

EFFECTS OF A FALL AND WINTER DRAWDOWN ON A FLOOD CONTROL LAKE

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ABSTRACT

Plans for a fall and winter drawdown (1955-56) were carried out on Nimrod, a turbid, flood control lake. The surface acreage was reduced from approximately 3,600 acres to 700 acres. Commercial fishermen removed over 200,000 pounds of rough fish most of which were smallmouth buffalo. Following the drawdown and subsequent filling, the water cleared up and remained clear. An increase in the number and size of young black bass and white bass was recorded with a resultant decrease in the number of young channel catfish, carp, drum and buffalo. Larger numbers of young sunfish and minnows were noted. The fish population, as tabulated by weight, showed a marked change in that the edible forage species (buffalo, drum, etc.) were reduced approximately one-half and the non-edible forage species (shad, minnows, etc.) were increased approximately three times. Boat dock operators reported improved sport fishing, especially for small white crappie.

INTRODUCTION

Nimrod Lake, located on the Fourche LaFave River in Arkansas, has a surface area of 3,500 acres at the conservation pool elevation. The dam was completed in 1942 by the Corps of Engineers, U. S. Army. The project is a unit in a plan to control floods in the Arkansas River basin.

During large floods the elevation of the lake's surface will vary between wide limits. However, such floods occur infrequently and the lake is quickly dewatered so that it more or less has a permanent shoreline demarcated by the growth of button bush, common willow and other shore and marsh plants.

When impounded, the lake furnished excellent fishing, and throughout Arkansas and surrounding areas was known as a bass, crappie and catfish lake. However, in recent years there has been considerable complaint that fishing success has fallen off and become more seasonal. This project was initiated to collect additional data and attempt to carry out possible conclusions and management plans derived from the investigation.

The data used herein were collected under Dingell-Johnson Project F-1-R. Project personnel who assisted in the field work were Messrs. Joe Hogan, Leroy Gray, Raymond Martin, Bruce Crawford and Robert Baker. Mr. Bruce Crawford also collected the records on the catch of the commercial fishermen. The Little Rock District, Corps of Engineers, U. S. Army cooperated with the Arkansas Game and Fish Commission in carrying out the drawdown.

PRE-DRAWDOWN INVESTIGATIONS

Data collected, from fish population sampling by the standard application of rotenone to selected areas during the summers from 1950 to 1955, were tabulated and analyzed. These records (and those of 1956) are summarized in Tables II and III and were used as a basis for subsequent studies and formulation of management plans. Definite changes in the fish population were observed to have taken place during this time.

These comparative samples showed that there was little change in the fish population as tabulated by weight from 1950 to 1952. However, after 1952 the population changed in that there was slightly less poundage in predator fish and considerably less poundage in non-edible forage species. The species listed as edible forage species had increased three to four times in total weight by 1955. Increases in the poundage of buffalo fishes and drum accounted for this change (Table III, years 1950 through 1955).

Marginal test seining and test netting as well as fish population samples obtained by the use of rotenone in coves (Table IV) indicated that there was a high survival of young buffalo in 1951, 1952 and 1953. Rotenone samples in

1955 showed a reduction in young white bass and buffalo and an increase in young drum, channel catfish and white crappie. There were quite a few young largemouth bass present in 1955 but they were extremely small and there were very few forage fishes present small enough for them to feed upon. The water was very muddy in 1955 (colloidal turbidity) the same as it had been for several years. Secchi's disk readings ranged from 4 to 12 inches.

MANAGEMENT PLAN

Controlled fluctuation of the water level below the conservation pool elevation and intensive commercial fishing seemed to be the most feasible and orthodox method of reducing the poundage of buffalo and drum and invigorating the game fish population. A three-year management plan was set up in cooperation with the Little Rock District, Corps of Engineers, U. S. Army, on an annual basis. The plan was simple. Starting about October 1, 1955, the lake was to be lowered at the rate of 0.25 feet per day until the fish were thought sufficiently concentrated to affect commercial harvest and predation. The drawdown was stopped December 1, 1955 when the surface level was 12 feet below the elevation of the conservation pool. At this level the lake contained approximately 700 acres of water. The existing fish population was concentrated into one-fifth the normal lake area.

RESULTS OBTAINED DURING AND FOLLOWING DRAWDOWN

While the lake was being lowered, legally licensed commercial fishermen, using large mesh legal tackle (gill and trammel nets, 3.0 inches bar mesh) were encouraged to harvest the commercial species (Table I and Figure 1).

TABLE I
TOTAL CATCH RECORDED DURING DRAWDOWN OF LAKE NIMROD—1955-56

	<i>No. of Fish</i>	<i>Weight in Pounds</i>
<i>Commercial Food Fishes:</i>		
Mostly smallmouth buffalo.....	36,077	188,045
Gar	1,908	16,514
	37,985	204,559
<i>Game Fish Caught and Released:</i>		
Crappie	2,401	Esti. 4,802
White bass	173	" 346
Largemouth bass	9	" 45
	2,583	Esti. 5,193

There were approximately 37,985 rough fish caught weighing 204,559 pounds. These fish were sold for food by the commercial fishermen. Some of the gar were purchased by the Arkansas Game and Fish Commission for experimental feeding at the Lonoke Fish Hatchery. Those that were not utilized were destroyed. There were approximately 2,583 game fish caught weighing an estimated 5,193 pounds. The law required that these fish be returned unharmed to the water.

