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REACTION OF HARDWOOD TIMBER TO SHALLOW-WATER IMPOUNDMENTS

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In recent years farmers and sportsmen have built many temporary shallow-water impoundments in southern hardwood forests. While the main purpose has been to attract waterfowl, a recent study shows that these forest lakes, if properly managed, can also benefit the timber.

The impoundments are generally created by constructing low dikes and dams in flats and sloughs. They are built in time to catch the rains of fall and early winter, as most of the low lands are dry by late autumn. When rains are light or delayed, water is sometimes pumped into the diked areas from wells, streams, or canals. Impoundments in oak woodlands are especially attractive to mallard ducks, which feed on the mast.

As some forest owners are concerned that the water might damage the trees, the Southern Forest Experiment Station studied 16 impoundments in Mississippi and Arkansas, representing a variety of flooding conditions. Briefly, the study showed that impoundments increase the amount of water that goes into soil storage; this extra moisture is especially beneficial to trees during dry summers. But it showed also that the impoundments should be drained promptly each spring. Letting the water stand all year reduced growth for most tree species, and killed others.

The 160-acre woodland impoundment shown in Figure 2 is an example of the best procedure for using surface water in timber management. The lake is filled to a depth of about 6 to 12 inches by mid-October. It is principally maintained by rainfall in winter until drained in April Considerably more soil moisture is available for tree use following winter impoundment than on similar non-flooded areas. In dry summers this additional moisture supply could mean the difference between good growth or practically none.

Fig. 1. Water impounded in good hardwood forests creates an attractive habitat for migrating waterfowl. (U. S. Fish and Wildlife Service photo)

Borings from representative trees growing in such well-managed lakes indicate an average diameter growth of 0.4 inch in each of the years since the impoundments were installed. Average growth rate for the same tree an equal number of years prior to the shallow-water flooding was 0.2 inch. The fact that dry weather occurred in most years (except 1957) since the impoundments were started, makes the growth difference all the more impressive.

One timber stand of about 700 acres had been flooded from September to April for 14 consecutive years. Diameter growth consistently and uniformly exceeded growth made before the impoundment was constructed. In all stands with this type of management tree vigor and acorn production were found to be excellent. Reproduction was good to excellent in all openings. The young seedlings have benefitted not only from the increased soil moisture during the hot, dry summers, but perhaps even more from complete fire control from September to April. The shallow water affords protection during the time of year when fire hazard is greatest.

Hardwood species react differently to bad management or continuous flooding. In some forests the water was left to stand from year to year. The lake shown in Figure 3 is an example. After 3 years' continuous impoundment of one to three feet of water, all forest trees are dead except a very few overcup oak and green ash.

A study was made in a stand that had been flooded for four consecutive years. All species had made a surprising spurt in diameter growth during the first year of flooding. From there on until the trees died, the reaction was quite variable between species, and occasionally within species. Cherrybark oak was the only im-

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(Over)

portant commercial species in which occasional trees died at the end of the first year of flooding. In the second year, all cherrybark oaks slowed down in growth and many died. All elm, sugarberry, honeylocust, and persimmon trees died sometime during the second season of continuous flooding. Willow oak and water oak lasted a little longer. Some trees began to decline in growth during the second year, but few died until the third and sometimes the fourth year. Some willow oak and water oak even spurted in growth for three consecutive years before decreasing and dying.

Overcup oak, green ash, sweetgum, and Nuttall oak made up the most water-tolerant group. Some trees in these species increased in diameter growth all 4 years of flooding, while others declined during the third year, and died in the fourth year.

Difference in reaction within species was probably due to vigor differences and possibly to differences in depth of impounded water. Acorn production stopped after one year of continuous flooding, even though the trees sometimes continued to grow in diameter.

Figure 2. Six to twelve inches of water impounded in September or October and released the following April, if not already used by the trees, is beneficial to timber growth.

Figure 3. Continuous impoundment of water kills hardwood timber.

In short, the study showed that with careless or bad handling of water impoundments, all of the trees will ultimately be killed and forest benefits such as increased tree growth and better mast production (usually the reasons for the impoundment) will not be achieved. But about 6 to 12 inches of water impounded in September or October and drained in April will increase the amount of moisture stored in the soil for use by the trees during dry summers. The impounded water will not damage the trees if it is drained off promptly each spring.