JOB COMPLETION REPORT

As required by

FEDERAL AID IN FISHERIES RESTORATION ACT

TEXAS

Federal Aid Project No. F-7-R-10

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

Job No. C-1 Pollution Studies

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ABSTRACT

A survey of pollution conditions in the Borger industrial area revealed little improvement in some of the effluents. Two effluents were found to contain materials highly toxic to fish. Test fish died in both of these effluents within 7 minutes. Test fish survived only one effluent, Hill Creek or station number two.

Investigation of two instances of pollution revealed that endrin, an agricultural insecticide, was responsible for fish kills. Suspected pollution in the case of a fish kill at Lake Stamford was investigated, but no evidence of pollution was found. Apparently, the fish had died of natural causes.

JOB COMPLETION REPORT

State of Texas

Project No. F-7-R-10 Name: Fisheries Investigations and Surveys of the Waters of Region I-A

Job No. C-1 Title: Pollution Studies

Period Covered January 1, 1962 - December 31, 1962

Objectives:

To determine the source and nature of man made pollutants which affect fish populations.

Techniques Used:

In conjunction with other jobs of this project, a search was made for sources of pollution. Reports of pollution were investigated and the nature and extent of damage to the fish populations were determined. In cooperation with the Water Pollution Control Division, Texas State Department of Health, a survey was made in the Borger area to determine the quality, quantity, and toxicity to fish of effluents entering the Canadian River from the industrial plants in the Borger area.

Findings:

Three reports of suspected pollution involving fish kills were investigated. In one case, a fish kill occurred in a small lake located on a tributary of Grosbeck Creek in Childress County. Netting revealed an almost total kill. A few larger fish were found alive, but not healthy. Fish taken during the investigation were in poor physical condition and exhibited signs of nervous disorders. Their body and eye colors were abnormal, fatty tissues were flaccid and dark yellowish, and each of their livers were pale. The fish remaining alive at the time of the survey probably eventually succumbed to the effects of the toxicant.

The cause of the fish kill was traced to an agricultural insecticide (endrin) which had been sprayed on nearby cotton fields. Shortly after the spraying had been completed, a light rainfall washed the toxicant into the lake.

A second case of accidental poisoning with cotton insecticide occurred in Hall County in a small lake located on a tributary of the Prairie Dog Town Fork of the Red River. The extent of damage to the fish population was about the same as in the lake in Childress County. Only a few larger individuals survived. The toxicant in this case was also endrin, which had been washed into the lake. In such cases, preventative measures are lacking, but fortunately, damage to fish is usually limited to ponds in the immediate vicinity of the area sprayed. One report of a fish kill in the Pease River in the Childress vicinity was received much too late to determine the nature and extent of damage to the fishery.

A report of the fish dying in Lake Stamford was investigated but no evidence of pollution was found. Local fishermen and residents at Lake Stamford were alarmed because several large catfish were found dead within a period of two to three days. A shoreline check revealed only an occasional individual of a species other than the flathead catfish noted. The internal organs of the fish appeared normal, no parasites were noted, and there were no signs of external injuries. The relatively small number of dead fish found suggests that they died of natural causes.

A survey of pollution of the Canadian River in the Borger area was conducted from April 16 to 19. Test minnows, Hybognathus placita, were seined from the Canadian River about four miles above Borger and were tempered in a 150 gallon transport vat for 18 hours before toxicity tests were begun. Seven stations were selected on the river and on tributary creeks. The locations of these stations are shown in Figure I.

Station I, located on the Canadian River about two miles above the State Highway 15 bridge, is above the effluent creeks of the industrial plants.

Station 2, located on Hill Creek about two miles above the State Highway 15 bridge, receives the industrial waste and domestic sewage from the Phillips Chemical Plant and also some oil field brine.

Station 3, located on Rock Creek at the State Highway 15 bridge, receives the waste of the J. M. Huber Company carbon black plant, the Borger city sewage treatment plant, and the Bunavista Housing Addition sewage treatment plant.

