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## AN ATTEMPT TO IMPROVE STREAM FISHING BY\* MANIPULATING THE LAKES IN THE STREAM BASIN

By

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### ABSTRACT

In the summer of 1963, 18 of the 21 old river lakes in the Saline River basin, comprising 168 acres, were completely eradicated using rotenone. These lakes were subsequently overstocked with game fishes from our state-owned hatcheries. The theory being that fish from crowded populations will emigrate during overflow periods, providing desirable fish as stocks for the river. These fish were stocked early enough in the year to allow them to grow to sub-adults and to become acclimated by the time of the first flood water.

### INTRODUCTION

The field of fish management in the Southeast has almost entirely ignored the problem of deteriorating stream fishing. The inability of the fishery manager to control several factors in the watershed, as well as the increasing tendency to let the U. S. Government bury these problems under huge impoundments, has led to this de-emphasis on stream fishing.

In the face of increasing fishing pressure; changing patterns of land use; more pollution from sewage systems already overloaded; silt from highway construction and dredging operations; an ever increasing load of pesticides and industrial wastes, who would blame the fishery manager for throwing up his hands?

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Faced with all the above problems, plus the added problem of several dry years, a scheme combining several ideas has been devised to improve fishing on the Saline River, Arkansas.

## DISCUSSION

Improvement of stream fishing has been a problem of the biologist since he came on the conservation scene. In the early periods of investigations, streams and natural lakes were the only public waters available for study. Much has been written and postulated concerning stream management, but the bulk of this work was done on trout, or cold water streams of the northern U. S.

With the advent of T.V.A., the public left the streams to pursue the more productive fishing provided in these new and "hot" lakes behind the high dams. In the process, the pressure was taken off the streams. Investigations were concerned only with the conditions present before a dam was to be built. These pre-impoundment studies contained no conclusion, and no management recommendations. Management up to this point consisted of promiscuous stocking of hatchery fish, and regulation of the fishery.

Such stocking of hatchery reared fish has been proven unsatisfactory and of little value to the stream. (Roach, 1941), (Funk, etal - 1953).

Regulations concerning fishing in general have been liberalized and improved upon through such findings as mentioned above.

In 1944, a leaflet from the Auburn Agricultural Experiment Station (Smith, 1944) called "Ponds for Improving Stream Fishing" was published. The authors contended that ponds helped improve stream fishing by: (1) continuously adding small fish to the streams as the pond overflowed (2) adding large fish to the stream during periods of high water (3) adding to the fertility of the stream (4) decrease fishing pressure on streams and (5) decreasing the flow of silt and sand by acting as settling basins.

Other types of management such as barrier dams, channel improvements, and of late, chemical treatments have been devised. These management techniques are, however, limited by the size of the stream.

In recent years nursery ponds have been built to be used to improve the fish population in lakes. Two of these have been constructed in Arkansas on Bull Shoals and Norfolk Lakes, and are being used to introduce various new species such as walleye, sauger, threadfin shad, etc., to these lakes. (Hulsey, 1963).

As the fishing pressure shifted to the larger impoundments, so did most of the research and investigations. As a result, some management techniques such as the fall and winter drawdown, selective chemical treatments, and intensive commercial fishing, have evolved. These techniques, while not directly applicable to streams, can be modified and used. For instance, the drawdown occurs naturally in streams. In fact, no matter what other management techniques are used on warm water streams, they are largely dependent on the spring flooding—summer and fall drawdown cycle of weather. The flooding during the spawning period gives added space for spawning and survival. With the passing of the flood waters the fish are then concentrated in the river itself, where predation is much more efficient. This drawdown then favors the predator species, which in turn benefits sport fishing.

Another factor in this "flooding-drawdown" timetable is the presence of channel scar, or oxbow lakes in the flood plain. During the period of flooding, practically all species of fish move about freely in this big, new world. Commercial fishermen know about this and their catch is accelerated during this period when they move into the overflow bottoms to fish. More proof of this movement was documented this summer in the Saline River project. Two small lakes which went completely dry last summer (1963) had good adult populations of

black crappie, largemouth bass, gizzard shad, gar and bowfin present. This evidence of movement from one environment to another has been noticed by others. In Wisconsin, it was noted that the annual degree of emigration from a section of a trout stream was influenced by the annual population density. (Hunt). This factor of a species emigrating, or extending its range, due to being crowded is a species management technique long used in game management. The refuge technique to establish a population takes advantage of this factor.

