

PERFORMANCE REPORT

As Required By

FEDERAL AID IN FISHERIES RESTORATION ACT

TEXAS

Federal Aid Project No. F-5-R-21

REGION I-B FISHERIES STUDIES

Objective XV: Ecological Evaluation of
Striped Bass in Lake E. V. Spence

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March 15, 1974

Abstract

This report represents one part of a study undertaken to measure the ecological factors that may influence and be influenced by the success of striped bass introductions in Lake E. V. Spence.

Three enclosures (2.33 acres) in Lake E. V. Spence were treated with rotenone to obtain a total fish kill. Of 363 marked fish introduced into the enclosures, 204 (56.20 per cent) were recovered. There were 5,595 unmarked fish weighing 292.13 pounds recovered. A total standing crop of 4,272.76 fish per acre weighing 223.13 pounds per acre was estimated. This standing crop exceeded that of 1972 probably because of the rapid lake expansion in 1971. Essentially, a new lake had been created and carrying capacity had not been reached by the time of the 1972 rotenone sampling.

Monthly physicochemical profiles obtained near the dam and elsewhere indicated stratification from May through August. Striped bass, which prefer cooler water, may have concentrated in a narrow zone above the thermocline in late summer because of the low oxygen levels below 30 feet. A significant fresh-water influx in March affected chemical readings in March, April and May.

PERFORMANCE REPORT

State: Texas Project Number: F-5-R-21

Project Title: Region I-B Fisheries Studies

Study Title: Ecological Evaluation of Striped Bass in Lake E. V. Spence

Contract Period: From March 1, 1973 To February 28, 1974

Program Narrative Objective Number: XV

Objective: To measure the ecological factors that may influence and be influenced by the success of striped bass introductions in Lake E. V. Spence.

I. Segment Objectives:

1. To determine, by rotenone sampling, species composition and estimated standing crop of fish in Lake E. V. Spence.
2. To collect and analyze basic limnological data.
3. To tabulate data for comparison with the results of other studies of striped bass introductions in Texas and other states.

II. Summary of Progress:

In August, 1973 a 0.50-acre cove, a 0.92-acre straight shoreline area, and a 0.92-acre shallow open-water area in Lake E. V. Spence were blocked off with 3/4-inch mesh netting. Test fishes, each marked with a hole punched in its caudal fin, were introduced into each enclosure. Rotenone (5% powder) was applied at the rate of 4 pounds per acre-foot. Fish were collected from each enclosure for 48 hours following treatment, sorted and counted by species and inch-groups (total length). Test fishes were counted separately to estimate overall recovery percentages. Ten or more unmarked fish of each species inch-group were weighed to estimate the total weight of fishes in each cove.

Between the 10th and 20th days of each month from March, 1973 through February, 1974, water samples were collected and hydrologic measurements made at one or two stations in Lake Spence. The temperature profile was determined with an electronic probe in the deepest water near the dam. A water sampler was used to collect samples from the surface and the bottom. Part of each sample was preserved for analysis by the regional chemist and the remainder analyzed on the spot for dissolved oxygen content. If the temperature profile revealed evidence of stratification, additional samples were obtained from the top and bottom of each distinct stratum. Also additional measurements were taken at a sampling station midway up the lake.

A summary of the actual recovery of unmarked fish by species is shown in Table 1. The total treated area from which these fish were recovered was 2.33 acres.

A summary of marked fish releases and recoveries by species and length classes is shown in Table 2. Of 363 marked fishes released in all 3 enclosures, 204 (56.20%) were recovered.

Table 3 is an estimate of the total standing crop per acre by species. This figure was derived from total number and weight of fish recovered on 2.33 acres adjusted by the percentage of marked fish recovery (56.20%). Although the treatment sites were selected to be as representative as possible of the different lake environments, several species of fish known to be present in the lake were missing from the sample: white bass, blue catfish, black bullhead, flathead catfish, and golden shiner. Small fishes such as silversides and minnows were underrepresented because of the difficulty of recovering them with dip nets, predation of dying fishes by larger fishes during the treatment, and the tendency of small fishes to appear briefly on the surface and, then, sink and decompose rapidly on the bottom.

