

Tennessee

Wetland Resources

Recent surveys have indicated that Tennessee has between 640,000 and 787,000 acres of wetlands (Tennessee Department of Conservation, 1988; Dahl, 1990). Another recent, unpublished survey determined that the State might have as much as 1.4 million acres of wetlands (D.L. Porter, Tennessee Valley Authority, written commun., 1993). Although wetlands constitute a small percentage of Tennessee's total area, wetlands, such as the bottom-land hardwood forest shown in figure 1, are ecologically and economically important to the State.

The benefits of Tennessee's wetlands include enhanced water quality, fish and wildlife productivity, and socioeconomic values. Wetlands enhance water quality by filtering nutrients, wastes, and sediment from upland runoff. Fish and wildlife benefit from the abundance of habitat and food that wetlands provide. More than 95 plant, 65 mollusk, and 44 vertebrate species listed by the State as rare are found in Tennessee's wetlands (Tennessee Department of Conservation, 1988). Socioeconomic values of wetlands include flood-damage reduction through temporary storage of floodwaters, erosion control, and, in a few areas, ground-water recharge. Tennessee wetlands also provide economically important recreational opportunities, such as hunting, fishing, boating, wildlife photography, hiking, and bird watching for residents and tourists.

TYPES AND DISTRIBUTION

Wetlands are lands transitional between terrestrial and deep-water habitats where the water table usually is at or near the land surface or the land is covered by shallow water (Cowardin and others, 1979). The distribution of wetlands and deepwater habitats in Tennessee is shown in figure 2A; only wetlands are discussed herein.

Wetlands can be vegetated or nonvegetated and are classified on the basis of their hydrology, vegetation, and substrate. In this summary, wetlands are classified according to the system proposed by Cowardin and others (1979), which is used by the U.S. Fish and Wildlife Service (FWS) to map and inventory the Nation's wetlands. At the most general level of the classification system, wetlands are grouped into five ecological systems: Palustrine, Lacustrine, Riverine, Estuarine, and Marine. The Palustrine System includes only wetlands, whereas the other systems comprise wetlands and deepwater habitats. Wetlands of the systems that occur in Tennessee are described below.

System	Wetland description
Palustrine	Wetlands in which vegetation is predominantly trees (forested wetlands); shrubs (scrub-shrub wetlands); persistent or nonpersistent emergent, erect, rooted, herbaceous plants (persistent- and nonpersistent-emergent wetlands); or submersed and (or) floating plants (aquatic beds). Also, intermittently to permanently flooded open-water bodies of less than 20 acres in which water is less than 6.6 feet deep.
Lacustrine	Wetlands within an intermittently to permanently flooded lake or reservoir. Vegetation, when present, is predominantly nonpersistent emergent plants (nonpersistent-emergent wetlands), or submersed and (or) floating plants (aquatic beds), or both.
Riverine	Wetlands within a channel. Vegetation, when present, is same as in the Lacustrine System.

Palustrine System.—Palustrine wetlands are the predominant wetlands in Tennessee. Most of these wetlands are in the Coastal Plain in the western part of the State along alluvial flood plains of the Mississippi River and its tributaries (fig. 2A and 2B). Tennessee's palustrine wetlands include bottom-land hardwood forests and upland swamps (forested wetlands), scrub-shrub wetlands, beaver ponds (unconsolidated-bottom, aquatic-bed, or emergent wetlands), wet meadows and marshes (emergent wetlands), and highland bogs (forested, scrub-shrub, or emergent wetlands that have organic soils).

Bottom-land hardwood forests are the most common wetlands in Tennessee. These forests have formed primarily in the flat flood plains along streams that drain into the Mississippi and Tennessee Rivers in western Tennessee. Unaltered bottom-land hardwood-forest wetlands in western Tennessee typically contain bald cypress, water tupelo, oaks, sweet gum, red and silver maple, river birch, box elder, and green ash (Hupp, 1992). Scrub-shrub wetlands are present along downstream reaches of channelized streams in western Tennessee. These areas support dense thickets of buttonbush and alder.



Figure 1. Forested wetland along the Hatchie River in western Tennessee. (Photograph by Cliff R. Hupp, U.S. Geological Survey.)