In order to properly relate the above information to stream management, some background material concerning the Saline River basin should be presented.

The Saline River rises in the Ouachita Mountain region of Central Arkansas and flows in a southerly direction to the point of confluence with the Ouachita River just north of the Louisiana border. The river drainage area of 3,270 square miles consists of shortleaf pine-hardwood vegetation in the headwaters, changing to a bottomland hardwood type nearest the river with shortleaf pine-loblolly in the foothills. In general, the water quality of the Saline River is good. (Poll. Cont. Comm.). Although small fish kills have been noticed in the river near Benton, most of the pollution is localized in small tributary streams. Flows of 17 c.f.s. minimum, and 268 c.f.s. maximum were recorded in the summer of 1963 (Poll. Cont. Comm.) with greatly increased flow in the fall, winter and spring.

The distribution of fishes in this river fall into the classic textbook form for rivers of this type. In the headwaters near Benton are found smallmouth bass, rock bass, walleye, chain pickerel, and flathead catfish. (App. Page XII, XIII, XIV). As one descends the river some 100 miles to Cleveland County, spotted bass, some largemouth bass, flathead catfish, walleye, some channel catfish, and rock bass are present. On descending further downstream some 10 miles below Warren and some 50 miles north of the Louisiana border, largemouth bass, spotted bass, rock bass, flathead catfish, channel catfish, walleye, sauger, drum, buffalo, redhorse suckers, gizzard shad, gar, and bowfin are present.

The bottom is gravel from beginning to end; aquatic insects and other bottom organisms are abundant. (Poll. Cont. Comm.). The stream gradient is such that the pool-riffle approximates 60-40. This, then, is the stream we are concerned with in this project.

Associated with the Saline River are several small oxbow, or meandered lakes. These lakes, with the river, provide the bulk of the fishing opportunity for residents of Cleveland, Dallas, Bradley, Drew, Ashley, and Grant Counties. The larger lakes in the basin lie in the middle to upper sections of the drainage area. Even though the river fish population is the smallmouth bass—spotted bass type, the lakes contain a normal lake population for this area. This is because largemouth bass, bluegill and redear bream, and crappie have been stocked in these lakes over the past 30 years.

At the time of eradication of the fish population in these lakes this summer the fishing had gone to pot, so to speak. (App. Page VI). The fish killed in these lakes were largely commercial or trash fish. The dominant species of fish in these lakes were as follows: Gizzard shad, smallmouth buffalo, gar (all species), bowfin, suckers, largemouth buffalo, bream, crappie, and bass. In no lake did the game fish exceed 2% of the population by weight.

Wishing to accomplish the most good with the resources at our command, a scheme was devised to improve the fishery in both the lakes and the river by manipulating the fish population in these lakes.

In recent years, Arkansas had done much applied research on the management of these channel scar lakes. Our recommendations to our Commission concerning these lakes have always emphasized the manipulation of the existing fish population where possible. (Hulsey, 1954).

One of our more successful projects has been the renovation of Grand Lake, a 1,300-acre oxbow of the Mississippi River, now cut off from the river by a levee. Our population samples showed a steadily deteriorating fish population in Grand Lake due to overpopulation of some species and stunting of others. (See App. Pages I, II, III). In 1959, a total weight of 769 pounds of fish were in the sample acre. Of this total, 309 predators weighing 55.7 pounds were present. A rough fish removal project was carried out in September, 1960. A population sample made in the same area, using a block-off net, showed a reduction of 519.5 pounds of fish per acre, with a significant reduction in the numbers of all species. The population sample made in **the same area again in 1961, and using the exact same methods,** produced a total weight of 843.7 pounds of fish. Of this total, 966 predators weighing 162.6 pounds were recorded.

This great increase in the predator population was the desired goal. Therefore, our lake management has proceeded from there, modified only by local conditions.

