	8.50
23.	7/13/54	42	none	5	29	3	78	157	8.20

Note: Numbers in left-hand column refer to paragraph numbers on pages 3 to 7.

TABLE II. STREAM FLOW DATA FOR THE CANADIAN RIVER AT AMARILLO STATION AND CANADIAN STATION FROM OCTOBER 1, 1952 TO SEPTEMBER 30, 1953

	AMARILLO	CANADIAN
Mean October discharge	10.0	1.62
Mean November discharge	11.0	1.97
Mean December discharge	13.1	36.2
Mean January discharge	16.4	152.0
Mean February discharge	10.1	47.8
Mean March discharge	10.6	26.7
Mean April discharge	10.0	1.5
Mean May discharge	9.4	5.6
Mean June discharge	9.0	121.0
Mean July discharge	504.0	903.0
Mean August discharge	788.0	1,028.0
Mean September discharge	31.2	.8
Mean annual discharge, 1952-1953	121	197
17 year average discharge	550	702
Total October runoff	616	100
Total November runoff	654	117
Total December runoff	805	2,220
Total January runoff	1,010	9,360
Total February runoff	561	2,650
Total March runoff	653	1,640
Total April runoff	596	90
Total May runoff	577	345
Total June runoff	537	7,220
Total July runoff	30,980	55,500
Total August runoff	48,470	63,220
Total September runoff	1,860	46
Total annual runoff	87,320	142,500

Note: All discharge is measured in cubic feet per second; all runoff is measured in acre feet.

#### INVENTORY OF SPECIES:

Two types of species-inventories were made: a general, a real inventory of the species of fishes in the Canadian River, its tributary streams and their impoundments, and a seasonal inventory of the Canadian River only. In regard to the latter, we wished to determine the seasonal distribution of the fishes of the river, and especially to discover if there was any marked migration of fishes upstream, from Oklahoma to Texas, in periods of high water, or downstream from New Mexico on flood waters.

Details of the areal survey of the watershed are given on pages 3 to 7. It was quickly apparent that the ecological conditions of the Canadian River were so different from those of its tributary streams that both held distinct fish faunas. The impoundments of the tributaries held still different fish faunas, derived from

artificial stocking of game species. Major differences in the faunas of the river and its tributaries included the almost complete absence in tributaries of Notropis girardi, Hybognathus placita and Hybopsis storeriana though these three species are among the most common and characteristic forms of the river. In the tributaries we found Notropis lutrensis, Notropis deliciosus, Pimephales promelas and Fundulus kansae to be abundant, but these forms were usually rare in the river. Even when present, we suspect they were washed into the river by rains on the watersheds of the tributaries.

We were especially alert for the presence of European carp, gizzard shad and suckers. We found no evidence of their presence naturally in the river, its tributaries or tributary-impoundments. If these forms do migrate to Texas from the Oklahoma part of the Canadian River, or are washed downstream from Conchas Reservoir in New Mexico, such instances must be rare.

The Canadian River is, at present, almost valueless for game fishes. A few black bass, bluegill sunfish and black bullhead catfishes are taken by anglers in deeper holes in the river each year, but we doubt that the total number of all species, combined, will exceed 50 fish. A few of the larger and deeper tributaries contain black bass, sunfishes and catfishes of good size and in fair numbers. However, most of these impoundments are rather remote and are completely inclosed by large ranches. As a result, few persons fish in them. The larger impoundments of tributary streams furnish the best fishing for game fishes at present. The numbers and the quality of the black bass and other species in the tributary-impoundments suggests that the game fish crop of the proposed Sanford Reservoir should be excellent.

Locally there are concentrations of large minnows in the Canadian River that should be suitable for commercial bait seining. Considering the absence of game fishes in the river, it is possible that the river could stand heavier minnow-seining than it is getting at present.

The following is a generalized summary of the distribution of fishes in the Canadian River watershed.

Notropis deliciosus.-- Common in a few tributary streams. Absent from the river.

Notropis girardi.-- Abundant in the river but absent from tributaries.

Notropis lutrensis. -- Abundant in tributary streams and impoundments. Rare in the river where probably washed by floods following rains.