Isolated forested wetlands known locally as upland swamps are found in the Highland Rim, Central Basin, Cumberland Plateau, Valley and Ridge, and Blue Ridge Provinces. The predominant trees in upland swamps are sweet gum, sycamore, and species of oak, willow, and maple. Anderson Pond (72 acres), Cedar Hill Swamp (207 acres), and Mingo Swamp (563 acres), located in the High-

land Rim, are examples of upland swamps. Each represents landforms that were once commonplace and have been recommended for consideration as National Natural Landmarks (Ellis and Chester, 1989).

Beaver ponds, typically associated with flood plains, are present throughout the State. As beavers impound water in a bottom-land area, many of the less flood-tolerant trees are killed, thus opening the canopy and allowing for growth of herbaceous vegetation. The vegetation, which is determined by factors such as the age of the pond, topography, and soil characteristics, commonly includes cattails and sedges. The acreage of Tennessee wetlands attributable to beaver activity is unknown (Arner and Hepp, 1989).

Wet meadows are most common in the western and central parts of Tennessee. Grasses, sedges, and rushes are the predominant plants. These wetlands typically are covered by shallow water for only short periods during the growing season, typically after heavy rains. In dry years, wet meadows may be grazed by cattle. Such grazing generally alters the vegetation community.

Freshwater marshes exist throughout Tennessee. Freshwater marshes, vegetated primarily by smartweed and southern wild rice, can be found along the shores of 15,500-acre Reelfoot Lake, a reservoir in northwestern Tennessee. Extensive freshwater marshes also are present along the shores of the Tennessee River.

Highland bogs have formed in the Valley and Ridge Province of eastern Tennessee. Sedges, ferns, and manna grass are typical examples of emergent vegetation in these bogs. Buttonbush and tag alder (scrub-shrub vegetation) commonly are prevalent, and under some conditions, red maple and river birch also are present.

Lacustrine and Riverine Systems.—In Tennessee, lakes (mainly reservoirs) and rivers contain mostly deepwater habitat. However, aquatic beds consisting of floating and submersed aquatic plants, such as water lily and coontail, and nonpersistent-emergent wetlands consisting of plants such as pickerelweed and American lotus are associated with Tennessee's rivers, lakes, and reservoirs.

HYDROLOGIC SETTING

Wetland hydrology is a complex interaction of local and regional factors, including topography, climate, soil characteristics, and geology. Wetlands typically form along the margins of rivers and lakes that are subject to flooding and in depressions where the water table is at or near the land surface. Some wetlands form on highland slopes and are associated with ground-water-discharge points such as springs or seeps.

Tennessee has a diverse topography, ranging from rolling hills and broad flood plains in the Coastal Plain in western Tennessee to the mountains and valleys in the east. Annual precipitation averages about 50 inches statewide and ranges from approximately 47 inches in the west to 80 inches in the mountains in the east. About 20 percent of the precipitation infiltrates into the ground to recharge the State's aquifers. Average annual runoff ranges from approximately 18 to 40 inches. During winter and spring, when evapotranspiration is low, flooding is common. The abundance of water in the State enhances the potential for wetland development and persistence.

The structure and function of Tennessee's bottom-land hardwood-forest wetlands are determined primarily by the hydrologic regime of the State's rivers. Annual flooding for as long as 60 days in winter and early spring is typical of Tennessee's larger river systems such as the Tennessee, Hatchie, and Mississippi (Carter and Burbank, 1978). Rivers of western Tennessee lie almost entirely within the nearly flat Coastal Plain and include the Obion, Forked Deer, Hatchie, Loosahatchie, and Wolf. Low stream gradients, which contribute to the frequency and severity of flooding, and broad flood plains provide a suitable environment for bottom-land hardwood forests dominated by trees tolerant of a long dormant season and occasional growing-season flooding.

Many streams in western Tennessee have been channelized to enhance drainage of adjacent wetlands (fig. 3), making cultivation possible. However, these streams flow through unconsolidated and