These "old river" lakes suffered greatly during the drought years of the early 1950's. The desirable fish population declined with the poor water quality which they encountered. This reduction in numbers put them even further behind the undesirables, which have higher reproductive capacities in general. During the ensuing flood years, the rough fish population "exploded" to the detriment of fishing. This condition has steadily worsened to this point.

Our management plan calls for complete eradication where no fishable population of game fish exist. We have done this on several lakes, with no restocking, where fishing has been reported good after one flooding by the river.

In the case of these Saline River lakes, it was decided not only to restock them after eradication, but to crowd the fish in an effort to induce emigration to the river. Therefore, as soon as it was possible, 130 channel catfish per acre, 200 bass per acre, and suitable numbers of bream and fathead minnows were stocked.

#### SUMMARY

1. Due to the many uncontrollable factors encountered, warm water stream management has been largely ignored by most states.
2. Stream fishing in Arkansas has deteriorated steadily since the drought years of the early 1950's.
3. Oxbow, or old river, lakes have also declined in fishing for the same reason.
4. The management plan for the Saline River is a combination of the "Ponds to Improve Stream Fishing" idea and the "Nursery Pond" idea.

#### CONCLUSIONS

1. Arkansas' lake management has advanced steadily during the past 10 years to a point where fishing opportunity can be improved greatly in all areas, modified by local conditions.
2. Any improvement in the oxbow lakes associated with a river must eventually result in an improvement to the river itself through an improved fish population.

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Appendix I  
**FISH POPULATION SAMPLE**  
 Grand Lake, Chicot County  
 August 20-21, 1959

Species	Number		Weight Pounds	Per Cent of Total	
	Of Fish	In Group		Number	Weight
Largemouth Bass, Adult	2		3.0		
Largemouth Bass, Int.	4		0.3		
Yellow Bass, Young	32		4.3		
Largemouth Bass, Young	21		0.8		
Yellow Bass, Int.	126		12.5		
Yellow Bass, Young	2		0.1		
White Crappie, Adult	5		4.0		
White Crappie, Int.	1		0.1		
Black Crappie, Int.	11		1.0		
Black Crappie, Young	22		0.2		
Spotted Gar, Adult	3		6.1		
Channel Catfish, Adult	16		17.3		
Channel Catfish, Int.	7		2.1		
Channel Catfish, Young	55		0.8		
Bowfin, Adult	2		3.1		
<b>PREDATOR POPULATION</b>		<b>309</b>	<b>55.7</b>	<b>2.84</b>	<b>7.24</b>
Bluegill Sunfish, Adult	708		119.6		
Bluegill Sunfish, Int.	1,058		74.4		
Bluegill Sunfish, Young	2,150		10.7		
Redear Sunfish, Adult	45		7.0		
Redear Sunfish, Int.	6		0.5		
Orange Spotted Sunfish	17		0.7		
Warmouth Bass, Adult	25		7.5		
Warmouth Bass, Int.	7		0.3		
Longear Sunfish, Int.	325		12.0		
Drum, Int.	7		3.5		
Drum, Young	120		2.7		
Smallmouth Buffalo	1		3.9		
<b>EDIBLE FORAGE FISH</b>		<b>4,472</b>	<b>242.8</b>	<b>41.08</b>	<b>31.54</b>
Gizzard Shad, Adult	705		143.0		
Gizzard Shad, Int.	2,591		220.9		
Gizzard Shad, Young	1,244		106.7		
Threadfin Shad, Adult	63		0.5		
Native Minnows, Adult	1,500		0.3		
<b>NON-EDIBLE FORAGE FISH</b>		<b>6,103</b>	<b>471.4</b>	<b>56.08</b>	<b>61.22</b>
<b>NON-PREDATOR POPULATION</b>		<b>10,575</b>	<b>714.2</b>	<b>97.16</b>	<b>92.76</b>
<b>TOTAL POPULATION</b>		<b>10,884</b>	<b>769.9</b>	<b>100.00</b>	<b>100.00</b>

Predator—Non-Predator Ratio by Weight: 1:12.8  
 Area Sampled: 1 acre  
 Sample Taken: August 20-21, 1959  
 Gear Used: 3 gallons Chem-Fish

