AN EVALUATION OF PRESTOCKING CHECKS CONDUCTED BY FISHERY BIOLOGISTS IN ALABAMA PONDS

H. D. KELLY
Alabama Department of Conservation
Division of Game and Fish
Montgomery, Alabama

ABSTRACT

In its attempt to provide more and better fishing in the State, the Fisheries Section of the Alabama Department of Conservation initiated a program whereby fishery biologists would check all ponds before they were stocked with hatchery fish. Attempts were made to contact each pond owner, check the pond in his presence, and advise him of the proper methods of stocking and management which have resulted from fisheries research in Alabama.

A total of 845 ponds were checked in 14 counties in east-central Alabama during the period of September 1955 through September 1959. Of the 845 ponds checked, 766 were approved and stocked while 79 were disapproved for various reasons.

Balance checks were conducted in 114 of the approved ponds during the first year of fishing. These checks revealed that 81 ponds were in balance, 10 were crowded with bass, 20 were overpopulated with bluegills and 3 were unbalanced because of large populations of undesirable fish. Collectively, 80 per cent of the 114 ponds checked were successful and indicates that a high percentage of successful ponds can be realized from prestocking check programs as opposed to stocking ponds without such programs.

INTRODUCTION

The past two decades in the Southeast have produced tremendous advances in the construction of ponds and the propagation and management of warm-water fish populations in these ponds.

At one time, the construction of ponds was a "hit or miss" proposition. In reality, ponds are nothing more than earthen vessels designed to collect and retain water. A suitable pond site is one in which the topography of the land can be economically converted into a pond, the underlying soil formation is capable of retaining water, and the water supply provides an adequate but not an excessive amount of water. These basic considerations combined with the proper construction of the dam and spillway, installation of suitable overflow and drainage devices, and deepening of pond margins greatly enhance the possibilities of the pond successfully holding water and creating suitable environments for the production of desirable fish populations (Lawrence, 1949).

Geologically speaking, ponds are short-lived. Consequently, there was no evolution of a pondfish. Therefore, the proper stocking of ponds for many years was as much of a problem as was the proper construction of ponds. Many species of stream fish were tried in various combinations (Swingle 1949). This research revealed that there are three species of stream fish which when used in combinations will produce desirable populations in most ponds in the Southeast (Swingle 1949, 1951). The bluegill, *Lepomis macrochirus*, and the largemouth bass, *Micropterus salmoides*, or a combination of the bluegill and the redear sunfish, *Lepomis microlophus*, with the largemouth bass will create a population of fish producing successive annual crops of harvestable fish when stocked in the proper ratio and managed. Fish populations of this nature were described by Swingle (1950) as "balanced populations" and are unique in that the addition of fish is never required unless fish kills occur or there is inadequate bass reproduction.

Paralleling the advancement of methods of pond construction and the development of stocking combinations of fishes was the development of the use of inorganic fertilizers in the management of ponds.

In the Southeast, most ponds will become heavily infested with many species of undesirable aquatic plants as a result of ecological successions. The growth of these plants must be prevented in ponds stocked to create

high sustained yields of fish or population failure will result. These plant masses reduce the effective predatory action of the largemouth bass necessary in maintaining balanced populations, utilize nutrients in the water, and prevent fishermen from removing adequately the harvestable crop of fish present (Swingle 1945, 1952). With the periodic applications of an inorganic fertilizer having an 8-8-2 analysis, a dense phytoplankton population is created which shades the bottom of properly constructed ponds and will prevent the growth of submerged and emergent aquatic plants (Smith and Swingle 1941, 1942), (Swingle and Smith 1947).

A simultaneous and equally important benefit derived from the use of fertilizer in the management of ponds is the increase in the weight of fish supported by the pond. The phytoplankton population which shades the bottom of the pond and prevents the growth of certain aquatic plants is the foundation upon which an immense population of fish food organisms is built thereby increasing the weight of fish the pond can support (Smith and Swingle, 1939). Unfertilized ponds in Alabama will support from 40 to 200 pounds of fish per acre depending upon the fertility of the watershed. Fertilization can be expected to increase these figures to 400 or 600 pounds of fish per acre (Swingle and Smith, 1947). The annual catch of fish from unfertilized ponds varied from 5 to 40 pounds per acre. The annual catch from fertilized ponds varied from 150 to 300 pounds with an annual average of 200 pounds per acre per year (Swingle, 1952).

