FINAL REPORT

As required by

FEDERAL AID IN FISHERIES RESTORATION ACT

TEXAS

Federal Aid Project No. F-3-R-15

Region 3-B Fisheries Studies

Job No. B-23 Population and Reproduction Study of Channel Catfish in Lake O' the Pines

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ABSTRACT

With the completion of the 1965 segment study of channel catfish (Ictalurus punctatu in Lake O' the Pines, it was concluded that only a limited population of adult catfish was present. Various collection techniques including gill nets, hoop nets, trot lines and seining failed to provide evidence of successful reproduction of channel catfish.

Extensive flooding of the reservoir during 1966 hampered efforts to determine the effects of hydrogen sulfide gas as a detriment to channel catfish reproduction. Increases in fish collections of 1966 may indicate an increase of channel catfish in Lake O' the Pines. However, the fact that these fish could have entered the lake during flood stage must be considered.

Hydrogen sulfide gas has apparently diminished in the reservoir since the flood period as no toxic concentrations were recorded in 1967.

It is recommended that advanced fingerling channel catfish be stocked in Lake O' the Pines if a surplus is available. Extensive restocking is not considered feasible due to the relative large size of Lake O' the Pines and the uncertainty of future hydrogen sulfide levels.

It is recommended that this job be terminated with the completion of this final, F-3-R-15 segment.

FINAL REPORT

State of Texas

Project No. F-3-R-15 Name: Region 3-B Fisheries Studies

Job No. B-23 Title: Population and Reproduction Study of Channel Catfish in Lake O' the Pines

Period Covered: February 1, 1967 - January 31, 1968

OBJECTIVES:

To determine the need for stocking channel catfish (Ictalurus punctatus) in Lake O' the Pines.

1. To determine current population levels of channel catfish in Lake O' the Pines.

2. To determine if toxic concentrations of hydrogen sulfide gas are periodically present in Lake O' the Pines.

TECHNIQUES USED:

During the 1965 and 1966 segments of this study, experimental gill nets, hoop nets, seines and trotlines were utilized to evaluate the population level of channel catfish in Lake O' the Pines.

Experimental gill nets: Gill nets used in this study were 150 feet in length and eight feet in depth with mesh size ranging from 1 to 3½ inches.

Hoop nets: Nylon hoop nets with mesh sizes of 2 and 2½ inches square were stretched on cypress runners and baited with commercial dog food and cottonseed cake.

Trot lines: Nylon trot lines were constructed with 3/0 O'Shaugnessy hooks. Each line was 100 feet in length with 30 hooks.

Seines: Nylon bag seines were used in an attempt to locate spawning areas. These seines were 26 and 16 feet in length.

Hydrogen sulfide analyses: Eight permanent sampling stations were established on the reservoir during the 1966 segment to determine hydrogen sulfide gas levels. Early tests were made by sodium thiosulfate-iodine titrations. Later tests were made colorimetrically with a Hach DR-EL chemistry kit. Figure 1 is a map of Lake O' the Pines with station sites labeled.

FINDINGS:

During the 1965 segment 50 units of experimental gill nets were set in Lake O' the Pines. Five nets were set overnight once each month from March - December, 1965. Trotlines were set in conjunction with these netting activities for an approximate total of 1,800 baited hooks during the segment.