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## Appendix II

### FISH POPULATION SAMPLE

Grand Lake, Chicot County, Arkansas  
October 11-12, 1960

Species	Number		Weight Pounds	Per Cent of Total	
	Of Fish	In Group		Number	Weight
Largemouth Bass, Adult	1		4.5		
Yellow Bass, Adult	—		—		
Yellow Bass, Int.	46		6.3		
Yellow Bass, Young	3		—		
Black Crappie, Adult	2		1.4		
Black Crappie, Int.	10		0.7		
Spotted Gar, Adult	6		8.5		
Channel Catfish, Adult	54		59.7		
Channel Catfish, Int.	1		0.6		
<b>PREDATOR POPULATION</b>		<b>123</b>	<b>81.7</b>	<b>13.21</b>	<b>32.63</b>
Bluegill Sunfish, Adult	83		14.5		
Redear Sunfish, Adult	8		1.1		
Sunfish, Young	72		0.2		
Drum, Int	55		17.7		
Drum, Young	7		0.6		
Smallmouth Buffalo, Adult	4		16.7		
Largemouth Buffalo, Adult	6		12.7		
<b>EDIBLE FORAGE FISH</b>		<b>235</b>	<b>63.5</b>	<b>25.24</b>	<b>25.36</b>
Gizzard Shad, Adult	567		105.2		
Gizzard Shad, Young	4		—		
Threadfish Shad, Adult	2		—		
<b>NON-EDIBLE FORAGE FISH</b>		<b>573</b>	<b>105.2</b>	<b>61.55</b>	<b>42.01</b>
<b>NON-PREDATOR POPULATION</b>		<b>808</b>	<b>168.7</b>	<b>86.79</b>	<b>67.37</b>
<b>TOTAL POPULATION</b>		<b>931</b>	<b>250.4</b>	<b>100.00</b>	<b>100.00</b>

Predator—Non-Predator Ratio by Weight: 1:2.1  
 Area Sampled: 1 acre  
 Gear Used: 32 lbs. 6.9% Cube Powder  
 Sample Made: October 11-12, 1960

Appendix III  
 FISH POPULATION SAMPLE  
 Grand Lake, Chicot County  
 August 1-2, 1962

Species	Number		Weight Pounds	Per Cent of Total	
	Of Fish	In Group		Number	Weight
Largemouth Bass, Adult	9		20.6		
Largemouth Bass, Int.	1		0.2		
Largemouth Bass, Young	1		—		
Yellow Bass, Adult	36		9.0		
Yellow Bass, Int.	122		6.0		
Yellow Bass, Young	283		1.3		
White Crappie, Adult	23		16.0		
White Crappie, Int.	76		7.6		
White Crappie, Young	178		1.0		
Black Crappie, Adult	8		4.2		
Black Crappie, Int.	23		2.4		
Black Crappie, Young	59		0.4		
Spotted Gar, Adult	6		9.8		
Spotted Gar, Int.	1		0.5		
Shortnose Gar, Adult	7		10.4		
Channel Catfish, Adult	36		70.5		
Channel Catfish, Int.	21		2.2		
Channel Catfish, Young	76		0.5		
<b>PREDATOR POPULATION</b>		<b>966</b>	<b>162.6</b>	<b>7.04</b>	<b>19.27</b>
Bluegill Sunfish, Adult	168		40.7		
Bluegill Sunfish, Int.	1,554		73.7		
Bluegill Sunfish	4,534		13.6		
Redear Sunfish, Adult	2		0.7		
Redear Sunfish, Int.	2		0.1		
Green Sunfish, Int.	14		0.8		
Green Sunfish, Young	41		0.2		
Longear Sunfish, Adult	2		0.2		
Longear Sunfish, Int.	50		2.3		
Warmouth, Adult	1		0.6		
Drum, Adult	1		6.1		
Drum, Int.	170		31.2		
Drum, Young	6		0.1		
Carp, Adult	2		10.9		
Smallmouth Buffalo, Adult	1		5.4		
Largemouth Buffalo, Adult	5		19.6		
Largemouth Buffalo, Int.	1		0.4		
<b>EDIBLE FORAGE FISH</b>		<b>6,554</b>	<b>206.6</b>	<b>47.78</b>	<b>24.48</b>
Native Minnows, Adult	411		0.4		
Threadfish Shad, Adult	182		3.1		
Gizzard Shad, Adult	153		57.0		
Gizzard Shad, Int.	4,924		399.6		
Gizzard Shad, Young	528		14.4		
<b>NON-EDIBLE FORAGE FISH</b>		<b>6,198</b>	<b>474.5</b>	<b>45.18</b>	<b>56.25</b>
<b>NON-PREDATOR POPULATION</b>		<b>12,752</b>	<b>681.1</b>	<b>92.96</b>	<b>80.73</b>
<b>TOTAL POPULATION</b>		<b>13,718</b>	<b>843.7</b>	<b>100.00</b>	<b>100.00</b>