The utilization of the principles involved in fertilization of ponds and the accompanying results of increased fish production are exemplified in Alabama's public fishing lake program. These state-owned and managed lakes were constructed by the Alabama Department of Conservation to provide fishing in those areas of Alabama having insufficient fishing waters. The lakes were stocked with bluegill, redear, and largemouth bass within the limits required for balance as suggested by Swingle (1949, 1951, 1952). When subjected to heavy fishing pressure and opened daily from daylight to dark over a five-year period, 11 lakes with a total of 591 acres in Alabama provided an annual average catch per acre of 642 fish weighing 180.9 pounds (Byrd and Moss, 1956). Twelve state-owned and managed lakes containing 841 acres and opened daily from daylight to dark over an eight-year period yielded an annual average harvest by fishermen of 174.2 pounds of fish per acre (Byrd, 1959). Such data substantiate without doubt that large annual harvests of fish can be realized from ponds and lakes which are properly constructed, stocked and managed to maintain balanced fish populations.

Although the advancements made in the construction, stocking, and management of ponds have been significant, there are several factors that can cause or contribute to population failures even where proper stocking procedures are used. Fish present in the pond before the stocking of hatchery fish, adding fish before and/or after hatchery fish are stocked, high mortality of hatchery fish after they are stocked, and removal of the largemouth bass before they have spawned for the first time are common causes of population failures (Swingle, 1952). The migration of fish into ponds, both before and/or after adding hatchery fish has caused population failures (Moss and Hester, 1956). In Kentucky, Hall (1958) reported that 22 per cent of the ponds in a largemouth-bass-bluegill study and 60 per cent of the ponds in a largemouth bass-shellcracker study had to be discontinued because of the invasion of the ponds by other fish. Hall (1958) also reported that many ponds in Kentucky were incorrectly stocked because of the erroneous acreages reported on fish applications and that this contributed to pond failures in some instances. Moss and Hester (1956) found that 13 percent of the ponds they checked had been improperly stocked because of errors involved in acreages reported on fish applications. Therefore, in an attempt to provide better service to the people of Alabama and as part of its program to provide more and better fishing in the State, the Fisheries Section of the Alabama Department of Conservation decided that biologists would check all ponds before they were stocked with fish. Attempts were made to contact each pond owner, check the pond in his presence prior to approving the application to determine how many of the conditions discussed as causing unbalanced populations were present. The pond owner was advised of the proper methods of stocking and management which have resulted from fisheries research in Alabama.

This paper summarizes the results of prestocking checks of 845 ponds during the period of September 1955 through September 1959 and first year balance checks conducted in 114 ponds during the summers of 1958 and 1959.

PROCEDURE

The area of this investigation comprised fourteen counties in east-central Alabama. Field assistance was supplied by college students employed during the summer, Conservation Officers, and U. S. Soil Conservation Service personnel. All fish applications in this area were forwarded to the fishery biologist during this study. The biologist upon receipt of the application informed the applicant that his pond would be visited prior to stocking. The ponds were stocked with a bluegill-redear sunfish combination between October 1 and March 1. Largemouth bass fingerlings were delivered in April or May. When the pond owners indicated that they would fertilize properly, the ponds were stocked with 1000 bluegills and redear sunfish fingerlings (approximately 85 per cent bluegills and 15 per cent redear sunfish) and 100 largemouth bass fingerlings per surface acre. These rates of stocking were within the limits for balanced fish populations described by Swingle (1949, 1951, 1952).

If ponds were found to contain fish, it was explained to the owner why such fish should and must be removed before the addition of hatchery fish could be approved. To eliminate any fish found in a pond, the owner was advised to drain as much of the water from the pond as possible, close the valve and treat any remaining water in the lake and watershed area with Cubè powder containing 5 per cent rotenone (hereafter referred to in this paper as renovation). It was recommended that the Cubè compound be applied in such a manner as to yield an effective concentration of a minimum of 2 ppm of the formulation. All pond owners needing to renovate their ponds were given literature by the biologist instructing them as to how much of the compound to use, how to mix the compound with water, and how to apply it most effectively.