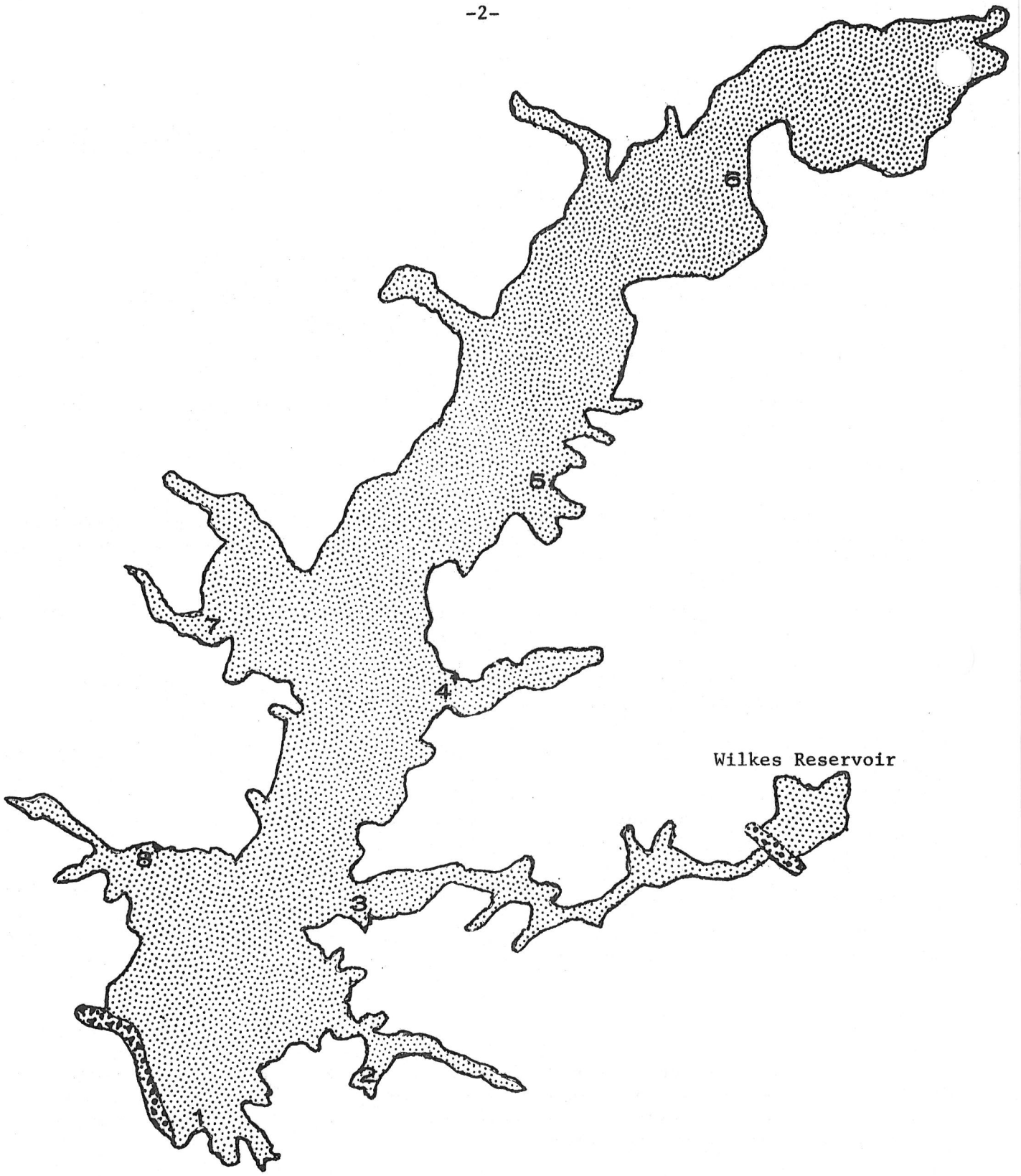

Figure 1. Hydrogen sulfide collection stations on Lake O' the Pines

Six adult channel catfish were collected this segment. Four of these fish were caught in gill nets, the remaining two on trot lines baited with small sunfish. The baited hoop nets failed to catch any channel catfish although a few bullhead catfish (Ictalurus sp.) were taken.

The average weight of the 6 fish collected was 3.92 pounds, with individual weights ranging from 2.37 to 6.37 pounds. Table 1 contains weights, standard lengths, K-factors and sexual conditions for each catfish.

Table 1

Channel Catfish Collection Data from Lake O' the Pines - 1965

Date	No.	Standard Length (millimeter)	Weight (lb.)	K	Condition
4/28/65	1	515	6.37	2.09	female-approaching ripeness
6/29/65	2	474	3.88	1.65	female-spent
6/29/65	3	408	2.37	1.54	male-spent
6/30/65	4	390	2.37	1.77	female-spent
7/1/65	5	503	4.50	1.60	male-spent
8/30/65	6	446	4.00	2.04	female-approaching ripeness

Potential spawning areas were seined in an effort to capture fry or fingerling channel catfish. Some areas were baited prior to seining with commercial dog food and cottonseed cake. The Hurricane Creek area was seined most frequently because of the success of collecting adult specimens in this area. Areas were seined at various hours, both day and night. No channel catfish were collected by seining.