A total of 58 pounds of fish per acre of conservation pool was removed from Lake Nimrod during the drawdown. Game fish caught by commercial tackle and released amounted to less than seven per cent by number and two and one-half per cent by weight of the total fish caught. During the month of December, after the water level had been dropped from 342 feet m.s.l. to 330 feet m.s.l., the lake remained stable at the low elevation and over 85,000 pounds of commercial species were harvested (Figure 1).

Fish population samples conducted in August, 1956, following the fall and winter drawdown of 1955-56, show some interesting changes in the fish population (Tables II, III and IV).

TOTAL POUNDS OF FISH CAUGHT EACH MONTH

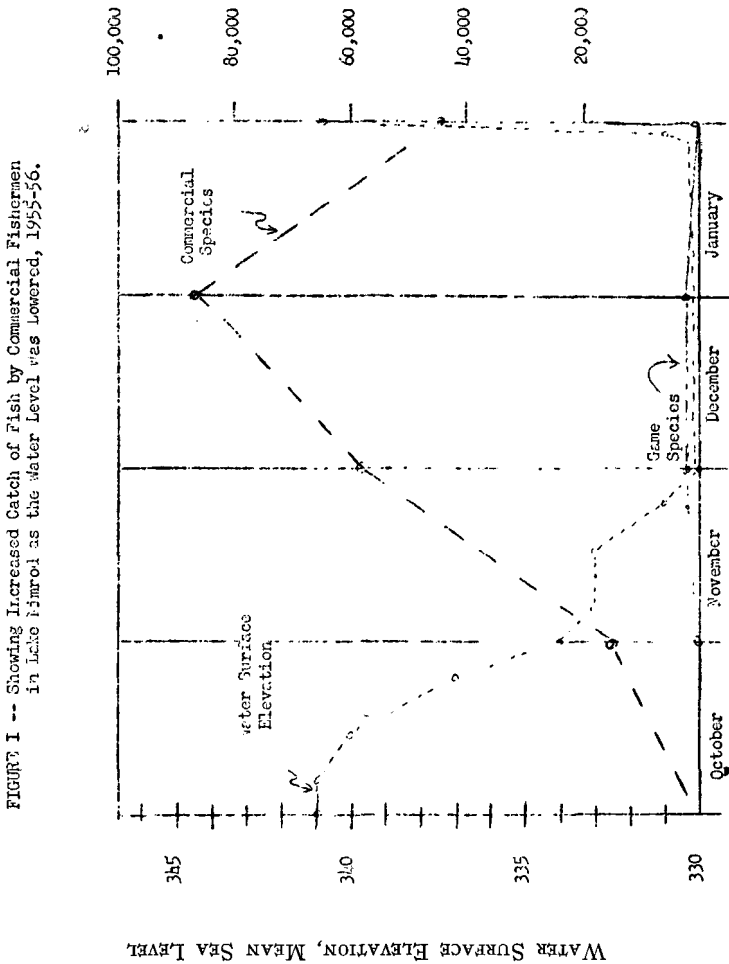


TABLE II
 SHOWING THE TREND IN THE COMPOSITION OF THE FISH POPULATION OF NIMROD LAKE ACCORDING TO WEIGHT, FROM THE YEAR 1950 TO 1955 AND THE CHANGE FOLLOWING THE FALL AND WINTER DRAWDOWN OF 1955-56. FISHES PRESENT SEPARATED IN THREE CATEGORIES

Year	Predator Population	Percentage by Weight		Total
		Edible Forage Species	Non-Edible Forage Species	
1956	19.66	29.74	50.61	100.01
Drawdown				
1955	24.78	61.73	13.49	100.00
1952	36.46	14.49	49.04	99.99
1951	37.10	12.80	50.10	100.00
1950	27.10	27.90	45.00	100.00

Following the drawdown and the removal of 58 pounds of rough fish per acre of conservation pool the predator population by weight showed a slight decrease while the edible forage species were reduced over one-half. The non-edible forage species showed a gain of approximately three times over the 1955 population.

TABLE III
SHOWING THE INCREASE IN THE NUMBER OF BUFFALO, GAR AND DRUM IN THE FISH POPULATION OF NIMROD LAKE, ACCORDING TO WEIGHT, FROM THE YEAR 1950 TO 1955 AND THE DECREASE FOLLOWING THE DRAWDOWN OF 1955-56

Year	Buffalo	Percentage by Weight		Total
		Gar	Drum	
1956	8.06	4.01	9.19	21.26
	Drawdown			
1955	15.8	7.0	25.1	47.9
1952	1.8	2.5	1.1	5.4
1951	5.7	3.5	1.5	10.7
1950	0.0	0.0	5.1	5.1

Buffalo, gar and drum made up nearly one-half of the weight of all fish collected in 1955 as compared to only 5.4 per cent in 1952, 10.7 per cent in 1951 and 5.1 per cent in 1950. In 1956, following the drawdown, each species showed a reduction in percentage of total weight to approximately one-half of the 1955 percentages.