Predator—Non-Predator Ratio by Weight: 1:5.2

Area Sampled: 1 Acre

Sample Made: August 1-2, 1962

Gear Used: 25 pounds 6.6% Cube Powder and Block-off Net

Made by: Bill Mathis

Appendix IV

Hurricane Lake Area, White County  
Bob Hopper and Bill Bailey

February 3-13, 1964 LAKE HURRICANE SHOOTING AREA

Name of Water	Estimate Acres	Estimate Max. Depth	Estimate Av. Depth	Amount Rotenone Used	REMARKS—Water levels 2'-3' below normal
BELL LAKE	20	4'	3'	4 gal.	Killed shad (mostly adults). An estimated 25% rough and 10% game fish killed from lake. Rough fish were mostly buffalo and grindle. Crappie were small, fair condition; bluegill were poor and few. No catfish.
HONEY LAKE	30	4'	2½'	7 gal.	Increased dosage to remove large numbers of rough fish. Fish were small and in fair condition. Over abundance of shad. No catfish. Water muddy.
MALLARD POND	40	3½'	2½'	6½ gal.	Extra large shad present (no young). Buffalo av. 4-5 lbs. and in good condition. Water green and rich. Few game fish killed. Crappie small, but in good condition. Still, no catfish.



Appendix IV—Continued

LITTLE HURRICANE	9	3'	2'	2 gal.	Water low, dingy. Evidence of super saturation of grindle. Rough fish were removed. Buffalo were small (1-3 lbs.) and stunted. About 4,000 lbs. of grindle were killed. Game fish were few. Bluegill small and poor. Crappie fair size and good shape.
BIG HURRICANE	80	7'	5'	12 gal.	Water a dingy green. Lots of shad, young and adults. Very few fish were killed. One (1) gal. 33-acre feet was used.
WHIRL LAKE	35	2½'	2'	7 gal.	Low, muddy and rolling with grindle and carp. Used the opportunity to use little chemical to kill (M's) of rough fish. A few bluegill were present (good shape). Crappie were fair size and fair condition. Two (2) flatheads and about 12 channel catfish were found. Glaise Creek runs through upper end and fish can travel upstream from river when small rise is on.
WILLOW LAKE	20	4'	2½'	3½ gal.	Water dingy and green. Lots of good buffalo (5-6 lbs. present). Few channel catfish. Carp were dominant in number. Few crappie and bass, which were extremely poor and small. Some bass had fungi on them.

## Appendix V

## February 3-13, 1964 LAKE HURRICANE SHOOTING AREA

Name of Water	Estimate Acres	Estimate Max. Depth	Estimate Av. Depth	Estimate Amount Rotenone Used	REMARKS—
LITTLE GREEN					Bob Hopper and Bill Bailey
TOM	2	1½'	1'	1 gal.	Water levels 2'-3' below normal About 1,500 lbs. of grindle, 1 carp, 1 gar, 1 buffalo, and 16 bluegill were present. Just a wide, shallow place in a usually dry slough. Very seldom fished.
GLAISE CREEK	4-5 miles	8'	5'	18 gal.	Treated approximately 4 or 5 miles from dam upstream. Shad and few small drum were killed. Water a deep rich green. Game fish plentiful, in good shape.
BIG BRUSHY	5	3¼'	2½'	8-10 gal.	Lots of adult shad. Few others, except several grindle. Water dingy, but rich.
LITTLE CLEAR	5	4'	3'	1 gal.	Water muddy, low. Moderate shad kill was accomplished. Several grindle and carp.
LITTLE BELL	6	3½'	2½'	1 gal.	Very low and dingy. Supporting lots of fish. Many game fish present. Results of treatment unknown.
DEEP BANK SLOUGH	6	6'	3'	6 gal.	Lots of shad. Buffalo were extremely small and numerous. Game fish small and stunted.
MOON LAKE (PRIVATE)	8	4'	3'	2 gal.	A shad and selective kill. Many adult shad present. A few large buffalo (10-20 lbs.) were found. However, most were from (3-5 lbs. Bluegill were infested with anchor worms. At times in past both bream and bass were badly infested.