Station 4, located on an unnamed creek 3 1/2 miles northeast of Borger, receives a portion of the waste from Phillips Petroleum Company, Borger Fractioner, and Rice Plant.

Station 5, located on an unnamed creek 4 miles northeast of Borger, receives a portion of the waste from Phillips Petroleum Company, Borger Fractioner, and Rice Plant.

Station 6, located on an unnamed creek 4 1/2 miles northeast of Borger, receives the waste from the Phillips Petroleum Company and the Phillips Refinery.

Station 7, located on the Canadian River at Plemons Bridge about 6 miles below Borger, is below the confluence of all the industrial effluents with the Canadian River.

Beginning on the morning of April 17, water samples, water temperatures, and general observation data were collected at each of the seven stations named. Collections at 4-hour intervals were continued for 24 hours. Water samples were collected for individual and composite analysis. Table 1 gives average figures for the analysis of individual 4-hour samples. Table 2 gives the analysis results of the composite samples for each station.

In addition to the 4-hour samples taken at the seven test stations mentioned, seven additional grab samples were collected at 12 n. on April 17 from the Canadian River at points both above and below the locality of the seven test stations. The locations where the seven additional grab samples were collected are shown in Figure 2. The grab sample analysis are given in Table 3.

Toxicity tests were begun at 8:46 a.m. on April 17, at station 7 and were continued until 2:10 p.m. on April 18. The duration of each test depended upon