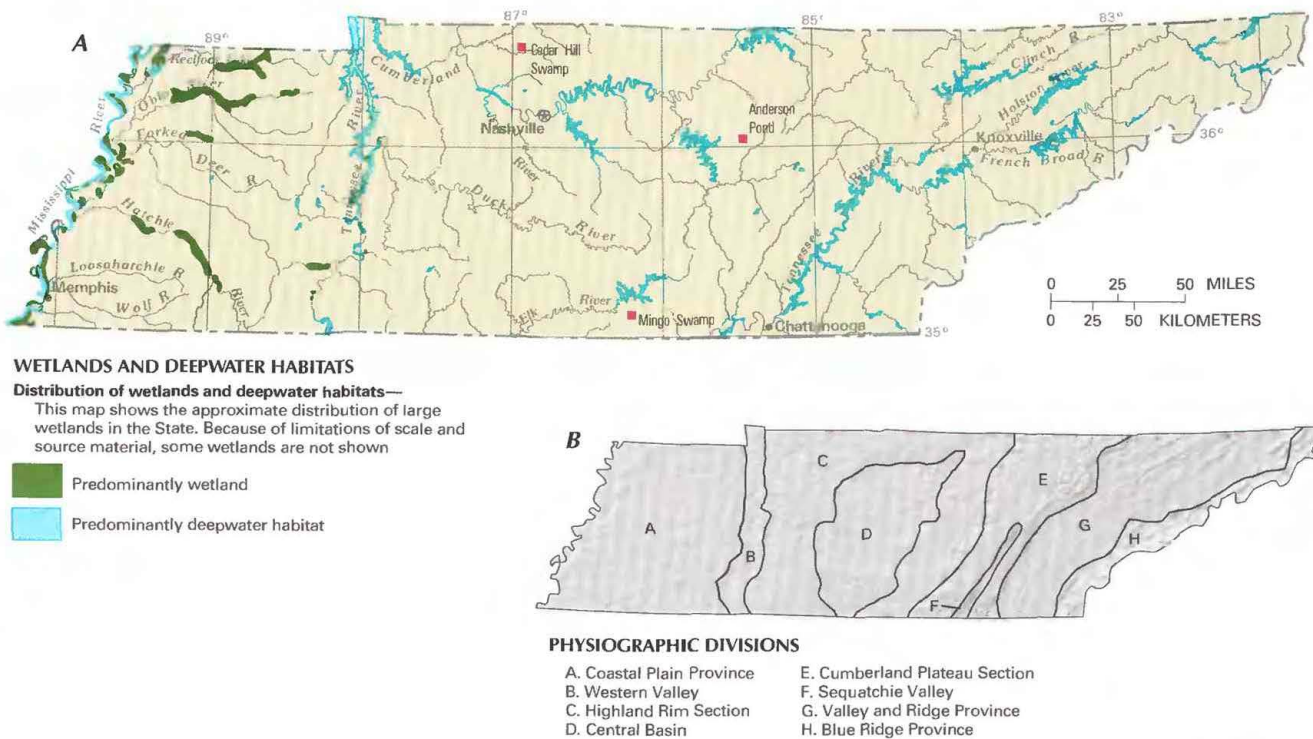


Figure 2. Wetland distribution in Tennessee and physiography of the State. **A**, Distribution of wetlands and deepwater habitats. **B**, Physiography. (Sources: A, T.E. Dahl, U.S. Fish and Wildlife Service, unpub. data, 1991. B, Physiographic divisions from Fenneman, 1946, and Miller, 1974; landforms data from EROS Data Center.)



Figure 3. Channelized creek in western Tennessee. (Photograph by Cliff R. Hupp, U.S. Geological Survey.)

erodible alluvial deposits, and channelization causes the streams to erode their channel beds and banks in some reaches, whereas other reaches fill with the material eroded from upstream (Robbins and Simon, 1983; Simon and Hupp, 1992). Thus, channelization has had a direct influence on wetland hydrologic processes in Tennessee by reducing flooding and lowering the water table in upper reaches of streams but increasing downstream deposition of sediment and contributing to downstream flooding (Shankman and Samson, 1991; Hupp, 1992).

Isolated wetlands, such as highland bogs and upland swamps, are not associated with streams and typically are formed in limestone sinkholes or depressions on stream terraces. These wetlands rely on direct precipitation and runoff, ground-water discharge, or both, to maintain water volume. Whereas water levels associated with these wetlands fluctuate and can be no more than a few inches deep during dry seasons, complete drying rarely occurs. Soils of these wetlands typically are poorly drained, organic, and acidic.

TRENDS

The FWS National Wetland Inventory has estimated that Tennessee lost as much as 59 percent of its wetland area in the 200 years before the 1980's (Dahl, 1990). Although wetland loss can occur as a result of natural ecological succession, human activities such as livestock grazing, draining, and clearing for agriculture, logging, pond and lake construction, and urban development are most often the cause. Losses have been particularly extensive in western Tennessee.