The fish application for a pond found to contain fish was not approved until notification was received from the pond owner that the pond had been renovated.

Occasionally, ponds were found that would not retain water. These applications were not approved until notification was received that the leak had been repaired and that the pond was suitable for stocking.

No particular ponds of the precheck group were selected for the first-year balance checks. But as time permitted, visits were made to ponds in the summers of 1958 and 1959 to determine the conditions of the fish populations. All ponds were checked for balance by the method described by Swingle (1945, 1956) and classified as to degree of balance as suggested by Swingle (1950, 1956). Basically, all ponds were considered to be either successful or unsuccessful. The successful ponds were those whose populations were found to be in balance or crowded with bass. The unsuccessful ponds were those which were found to be over-populated with bluegills or were crowded with populations of other species of fish.

Results and Discussion

PRESTOCKING CHECKS

During the period of September 1955 through September 1959, a total of 845 ponds was checked prior to stocking with hatchery fish. The owners of 843 ponds stated they planned to fertilize according to recommendations. Of the 845 ponds checked, 91 per cent were approved for stocking. For 55 per cent of the 845 ponds checked, the acreage reported on the applications was incorrect. The acreage of 4 per cent of the ponds had been underestimated, while that of 51 per cent had been overestimated. Of the 433 ponds whose acreage had been overestimated, 34 per cent had reported acreages with at last twice the true value. If the adjusted ponds had been stocked at the reported acreages, a high percentage of failures would have resulted. A total of 147 ponds would have received at least twice the recommended number of fish. The actual acreages were obtained from Soil Conservation Service personnel, from engineering surveys, or were estimated by pacing.

Fifty-one percent of the approved ponds required acreage adjustments. The total reported acreage of approved ponds was 3,403.2. The total adjusted acreage was 2,964.8 (Table 1). Of the 766 ponds approved,

7 percent required renovation and 15 percent were reported as being renovated prior to the check. Therefore, 169 ponds were renovated prior to stocking.

TABLE 1.

SUMMARY OF ACREAGE ADJUSTMENTS OF 845 PONDS CHECKED PRIOR TO STOCKING WITH HATCHERY FISH IN ALABAMA DURING THE PERIOD SEPTEMBER 1955 THROUGH SEPTEMBER 1959.

	Number	*Reported Acreage*	*Adjusted Acreage*	*Acres Difference*
Ponds Approved	766	3,403.2	2,964.8	438.4
Ponds Disapproved	79	250.2	206.5	43.7
Total	845	3,653.4	3,171.3	482.1

At the end of this study, 79 ponds containing 206.5 acres, or 9 percent of the 845 ponds checked, had not been approved. Forty-four of those ponds contained populations of bluegills and/or green sunfish, *Lepomis cyanellus*, and no report had been received from the pond owners that the ponds had been renovated. Nine of the ponds were found to have serious leaks and no report had been made by the owners that those conditions had been corrected.

Nineteen of the 79 ponds not approved for stocking were found to be too small. The success of the stocking combinations used in Alabama are dependent to a great extent upon the number of largemouth bass fingerlings surviving after they are added from the hatchery. With a stocking rate of 50 to 100 largemouth bass fingerlings per acre and an expected mortality of approximately 30 per cent the first year, the stocking of unfertilized ponds less than 0.5 acre and fertilized ponds of less than 0.25 acre cannot be recommended. (Swingle, 1949).

Of the seven remaining ponds, four owners requested that their applications be cancelled, two ponds were found to contain balanced populations, and one was an unmanageable beaver pond.

POPULATION CONDITIONS OF 114 PONDS AS DETERMINED DURING THE FIRST YEAR OF FISHING

Of the 766 ponds approved and stocked, a total of 126 or 16 per cent were checked during the first year of fishing to determine the condition of the fish populations. The first year of fishing should begin approximately one year after the largemouth bass fingerlings are added to the pond to prevent the stagnation of the fish population (Swingle and Smith, 1947). Of the 126 ponds visited, 114 were usable. Eighty-one of the 114 ponds were in balance, 10 were crowded with bass, 21 were overpopulated with bluegills, and three were unbalanced because of large populations of other species of fish (Figure 1).