Hydrogen sulfide tests made during the 1965 segment failed to indicate any lethal concentrations of un-ionized hydrogen sulfide gas. The highest concentration recorded was .06 p.p.m. from a sample taken in Johnson Creek in July. The pH value of this sample was 6.8.

The results of laboratory tests under Project F-8-R-10, Job E-1, were used as criteria in this study for determining lethal concentrations of hydrogen sulfide gas. According to these findings the median lethal dosage (LD-50) of un-ionized hydrogen sulfide is 0.8 p.p.m. at pH 6.8, 0.7 p.p.m. from pH 7.0 to pH 7.6 and 0.6 p.p.m. at pH of 7.8 for channel catfish fry. At pH of 7.0 the LD 50 was found to be 1.0 p.p.m. for fingerling catfish, 1.3 for advanced fingerlings and 1.4 for adult channel catfish. Factor used to compute the un-ionized hydrogen sulfide in p.p.m. from total hydrogen sulfide content was taken from Standard Methods for the Examination of Water, Sewage and Industrial Wastes. These data are contained in Table 2.

Table 2

Factors to Compute Un-ionized Hydrogen Sulfide from Total Hydrogen Sulfide Contents

pH	Factor	pH	Factor	pH	Factor
5.0	0.98	6.8	0.44	7.7	0.091
5.4	0.95	6.9	0.39	7.8	0.073
5.8	0.89	7.0	0.33	7.9	0.059
6.0	0.83	7.1	0.29	8.0	0.048
6.2	0.76	7.2	0.24	8.2	0.031
6.4	0.67	7.3	0.23	8.4	0.020
6.5	0.61	7.4	0.17	8.8	0.0079
6.6	0.56	7.5	0.14	9.2	0.0032
6.7	0.50	7.6	0.11	9.6	0.0013

These factors are applicable at a temperature of 25°C. For temperatures below 20°C. or above 30°C. or for sewages having a mineral solids content exceeding 2,000 mg/l, suitable corrections should be made.

Taken from Standard Methods for the Examination of Water, Sewage and Industrial Wastes, page 274.

An additional thirty-four channel catfish were collected during the 1966 segment. Nets and trot lines were set at monthly intervals in the reservoir with the exception of June, when 3 collections were made. Table 3 contains collection dates, size data and individual condition factors for each catfish taken.

Table 3

Channel Catfish Collection Data

Date	Number	Length (mm.)	Weight (grams)	"K" Factor	Sex
2/11/66	-	-	-	-	-
3/30/66	-	-	-	-	-
4/25/66	1	-	4083	-	-
5/24/66	2	255	304	1.83	male-3
6/8/66	9	522	3176	2.33	female
		500	1758	1.41	male-3
		396	1021	1.64	female-3
		295	1539	2.10	female-5
		293	404	1.61	female-5
		280	412	1.88	female-3
		172	82	1.61	male-3
		262	314	1.76	male-3
		261	305	1.71	immature

Table 3 (Continued)

Date	Number	Length (mm.)	Weight (grams)	"K" Factor	Sex
6/10/66	13	503	2495	1.96	male-5
		439	1474	1.74	male-5
		420	1503	2.03	male-5
		364	851	1.76	female-5
		288	464	1.94	male-3
		250	362	2.32	female-3
		261	360	2.03	female-3
		220	213	2.00	male-3
		225	141	1.24	female-3
		193	107	1.49	immature
		179	106	1.85	female-3
		179	97	1.69	immature
		183	102	1.66	male-3
6/29/66	2	189	101	1.50	female-3
		400	1219	1.91	female-3
7/66	2	-	-	-	-
8/66	-	-	-	-	-
9/30/66	2	275	392	1.88	female-5
		185	90	1.42	immature
10/2/66	2	-	-	-	-
11/22/66	1	318	652	2.03	male-3
12/66	-	-	-	-	-
1/67	-	-	-	-	-

"K" Range 1.24 - 2.32

Average "K" - 1.79

In mid-April, 1966, the reservoir was flooded by heavy rains on the watershed. The flood waters crested at approximately 10 vertical feet above conservation pool level. This flooded condition presisted through June, 1966. During this period the normally clear waters of the reservoir were throughly mixed. Figure 2 is a photograph of the flooded tailrace during flood stage. This flushing action apparently dissipated any stratified concentrations of hydrogen sulfide gas. Table 4 contains hydrogen sulfide data compiled in 1966.