Logging of western Tennessee bottom lands proceeded rapidly after about 1880, and favorable agricultural prices provided an economic incentive to cultivate marginal lands in the area. Drainage districts were formed to establish dredging and channelization projects to drain the bottom lands to exploit their agricultural potential. By the 1930's, many dredged channels in western Tennessee were partially or completely filled by sediment from agricultural operations. This sedimentation has altered the hydrology of the bottom lands and caused changes in vegetation patterns and wetland types (Wolfe and Diehl, 1993). As much as 83 percent of the original bottom-land hardwood-forest wetlands in the Obion and Forked Deer River Basins alone have been lost (Tennessee Department of Conservation, 1988).

The Hatchie and Wolf Rivers are the remaining major rivers in western Tennessee that have not been channelized along substantial parts of their courses. Most other streams, including tributaries to the Hatchie River, have been repeatedly channelized from their mouths nearly to the drainage divides. Following channelization,

reestablishment of bottom-land hardwood forests takes at least 65 years (Hupp, 1992). Although agricultural conversions could be decreasing, future losses of wetlands might occur as a result of urban conversion, transportation construction, and channelization. Also, though wetland losses are most notable in the western part of the State, significant losses of upland swamps, freshwater marshes, and bottom-land hardwood forests have occurred and could continue to occur in middle and eastern Tennessee (Tennessee Department of Conservation, 1988).

In 1988, the Governor of Tennessee established the Interagency Wetlands Committee in response to concerns over the significant losses of wetlands. The purpose of this committee is to exchange information and coordinate programs of Federal, State, and local agencies, conservation organizations, and private landowners to manage, conserve, or restore wetlands for beneficial uses.

CONSERVATION

Many government agencies and private organizations participate in wetland conservation in Tennessee. The most active agencies and organizations and some of their activities are listed in table 1.

Federal wetland activities.—Development activities in Tennessee wetlands are regulated by several Federal statutory prohibitions and incentives that are intended to slow wetland losses. Some of the more important of these are contained in the 1899 Rivers and Harbors Act; the 1972 Clean Water Act and amendments; the 1985 Food Security Act; the 1990 Food, Agriculture, Conservation, and Trade Act; and the 1986 Emergency Wetlands Resources Act.

Section 10 of the Rivers and Harbors Act gives the U.S. Army Corps of Engineers (Corps) authority to regulate certain activities in navigable waters. Regulated activities include diking, deepening, filling, excavating, and placing of structures. The related section 404 of the Clean Water Act is the most often-used Federal legislation

Table 1. Selected wetland-related activities of government agencies and private organizations in Tennessee, 1993

[Source: Classification of activities is generalized from information provided by agencies and organizations. ●, agency or organization participates in wetland-related activity; ..., agency or organization does not participate in wetland-related activity. MAN, management; REG, regulation; R&C, restoration and creation; LAN, land acquisition; R&D, research and data collection; D&I, delineation and inventory]

Agency or organization	MAN	REG	R&C	LAN	R&D	D&I
FEDERAL						
Department of Agriculture						
Consolidated Farm Service Agency	●
Natural Resources Conservation Service	●	●	...	●	●
Department of Defense						
Army Corps of Engineers	●	●	●	●	●	●
Military reservations	●
Department of the Interior						
Fish and Wildlife Service	●	...	●	●	●	●
Geological Survey	●	...
National Biological Service	●	...
National Park Service	●	...	●	●	●	●
Environmental Protection Agency	●	●	●
Tennessee Valley Authority	●	...	●	...	●	...
STATE						
Department of Environment and Conservation	●	●	●
Department of Transportation	●
Tennessee Technological University	●	...
University of Tennessee	●	...
Wildlife Resources Agency	●	...	●	●	●	●
PRIVATE						
The Nature Conservancy	●
Ducks Unlimited	●	...	●	●
Farm Bureau Federation	●

protecting wetlands. Under section 404 provisions, the Corps issues permits regulating the discharge of dredged or fill material into wetlands. Permits are subject to review and possible veto by the U.S. Environmental Protection Agency, and the FWS has review and advisory roles. Section 401 of the Clean Water Act grants to States and eligible Indian Tribes the authority to approve, apply conditions to, or deny section 404 permit applications on the basis of a proposed activity's probable effects on the water quality of a wetland.