Ponds in balance—Twenty-four of the 81 ponds in balance were renovated prior to the stocking of hatchery fish (Table 2). Of the 24 renovated ponds, three were built below old ponds containing fish populations. None of the 57 ponds which did not require renovation were built below old ponds. The ponds were either dry prior to impoundment or seining did not reveal the presence of fish at the time of the prestocking check.

Crowded bass ponds—Of the 10 ponds found to be crowded with bass, three were renovated prior to stocking with hatchery fish. There were no old ponds above any of these ponds.

Overpopulated bluegill ponds—Of the 20 overpopulated bluegill ponds, four had been renovated prior to stocking with hatchery fish. One of the renovated ponds was built below an old pond which overflowed very heavily during seasonal rains. The cause of unbalance in the remaining three ponds was not determined. Also, the causes of unbalance in 9 of the 16 ponds not renovated prior to stocking were not determined. However, of the remaining overpopulated bluegill ponds, the principal reasons suspected as causing the unbalance condition were: (1) two ponds had severely fluctuating water levels, (2) one pond did not fill the first year, (3) one pond had large numbers of bass removed before they had spawned, and (4) migration of fish from old ponds downstream into three ponds.

Ponds crowded with other species of fish—Of the three ponds found to be unbalanced because of large populations of other species of fish, two

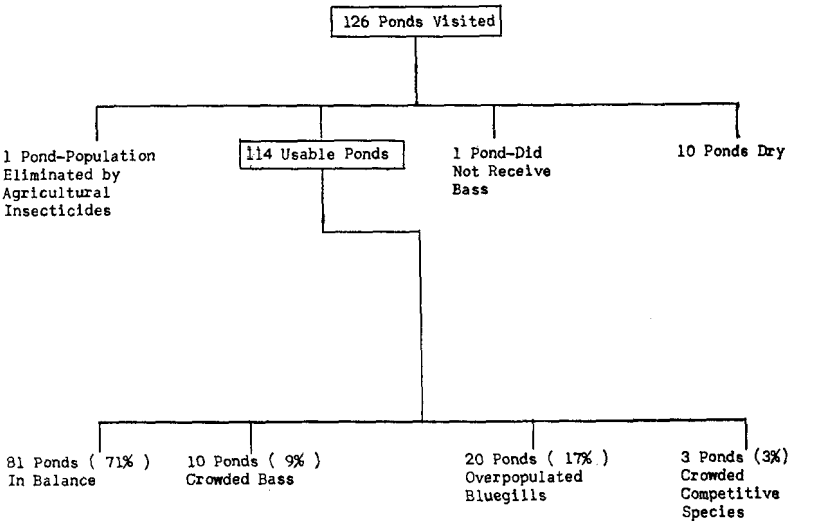

Figure 1. Balance conditions of 114 farm fish ponds in Alabama as determined during the first year of fishing.

had been renovated prior to stocking. In both instances the suspected cause of unbalance was an inadequate renovation program. In one pond the crowding species was the yellow bullhead, *Ictaluris natalis*, and in the other pond the green sunfish. In the remaining pond, the owner reported that an unknown number of adult bullheads, *Ictaluris* sp., was added the first spring the pond was impounded and apparently spawned very heavily that year. The largemouth bass fingerlings stocked were too small to prey on the bullhead spawn, and this resulted in a high survival of young bullheads.

FERTILIZATION

All but one pond owner of the 114 usable ponds checked had indicated on their fish applications that the ponds to be stocked would be fertilized as recommended. Information on proper fertilization techniques had been made available to the pond owners through correspondence and personal contact. The number of applications of fertilizer required for any pond will vary from year to year, depending upon the fertility of the watershed, the amount of excessive water leaving the pond, and the amount of flood water the pond is subjected to from time to time. The number of applications of 100 pounds of 8-8-2 or its equivalent per acre could vary from 8 to 14 per year (Swingle and Smith, 1947). Therefore, in this study, a total of 8 applications or more per year was considered adequate. Of the 114 ponds checked for balance, 54 or 47 per cent had received from 0 to 4 applications of fertilizer; 28 ponds or 25 per cent had received from 5 to 10 applications; and 32 ponds or 28 per cent had received from 11 to 15 applications (Table 3). Any evaluation of the effects of the erratic fertilization programs on population balance in this study would be questionable because of such unknowns as mortalities in the fish populations, addition of fish to the ponds, poaching prior to bass spawning, and mortalities of hatchery fish after they were added.