Appendix VI

FISH POPULATION SAMPLE  
Lower Black Lake—Bradley County  
July 15-16, 1964

Species	Number Of Fish	In Group	Weight Pounds	Per Cent of Total Number Weight	
Largemouth Bass, Adult	2		3.2		
Black Crappie, Int.	1		0.4		
Bowfin, Adult	10		45.4		
Bowfin, Int.	1		0.3		
Spotted Gar, Adult	123		281.0		
Longnose Gar, Adult	2		7.9		
Shortnose Gar, Adult	36		85.4		
Alligator Gar, Adult	77		403.4		
<b>PREDATOR POPULATION</b>		<b>252</b>	<b>827.0</b>	<b>77.54</b>	<b>94.46</b>
Bluegill Sunfish, Adult	9		3.6		
Green Sunfish, Adult	1		0.4		
Warmouth, Adult	3		1.2		
Yellow Bullhead, Adult	17		9.5		
Largemouth Buffalo, Int.	1		0.2		
<b>EDIBLE FORAGE FISH</b>		<b>31</b>	<b>14.9</b>	<b>9.54</b>	<b>1.70</b>
Gizzard Shad, Adult	42		33.6		
<b>NON-EDIBLE FORAGE FISH</b>		<b>42</b>	<b>33.6</b>	<b>12.92</b>	<b>3.84</b>
<b>NON-PREDATOR POPULATION</b>		<b>73</b>	<b>48.5</b>	<b>22.46</b>	<b>5.54</b>
<b>TOTAL POPULATION</b>		<b>325</b>	<b>875.5</b>	<b>100.00</b>	<b>100.00</b>

Predator—Non-Predator Population by Weight 1:0.055  
Area in Sample—5 acres  
Gear Used—120 lbs. 4.67% Cube  
Collector—Bill Mathis

Remarks—The above tabulation represents approximately 60% of the population. The figures are more accurate for the larger fish while they are less accurate for the smaller ones. We had about 100 people on the lake picking up fish to eat. Since 75 of them were Negroes, not many edible fish were missed, including gar, one of their delicacies.

Two of the alligator gar weighed over 100 pounds each. The larger measured 6'4" in length while the smaller of the two measured 5'11" in length. The weights were estimated.

The fish population in this lake was the worst sport fishing population encountered on this project. Attempts were made to tabulate information on other lakes, but the great numbers of people (200 to 1,000) made it impossible.

Appendix VII  
CLEVELAND COUNTY

Name of Lake	Maximum Depth	Average Depth	Acreage	Chemical Pounds	REMARKS
<b>CRANE LAKE</b>					
August 4, 1964	16'	10'	20 acres	500 pounds	Good buffalo population present, range up to 30 pounds. Bass and crappie present as adults and young-of-the-year. Large numbers of threadfin shad and gar present.
<b>LITTLE LAKE</b>					
August 5, 1964	6'	3'	3 acres	50 pounds	Shad, bowfin and buffalo make up the entire population.
<b>CHOWNING LAKE</b>					
August 5, 1964	6'	3'	3 acres	50 pounds	Mostly suckers and shad. No game fish present in numbers. Some chain pickerel.
<b>GRANT COUNTY</b>					
<b>MOORES LAKE</b>					
August 6, 1964	13'	5'	20 acres	300 pounds	Many buffalo, some large gar, shad, suckers, bass, bluegill, redear and crappie in small numbers. Poundage per acre less than lakes further south.
<b>TOLLERS LAKE</b>					
August 7, 1964	9'	6'	10 acres	200 pounds	Poundage per acre still lower than before. No appreciable numbers of game fish.