Of the 34 channel catfish collected in 1966, 24 were taken during the flood period in the month of June. A total of 15 experimental gill nets and 300 baited hooks were set during the June collections. Individual fish ranged from 82 grams in weight to 7 pounds. Fifteen immature catfish were collected. Condition factors ranged from 1.24 to 2.32 with the average "K" being 1.79. Figure 3 indicates size range of the June collection.

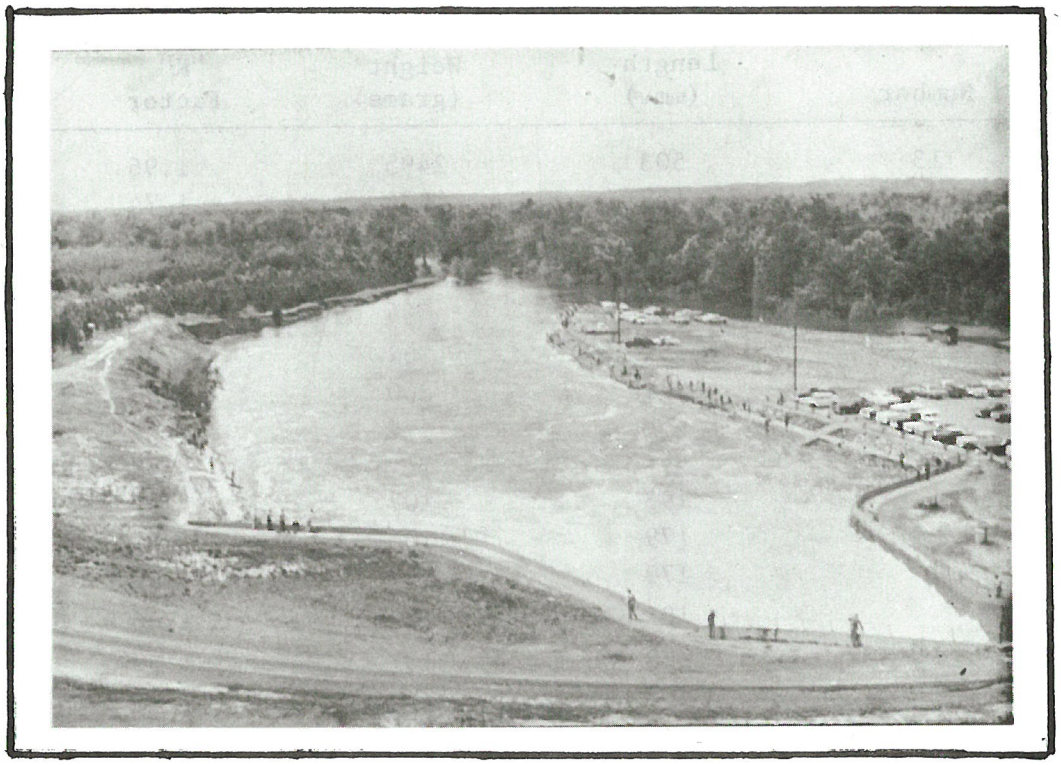

Figure 2. Lake O' the Pines tailrace at flood crest

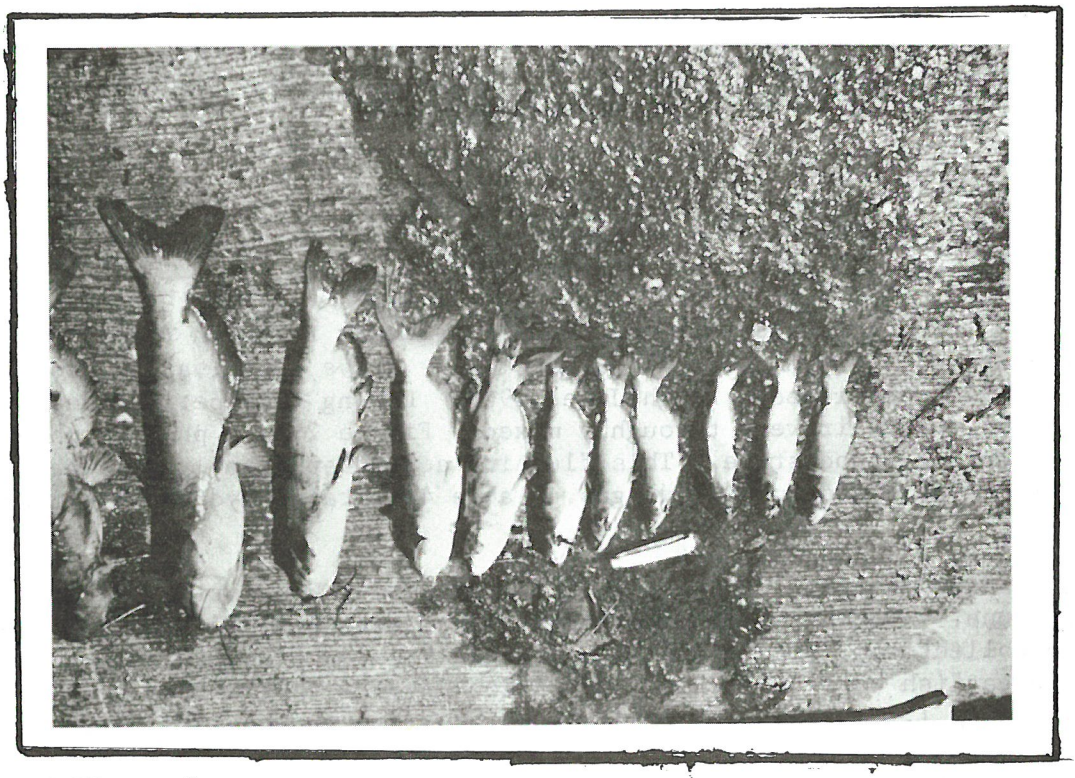

Figure 3. A portion of the June channel catfish collection - 1966

Table 4

Lake O' the Pines Hydrogen Sulfide Study - 1966

Station #1 East Abutment Dam	3 March	15 March	28 March	14 April	31 May	17 June	27 June	11 August	9 Sept.	23 Sept.	25 Oct.	21 Nov.	4 Jan.
Water Temp. °F	52	65	57	65	75	76	82	88	80	78	68	65	50