An examination of the numbers of young-of-year fish obtained in the rotenone sampling shows a good survival of young black bass and white bass. No young drum or buffalo were collected. Table IV lists the young-of-year fish collections before and after the drawdown.

TABLE IV
THE NUMBER OF YOUNG-OF-YEAR BLACK BASS, WHITE BASS, CRAPPIE, CHANNEL CATFISH, DRUM AND BUFFALO COLLECTED PER ACRE IN COMPARATIVE POPULATION SAMPLES CONDUCTED IN COVES USING ROTENONE FROM 1950 THROUGH 1956

Year	Black Bass*	White Bass	Crappie**	Channel Catfish	Drum	Buffalo
1956	213	107	420	6	0	0
	Drawdown					
1955	191	5	651	53	115	0
1952	117	78	352	28	0	53
1951	51	47	27	0	11	20
1950	***	0	60	0	8	0

DISCUSSION

Fall and winter drawdowns can undoubtedly play a great part in the welfare of certain desirable species and also affect angling success. Many of the larger impoundments may not lend themselves readily to such a management program due to their multiple-purpose functions. Since Lake Nimrod was created primarily to serve as a flood control reservoir, lowering the water level did not involve loss of some other beneficial use.

Pre-drawdown data indicated an abundance of rough fish and relatively few game fish except white crappie. Post-drawdown data, of the first summer, show a change in the fish population towards a higher relative number of desirable species. There was an increase in the size and number of young-of-year black bass and white bass. No young drum, buffalo or carp were collected.

In the summer of 1955 the young black bass were among the smallest fish in the lake and very few forage fish were small enough for them to feed upon. It is believed that over-winter survival of these small bass was limited. Very few yearling bass were collected in the 1956 samples. The fact that there was

* Includes a few spotted black bass but mostly largemouth black bass.
** Mostly white crappie.
*** Young bass recorded as "heavy" but no count given.

an abundance of fry sunfish and minnows small enough for the young black bass and white bass to feed upon this year leads us to expect much greater survival of these predators.

The water cleared up and remained clear all year. Secchi's disk readings ranged from 3 to 4 feet as compared to 4 to 12 inches last year. Evidently the bottom muds solidified when they dried out and cracked open. The large cracks can still be found on the bottom of the lake even after being covered with water for several months.

During and following the drawdown period, the harvest of fish was highly successful. Not only was the harvest of commercial fish profitable to commercial fishermen but boat dock operators and sportsmen reported that off season (summer) fishing was noticeably improved over recent years, especially for small crappie.

SUMMARY AND CONCLUSION

The drawdown resulted in: (1) the harvest of 200,000 pounds of commercial food fishes and gar, (2) marked changes in the fish population as tabulated by weight, (3) higher survival of young black bass and white bass, (4) the clearing of the water, and (5) better spawning and survival conditions for sunfishes and minnows.

The faster growth of the young bass was probably due to the clearer water and abundance of young sunfish and minnows. The survival of these bass is expected to exceed anything that has taken place in the last few years.

Following the drawdown it was expected that all species of fish would spawn heavily and high survival of young would result. However, survival of young carp, drum, buffalo and channel catfish was evidently very small. The reason for this could possibly be, that, due to the clearer water, predation on these species was very effective.

In order to fully determine the value of a drawdown in the management of this lake, it will have to be continued at least two more years.

PANEL DISCUSSION—FISHERIES MANAGEMENT PROBLEMS IN LARGE IMPOUNDMENTS

Chairman: ANDREW H. HULSEY, Arkansas Game and Fish Commission; ELLIS R. CARTER, Kentucky Department of Fish and Wildlife Resources; CARLOS M. FETTEROLF, JR., Tennessee Game and Fish Commission; DAVID N. GRAVES, Corps of Engineers, U. S. Army; W. H. IRWIN, Oklahoma A. and M. College.

Mr. Graves discussed how cooperative fisheries management programs could be initiated on Corps of Engineers projects. If management proposed conflicted with the approved plan of operation, authority from Congress would have to be obtained. In the discussion it was brought out that provision for recognizing fishery management should be incorporated into the preliminary plans for impoundments and should receive recognition in the final plans that are approved by Congress.

Mr. Carter discussed the use of rotenone for selective poisoning of gizzard shad. He described the tremendous reproduction by this species that follows a reduction in the population. To date follow-up operations have been necessary to control this reproduction. The possibility of using fingerling bass to control the shad reproduction following a selective poisoning operation was brought up.

Dr. Irwin discussed the proposal that a larger harvest of both sport and commercial species is needed from large impoundments. He pointed out that in order for fishery management aspects to be considered in plans for impoundments it would have to be shown that the benefits to be derived would offset the costs. Harvesting basins, seining areas, provisions for drawdowns, etc., are all possible if it is shown that the cost will be offset by the benefits derived.

Mr. Fetterolf reviewed the experiences of Tennessee in the use of introductions in the management of large impoundments in that state. The thought