Appendix VIII  
BRADLEY COUNTY

Name of Water	Estimate Acres	Maximum Depth	Average Depth	Chemical Used	
LOWER BLACK LAKE July 15, 1964	5	14	10	200# 5 %	Strictly a gar lake. Few bowfin and other species present. Weights and counts were made first day. Report made. Two (2) 100 pound + gars found.
UPPER BLACK LAKE July 22, 1964	8	8	6	235# 5 %	Population heavy with buffalo, small, but in good shape. Gar, bowfin, bream, bass, and crappie present.
HIGHWAY 4 BORROW PITS July 22, 1964	5	4	2.5	50# 5 %	Good young-of-year bass and crappie population. Buffalo and shad abundant. Suckers present.
WARREN OLD RIVER July 23, 1964	10	11	7	175# 7.3%	Over abundance of buffalo and shad. Game fish present, bass, large bream, crappie and chain pickerel.
FRANKS LAKE July 30, 1964	7	5	4	100# 5 %	Mostly buffalo, larger than in previous lakes. Influence of Ouachita River overflow. Few game fish. 500 people present. Shad abundant, drum present.
MIDDLE LAKE July 30, 1964	12	13	7	300# 5 %	Buffalo and shad abundant. Large buffalo (35 lbs.) present. Bass, bream, crappie (adult and young), chain pickerel, bowfin, and suckers present.

Appendix IX  
ASHLEY COUNTY

Name of Water	Estimate Acres	Maximum Depth	Average Depth	Chemical Used	REMARKS
KEYHOLE OLD RIVER July 16, 1964	12	7	5	200# 7.3%	Shad, buffalo, spotted suckers equally abundant. Gar and bowfin comprise 99% of fish. Bass and crappie present.
CLEAR LAKE July 17, 1964	10	8	4	150# 5%	No appreciable numbers of game fish, although young crappie present. Black bullhead young abundant. Buffalo fairly abundant, but small.
UPPER MUD LAKE July 17, 1964	2	3.5	2	50# 5%	Buffalo, shad, bowfin and gar abundant. Although dry last year, this hole had 17 adult black crappie as well as young present.
HORSEHEAD OLD RIVER July 20, 1964	10	10	6	225# 5%	Mainly small buffalo and gar, few bowfin. No appreciable numbers of game fish. Spotted suckers present.
ROUND HOLE July 21, 1964	2	4	4	50# 5%	Shad abundant and large (1.5 lbs.). Several adult crappie, bowfin and gar present. Hole dry last summer.
BADEN OLD RIVER July 21, 1964	3	6	3	50# 5%	No bass and crappie present. Gar, bowfin and spotted suckers equally abundant. Small bream present.

Appendix X

FISH POPULATION SAMPLE

Saline River—Saline County

October 10, 1961

This population sample was made in a hole of water directly below the Nickel Bill Ford, approximately ten (10) river miles above Benton, in Saline County. This sample is qualitative only; no attempt was made to calculate the standing crop, or pounds per acre. The powdered rotenone (35 pounds) was introduced on a shoal and allowed to slowly sweep through the hole of water. The results are as follows:

SPECIES	NUMBER	POUNDS
Largemouth Bass	1	2.6
Smallmouth Bass	12	1.5
Spotted Bass	5	2.4
Rock Bass	18	7.9
Walleye (young-of-year)	6	0.8
Chain Pickerel	5	2.8
Flathead Catfish	5	22.2
Black Crappie	3	1.6
PREDATORS	55	41.9
Bluegill Sunfish	4	0.5
Longear Sunfish	18	1.9
Green Sunfish	14	1.8
Redhorse Suckers	93	65.4
Hog Suckers	8	6.8
Gizzard Shad	44	28.8
NON-PREDATORS	181	105.2
TOTAL POPULATION	236	147.1

*Discussion*

The largest predator was a 14-pound flathead catfish. The largest bass weighed 2.6 pounds. The population looked good at this point, except for the small size of the smallmouth bass. Reproduction of all species listed above was picked up, even though not specifically noted in the tabulation above. Forage fish in the form of shiners, log perch, brook silversides, and spottail minnows were plentiful. These smaller fish are hereby noted.