Comparison of 1973 (Table 3) with 1972 (Table 4) rotenone sampling results indicates a larger standing crop in 1973. A graph of lake level fluctuation (Figure 1) shows that Lake Spence expanded greatly in 1971 (from 1808.1' MSL on May 26 to 1855.1' on September 29). This rise increased the total lake surface 1,000% and its volume more than 5,000%. Essentially, a new lake was created and carrying capacity of fishes had not been reached at the time of the 1972 rotenone samples. The lake was at or near carrying capacity by the time of the 1973 samples. Table 5 summarizes Lake Spence temperature profiles near the dam from March, 1973 through February, 1974. A strong temperature gradient was evident from 45 to 50 feet below the surface in May and a distinct thermocline was detected at the 35-40 foot level in June, July and August. The stratification had dissipated by September 14, probably due mostly to high winds and rain in early September (remnants of Hurricane Delia).

Table 6 shows dissolved oxygen concentrations at various depths during the year. In August, lake water with oxygen concentrations higher than 1.2 ppm was at temperatures from 78° to 85°F. Striped bass, which prefer cooler water, were probably concentrated in narrow, cooler lake zones and were relatively inactive at this time. This may explain why only two were collected in the August rotenone sampling.

Selected chemical parameters, from analyses made by the regional chemist on Lake Spence water samples, are shown in Table 7. The samples were collected concurrently with the dissolved oxygen and temperature measurements shown in Tables 5 and 6. Lake chemistry appeared generally stable. Lower values for total hardness, chlorine, total dissolved solids, and conductivity in March, April and May probably resulted from a substantial influx of fresh water in early

Table 1

LAKE E. V. SPENCE AUGUST 1973 ROTENONE SAMPLE

RECOVERY OF SPECIES BY NUMBER AND WEIGHT

Total area treated: 2.33 acres

<u>Species</u>	<u>Number</u>	<u>Weight (lbs.)</u>
Threadfin shad	863	9.88
Gizzard shad	2,538	140.63
River carpsucker	31	17.89
Carp	30	28.15
Red shiner	24	0.08
Blacktail shiner	10	0.04
Bullhead minnow	91	0.18
Channel catfish	67	27.29
Mosquitofish	2	0.01-
Tidewater silverside	109	0.18
Striped bass	2	0.10
Largemouth bass	98	15.35
Warmouth	17	0.56
Green sunfish	195	4.46
Redear sunfish	19	0.23
Bluegill	1,363	43.39
Orangespotted sunfish	26	0.37
Longear sunfish	98	1.84
White crappie	3	0.31
Freshwater drum	9	1.20
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TOTAL RECOVERED	5,595	292.13

Table 3

ESTIMATED STANDING CROP OF FISHES IN LAKE E. V. SPENCE

Based on rotenone sampling with 56.20% marked fish return
Total area treated: 2.33 acres

August 1973

<u>Species</u>	<u>No./Acre</u>	<u>Wt.(lbs)/Acre</u>
Threadfin shad	659.05	7.55
Gizzard shad	1,938.20	107.40
River carpsucker	23.67	13.66
Carp	22.91	21.50
Red shiner	18.33	0.06
Blacktail shiner	7.64	0.03
Bullhead minnow	69.49	0.14
Channel catfish	51.17	20.84
Mosquitofish	1.53	Trace
Tidewater silverside	83.24	0.14
Striped bass	1.53	0.08
Largemouth bass	74.84	11.72
Warmouth	12.98	0.43
Green sunfish	148.92	3.41
Redear sunfish	14.51	0.18
Bluegill	1,040.89	33.14
Orangespotted sunfish	19.86	0.28
Longear sunfish	74.84	1.41
White crappie	2.29	0.24
Freshwater drum	<u>6.87</u>	<u>0.92</u>
TOTALS	4,272.76	223.13