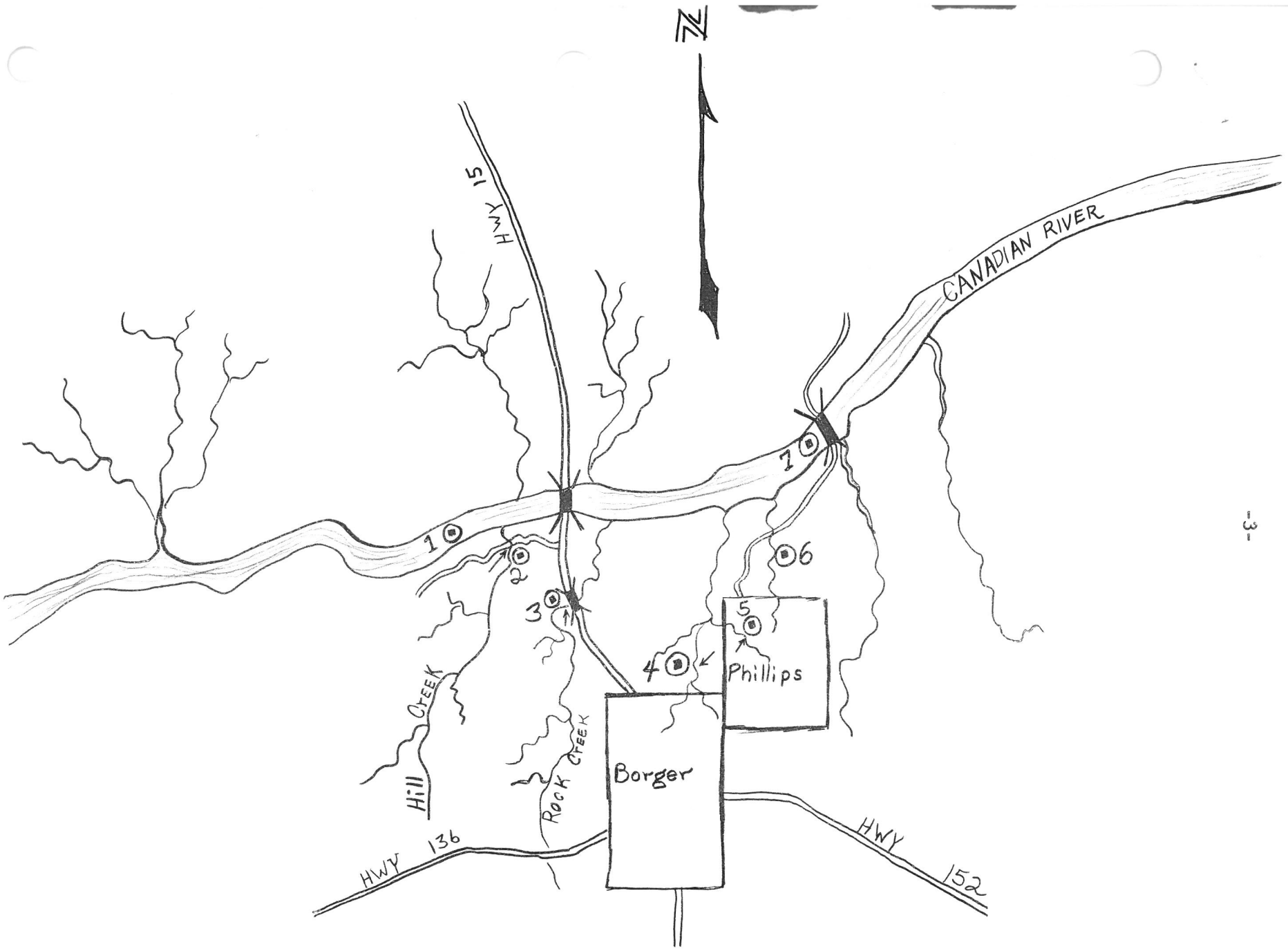

Figure I. Location of Test Stations, Survey of Pollution Conditions, Borger Area, April, 1962

Table 1. Average Analysis of 4-hour Samples from the Seven Stations in the Borger Area

	Stations						
	1	2	3	4	5	6	7
pH	8.0	6.9	6.9	7.0	7.2	7.9	7.5
Cond. Micromhos	4438	6935	3993	2282	813	2892	5533
Dissolved Solids	2661	4161	2391	1370	488	1735	3320
Chlorides	785	1655	805	171	28	361	993
Sulphates	619	520	325	561	237	439	652
Chlorine Demand	4.3	13.0	139	8.8	12.0	2.0	8.1
Dissolved Oxygen	5.6	2.0	0.0	1.7	0.5	0.0	0.6
B.O.D.	5.3	9.6	101.7	13.0	17.6	138	11.8
Ammonia Nitrogen	0.4	0.4	14.3	0.7	0.4	47	3.3
Nitrite	0.1	0.1	0.1	0.3	0.7	1.2	0.2
Nitrate	0.1	0.1	0.1	1.7	1.0	0.1	0.1
P. Alkalinity	0	0	0	0	0	0	0
Total Alkalinity	180	129	259	126	123	151	160
Tot. Suspend. Solids	40	23	250	97	295	417	91
Volitile Solids	17	14	223	38	136	205	33
Fixed Solids	23	9	27	59	159	212	58

Table 2. Analysis Results of Composite Samples from the Seven Stations in the Borger Area

	Stations						
	1	2	3	4	5	6	7
pH	8.1	7.0	7.0	7.0	7.0	7.9	7.6
Cond. Micromhos	4400	5730	4000	2350	815	2850	5500
Dissolved Solids	2640	4040	2400	1410	490	1710	3300
Chlorides	800	1700	770	200	24	365	980
Sulphates	587	525	320	490	243	447	645
Chlorine Demand	5.0	12.5	145	13.5	16.0	0	7.5
Dissolved Oxygen	9.2	3.4	0	0	0.5	0	2.5
B.O.D.	6.5	8.5	110	22	21.5	76	8.0
Ammonia Nitrogen	0.4	0.4	12	14	0.4	38	4
Nitrite	0.1	0.1	0.1	0.6	0.9	0.8	0.2
Nitrate	0.1	0.1	0.1	0.8	0.1	0.1	0.1
P. Alkalinity	0	0	0	0	0	0	0
Total Alkalinity	182	124	252	130	130	150	158
Tot. Suspend. Solids	48	15	255	112	339	342	105
Volitile Solids	23	10	226	55	155	160	35
Fixed Solids	25	5	29	57	184	182	70
Phenols	-	-	-	0.7	0.6	1.5	-
Flow (MGD)	-	4.5	2.33	0.67	1.81	2.15	-

