Bacterial diseases are more prevalent in the spring and early summer and decrease in fall-winter. Parasitic cases are more frequent in spring and fall with approximately 61 percent of the cases occurring from April to September. During periods when disease potential is highest it would be advantageous to the fish farmer or pond owner to practice good pond management. To reduce the frequency and severity of disease outbreaks prophylactic treatments should be used when handling fish, good water quality should be maintained, and the fish should be observed closely for signs of stress.

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SURVEY OF SUCCESS AND OWNER MANAGEMENT OF NORTH ALABAMA PONDS ONE ACRE AND LESS IN SIZE

by

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ABSTRACT

To determine the extent of pond owner management and the condition of balance of the fish population during the first 2 years of fishing in small ponds, 40 ponds were randomly selected for study from 150 ponds 1.0 acre or less in size stocked in the 1971-72 stocking season. Only five ponds contained balanced fish populations both study years. Primary factors affecting fish population balance were fertilization, livestock utilization, competitive species, severe water level reduction or complete loss of water, and fish kills. Proper pond management was not practiced by most pond owners in the study.

INTRODUCTION

In 1951, the Fisheries Section of the Game and Fish Division, Alabama Department of Conservation and Natural Resources, was organized and furnished technical advice on construction and management of ponds including fish population analysis where requested (Alabama Department of Conservation, 1952). Fisheries biologists began visiting ponds prior to the stocking of hatchery fish in 1955 (Kelly, 1961). Kelly's study demonstrated that these prestock visits to the ponds and discussions of pond management with the owners increased the chances of the fish populations attaining a balanced condition as described by Swingle (1950). Swingle (1949) stated that unfertilized ponds less than 0.5 acre and fertilized ponds less than 0.25 acre are too small to insure good results with the bass-bluegill combination. Hooper (1970) reaffirmed Swingle's findings in a study of 33 ponds in Alabama with a surface area of 0.25 acre or less. In recent years, observations by fisheries biologists indicate that ponds 1.0 acre or less in size, constructed for purposes other than fishing, such as stock

watering and irrigation, fail to provide satisfactory fishing. It appears that fish are requested for many of these ponds only because they are free. In such cases, it is difficult for the biologist to interest the pond owner in good management practices.

Pond construction in Alabama is directly related to Federal financial assistance. In 1973, cost-sharing funds were not appropriated for the Rural Environmental Assistance Program of the Agricultural Stabilization and Conservation Service Program. However, funds were provided in 1974. Funds must be appropriated annually by Congress; however, the President can impound the funds from year to year. The possibility exists that the program could be terminated completely. Local ASCS personnel felt that if these funds are reduced or eliminated, the average size of excavated ponds would be reduced and the number of earthen dam ponds would decline.

Since improper management techniques are often reported on small ponds and the possibility of increased small pond construction exists, it was the objective of this study to determine the extent of pond owner management and the condition of the fish populations during the first 2 years of fishing in ponds with a surface area of 1.0 acre or less.

METHODS AND MATERIALS

From September, 1971, through February, 1972, prestock checks were conducted in 12 North Alabama counties on 283 ponds for which applications for fish had been received. During the prestock check, the correct pond size and presence of wild fish, if any, were determined. The owner, whose presence was required, was advised of proper pond management techniques including fertilization and the time to begin fishing. He was cautioned against stocking wild fish. If requested, the correct stocking rate for channel catfish *(Ictalurus punctatus)* was recommended (100/acre). The owner was given the opportunity to ask questions and the booklet, "Alabama Fish Ponds" was provided for use as a future reference.

Bream, approximately 85% bluegill *(Lepomis macrochirus)* and 15% redear sunfish *(L. microlophus)*, and largemouth bass *(Micropterus salmoides)* were stocked at a rate of 1,000 bream and 100 bass per surface acre in fertilized ponds. Unfertilized ponds were stocked at one-half this rate. Fingerling bream were provided by the State fish hatcheries from November, 1971, through March, 1972, and fingerling bass in May and June, 1972.