Table 4

ESTIMATED STANDING CROP OF FISHES IN LAKE E. V. SPENCE

Based on rotenone sampling with 45.45% marked fish return

Total area treated: 3 acres

August 1972

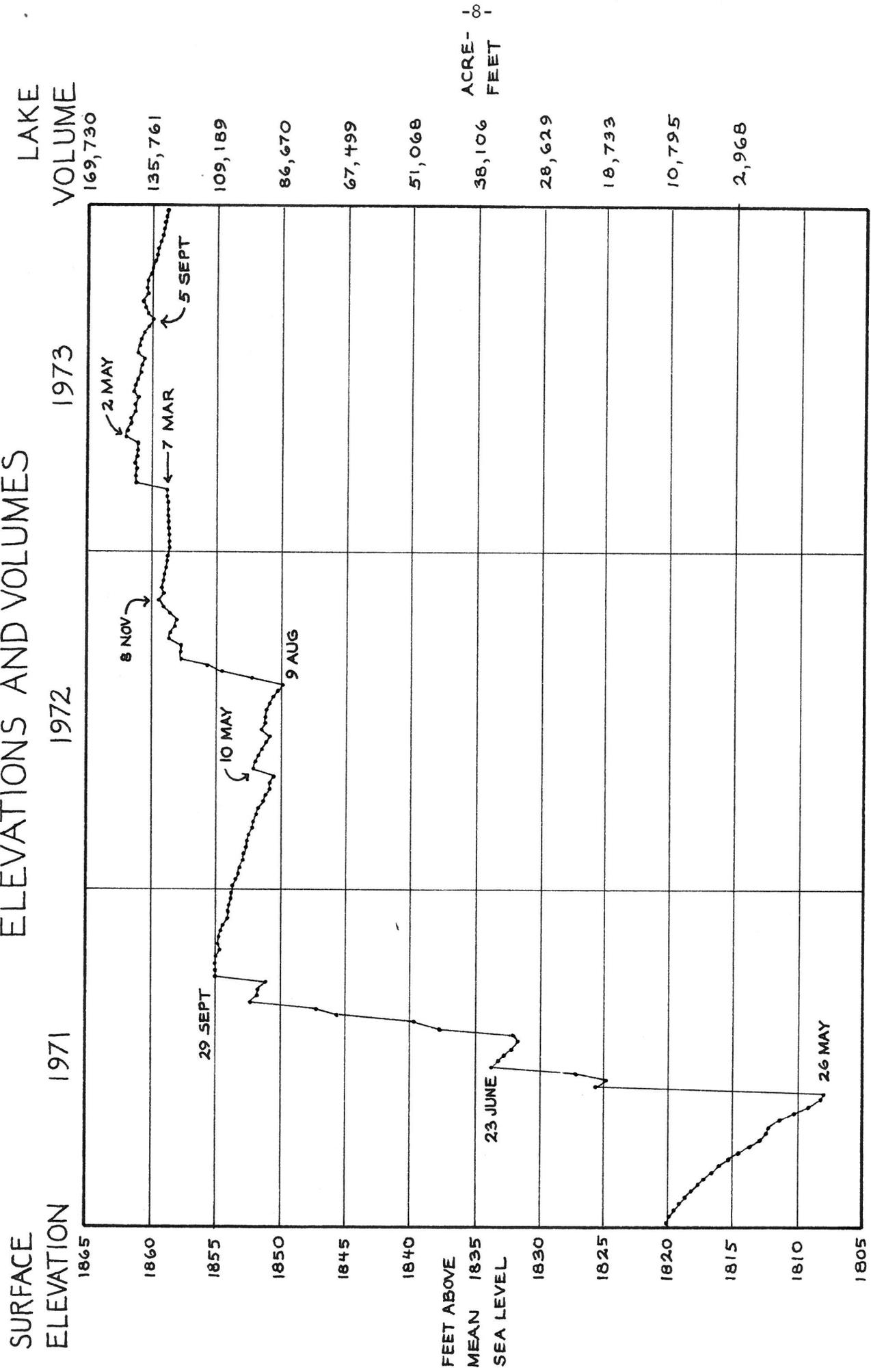
<u>Species</u>	<u>No./acre</u>	<u>Wt.(lbs)/acre</u>
Threadfin shad	147.3	0.93
Gizzard shad	1,567.7	60.48
River carpsucker	9.7	5.97
Goldfish	0.3	0.14
Carp	137.3	81.02
Golden shiner	9.0	0.35
Red shiner	0.7	Trace
Channel catfish	20.3	8.84
Blue catfish	1.0	0.15
Black bullhead	1.0	0.09
Flathead catfish	0.3	0.01
Silverside	0.3	Trace
White bass	0.3	0.32
Striped bass	3.7	0.13
Largemouth bass	18.0	8.58
Warmouth	23.3	0.24
Green sunfish	130.3	2.40
Redear sunfish	3.3	0.08
Bluegill	1,232.7	20.70