Fifty pounds of  $KMnO_4$  was used.

By: Bill Mathis

(Thirty (30) more pounds of game fish found after report was tabulated—fourteen (14) pounds being flathead catfish.)

Appendix XI

FISH POPULATION SAMPLE

Saline River—Grant and Cleveland Counties  
October 11, 1961

This sample was made near Lee's Ford, on the Grant-Cleveland County line. The rotenone, fifth (50) pounds, was introduced on a shoal and allowed to sweep through the deep hole. This was a qualitative sample, no attempt being made at arriving at a pounds per acre figure. The results are as follows:

SPECIES	NUMBER	POUNDS
Largemouth Bass	2	4.7
Spotted Bass	30	31.0
Rock Bass	2	1.0
Walleye	4	8.0
Chain Pickerel	3	3.5
Flathead Catfish	10	36.0
Channel Catfish	35	59.5
Black Crappie	2	0.5
<b>PREDATORS</b>	<b>88</b>	<b>144.2</b>
Bluegill Sunfish (young noted)	—	—
Longear Sunfish	2	0.5
Redhorse Suckers	104	136.0
Hog Suckers	2	0.5
Spotted Suckers	1	1.0
Drum	22	38.5
Gizzard Shad	120	30.0
<b>NON-PREDATORS</b>	<b>261</b>	<b>206.5</b>
<b>TOTAL POPULATION</b>	<b>349</b>	<b>350.7</b>

Again, we made no attempt to pick up the smaller forage species such as darters, shiners, log perch, madtoms, and young sunfish. These species were plentiful as forage and are hereby noted. The flathead catfish again was our biggest predator: one weighed 21 pounds. The predator population looked real good here, in spite of the pollution which was evident by much filamentous algae. Well spaced rainfall has reduced the effects of the pollution from the bauxite mines this past summer.

The river is beginning to take on the look of a bayou type stream, with drum being plentiful. We were surprised at the presence of rock bass this far south. We were also gratified at finding good walleye production, as well as largemouth and spotted bass.

Eighty pounds of  $KMnO_4$  was used.

By: Bill Mathis



Appendix XII  
 FISH POPULATION SAMPLE  
 Saline River—Bradley County  
 October 12, 1961

This sample was made near Hudspeth Landing, approximately ten (10) miles south of the Highway 4 crossing. Fifty pounds of rotenone was introduced into the upper end of a deep hole. The rotenone was distributed over about 0.5 acre because of the slow rate of flow. Again, a qualitative sample was made, although we could possibly have come close to a figure standing crop. The results are as follows:

SPECIES	NUMBER	POUNDS
Largemouth Bass	4	8.5
Spotted Bass	27	11.8
Rock Bass	3	0.7
Flathead Catfish	15	14.5
Channel Catfish	26	26.7
Walleye	13	6.3
Chain Pickerel	3	5.3
Shortnose Gar	6	6.3
Bowfin	1	5.6
Sauger (reproduction found)	—	—
<b>PREDATORS</b>	<b>100</b>	<b>85.7</b>
Bluegill Sunfish	2	0.8
Redear Sunfish	3	1.5
Longear Sunfish	40	4.0
Redhorse Suckers	45	50.1
Spotted Suckers	2	3.2
Smallmouth Buffalo	29	106.7
Bigmouth Buffalo	2	4.5
Gizzard Shad	113	72.0
Drum	134	126.7
<b>NON-PREDATORS</b>	<b>370</b>	<b>369.5</b>
<b>TOTAL POPULATION</b>	<b>470</b>	<b>455.2</b>

With the appearance of buffalo and bowfin, the river takes on the characteristics of a bayou. We did not know that rock bass lived this far south, but the gravel bottom in the Saline River could be just the habitat they like. The predator population is plentiful, but includes several undesirable species from a sport fish standpoint. The largest predators were a 5.6 pound walleye and a 5.6 pound bowfin. Reproduction, of all species listed above, was found.

Fifty pounds of  $KMnO_4$  was used.

By: Bill Mathis