pH	7.3	7.7	7.4	7.7	6.5	6.8	7.1	6.8	7.3	6.5	.76	8.3	7.3
Total H_2S p.p.m.	.64	-	-	-	-	-	-	-	-	-	-	-	-
Unionized H_2S p.p.m.	.147	-	-	-	-	-	-	-	-	-	-	-	-
Station #2 Hurricane Creek													
Water Temp. °F	56	63	58	65	71	78	88	88	79	78	68	65	50
pH	7.5	7.5	7.6	8.5	7.2	6.7	6.9	8.0	6.9	7.2	7.7	8.3	7.5
Total H_2S p.p.m.	-	-	-	.85	-	-	-	-	-	1.065	1.9	.213	-
Unionized H_2S p.p.m.	-	-	-	.017	-	-	-	-	-	.245	.173	.005	-
Station #3 Johnson Creek													
Water Temp. °F	53	65	58	65	70	78	88	88	79	78	71	65	50
pH	7.4	7.5	7.5	7.8	7.3	6.9	7.5	7.3	7.5	7.1	7.3	6.8	7.5
Total H_2S p.p.m.	1.06	.64	-	.0426	-	-	-	-	-	2.13	1.9	.426	-
Unionized H_2S p.p.m.	.18	.0896	-	.0031	-	-	-	-	-	.618	.437	.187	-
Station #4 Alley Creek													
Water Temp. °F	55	65	58	65	75	78	88	88	79	78	68	65	50
pH	8.2	8.2	7.7	8.6	7.6	7.1	7.5	8.0	7.5	7.3	7.4	6.7	7.6
Total H_2S p.p.m.	.43	-	-	-	-	-	-	-	-	-	-	-	-
Unionized H_2S p.p.m.	.013	-	-	-	-	-	-	-	-	-	-	-	-