Hybognathus placita. -- Abundant throughout the length of the river in Texas. Absent from tributary streams and impoundments.

Hybopsis gracilis. -- Locally common in the river. Absent from tributary streams and impoundments.

Hybopsis aestivalis. -- Rare in the river, where usually found near the mouths of tributary streams, but apparently absent from the tributaries.

Pimephales promelas.-- Common to abundant in deeper tributary streams. In the river we found this form only near Tascosa, where it was abundant in pools after rains. It is probably not a natural resident of the river.

Notemigoneus crysoleucas.-- Uncommon in the river. More common in the deeper tributary streams and their impoundments.

Ameiurus melas.-- Uncommon in the river. Common in deeper tributary streams and their impoundments.

Ictalurus punctatus.-- Rare in the river but more common following rains. Moderately common in deeper tributary-stream impoundments.

Fundulus kansae. -- Abundant in most tributary streams. Uncommon to rare in the river.

Gambusia affinis.-- Widespread; rare to abundant in the river, tributary streams and some impoundments.

Micropterus salmoides.-- A few are present in deeper holes in the river near the Oklahoma boundary. Black bass are common in some tributary streams and most impoundments of such streams.

Chaenobryttus coronarius. -- Rare in a few tributary streams and their impoundments in Hemphill County.

Lepomis cyanellus. -- Common to locally abundant in deeper pools in the river, deeper tributary streams, and most impoundments. Rarely weighing more than a few ounces.

Lepomis macrochirus.-- Rare in the river except near the Oklahoma boundary where some good-sized specimens occur. The bluegill is uncommon to common in most deeper tributary streams and impoundments.

Lepomis megalotis.-- Locally common in a few deeper tributary streams and impoundments.

Lepomis microlophus. -- Generally uncommon but sometimes of large size in some tributary impoundments.

Our seasonal inventory was based on monthly samples of water and fishes from five stations along the length of the river. These stations were selected as approximately equidistant, representative, and accessible at all times of the year. These stations are discussed from west to east.

Tascosa Station is located on the Canadian River where it is crossed by the new State Highway 51 bridge, near the site of Old Tascosa. Seining was done at the bases of the bridge supports and in pools a short distance downstream from the bridge. The bottom is mud or sandy mud. In January and February the river could not be seined here because of ice. In April and May the river was dry here. No black bass, bluegill sunfish or golden shiners were ever taken at this station. Water quality is generally good. We are unable to explain the great jump in chlorides in November. In April we were unable to get water enough for analysis.

TABLE III. MONTHLY VARIATION IN SPECIES AND NUMBERS OF FISHES AT TASCOSA STATION

species	6/29	7/16	8/10	9/11	10/16	11/11	12/3	1/12	2/7	3/9	4/22	5/10
<u>N. girardi</u>	83	47	23	114	51	-	16	-	-	8	-	-
<u>N. lutrensis</u>	-	4	3	-	-	-	-	-	-	-	-	-
<u>Hybognathus</u>	102	144	114	830	17	472	58	-	-	-	-	-
<u>H. gracilis</u>	-	-	-	3	-	-	9	-	-	-	-	-
<u>H. aestivalis</u>	-	-	-	-	-	-	-	-	-	2	-	-
<u>Pimephales</u>	9	1	-	-	-	-	2	-	-	-	-	-
<u>Ameiurus</u>	-	1	5	3	-	1	-	-	-	-	-	-
<u>Ictalurus</u>	-	-	2	3	-	-	-	-	-	-	-	-
<u>Fundulus</u>	3	5	6	-	1	1	11	-	-	-	-	-
<u>Gambusia</u>	-	-	11	-	1	-	-	-	-	-	-	-
<u>L. cyanellus</u>	16	4	21	46	13	-	2	-	-	-	-	-