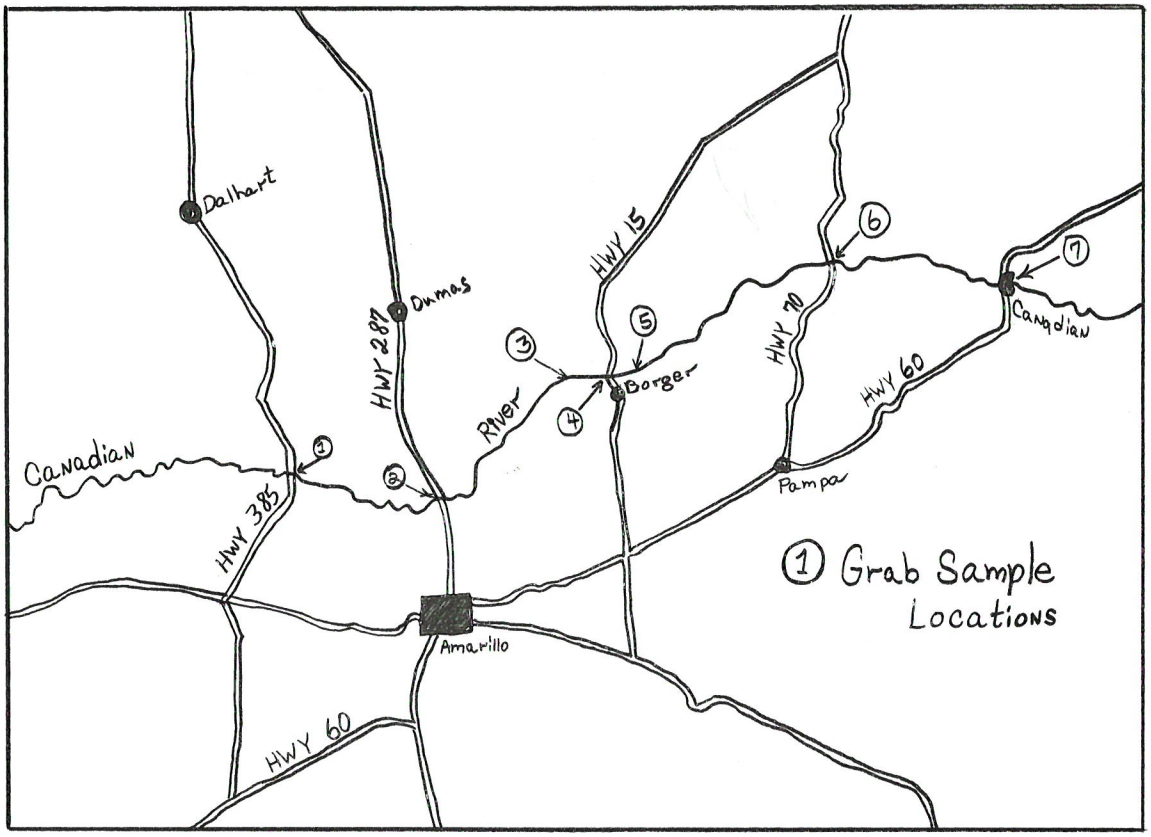

Figure II. Localities where Grab Samples were Collected, 12:00 Noon, April 17, 1962

Table 3. Analysis of Grab Samples Collected at 12:00 Noon Along the Canadian River