Table 4 (Continued)

Station #5 Mim's Chapel	3 March	15 March	28 March	14 April	31 May	17 June	27 June	11 August	9 Sept.	23 Sept.	25 Oct.	21 Nov.	4 Jan.
Water Temp. °F	61	61	58	65	76	78	88	88	80	87	68	65	50
pH	7.3	7.4	7.3	7.5	7.2	6.8	7.6	7.3	7.4	7.2	7.6	7.6	7.6
Total H_2S p.p.m.	-	-	.64	-	-	-	-	-	-	.213	-	-	-
Unionized H_2S p.p.m.	-	-	.147	-	-	-	-	-	-	.051	-	-	-
Station #6 Highway 155 East													
Water Temp. °F	61	63	60	68	85	76	90	88	80	78	68	65	50
pH	7.5	7.1	7.1	7.2	7.1	6.8	8.3	7.4	7.2	7.4	7.6	7.6	7.5
Total H_2S p.p.m.	1.27	-	-	-	-	-	-	-	-	-	.213	-	-
Unionized H_2S p.p.m.	.178	-	-	-	-	-	-	-	-	-	.023	-	-
Station #7 Copland Creek													
Water Temp. °F	58	58	58	66	80	78	88	88	80	79	68	65	50
pH	7.6	7.8	7.4	8.1	-	7.6	6.6	7.2	8.2	7.6	7.6	7.6	7.6
Total H_2S p.p.m.	.21	1.9	-	-	-	-	-	-	-	-	-	-	-
Unionized H_2S p.p.m.	.023	.139	-	-	-	-	-	-	-	-	-	-	-
Station #8 Brushy Creek													
Water Temp. °F	59	58	58	66	80	-	88	88	80	78	68	68	50
pH	8.0	7.6	7.7	7.7	7.0	-	6.9	7.5	7.2	6.8	7.9	7.9	7.4
Total H_2S p.p.m.	.43	-	.43	-	-	-	-	-	-	.2	-	-	-
Unionized H_2S p.p.m.	.021	-	.039	-	-	-	-	-	-	.088	-	-	-

There is a good possibility that many of the channel catfish taken in the June, 1966, collections entered Lake O' the Pines from Wilkes Reservoir, a private lake located on the upper reaches of Johnson Creek. Figure 1 is a map which shows the location of Wilkes Reservoir as well as the hydrogen sulfide collection stations. Wilkes Reservoir has a substantial channel catfish population and the fish could have readily entered Lake O' the Pines during flood stage.

Field work during the final segment of this study in 1967 was confined to further hydrogen sulfide checks each month. Table 5 contains these data for all stations in 1967. Only five analyses revealed the presence of hydrogen sulfide gas, all in sub-lethal concentrations.

Table 5

Lake O' the Pines Hydrogen Sulfide Study - 1967

Station #1 East Abutment of Dam	17 March	14 April	12 May	8 June	15 July	17 August	22 Sept.	13 Oct.	5 Nov.	26 Jan.
Water Temp. °F	66	73	81	83	89	84	78	70	57	43
pH	7.6	7.5	8.2	7.6	8.3	7.0	8.0	7.6	7.8	7.5
Total H_2S p.p.m.	-	-	-	-	-	-	-	-	-	-
Unionized H_2S p.p.m.	-	-	-	-	-	-	-	-	-	-
Station #2 Hurricane Creek										
Water Temp. °F	66	73	81	83	89	82	78	70	57	44
pH	7.6	7.5	8.1	7.8	8.4	7.7	7.2	7.6	7.5	7.3
Total H_2S p.p.m.	-	-	-	-	-	.3	-	-	-	-
Unionized H_2S p.p.m.	-	-	-	-	-	.027	-	-	-	-
Station #3 Johnson Creek										
Water Temp. °F	68	73	81	83	88	84	78	70	58	45
pH	7.5	7.2	8.2	8.1	8.3	7.8	7.5	8.0	7.5	7.8
Total H_2S p.p.m.	-	-	-	.1	-	-	-	-	-	-
Unionized H_2S p.p.m.	-	-	-	.004	-	-	-	-	-	-
Station #4 Alley Creek										
Water Temp. °F	65	74	82	83	88	84	78	70	58	45
pH	7.4	7.4	8.1	8.2	8.4	7.8	8.0	8.0	8.2	7.6
Total H_2S p.p.m.	-	-	-	-	-	-	-	-	-	-
Unionized H_2S p.p.m.	-	-	-	-	-	-	-	-	-	-