TABLE IV. MONTHLY VARIATION IN WATER QUALITY AT TASCOSA STATION

date	calcium	sodium	chloride	sulfate	bicarbonate	total salts	pH
6/28/54	80	360	236	214	447	1374	8.42
7/16/54	167	270	378	234	237	1306	8.35
8/10/54	37	285	214	189	254	997	8.30
9/11/54	77	210	229	177	160	853	8.51
10/17/54	225	180	391	215	221	1232	8.23
11/11/54	706	341	1399	314	246	3006	8.25
12/3/54	183	372	489	321	277	1642	7.98
1/13/55	174	480	621	327	317	1919	7.96
2/10/55	181	525	639	423	311	2079	8.60
3/9/55	93	156	71	144	392	856	8.32

Amarillo Station is located where the bridge on U. S. Highway 87-287 crosses the Canadian River. The bottom is sandy and relatively firm. This is the only station where there is a flow of water at all times, principally because Amarillo Creek, the sewage effluent of the city of Amarillo empties into the river a short distance upstream from the station. The water volume of this stream is large. The sewage is treated but sometimes the stream seems to carry other pollutants that kill fishes. One-celled green algae are so abundant here that the water is usually deep green in color. Water quality is generally good; better than at Tascosa Station.

This station was not seined in June, 1954, and in January, 1955, was frozen over so that we were unable to seine. In February, March and April, 1955, no fish were taken, presumably due to pollution in February and floods in March and April. No golden shiners, black bass or bluegill sunfish were ever taken here.

TABLE V. MONTHLY VARIATION IN SPECIES AND NUMBERS OF FISHES AT AMARILLO STATION

species	6/29	7/16	8/10	9/11	10/16	11/11	12/3	1/12	2/7	3/9	4/22	5/10
<u>N. girardi</u>	-	133	65	158	226	19	66	-	-	-	-	-
<u>N. lutrensis</u>	-	1	-	-	-	-	-	-	-	-	-	-
<u>Hybognathus</u>	-	44	13	335	65	326	93	1	-	-	-	-
<u>H. gracilis</u>	-	-	-	1	-	-	-	-	-	-	-	-
<u>H. aestivalus</u>	-	-	-	-	-	-	-	1	-	-	-	-
<u>Pimephales</u>	-	-	1	-	-	-	-	-	-	-	-	-
<u>Ameiurus</u>	-	1	-	-	-	-	-	-	-	-	-	-
<u>Ictalurus</u>	-	-	-	-	3	-	-	-	-	-	-	-
<u>Fundulus</u>	-	58	1	41	42	11	42	1	-	-	-	-
<u>Gambusia</u>	-	1	-	-	-	1	-	-	-	-	-	-
<u>L. cyanellus</u>	-	3	1	3	2	-	6	-	-	-	-	-

TABLE VI. MONTHLY VARIATION IN WATER QUALITY AT AMARILLO STATION

date	calcium	sodium	chloride	sulfate	bicarbonate	total salts	pH
6/28/54	94	120	102	110	315	785	8.27
7/16/54	128	132	124	100	335	850	8.40
8/10/54	129	222	240	262	237	1,096	7.15
9/12/54	131	135	147	126	345	886	7.52
10/16/54	127	231	315	186	221	1,080	7.20
11/11/54	250	308	552	377	358	1,845	7.89
12/3/54	225	276	320	303	485	1,609	7.51
1/12/55	210	282	320	269	494	1,575	7.68
2/10/55	214	303	374	335	391	1,617	8.50
3/9/55	208	144	134	163	577	1,226	7.90
4/22/55	108	129	121	9	21	809	8.09
5/11/55	160	275	404	229	223	1,291	7.90

Borger Station is located where State Highway 117 crosses the Canadian River north of Borger. The river channel is braided sand, mostly quicksand. This part of the river is subject to industrial pollution on occasions, though most pollution of the Borger area occurs a mile or more downstream from the station. Fish were taken on every visit. No red shiners, golden shiners, channel catfish, black bass or bluegill sunfish were ever taken here.