Table 4

ESTIMATED STANDING CROP OF FISHES IN LAKE E. V. SPENCE
(Continued)

<u>Species</u>	<u>No./acre</u>	<u>Wt.(lbs)/acre</u>
Orangespotted sunfish	32.3	0.31
Longear sunfish	47.7	1.01
White crappie	12.0	2.64
Freshwater drum	3.0	0.37
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TOTALS	3,401.5	194.76

Figure 1
LAKE E. V. SPENCE
ELEVATIONS AND VOLUMES



LAKE E. V. SPENCE TEMPERATURE PROFILES

March 1973 - February 1974
(°C)

Measured Near Dam

Depth	20 Mar	17 Apr	18 May	13 Jun	13 Jul	20 Aug	14 Sep	15 Oct	16 Nov	18 Dec	14 Jan	13 Feb
Surface	14.5	14.1	21.8	24.0	26.3	29.2	24.3	22.9	17.0	11.6	6.4	9.2
5'	13.6	14.0	21.4	24.0	26.3	28.1	24.1	22.3	17.0	11.4	6.3	9.1
10'	13.6	14.0	21.3	23.9	26.3	27.9	24.1	22.2	17.0	11.3	6.1	9.0
15'	13.6		19.6	23.9	26.1	27.8	24.0	22.2		11.2	6.0	8.9
20'	13.4	14.0	19.0	23.8	25.8	27.3	24.0	22.2		11.2	6.0	8.8
25'	13.4		18.9	23.6	25.4	27.1	23.9	22.2		11.1	5.9	8.7
30'		13.9	18.8	23.0	24.7	26.9	23.8	22.2	17.0	11.1	5.9	8.6
35'			18.6	22.4	23.9	25.7	23.8	22.2		11.0	5.9	8.5
40'	13.1	13.7	18.5	20.8	21.9	23.8	23.7	22.2	17.0	11.0	5.9	8.4
45'		13.7	17.9	19.8	21.0	22.0	23.4	22.2		11.0	5.8	8.2
50'		13.2	16.5	18.9	20.1	20.9	23.1	22.2	17.0	11.0	5.8	7.9
55'	13.1(52')	13.0(53')	15.1	17.9(54')	19.0	20.6(53')	22.4	22.1		11.0	5.8	7.8
60'								21.9	17.0			7.7
65'								19.8(64')	17.0(62')		5.6(57')	

Table 6

LAKE E. V. SPENCE DISSOLVED OXYGEN AND TURBIDITY

March 1973 - February 1974

d.o. in ppm
 * H₂S odor noted
 surface turbidity in
 " Secchi

Measured Near Dam

Depth	20 Mar	17 Apr	18 May	13 Jun	13 Jul	20 Aug	14 Sep	15 Oct	16 Nov	18 Dec	14 Jan	13 Feb
Surface	10	10	10	9.0	8.0	10.0 20.0	8.4	7.0	8.0 8.5	10.0	11.0	11.2
5'	-	-	-	-	-	-	-	-	-	-	-	-
10'	-	-	-	-	-	-	-	-	-	-	-	-
15'	-	-	-	-	-	-	-	-	-	-	-	-
20'	-	-	8	-	-	-	-	-	-	-	-	-
25'	-	-	-	-	-	8.0	-	-	-	-	-	-
30'	-	-	-	-	3.0	-	-	-	-	-	-	-
35'	-	-	8	7	-	1.2	-	-	-	-	-	-
40'	-	-	-	0.8	-	-	-	-	-	-	-	-
45'	-	-	9	2.6	-	-	-	-	-	-	-	-
50'	9 (52')	8 (53')	-	0.2 (54')	-	0.0 (53')*	-	-	-	-	-	-
55'	-	-	0.6	0.4*	-	1.4	-	-	-	10.0	-	-
60'	-	-	-	-	-	-	-	6.0 (64)*	8 (62')	11.0 (57')	-	9.0 (62')
65'	-	-	-	-	-	-	-	0.0 (64')	8.0	-	-	-
Surface turbidity	38"	52"	44"	36"	-	84"	58"	60"	42"	42"	80"	48"