Despite the troubles experienced, the high percentage of successful ponds emphasize the value of fishery biologists checking ponds prior to stocking with hatchery fish. Moss and Hester (1956) reported that only 59 per cent of 82 ponds not checked prior to stocking were successful. Even when comparisons of successful and unsuccessful ponds in this study are made on a 2-year basis, in which the balance checks were made, the relatively consistent percentages indicate a trend of uniform results from prestocking checks (Figure 2). The 79 ponds visited during the summer of 1958 was 30 percent of the ponds stocked during the period of October 1956 through May 1957, and the 47 ponds visited during the summer of

TABLE 2.

BALANCE CONDITIONS FOUND DURING FIRST YEAR FISHING CHECKS OF 114 FARM FISH PONDS IN ALABAMA THAT REQUIRED TREATMENT[1] OR DID NOT REQUIRE TREATMENT TO ELIMINATE FISH PRESENT PRIOR TO STOCKING WITH HATCHERY FISH.

	In balance	*Crowded bass*	*Overpopulated bluegills*	*Crowded Competitive species*	*Total ponds*
Ponds treated prior to stocking	24	3	4	2	33
Ponds not treated prior to stocking[2]	57	7	16	1	81
Totals	81	10	20	3	114

[1] The treatment consisted of applying 2ppm Cubè powder containing 5% rotenone to all water in the pond and watershed area after construction was completed.

[2] These ponds and their watershed area were dry prior to impoundment and/or fish could not be found in them by seining prior to stocking.

TABLE 3.

BALANCE CONDITIONS AND FERTILIZATION RECORDS OF 114 FARM FISH PONDS IN ALABAMA AS DETERMINED DURING THE FIRST YEAR OF FISHING[1]

Balance Condition	*Number of Fertilizer applications*[2] *0-4*	*5-10*	*11-15*	*Total*
Successful ponds:				
in balance	43[3]	14	24	81
crowded bass	1	7	2	10
Unsuccessful ponds:				
overpopulated bluegills	10	5	5	20
competitive species		2	1	3
Totals	54	28	32	114

[1] First year of fishing began one year after bass fingerlings were added from the hatchery.

[2] One application of fertilizer consisted of 100 pounds of an 8-8-2 analysis or its equivalent per surface acre of water.

[3] One pond was not to be fertilized and it was stocked at an unfertilized rate.

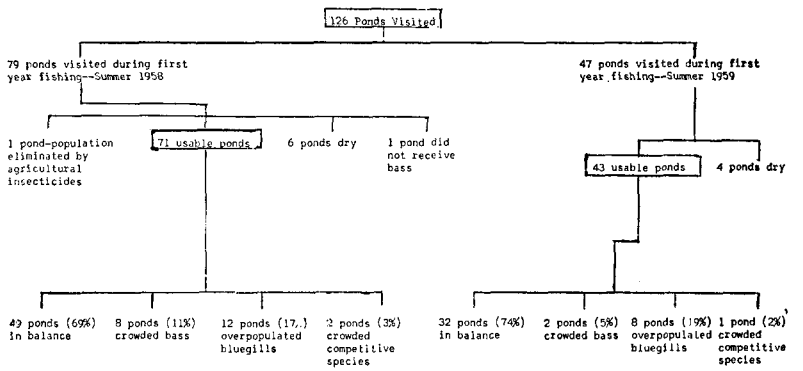

Figure 2. Balance conditions of 114 fish ponds in Alabama as determined during the first year of fishing in a two-year period.

1959 was 18 percent of the ponds stocked during the period of October 1957 through May 1958.

LITERATURE CITED

Byrd, I. B. 1959. Angling success and seasonal distribution of catch in Alabama's state-owned public fishing lakes. N. Am. Wildl. Conf., 24: 225-237.

Byrd, I. B., and D. D. Moss. 1956. The production and management of Alabama's state-owned public fishing lakes. Trans. Am. Fish Soc. (1955), 85:208-216.