TABLE VII. MONTHLY VARIATION IN SPECIES AND NUMBERS OF FISHES AT BORGER STATION

species	6/28	7/15	8/11	9/8	10/15	11/13	12/4	1/11	2/7	3/8	4/22	5/10
<u>N. girardi</u>	33	17	17	673	101	-	-	-	138	6	30	11
<u>Hybognathus</u>	61	32	26	1140	161	705	521	2318	326	72	72	4
<u>H. gracilis</u>	2	-	-	-	-	-	-	-	-	-	3	-
<u>H. aestivalus</u>	-	-	-	-	-	-	1	1	-	-	-	-
<u>Pimephales</u>	-	-	-	-	-	-	-	1	-	-	-	-
<u>Ameiurus</u>	1	-	-	-	2	-	-	-	-	-	1	2
<u>Fundulus</u>	-	-	-	-	3	-	1	-	-	-	3	-
<u>Gambusia</u>	-	-	1	-	7	-	-	-	-	-	5	-
<u>L. cyanellus</u>	5	2	-	-	1	-	1	-	-	-	-	-

TABLE VIII. MONTHLY VARIATION IN WATER QUALITY AT BORGER STATION

date	calcium	sodium	chloride	sulfate	bicarbonate	total salts	pH
6/26/54	186	459	710	311	133	1,818	8.07
7/15/54	535	624	1429	518	156	3,271	7.95
8/11/54	63	333	320	290	145	1,157	7.85
9/8/54	176	50	89	286	148	749	8.02
10/15/54	170	74	138	216	192	790	8.02
11/13/54	137	228	235	230	232	1,062	8.31
12/3/54	596	87	142	1301	152	2,278	8.06
1/11/55	200	78	178	260	165	881	8.02
2/7/55	230	222	391	346	183	1,372	8.04
3/8/55	308	348	657	384	235	1,932	7.80
4/22/55	204	288	479	301	180	1,452	7.65
5/10/55	112	218	315	152	183	980	7.70

Pampa Station is located at the site of the new bridge, completed during the course of this study, across the Canadian River on State Highway 70, north of the town of Pampa. This part of the river is usually polluted by industrial waste from the Borger area and as a result is rarely capable of supporting fishes. Water samples were taken each month from July through May, and fish were sought on every visit. Only four fish were taken, on three different occasions, as follows:

September 8, 1954: 1 Notropis girardi and 1 Hybognathus placita.  
 October 15, 1954: 1 Notropis girardi.  
 November 13, 1954: 1 Hybognathus placita.



TABLE XI. MONTHLY VARIATION IN WATER QUALITY AT CANADIAN STATION

date	calcium	sodium	chloride	sulfate	bicarbonate	total salts	pH
6/26/54	89	65	75	41	214	507	8.40
7/13/54	90	48	62	12	231	467	8.50
8/10/54	74	282	328	235	87	1,016	7.80
9/7/54	93	65	87	15	265	525	8.60
10/15/54	238	55	275	158	200	926	8.29
11/13/54	129	144	231	75	278	857	8.15
12/4/54	125	159	208	71	323	886	7.60
1/11/55	191	402	667	186	262	1,708	7.91
2/7/55	162	486	755	402	226	2,031	8.40
3/8/55	168	198	334	107	330	1,137	8.20
4/21/55	90	78	107	12	274	561	8.20
5/10/55	108	236	334	116	235	1,029	7.75

SUMMARY:

A basic survey and inventory of fish species was carried out on the Canadian River of the Texas Panhandle in order that the sports fisheries to be established in the proposed Sanford Reservoir, presently to be constructed on the Canadian River, might be better managed. It was found that the water quality of the river, its tributaries and tributary impoundments, except where subject to industrial pollution, is of good quality for game fishes. There is no sports fishing in the Canadian River at present, except in a few places on rare occasions. No rough fishes live in the Canadian River or any of its tributary streams or impoundments in Texas, so far as we could discover, but are said to occur in Conchas Reservoir, an impoundment of the Canadian River in New Mexico. There is evidence that fishes are washed into the river from local tributaries by heavy rains but there is no evidence of upstream migration of rough fishes from the state of Oklahoma. Tributary streams support some sports fishing but the small impoundments of the tributary streams support a great deal more. It would appear that fishing should be excellent in the proposed lake unless and until the waters are contaminated by rough fishes from outside the present drainage of the Canadian River in Texas.

Two species of fishes, Notropis girardi and Hybopsis gracilis, were found to be common in the Canadian River. Neither species has previously been reported from the state of Texas.