Soils within the 12 counties varied greatly, but most of the study ponds were located on silty or sandy loams in the Hartsells, Albertville, Muskingum, Linker or Tilsit series derived from weathered sandstone and shale. A few ponds were constructed on loams and silty clay loams of the Decatur and Cumberland series derived from weathered limestone.

Ponds approved for stocking with a surface area of 1.0 acre or less were arranged by size in 0.25-, 0.50-, 0.75-, and 1.0-acre categories to determine if size within this range affects pond balance. Ten ponds were randomly selected from each category for study.

Questionnaires were mailed to each pond owner in 1973 and 1974 to obtain additional information on pond management practices and a recent history of the pond.

The ponds were analyzed for fish population balance according to methods described by Swingle (1956). These balance checks were conducted in June, 1973 and 1974, the first and second year of fishing (Swingle and Smith, 1947).

RESULTS AND DISCUSSION

In 1971-72, 231 ponds were approved for stocking. Of this total, 150 ponds (65%) were 0.25 to 1.0 acre in surface area. The 40 randomly selected study ponds represented 27% of the 150 small ponds.

Balance checks during the first year of fishing (June, 1973) revealed that nine ponds contained balanced fish populations. One of the balanced ponds was in a state of temporary balance with crowded bass. Unbalanced fish populations were found in 26 ponds. Crowded bream populations were found in 18 of these ponds and 8 contained competitive species. Four ponds went dry. One of the study ponds was not checked the first year because of incomplete directions to the pond site.

Balance checks the second year of fishing (June, 1974) revealed that, of the nine ponds in balance the first year, five ponds remained in balance, three ponds became crowded with bream, and a fish kill occurred in one pond.

Information obtained from the questionnaires and personal observations made at the pond sites indicated that the five ponds which contained balanced fish populations both years were properly managed by the owners.

Of 18 ponds which contained crowded bream the first year, 11 ponds were unchanged the second year, 4 ponds attained balanced conditions, 1 pond became crowded by competitive species, and 2 ponds were dry. The pond not checked the first year had crowded bream the second year. A fish kill occurred in one of the ponds containing crowded bream, however, this did not change the state of balance.

Six of the eight ponds which contained competitive species the first year were unchanged the second year. One pond attained a balanced condition and the remaining pond was crowded with bream.

Pond size within the study range apparently had little effect on the state of balance of fish populations; however, crowded bream populations tended to occur with greater frequency in 0.25-acre ponds. Other variables appeared to have greater influence on the state of balance in the study ponds than did pond size alone.

Several factors were found to be of particular importance in affecting the condition of balance in the study ponds. These factors were fertilization, livestock utilization, competitive species, severe water level reduction or complete loss of water, and fish kills. Other factors, such as mortalities in the fish population, catch of bass prior to spawning, and mortalities of hatchery fish after stocking could not be evaluated.

The primary factor affecting the state of balance of the fish populations in the study ponds was the failure of the pond owners to implement a proper fertilization program. All 40 ponds were stocked at the fertilized rate since each owner stated he would follow a proper fertilization schedule. Failure of pond owners to properly fertilize their ponds occurred despite an explanation on the importance of fertilization during the prestock visit. Additional information on fertilization was provided each pond owner in correspondence and in the farm pond booklet.

The first and second years of fishing, there were 27 and 26 ponds, respectively, which were either improperly fertilized or not fertilized at all. The combined proportion of pond owners who failed to heed the information provided on pond fertilization was 78%.

Similar results were obtained by Holloway (1951) in a study of 323 ponds in the Southeastern United States where 80% of the ponds stocked at the fertilization rate were not fertilized and by Moss and Hester (1956) in an earlier study in Alabama where 75% of the ponds were improperly fertilized. King (1960) reported that "inadequate" was the term usually used to describe fertilization in a 1,000 pond survey, nationwide. The implementation of proper pond fertilization by pond owners in Alabama appears to differ very little from other areas of the Southeast or even the Nation. Insufficient fertilization appeared to be one of the most important reasons that 0.25 to 1.0 acre ponds failed to produce balanced fish populations.