Table 7

LAKE E.V. SPENCE SELECTED WATER ANALYSIS RESULTS
 March 1973 - February 1974

WATER SAMPLES COLLECTED NEAR DAM

	20 MAR	17 APR	18 MAY	13 JUNE	13 JULY	20 AUG	14 SEPT	15 OCT	16 NOV	18 DEC	14 JAN	13 FEB
SURFACE	8.7	8.55	8.4	8.6	8.4	8.1	8.3	8.0	8.2	7.9	7.9	7.95
pH				8.55 (35')	7.6 (30')	8.1 (25')		8.0 (60')				
BOTTOM	8.5 (52')	8.35 (53')	8.4 (45')	8.3 (45')	7.6 (40')	7.6 (35')	8.3 (55')	8.0 (64')	8.2 (62')	8.0 (55')	7.9 (57')	7.85 (62')
SURFACE	140 PPM	125	125	140	125	230	185	124	124	132	134	125
TOTAL				140	135	140						
ALKALINITY			130	140	150	130	132					
BOTTOM	145	160	140	140	150	170	190	132	128	133	135	137
SURFACE	350 PPM	345	360	390	390	410	380	405	402	400	455	417
TOTAL				420	390	410						
HARDNESS			360	410	385	390	395					
BOTTOM	400	350	365	380	380	380	395	400	400	400	455	419
SURFACE	342 PPM	350	370	430	470	420	430	432	424	431	424	446
CHLORINE				450	370	420						
BOTTOM	347	355	375	450	400	410	433	431	431	431	424	452
SURFACE	1065 PPM	1142	1008	1227	1116	1322	1267	1281	1268	1245	1228	1381
TOTAL DIS-				1327	1045	1238						
SOLVED SOLIDS			996	1313	1180	1210	1266	1171	1312	1252	1246	1344
BOTTOM	1086	1184	1103	1207	1104	1252		1166				
SURFACE	1620	1734	1940	2000	2000	2100	2100	2100	2000	2100	2000	2073
CONDUCTIVITY				2100	1900	2150						
BOTTOM	1640	1765	1890	2050	1900	2100	2100	2100	2000	2100	2000	2071

March (Figure 1). Values of pH in these months and June was higher than in later measurements. Total alkalinity appears to have peaked in August or September. The greatest measured ranges of pH, total alkalinity, chlorine, and conductivity corresponded with the maximum thermal stratification in July and August.

III. Significant Deviation:

Segment objectives (1) and (2) were accomplished on schedule with no significant problems. One of the enclosures treated in the August rotenone sampling was only 0.50 acre in area because the 1-acre cutoff point in the cove selected was too deep for the barrier. However, it is felt this did not significantly affect the results. In the hydrologic measurements, a third sampling station in the upper end of the lake was not used because (1) excessive time would be required to travel to the station, (2) the upper end of the lake is mostly within the river channel, does not contribute much to the total volume of the lake, and is never stratified, and (3) the volume, temperature, and turbidity of inflowing water vary widely and rapidly and are not useful in determining longer-term lake fluctuations. In other words, this station is not representative of lake conditions.

The third segment objective, tabulation and analysis of the data for comparison with other lakes, has been deleted from the coming project segment and will be rescheduled for the 1975-1976 segment. This was done to allow final tabulation, correlation, and statistical analysis by electronic computer when data collection is complete. Preliminary tabulations and analyses were, however, presented in this report.

IV. Conclusions, Evaluations and Recommendations:

The study is progressing according to design. It appears meaningful evaluations of striped bass introductions into Lake E. V. Spence can be made when data collection and analyses have been completed.

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