Table 5 (Continued)

Station #5 Mim's Chapel	17 March	14 April	12 May	8 June	15 July	17 August	22 Sept.	13 Nov.	5 Dec.	26 Jan.
Water Temp. °F	65	75	81	83	89	84	78	70	57	45
pH	7.0	7.5	8.2	8.3	8.3	7.4	7.2	7.8	7.8	7.7
Total H_2S p.p.m.	-	.1	-	-	-	-	-	-	-	-
Unionized H_2S p.p.m.	-	.014	-	-	-	-	-	-	-	-
Station #6 Highway 155										
Water Temp. °F	66	72	83	83	89	82	78	70	58	46
pH	7.3	8.0	8.1	7.2	7.0	7.8	7.6	6.8	7.8	7.7
Total H_2S p.p.m.	-	-	-	-	.2	-	-	-	-	-
Unionized H_2S p.p.m.	-	-	-	-	.426	-	-	-	-	-
Station #7 Copland Creek										
Water Temp. °F	64	72	81	83	89	82	78	70	57	45
pH	8.0	7.4	7.5	7.3	7.0	7.7	7.2	6.8	7.8	7.7
Total H_2S p.p.m.	-	-	.2	-	-	-	-	-	-	-
Unionized H_2S p.p.m.	-	-	.04	-	-	-	-	-	-	-
Station #8 Brushy Creek										
Water Temp. °F	65	72	81	83	90	84	78	70	57	45
pH	7.5	8.1	8.0	8.1	8.2	7.6	7.2	8.0	7.6	7.7
Total H_2S p.p.m.	-	-	-	-	-	-	-	-	-	-
Unionized H_2S p.p.m.	-	-	-	-	-	-	-	-	-	-

CONCLUSIONS AND RECOMMENDATIONS:

With the completion of the 1965 segment field work it was concluded that only a limited population of adult channel catfish was present in Lake O' the Pines. A lack of young channel catfish in the reservoir was attributed to hydrogen sulfide gas.

The extensive flooding of the reservoir in 1966 provided an improved habitat for channel catfish by creating homologous water conditions and dissipating existing hydrogen sulfide gas. This improvement in water quality made difficult further evaluation of hydrogen sulfide effects. Apparently this flood has provided lasting benefits to the reservoir, as 1967 hydrogen sulfide tests failed to indicate even periodical toxic concentrations.

Evaluation of the increased collection of channel catfish obtained in 1966 is difficult due to the possibility that these catfish may have migrated into Lake O' the Pines during the flood period.

Although population sampling was discontinued in 1967, several reports have been received of good catches of channel catfish by sport and commercial fishermen. One commercial fisherman reported taking numerous young channel catfish which indicates successful reproduction of the species.

Additional stocking of advanced channel catfish fingerlings is recommended if a surplus is available. It is not felt that a complete restocking of Lake O' the Pines would be economically feasible. Without periodic flooding, hydrogen sulfide gas could again eliminate channel catfish reproduction and prove toxic to fingerlings.

The flathead catfish (Ictalurus olivarus) may well be a factor of mitigation in Lake O' the Pines. Numerous young flathead catfish were taken in netting activities during this study. Increased interest in the flathead catfish is apparent from discussion with local fishermen.

It is recommended that this job be terminated with the completion of the F-3-R-15 segment. In the event that additional stocking of channel catfish is made, future population and water quality data may be necessary to evaluate the stocking program.

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Project Leader

Approved Marion Toole
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Date May 8, 1968

Charles E. Gray
Regional Supervisor