Since stocking rates and fertilization practices are integral factors, it is not surprising that 93% of the 27 inadequately fertilized ponds were unbalanced the first year and 85% the second year. Holloway (1951) found that 75% of unfertilized ponds stocked at the fertilized rate contained unbalanced fish populations.

Of eight ponds in 1973 which had been fertilized properly, seven contained balanced fish populations. In 1974, six of seven ponds which were properly fertilized were in balance.

It is apparent that the few pond owners who followed the recommended fertilization program were more successful in establishing desirable fish populations than those who did not follow the recommended fertilization program.

A second factor affecting the state of balance in small farm ponds was unrestricted use of the ponds by livestock. Sixty-eight percent or 27 of the study ponds were constructed for livestock watering or for the dual purpose of stock watering and fishing. This value agrees favorably with those reported by King (1960) in a nationwide pond survey where most pond owners gave at least two reasons for pond construction (80% for livestock watering and 70% for fishing). The number of livestock watered on these ponds over the 2-year study period ranged from 8 to 160/acre with an average of 36/acre.

Generally, as pond size increased within the study range, the number of livestock per acre watered on the ponds decreased. The average number of livestock per acre ranged from a high of 81 in 0.25-acre ponds to 13 in 1.0-acre ponds. This may indicate that the smaller ponds (0.25- and 0.50-acre) were constructed primarily for livestock watering.

Observations made at pond sites on the effects of livestock activity indicated that adverse effects to the pond habitat were directly related to the number of livestock per acre utilizing the pond.

Ponds supporting heavy livestock activity in this study were characterized by eroded shorelines with reduction of fish spawning areas, increased siltation and muddy water, and high organic fertilization resulting from stock fecal material entering the pond. Swingle (1949) considered ponds with siltation resulting from livestock wading unsuitable for bluegill and bass.

Twelve ponds were not utilized for stock watering in 1973. Four of these ponds contained balanced fish populations and four contained crowded bream populations. No stock watering occurred in 14 ponds in 1974. Five of the 14 ponds were in balance and 4 ponds contained crowded bream. Four ponds in 1973 and five ponds in 1974 were affected by factors that could not be related to watering livestock, such as competitive species, complete loss of water, or fish kills.

Balanced fish populations were found in five of the stock ponds in 1973 and five ponds in 1974. Crowded bream occurred in 14 and 12 stock ponds the first and second years, respectively. Only 29% of the non-stock watering ponds contained crowded bream, while an average of 48% of the stock watering ponds contained crowded bream. As a possible explanation, Swingle (1956) reported that bluegill are apparently able to reproduce in more heavily silt-laden waters than bass and that bass spawning can be retarded by reduced light penetration.

The number of cattle which could use a pond without affecting balance could not be established. Differences in the number of balanced ponds between the stock and non-stock watering ponds existed. In 1973 and 1974, 19% of the stock ponds were in balance; however, 33% of the non-stock ponds were in balance the first year and 36% the second year. These figures indicate that even small numbers of livestock utilizing a pond can be detrimental.

A possible solution to the problems created by livestock watering in ponds containing fish populations would be to fence part of the pond or the entire pond from livestock activity. Fencing of ponds is recommended or required by some state conservation agencies (Lopinot, 1972, and Moorman, 1957). The fencing of ponds from livestock would serve several purposes. Fencing would protect most of the dam and shoreline from erosion and protect suitable fish spawning areas from wading cattle. It would reduce siltation and muddy water and reduce the quantity of fecal material entering the pond.

The third factor affecting fish populations in the 40 study ponds was severe water level reduction or complete loss of water. Fish populations were lost entirely because of the complete loss of water in 10% of the ponds the same year the fish were stocked. The second year following stocking, 15% of all ponds were dry. From information received from the pond owners in the questionnaires, at least eight ponds the first year and seven ponds the second year experienced severe water level reductions of 50% or more. Three of these ponds suffered severe water level reductions both years.

