GAME MANAGEMENT ON A FLOOD CONTROL RESERVOIR

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Proc. Annu. Conf. Southeast. Assoc. Game & Fish Comm. 8:142-146

The author wishes to give credit to the Department of Conservation and Recreation, U. S. Army Corps of Engineers, especially to the late Mr. Henry Payne who was known throughout the state for his devotion to wildlife conservation and whose efforts on behalf of the sportsman were largely responsible for the success of Sardis Reservoir, to Mr. Tommy Steiner of the U. S. Fish and Wildlife Service, and to the staff of the Mississippi Game and Fish Commission. Their criticisms and active assistance are gratefully acknowledged.

For many years wildlife conservationists in this country have been faced with a grave problem. That has been the destruction of wildlife habitat concurrent with an increased demaned on the part of sportsmen for more hunting and fishing. Waterfowl habitat has, perhaps, suffered the most. Through reclamation and flood control programs both by public agencies and by individuals seeking more and more agricultural land, our wetlands have dwindled alarmingly in size. It is, or course, hopeless to attempt to restore for waterfowl use the thousands of acres in this country that have succumbed to drainage programs. But the problem of supplying food and water for ducks and geese and hunting areas for sportsmen must be solved. Our job in Mississippi is to provide enough intensively managed areas to compensate for unmanaged wetlands no longer available. To do this both public and private development is needed. That basic concept of conservation, the use of each land unit according to its capabilities, has been largely discarded in favor of the idea of getting the best cash return from every acre. Wildlife has suffered accordingly. The arguments for wetland preservation can hardly compete with the material benefits of a successful beef herd.

Instead of trying to halt these drainage programs by appealing to the average landowner's aesthetic appreciation, we are facing the problem from within by stressing the current farm practices that have as an important by-product the production of wetland habitat and are showing by demonstration the value of wildlife in a balanced farm program. The present drouth has caused a tremendous demand by landowners for irrigation and farm ponds. Acreage allotments have made many acres idle. The combination of the two has presented us with an exceptional opportunity for wildlife development.

In Mississippi there were approximately 60,000 farm ponds in 1954. Many new ones are constructed each year. Stressing the multiple use of these ponds presents a program of economical development for wildlife and creates a large demaned for assistance in developing farm pond areas for waterfowl. Our best is the 35-acre pond of Mr. Pratt Thomas, located 20 miles from the nearest lake and 8 miles from a small river and situated in an eastern county not considered waterfowl territory. Hunted once a week during the open season, this pond furnished many bag limits, often in the space of an hour's hunting. At other times it is a valuable feeding and resting area for migrant waterfowl. Covering the state with ponds such as this is quite possible if good publicity and economical development techniques are forthcoming from the Game and Fish Commission.

What has all this to do with reservoir management? First, reservoirs are publicly owned and available free of charge for wildlife development and experimentation by public agencies. Properly developed, they attract and hold waterfowl in the state. Secondly, from these reservoirs have come the management techniques that make it possible for the average landowner to build excellent waterfowl habitat for a very small investment. Now, let us examine the methods applied at Sardis Reservoir that have produced maximum wildlife usage as well as a program applicable to small privately owned areas.

Sardis Reservoir is a 98,000-acre area located on the Little Tallahatchie River in northwest Mississippi. It is one of four flood control reservoirs built in the Yazoo River Basin by the U. S. Corps of Engineers. Once the flood-control requirements were determined and specifications were met, the Corps placed primary stress upon the development of the area for recreation and gave to the Mississippi Game and Fish Commission the respondibility for developing fish and wildlife habitats on the reservoir.

The average year will find the reservoir filling rapidly in late winter or early spring, reaching a maximum storage in April. The rate of discharge depends upon downstream flood conditions but is planned so that the water will have receded to conservation-pool level by November 1, a date coincident with the beginning of waterfowl migration into Mississippi. Water levels will fluctuate as much as 47 feet during the course of a year if full capacity flood conditions occur. This fluctuation caused a competent biologist to label Sardis a biological desert in which neither game nor fish could survive.

For a better understanding of the wildlife development problems met in this type of project, the reservoir will be described according to contour limits. The lowest elevation to which the water is drawn is 235 feet mean sea level. At this limit the conservation pool with an area of 9,800 acres, representing 10 percent of the total land area is an excellent attraction to visiting waterfowl and maintains a fish population from which an estimated 750,000 pounds of game and rough fish are harvested annually.

