SOME FORESTRY ASPECTS OF RESERVOIR CLEARING

C. A. FRIEDRICH, *U. S. F. S.*
Atlanta, Georgia

Gentlemen, I'll not try to make a case either for or against reservoir clearing. All I'd like to do here this morning is discuss briefly from the forestry angle some matters that should be considered if a reservoir area is to be cleared, others to consider if it is not to be cleared, and then some items we ought to think about whether or not clearing is involved.

First, I'd like to make the point that as a resource conservation measure we in the Forest Service favor salvaging just as much of the usable timber as is feasible from the reservoir area. Where the volume of timber involved is very great, it is important that salvage operations be carefully planned and be accomplished in as orderly a manner as possible so as to minimize the impact on local markets and disruption of long range harvesting schedules on surrounding lands.

The situation at McGee Bend in Texas is an example of a case where this item is very important. On the 129-thousand acre reservoir there are about 341M cords and 517MMBM of merchantable timber worth some $9,000,000. The U. S. Forest Service has curtailed cutting elsewhere and is spreading the cut on National Forest reservoir land, about 27,000 acres, over as long a period as possible. There is a more serious problem on the private forest lands as many of the owners, including some large owners, seem to prefer to sell the timber with the land. This means that the Corps of Engineers will have to dispose of the timber on competitive bids and there is some question whether they are set up to see that the harvest is handled in an orderly manner. Of course there is no provision to curtail normal harvest on other private lands. Advantage should be taken of every opportunity to spread the salvage operation over as long a time as possible by starting early near the river and leaving areas above the permanent pool as long as feasible. In some cases it might be practical to confine the salvage cutting in the upper part of the flood control pool to the species known to be least tolerant to flooding.

Where stumps and slash from pines will not be covered by water within a month or two after cutting, standard precautions against insects should be taken. More about this later.

There is no future for timber production in the permanent or full power pool area. After usable timber products are salvaged, it would seem to be unimportant from the forestry point-of-view whether the remaining material is cleared or covered by water, except insofar as insects are concerned.

The Forest Service is, of course, interested in other things besides tree-growing forestry. If the area is to be cleared, we would urge the use of clearing practices and timing of operations that would minimize downstream sedimentation. If the whole permanent pool area is not to be cleared, we would favor clearing of at least those areas most likely to be of value for recreation, swimming, fishing, and boating to reduce the safety hazard and improve aesthetic values.

In reservoirs with flood control storage above permanent or power pool level there may be opportunities to practice timber culture. Here, above the permanent pool, indiscriminate clearing would be discouraged, but pines should probably be removed from those areas where they would likely be subject to damage from flooding. Feasible measures to encourage tolerant species of commercial value should be encouraged. If plans are made far enough in advance, there should be real opportunities in this direction. For example, open areas could be planted to tolerant species far enough in advance to let the seedlings make several years height growth before flooding.

There are many opportunities for recreation developments in this zone of periodic flooding. Good shade and scenic trees should be protected. Dead or weakened trees should be removed in places where they could be dangerous. Favor tolerant species in and near recreation areas. There is also a place for tolerant grasses and other low plants here.

Considerable information is available from which some general conclusions can be drawn regarding relative tolerance of various species to flooding.

1. Generally flooding during the winter dormant season is less damaging than during the growing season.
2. Flooding discourages or prevents reproduction of even the most tolerant species.
3. Shallow impoundments during winter can be beneficial to tree growth if properly handled. This is compatable with certain waterfowl needs. If not properly handled, this practice can be fatal to timber stands.
4. At the West Sandy Dwatering Project on Kentucky Reservoir, TVA studies showed considerable difference in tolerance of various tree species to soil surface flooding during the growing season. Here are some of the results, in decreasing order of tolerance: Swamp ironwood and black willow withstood flooding during 42 percent of the growing season, overcup oak—40 percent, pine oak—39 percent, ash and tupelo—38 percent, red maple—36 percent, deciduous holly—35 percent, cottonwood—34 percent, sweet gum—34 percent, hawthorn—32 percent, willow oak—31 percent, and persimmon—30 percent. Some of those with low tolerance were: black cherry—0.6 percent, dogwood—0.8 percent, hornbeam—1.8 percent, beech—3.2 percent, yellow poplar—4.5 percent, Christmas holly—9.7 percent, red cedar—14.0 percent, hickory—16.0 percent, loblolly pine—16.1 percent.

These findings are in general agreement with those of others reporting on the subject. Bald cypress, not represented at West Sandy, is known to be highly tolerant although sustained deep flooding will kill it in time. An interesting point about bald cypress, which may not be common knowledge, is that it does not require very wet conditions to make good growth. It will thrive on fairly dry sites and therefore may have good promise for planting for commercial purposes on areas subject to periodic flooding.

Bermuda and buffalo grass are two of the most tolerant grasses. Vine mesquite and knot grass also withstand considerable growing season flooding.

