

# Water Management In Coastal Plain Woodlands

By RALPH A. KLAWITTER

Water management of one form or another is already a reality on large segments of wet woodlands in the coastal plain. Up to the present time, water levels have been altered on about two million acres of wetland forests in the South for forestry purposes, and this work is continuing. Most woodland water management consists of ditching, which in the past has had the objective to remove surface and ground-water and provide spoil for road construction into inaccessible wetland areas. But another consideration that has assumed more importance in recent years is the possibility that drainage can upgrade soil productivity. And last but not least is the up-surge in reservoir construction on wetland sites to meet wildlife, power, and the other water needs. Thus one can begin to see that some form of water management, however crude, is assured in wetland forests as land-owners turn their attention from the intensively managed up-lands to watershed management's new frontier—the wetland forests.

Wetland forests in the Southeast cover nearly 20 million acres along the coastal plain, from the James River in Virginia to southern Florida. The vegetation of these wetlands, their soils and wildlife, and even their uses reflect the hydrology of this vast watery domain. It is this inherent wetness that sets them apart from other woodlands. Wetland forests serve as the headwaters for countless streams and lakes, as well as recharge areas for huge underground reserves which provide a fresh water buffer against intrusion of salt water from the sea. Any change in their water relations will surely modify the whole wetland environment; e.g., ground-water levels, including the timing and amount of steamflow; potential of

the forest habitat for fish, waterfowl, and other wildlife; and productivity of the soil for forage and timber.

## Varying Site Conditions

A wide spectrum of site conditions, each reflecting a particular combination of soil, water, plant, and physiographic conditions, can be delineated within the complex labeled "Wetland Forests." One of the most common of these is the *Wet Flats* (Figure 1). These areas usually feature over-abundant water supplies as the primary limiting factor to a more intensive program of woodland management. In dry periods, either seasonally or because of some other weather cycle, they can become exceedingly dry because their primary source of water is precipitation. Occasionally, however, water supplies of wet flats are supplemented by leakage from artesian seeps. Tree cover may consist of scattered stems of one of the Southern pines, heavy stands of pines and hardwoods, or, as in the case of wet savannahs and prairies, be replaced by grasses and sedges.

*Bays and Pocosins* can be found throughout the coastal plain, but

they tend to occur most frequently in North Carolina. Although these wetlands are often higher in their center than along their perimeters, natural drainage is impeded because of elevated rims, sluggish outlets, and impermeable subsoils. Peat soils, sometimes many feet thick, accumulate over the land because high water levels act to retard the decomposition of plant remains. Dense tangles of evergreen shrubs, vines, and small deciduous trees, overtopped by pond pine alone or in the company of one of the other Southern pines, commonly occupy these sites.

Along the branches, streams, creeks, and rivers that dissect the coastal plain surface, *Bottomlands* provide the extra channel capacity needed to carry stormflow to the sea. They are wetted by rain, seepage, and overflow, and are the repository of water-borne sand, silt, and clay. They are among the most productive forest sites for plants and wildlife in the Southeast.

*Swamps and Ponds* occupy the lowest locations along branches, streams, and rivers, as well as depressed situations in wet flats, bays,

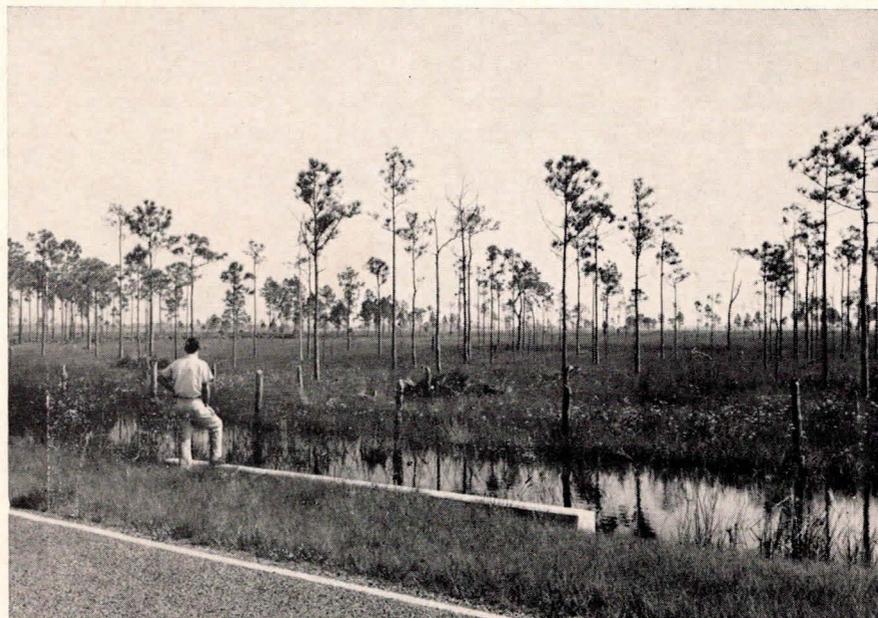


FIGURE 1.—A typical, wet, slash pine flat in southern Florida where high water levels affect forest productivity.

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or bottomlands. Water levels stand above the soil surface for long periods of time and may be subject to considerable fluctuation in depth. Often water movement is so slow as to be almost imperceptible, but in wet periods large volumes of water may pass through these sites, particularly along the larger rivers and streams. Characteristically, such hydrophytes as swamp tupelo, water tupelo, cypress, maple, ash, and a host of other wetland plants occupy these sites.