Most farming, ranching, and silviculture activities are not subject to section 404 regulation. However, the "Swampbuster" provision of the 1985 Food Security Act and amendments in the 1990 Food, Agriculture, Conservation, and Trade Act discourage (through financial disincentives) the draining, filling, or other alteration of wetlands for agricultural use. The law allows exemptions from penalties in some cases, especially if the farmer agrees to restore the altered wetland or other wetlands that have been converted to agricultural use. The Wetlands Reserve Program of the 1990 Food, Agriculture, Conservation, and Trade Act authorizes the Federal Government to purchase conservation easements from landowners who agree to protect or restore wetlands. The Consolidated Farm Service Agency (formerly the Agricultural Stabilization and Conservation Service) administers the Swampbuster provisions and Wetlands Reserve Program. The Natural Resources Conservation Service (formerly the Soil Conservation Service) determines compliance with Swampbuster provisions and assists farmers in the identification of wetlands and in the development of wetland protection, restoration, or creation plans.

The 1986 Emergency Wetlands Resources Act encourages wetland protection through funding incentives. The act requires States to address wetland protection in their Statewide Comprehensive Outdoor Recreation Plans to qualify for Federal funding for State recreational land; the National Park Service provides guidance to States in developing the wetland component of their plans.

The Tennessee Valley Authority (TVA) does not directly regulate wetland activities but conducts a wetlands review for any action affecting TVA-controlled properties. Through the review process, the TVA attempts to minimize the destruction, loss, or degradation of wetlands. In cooperation with the FWS, the TVA operates projects in western Tennessee that provide wetland habitat for migratory waterfowl. In addition, the TVA promotes the use of constructed wetlands as a means of wastewater treatment.

State wetland activities.—The Tennessee Department of Environment and Conservation was created in 1990 by combining the Department of Conservation and the Department of Health and Environment. The Department of Environment and Conservation regulates development activities in wetlands through sections 401 and 402 of the Clean Water Act. The section 401 program requires that a section 404 permit applicant provide certification from the State that a discharge will comply with State water-quality standards. The section 401 certification from the Department is necessary before a section 404 permit can be obtained from the Corps. Section 402 of the Clean Water Act requires that permits be obtained for discharges of treated wastewater to wetlands under the National Pollutant Discharge Elimination System Program. The Department of Environment and Conservation is the State agency delegated to administer this program. The Tennessee Water Quality Control Act of 1977 requires that a State permit be obtained if changes are proposed to an existing aquatic environment; agricultural and forestry activities are exempted.

Through the Tennessee Natural Areas Preservation Act of 1971, the Department of Environment and Conservation has assumed the former Department of Conservation's responsibility for acquiring wetlands that represent outstanding examples of the State's natural landscape. The Tennessee Oil and Gas Law enables the Department to regulate oil and gas drilling by placing special conditions on drilling activities near wetlands. As a result of the U.S. Land and

Water Conservation Act of 1965, the Department is active in wetland-program planning by amending and updating the Statewide Comprehensive Outdoor Recreation Plans to identify wetlands that have high recreation potential.

The Tennessee Wildlife Resources Agency administers the Wetlands Acquisition Fund. The Tennessee Wetlands Acquisition Act of 1986 sets aside a part of the State real estate transfer tax for acquisition of wetlands. The acquisition of wetlands through the Wetlands Acquisition Fund must be approved by the Director of the Wildlife Resources Agency and the Commissioner of Agriculture.

The Tennessee Department of Transportation conducts wetland restorations along its construction projects to mitigate unavoidable wetland destruction. The Department of Transportation also constructs wetlands as large as 450 acres to compensate for unavoidable losses.

County and local wetland activities.—There has been little involvement by county and local governments in wetlands issues in Tennessee. Notable exceptions include Knoxville, Nashville, Chattanooga, and Memphis. These metropolitan areas have developed plans for the construction of greenway recreational areas, some of which will contain wetlands. However, as of 1993, the only city that had begun implementing its plan was Chattanooga.

Private wetland activities.—Several private groups are actively involved in wetlands issues in Tennessee. The Farm Bureau Federation promotes funding and research concerning the use of constructed wetlands for water-quality improvement. The Nature Conservancy cooperates with the State in acquiring areas for preservation. The Tennessee Conservation League and the Sierra Club promote public use and conservation of wetlands. Through its national headquarters in Memphis, Ducks Unlimited cooperates with the Tennessee Wildlife Resources Agency in acquiring and managing wetlands and assists private landowners in constructing wetlands.

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