Now more about the forest insect problems that may be associated with reservoirs. This problem is not entirely confined to pines but with them it is especially acute, because epidemics can build up very rapidly in them. The danger is primarily from various kinds of bark beetles.

Stumps and slash, and weakened or dead pine trees, are fertile breeding grounds for pine bark beetles. These beetles are endemic throughout the Southeast and are hazardous at all seasons of the year. Given suitable conditions they can rapidly build up to epidemic populations and do serious damage to surrounding pine stands. The *turpentine beetle* generally breeds and works in stumps and the boles of the trees within about 8 feet of the ground. Stumps are in danger of infestation for 8 or 10 months and epidemics can build up in them in 6-8 weeks time. Stumps from salvage or clearing operations should be checked periodically for bug invasion until they have been flooded for several weeks or are more than 10 months old.

The *Southern pine beetle* works in the bole of the tree to any height, so shallow flooding won't prevent its development, as in cull pines which protude above the water. *Ips* will even work in the smaller branches protruding above water or in slash on the ground. The biggest danger in dead material is during the first year after cutting or death, but weakened trees still living can be a source of danger over long periods. Therefore, it is important that pines either be removed, or very close watch be kept over them, in areas where they are subject to serious damage from flood water.

Technical advice and assistance is available to construction agencies and reservoir managers and others to help them cope with forest insects and diseases. The Forest Pest Control Act of 1947 gave principal responsibility for protection of the Nation's timber resources from insects and diseases to the U. S. Forest Service. These services are available directly to other federal agencies on federal lands and through cooperation with State Foresters on private and other public lands.

REFERENCES

1. *Corps of Engineers, U. S. Army. New Orleans District,* June, 1955, Timber Protection in Reservoirs. Civil Works Investigation, Project CW-515.

2. *Silker, T. H.* 1948. Planting of water-tolerant trees along margins of fluctuating level reservoirs. Iowa State College Journal of Science, 22(4) :431-448.
3. *Hall, T. F. and G. E. Smith.* 1955. Effects of flooding on woody plants, West Sandy Dewatering Project, Kentucky Reservoir. Journal of Forestry 53(4) :281-285.
4. *Putnam, John A.* 1951. Management of bottomland hardwood. Occasional Paper 116, Southern Forest Experiment Station.
5. *Gamble, M. D.* Inundation tolerance of some grasses and legumes—A progress report (SCS, Oklahoma City, Okla., mimeographed report, undated, probably 1958).
6. *Broadfoot, M. W.* June, 1958. Study effects of impounded water on trees. Mississippi Farm Research 20(6) :1-2. Agricultural Experiment Station, State College, Mississippi.

THE BLACK AND WHITE CRAPPIES OF THE SANTEE-COOPER RESERVOIR

By ROBERT E. STEVENS
South Carolina Wildlife Resources Department

ABSTRACT

The reservoir has a surface acreage of 160,500 and contains two rather dissimilar lakes; namely, Lake Moultrie and Lake Marion.

A four-year continuous creel census indicated that three-fourths of the catch of crappies was made in Lake Marion.

Four distinct growth rates were encountered in a growth study of each species in each lake.

A food habit study of 149 full crappie stomachs showed insects to occur 77.1% of the time and fish 55.7% of the time.

A world record black crappie *(Pomoxis nigro-maculatus)* was caught in Lake Moultrie on March 15, 1957.

INTRODUCTION

On November 12, 1941, the water of the Santee River was impounded and diverted to form the Santee-Cooper Reservoir. The reservoir contains 160,500 acres when full and is composed of Lake Marion which is 100,500 acres, and Lake Moultrie which is 60,000 acres. The lakes are joined by a canal which serves to divert the water of the Santee River down the Cooper River where it meets the ocean (Figure 1). The primary purpose of the reservoir is electrical power which is generated at Pinopolis Dam on Lake Moultrie. Also at Pinopolis Dam is a navigation lock which is 180 feet long, 60 feet wide and has a lift of 75 feet.

The reservoir is unique in that while it is one of the largest impoundments in existence, it is also very shallow. In the four years covered by a creel census, low water conditions have reduced the average surface acreage of the reservoir from 160,500 to approximately 108,000 acres with an average depth of only 14.3 feet. This, along with the fact that the water is turbid only after prolonged periods of heavy rain, goes a long way in explaining the unusual productivity of the reservoir.

Lake Marion: The upper impoundment is a relatively long narrow lake which has averaged 63,000 surface acres and only 12.4 feet in depth for the past four years. It is approximately 40 miles long and 3.5 miles wide. The shoreline is about 300 miles and includes many cove areas. The maximum depth is 35 feet.

Except for a small area near the dam, the forest was left standing at the time the basin was inundated. This forest of dead trees along with many sunken and derelict logs creates an ideal habitat for members of the sunfish