There are 14,257 acres, or 14.5 percent of the reservoir land immediately surrounding the conservation pool, which is gradually exposed between August 15 and November 1 as the water is drawn down to conservation pool state. Depending upon its length of emersion, this land supports a growth of native annuals in various stages of maturity that furnish grazing and feeding to ducks and geese during their early-season stay on the reservoir. As this section begins to be reflooded by the first of December, no management is practical. The entire area is rapidly inundated, often as soon as two weeks after the onset of the rainy season.

Between the 250 and 265 foot contours lies 13.9 percent of the land, or 13,694 acres, which is generally exposed by drawdown before August 15, the latest practical planting date. All waterfowl development activities are carried on between these contours. In this area the best duck foods are produced, but, unfortunately, it is not flooded until February and after the close of the hunting season.

The slope of the land is flat to gently rolling. Approximately 25 percent is in woods, mostly classified as bottomland hardwoods. A general program for this acreage is to curtail the growth of willow, buttom bush, cocklebur, and trumptet vine, our four serious pest plants; to construct sub-impoundments where practical for premature flooding; and to operate the wooded areas under a sustained yield program.

Controlling the growth of pest plants is limited to mechanical means by management policy in order to prevent possible crop damage on neighboring areas from chemicals and fire. Growth up to two inches in diameter is first cut with a rotary five-foot mower mounted on a farm tractor. It cuts approximately 3.5 acres per hour. When this cutting is made early in the year so that the non-woody dicotyledonous plants such as cocklebures are beheaded, while the millet and smartweeds are relatively unharmed, the result will be a nearly pure stand of millet and smartweed.

Woody perennials require additional controls in the form of initial discing with a bush and bog disc and a final treatment by the use of a disc harrow prior to planting to grains. Repeated cuttings with the pasture clipper are necessary to finally eliminate the pests. Once the seed bed has been prepared, successive mowings will assure the growth of annuals each year. The planting of disced areas is done in part by the Commission and in part by local farmers who in lieu of cash rentals leave one-sixth of the crop standing in the fields for wildlife. Only grain crops are permitted. About every third year high water and a late drawdown make farming this area impractical, but it will grow up in heavy stands of millet and smartweed.

The reservoir as a whole has an abundance of wildlife food on it, but at the time when most desired by waterfowl, it is not under water. No change in flood-control policies can be made, but sub-impoundments can be built that will not significantly violate the flood-control storage. The less acre feet of water stored in a pond, the more the number of ponds that can be built. About twenty ponds varying in depth from six feet at the dam to a feather edge were built by the fall of 1953. Cost of construction was $180.00 per mile of levee plus either the installation of expensive control structures or additional levee construction each year to repair the breaks caused by drainage. Some of these ponds used a large amount of unnecessary water and as a result did not fill quickly enough to be satisfactory. They had to fill within a month in order to be of maximum use.

Beginning at the barrow pit the superfluous depth held a great amount of water that could be used to better advantage for flooding food areas. Because they drained late or not all, the pits were never available for food production. Even if they could be drained, they were too steep to permit cultivation. Instead of building such high levees, it was decided to build terraces using as many as three terraces if necessary to replace one dam and building them on the contour to obtain maximum use of any water available.

The results has been the elimination of the barrow pit, the provision of water first on the outer reaches of the pond where most needed, and a maximum water depth of 18 inches. Farming operations can be carried on to the base of the terrace, and many excellent food areas too small to justify the cost of a large dam can be easily flooded. These terraces need no expensive maintenance and can be drained or plugged with a shovel in a few minutes. They suffer less damage from wave action than the large levees and can be built on agricultural or forest land without interfering with regular land-use programs. They are inexpensive to build. They are, we believe, the answer to demands on the part of individuals for an economical system of private development, and we hope they will eliminate a major problem in our long range statewide development program for waterfowl.

Several methods of building these terraces were tried and will be described for the benefit of other workers who may have similar situations. A comparison of building efficiency, cost, and results is shown in Table 1. The method first tried was a terracing plow in common use among farmers and recommended by several agricultural workers. It consisted of a single disc plow mounted in the center of a farm tractor. This machine worked well, but we were unable to make it erect a terrace two feet high which would be the minimum required to hold 18 inches of water.