More than 80 soil series are recognized in wetland forests, and this list is sure to be extended as scientists become better acquainted with bays and swamps, where soils were once lumped into broad, ill-defined categories, such as peat or swamp soils. This kaleidoscope of wetland soils—the basic element in woodland productivity—holds, transmits, and yields water in different amounts. No two of them can be expected to react completely alike to treatment.

### Three Major Resources

The three major resources—water, soil, and vegetation—can be manipulated to alter the character of wetland forests and their utility to man. Water engineering in wetland forests can increase or decrease the rate of water transmission through soils or over the surface. It can also increase or decrease evapotranspirational losses from forest vegetation by altering the water supply available for this use. Water can be gathered into ditches and reservoirs or spread out over woodland soils to recharge them. How it is handled affects both the physical and chemical properties of the soil, as well as the kind, amount, and growth of forest vegetation.

Soil management measures, such as land leveling, bedding, disking, fertilization, and burning can be employed singly or in combination

to alter surface configuration and the physical and chemical properties of the soil. They, in turn, affect surface run-off, water transmission rates through the soil, and ultimately, the total production of the forest for each resource.

Finally, by manipulation of the kinds and amounts of forest vegetation, water levels can be raised and soil properties altered to increase the amount of streamflow or provide more moisture for plant growth. To all appearances then, man can shape wetland forest environments to meet his future needs for any one of several natural resources by prescribed changes in water regimes, soil properties, and forest vegetation. More than rule-of-thumb procedures and general engineering know-how are needed, however, if woodland water management programs are to avoid wasteful methods and truly conserve our soil and water resources.

Several examples of woodland water management in practice may be helpful in demonstrating the opportunities available to increase production of various forest resources from wetland areas. In one part of the coastal plain, a small community depends upon groundwater available in the upper 25 feet of land beneath a cypress swamp near the city limits for its water supply, because water below this depth is brackish and unpotable. Unfortunately, rainfall has been below normal for several years, while community growth and water needs have continued to rise. Consequently, water levels have fallen to 18 feet below the surface, turning what once was a flooded area into a virtual desert. One measure under consideration to alleviate the shortage is conversion of the deep-rooted forest vegetation to shallow-rooted grasses to reduce evapotranspira-

tional losses during dry periods. Another is to spread the surplus water from drained wetlands nearby over the city's well field.

In another part of the coastal plain, a bottomland forest is artificially flooded each fall to attract wood ducks primarily, but smaller numbers of other waterfowl as well. The main requirements in this water management operation are mast-producing forest trees, suitable terrain and soils, and, of course, water. Flooding begins when the leaves have started to change their color in the fall and ends in the spring when tree buds swell and dormancy ends. Depth of flooding is from one to 18 inches and, when properly done, promotes increased soil water storage and timber growth.

Elsewhere, a large cattle ranch manager is concerned lest nearby woodland drainage operators lower water levels on his range land and reduce forage production. His observations indicate best forage production occurs in moisture locations where the water table is close to the soil surface but not standing over it. As a result, he is trying to hold water in wet locations as long as possible with control structures to keep water levels high when seasonal rainfall is low.

### Caution Necessary

Use of forest drainage of wetlands to raise the general level of soil productivity for pine trees is widespread. Some evidence of the early improvement in wet areas is shown by the thousands of acres of vigorous, young pine plantations on sites once too wet to seed or to plant (Figure 2). But at this point, caution should be interjected into the discussion before broad generalizations concerning woodland drainage and timber production evolve because of the promise the treatment indicated in some situations. First, we do not know the net effect of large-scale drainage on the water supplies of drained areas and those adjacent to them. Nor do we know what unique properties of soils that affect productivity are changed when water levels are lowered by drainage, or indeed whether the long-time changes are permanent or only temporary in nature. Moreover, we cannot tell you at this time how to drain wet pinelands to produce the most desirable combination of soil properties and to achieve optimum water levels.

We do know that just getting rid of water from wet woodlands is not necessarily the best or only solution for timber growth. For although



FIGURE 2.—A previously inaccessible, slow-growing cypress swamp has been converted to a productive pine forest with the aid of prescribed water management measures.

some sites respond to this treatment, others either do not or else they are more valuable and productive in their natural wetland state. The deep peatsoils of coastal plain bays and pocosins are one example. A number of large-scale drainage tests in this soil condition have not yet been able to demonstrate convincingly that drainage by itself will create highly productive timber sites from wetlands which now support only low-growing heaths and degenerate forests.

As another example, forest drainage probably has little value as a wetland improvement tool in the productive tupelo swamps of the South. Moreover, water tupelo is not alone in its adaptation to wet conditions. For it and other similarly disposed wetlands species, woodland

water management may consist primarily of water application in prescribed amounts rather than water removal by drainage.

As we gain more scientific knowledge, it becomes increasingly apparent that water management practices in wetland forests must be tailored to fit particular kinds of forests and trees, as well as wetland hydrology, soils, and man's needs. Our previous examples demonstrated that in one case a cypress swamp can be used as a source for a community water supply, and in another case as a water storage site for waterfowl. Furthermore, cypress ponds can be converted to pasture by drainage, and clear-cutting or similar measures can be employed to convert them to productive pine lands. Moreover, cypress swamps

can also be managed in their natural state for timber, for wildlife, for water, or in parks and scenic areas for their natural beauty. In other words, cypress ponds and swamps, and other wet woodlands as well, are suitable for the production of a variety of different resources through the scientific manipulation of their soil, water, and forest cover. However, because man's needs change with time, perhaps the measures we apply to wetland forests should be sufficiently controlled and well enough understood to enable us to change from the production of one forest resource to another as the future demands. Only then, I believe, can we truly say we are using water management to conserve soil and water in coastal plain forests.

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