Hall, John F. 1958. Final report on the success of largemouth bass-bluegill and largemouth bass-shellcracker rates and ratios in Kentucky farm ponds. Proc. Southeastern Assoc. of Game and Fish Comm., pp. 91-116.

Lawrence, J. M. 1949. Construction of farm fish ponds. Ala. Poly, Inst. Agr. Exp. Sta. Cir. 95, 55 pp.

Moss, D. D. and J. M. Hester. 1956. Farm pond investigations in Alabama. Prog. Fish-Culturist, 18:4, 171-177.

Smith, E. V. and H. S. Swingle. 1939. The relationship between plankton production and fish production in ponds. Trans. Am. Fish Soc., 68 (1938): 309-315.

1941. The use of fertilizer for controlling the pond weed, *Najas guadalupensis*. Trans. N. Am. Wildl. Conf., 6:245-251.

1942. The use of fertilizer for controlling several submerged aquatic plants in ponds. Trans. Am. Fish. Soc. Vol. 71 (1951) pp. 94-101.

Swingle, H. S. 1945. Improvement of fishing in old ponds. Trans. N. Am. Wildl. Conf., 10: 299-308.
1949. Some recent developments in pond management. Trans. N. Am. Wildl. Conf. 14: 295-312.
1950. Relationships and dynamics of balanced and unbalanced fish populations. Ala. Poly. Inst. Agr. Exp. Sta. Bull. 274, 74 pp.
1951. Experiments with various rates of stocking bluegills, *Lepomis macrochirus* Rafinesque, and largemouth bass, *Micropterus salmoides* (Lacepede), in ponds. Trans. Am. Fish. Soc., Col. 80 (1950) pp. 218-230.
1952. Farm pond investigations in Ala. Journ. Wildl. Mgt., Vol. 16, No. 3, pp. 243-249.
1956. Determination of balance in farm fish ponds. Trans. N. Am. Wildl. Conf., 21: 298-322.
Swingle, H. S. and E. V. Smith. 1947. Management of farm fish ponds. Ala. Poly. Inst. Agr. Exp. Sta. Bull. 254, 30 pp.

THE EFFECT OF BLACK BULLHEAD CATFISH AND BLUEGILL REMOVALS ON THE FISH POPULATION OF A SMALL LAKE

[1] *Contribution No. 80 of the Oklahoma Fishery Research Laboratory, a cooperative unit of the Oklahoma Department of Wildlife Conservation and the University of Oklahoma.*

ALFRED HOUSER AND BOB GRINSTEAD
Oklahoma Fishery Research Laboratory

ABSTRACT

The effect of removing various amounts of bluegill and black bullhead catfish from a small lake on the remaining fishes were studied. Estimates of population size by mark and recapture, numbers of desirable size fish, condition indexes and age and growth rates reveal some improvement in certain species but it was concluded that removals alone may not always produce greatly improved fish populations.

INTRODUCTION

An attempt was made to determine the effects of removing various amounts of fish upon the remaining population of a small lake in southern Oklahoma.

The reduction of overcrowded populations in small lakes and ponds has previously been demonstrated to be beneficial for improving growth rates and proposed as a means for restoring a better balance between desirable and less desirable species.

The Ardmore Rod and Gun Club South Lake was treated with rotenone in 1955 to reduce the excessive populations of gizzard shad and carp. A partial-kill treatment eradicated both species. Population statistics on that date were reported by Jenkins in 1955 in a study of the effect of gizzard shad on the population. From that date through 1960 continued studies have been conducted for the purpose of observing further population changes.

During the summer study of 1958 it became evident that large populations of black bullhead catfish *(Ictalurus melas)* and bluegill *(Lepomis machrochirus)* had developed. Since neither species was considered desirable and few were ever harvested by the club members, it was agreed that both would be removed during subsequent studies. Mark and recapture estimates of population size were conducted in 1958, 1959 and 1960 when various amounts of both species were removed.

Ardmore Rod and Gun Club South Lake was constructed in 1896 for recreational purposes. It has an area of 17.24 acres and a capacity of 111.9 acre feet when full. It has a maximum depth of 18 feet (Figure 1). Cattails and bulrush surround the lake in shallow water. *Ceratophyllum demersum* and *chara sp.* occur in dense growth to a depth of 8 feet. The water is clear and the lake has a smooth mud bottom.