	Stations						
	1	2	3	4	5	6	7
pH	7.5	7.2	8.2	7.9	7.5	7.8	7.5
Cond. Micromhos	3100	2850	4800	4900	5150	3720	3550
Dissolved Solids	1860	1710	2880	2940	3040	2230	2130
Chlorides	440	400	840	920	1000	650	660
Sulphates	510	360	620	575	595	378	351
Chlorine Demand	2.5	3.5	4.0	6.5	6.5	6.0	4.5
Dissolved Oxygen	6.5	1.5	10.0	7.5	3.0	5.0	5.7
B. O. D.	2.0	17.0	2.5	5.0	15.0	7.0	5.5
Ammonia Nitrogen	0.4	16.0	2	5	6	0.4	0.4
Nitrite	0.1	0.1	0.1	0.1	0.2	0.1	0.1
Nitrate	0.1	0.1	0.1	0.1	0.1	0.1	0.1
P. Alkalinity	0	0	0	0	0	0	0
Total Alkalinity	154	238	190	158	156	162	142
T. Suspended Solids	20	325	38	41	80	45	110
Volitile Solids	10	95	15	23	40	15	32
Fixed Solids	10	230	23	18	40	30	78

the length of time that fish remained alive in the test cages. At stations 1 and 2, the test fish were still alive after 25 hours and 10 minutes, at which time the tests at these stations were terminated. At the other five stations, fish died in from 7 minutes to 8 hours and 34 minutes. Table 4 gives the results of the toxicity tests. In each test twelve Hybognathus placita were placed in the screen wire test cages, and their immediate reactions and their survival times were noted accordingly. It should be noted that at stations 5 and 6 the effluents were so highly toxic that fish died in 7 minutes in both cases. Survival time at all the other stations greatly exceeded this, and the effluents on which stations 5 and 6 were located are considered as being primarily responsible for rendering the area of the Canadian River downstream from Borger incapable of supporting the fish population which it should.

Conclusions:

The poor quality of some of the effluents from the Borger industrial area remains highly detrimental to aquatic life in the Canadian River. Fish cannot survive in the Canadian River for a considerable distance downstream from Borger. This toxic zone constitutes a barrier to native fish species, preventing natural upstream and downstream movements associated with spawning and seasonal migration. The downstream effects of pollution from the Borger area needs additional study to determine more precisely the distance of stream affected.

The downstream distance that lethal conditions exist is probably proportional to the flow of the river and therefore would vary. The degree of dilution of the toxic effluents depends on the flow of the Canadian River as it passes Borger. Creation of the Sanford Reservoir, only about seven miles upstream from Borger, will all but halt the normal stream flow at Borger, thus eliminating the dilution. This will cause serious pollution to carry much farther downstream unless improvements are made in the quality of the effluents concerned.

Recommendations:

The downstream effects of pollution from the Borger industrial area should be further studied to determine the distance devoid of native minnow species. A comprehensive survey of pollution conditions in the Canadian River, similar to the study completed in April 1962, should be made again in 1963 to determine whether any changes have occurred.

Prepared by Lonnie Peters
Project Leader
Date March 18, 1963

Approved by Marion Toole
Coordinator
Leo D. Lewis
Regional Supervisor

Table 4. Results of Toxicity Tests at the Seven Stations in the Borger Area

	Stations						
	1	2	3	4	5	6	7
Time begun	12:50 p.m. April 17	1 p.m. April 17	1:09 p.m. April 17	9:54 a.m. April 17	9:39 a.m. April 17	9:16 a.m. April 17	8:46 a.m. April 17
Duration of Test	25 hr. 10 min.	25 hr. 10 min.	3 hr. 21 min.	2 hr. 16 min.	0 hr. 7 min.	0 hr. 7 min.	8 hr. 34 min.
Results	fish survived	fish survived	fish died	fish died	fish died	fish died	fish died