Table 1. *Comparison of construction methods for sub-impoundment terraces and levees.*

	Terraces				Levee
	Road grader	Terrace plow	Rice field drag	Bulldozer	Bulldozer
Plane survey needed	Yes	Yes	Yes	Yes	Yes
Number of operators	2	1	1	1	1
Ground preparation required	Partial	Partial	Complete	No	No
Correct soil moisture required	No	Yes	Yes	No	No
Maximum height	2 ft.	1½ ft.	1½ ft.	No limit	No limit
Variable height	No	No	No	Yes	Yes
Diversion ditch construction	Yes	Yes	No	Yes	Yes
Spillway construction	Yes	No	No	Yes	Yes
Dam compression	Yes	No	No	Partial	Yes
Rate foot/hour	2500	2500	4000	600	88
Cost/hour	5.00	3.00	4.00	3.00	3.00
Cost/mile	10.00	6.00	5.30	25.80	180.00

A drag designed for use in the rice fields was tried. Basically, this machine consisted of two grader blades mounted in an open "V", which when pulled through a pulverized soil behind a large tractor or bulldozer, squeezed together a terrace. On the reservoir soil, it raised a maximum terrace of 18 inches. Although certain changes in the design of the machine could be made to attain a greater terrace height, the machine is awkward to handle and is limited in its use to terrace construction.

An ordinary road grader pulled behind a crawler tractor erected satisfactory terraces with the additional advantage of packing the soil as construction progresses. Its greatest disadvantages were the need for the skilled operators, and the inability to vary terrace height. The initial cost of adequate equipment is also great.

One disadvantage to terrace construction is that any low spot such as a "draw" or "stump hole" must be bypassed if the terrace is to be kept at the same height at all times. None of the above methods would allow for additional earth moving to build up the terrace to the required level. In order to save time and terraace length, and eliminate curves with a short radius, it was necessary to select a method of construction that would be adequate in low spots and make allowances for the additional earth needed. The final method tried and the one most successful to date was to push up the terraces with a dozer blade. The amount of dirt required does not make a barrow pit necessary, and low spots can be bridged.

In addition, the blade is available to build necessary spillways and occasional diversion ditches.

No private farming is permitted in the sub-impoundments. These ponds are kept under water as late as possible in order to furnish a moist seed bed for the germinating duck food and also to provide water for any possible broods that may raise in there. A few mallard and blue wing teal breed on the reservoir plus about 3,000 wood ducks. Cooperating local sportsmen supply wood duck nesting boxes as club projects that are erected under Commission supervision.

All timber is to be marked for cutting on the reservoir is cruised jointly by the Corps of Engineers and the Game and Fish Commission. No mast producing trees are marked unless their removal will stimulate mast production of other trees. Den trees are always saved. A sustained yield program is desired but lumber production is not stressed; the timber is cut primarily to improve the stand for wildlife.

Above the 265-foot contour lies 60,411 acres, or 61.6 percent, of the area. This land slopes too much to permit pond construction and is seldom flooded, thus the value of this land for waterfowl is only significant during the rare high water stages when crop residues, mast, and annuals became available. That part of it suitable for farming is leased directly to farmers by the Corps on a cash rental basis according to the original setup in the management program. Timber here is managed as previously mentioned. Except for a minor amount leased as pasture and that in refuge, all of this land is open to public hunting.

While of not much value to waterfowl, this section supports a good population of upland and forest game for which development is stressed. A cleared area of approximately 20 new *Lespedeza bicolor* plantings is established annually until such a time as the carrying capacity of the range for quail is reached. Reservoir populations of quail, squirrels, and deer, as well as waterfowl, rank among the best in that state. Bear and wild turkeys are present but not yet sufficiently established to permit hunting.

Intensive management has demonstrated that this reservoir can provide superlative wildlife habitat. The number of geese has increased from none to 1,000, and the number of ducks from 500 to 50,000 in four years. In one artificial pond of eight acres, 4,000 ducks were counted on an aerial census in 1953. Two refuges ten miles apart on the reservoir provide ample protection during the hunting season. Approximately 500,000 people visit Sardis annually in quest of recreational pursuits. Ten thousand hunting days are spent seeking waterfowl alone.

Because flood control reservoirs must be drawn down during the summer months, they represent an invaluable management area for waterfowl and other game. The summer growth of millets and smartweeds can be made available either by winter floods or the construction of sub-impoundments. Techniques developed on Sardis present a solution to a general lack of aquatic habitat. Contour terracing can be accomplished quickly and at little cost on agriculture or forest land, or at the head of farm ponds. Water requirements during the winter months will not interfere with other land-use practices. By supplying technical assistance only, a vast number of waterfowl areas can be constructed throughout the state at little cost to the State Game and Fish Commissin. The result will be an easing of hunting pressure on public areas, more habitat built per dollar of public money invested, and sufficient habitat to meet the wintering requirements of waterfowl in Mississippi.