These drawdowns and complete losses of water occurred during the fall and early winter months. According to Swingle (1956), severe drawdowns during this period followed by rising water the following summer may result in crowded bream populations. This situation apparently developed in seven ponds experiencing severe drawdowns. Four of five ponds suffering water level reductions the first year only developed crowded bream populations by the second year's balance check. Of the four ponds experiencing severe water level reductions the second year only, three contained crowded bream. No relationship between pond balance and water level reduction could be established on the three remaining ponds that suffered two consecutive years of severe water level reductions. Only two ponds with severely reduced water levels contained balanced fish populations both study years.

Since adequate rainfall (51, 67, and 64 in. during 1972, 1973, 1974, respectively) occurred prior to and during the study period, it would appear that the causes of water loss in the ponds were related to poor site selection and improper construction. The watershed to pond area ratio appeared to be inadequate in some cases. Improper core construction in the dam was the suspected cause of water loss in other cases. Porous soils occurring in the study area could also have affected water levels; however, this factor could not be properly evaluated.

Fish populations were affected by competitive species in a total of nine ponds during the 2-year study period. Channel catfish were overstocked by four pond owners. Stocking rates up to 1,200/acre were reported. Black bullheads (*Ictalurus melas*), and crappie (*Pomoxis sp.*), were also stocked by the owners.

Wild fish were found in seven of the ponds. The species found were green sunfish (*L. cyanellus*), threadfin shad (*Dorosoma petenense*), black bullhead, golden shiner (*Notemigonus crysoleucas*), and fathead minnow (*Pimephales promelas*). The mode of entry into the ponds by wild fish was probably over improperly constructed spillways, accidental stocking of green sunfish with commercially purchased channel catfish and inadequate pond poisoning after wild fish were found during the prestock check.

Fish kills occurred in two ponds the second year of the study. Both resulted from agricultural insecticides; however, neither of the fish kills resulted in the total loss of the fish populations. If ponds located in watersheds where pesticides are applied were more carefully scrutinized with regard to pond usage and location during the prestock check, the incidence of pesticide kills in farm ponds

would be reduced. When the fisheries biologist recommends preventative measures, such as diversion ditches and changes in land usage, and the pond owner is unwilling to comply with the recommendations, the pond should not be stocked. The diversion of runoff water that originates on crop lands where pesticides are applied would not only reduce the chances of a fish kill but would also reduce siltation in the pond.

Information on fishing effort and success was requested in the 1974 questionnaire. The number of responses to these questions was disappointing. A total of 21 pond owners returned the questionnaire. Of this total, 14 stated that their pond was providing satisfactory fishing. Balance checks the second year of fishing revealed that only 8 of the 14 ponds were in balance. Pond owners estimated that 111 individuals fished a total of 262 times in the study ponds the second year of fishing. An estimated 8 fishermen/acre/year fished the reported 21 ponds. An estimated total of 19 fisherman trips/acre/year occurred on the ponds.

King (1960) estimated that 16 fishermen/acre/year fished on ponds nationwide in 1959 and that 64 fisherman trips/acre/year were spent on the ponds. In 1971, the number of fishing trips to ponds and small lakes in Alabama was estimated at 66/acre/year (Auburn University Agricultural Experiment Station, 1973). Values for the two studies were considerably higher than those obtained in this study. Fishing interest was low possibly because the primary purpose for construction of the ponds was other than fishing, and undesirable fish populations were present in many ponds.

Few ponds in this study were properly managed, therefore, few maintained balanced fish populations. Limited interest in fishing was expressed by pond owners. Consequently, the quality of fishing and resulting fishing pressure was low. Modifications in the present pond stocking program, where demands on the pond owner are strengthened, are needed to insure quality fishing in small ponds. Further investigations are needed to determine if the fishing provided by these small ponds justifies the cost of the stocking program.

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