

# North Carolina

## Wetland Resources

**W**etlands of North Carolina are diverse and widely distributed. About 5.7 million acres, or 17 percent, of the State is covered by wetlands (Dahl, 1990). About 95 percent of these wetlands are in the eastern part of the State (fig. 1).

Wetlands affect streamflow and water quality and provide critical habitat to a variety of plants and animals. Because of the large size of some eastern North Carolina wetlands and their proximity to coastal waters, these wetlands are important regulators of freshwater, nutrient, and sediment inputs to North Carolina estuaries. Almost one-half of North Carolina's wetlands are bottom-land hardwood forests, which are valuable habitats for waterfowl breeding and overwintering and for anadromous fish spawning (U.S. Fish and Wildlife Service, 1992). About 90 percent of the State's commercial fish harvest is derived from estuary-dependent species. Tidal and nontidal creeks surrounded by wetlands and vast beds of submersed aquatic vegetation function as nursery areas for larval and juvenile fish and provide critical finfish and shellfish habitats for adults. Small wetlands throughout the Piedmont and Blue Ridge Provinces of the State harbor at least 80 species of rare or endangered plants. Statewide, about 70 percent of the rare and endangered plants and animals depend on wetlands.

### TYPES AND DISTRIBUTION

Wetlands are lands transitional between terrestrial and deepwater 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 North Carolina 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 North Carolina are described below.

System	Wetland description
Palustrine .....	Nontidal and tidal-freshwater 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 larger than 20 acres and (or) deeper than 6.6 feet. Vegetation, when present, is predominantly nonpersistent emergent plants (nonpersistent-emergent wetlands), or submersed and (or) floating plants (aquatic beds), or both.
Riverine .....	Nontidal and tidal-freshwater wetlands within a channel. Vegetation, when present, is same as in the Lacustrine System.
Estuarine .....	Tidal wetlands in low-wave-energy environments where the salinity of the water is greater than 0.5 part per thousand (ppt) and is variable owing to evaporation and the mixing of seawater and freshwater.
Marine .....	Tidal wetlands that are exposed to waves and currents of the open ocean and to water having a salinity greater than 30 ppt.

**Palustrine system.**—Palustrine wetlands account for most of the wetland acreage in North Carolina. Palustrine wetlands in the State include forested wetlands (bottom-land hardwood forests, fringe wooded swamps, wet pine flatwoods, pine savannas, and hardwood flats), wetlands that are classified as forested or scrub-shrub wetlands, depending on the characteristics of the dominant vegetation (Carolina bays, pocosins, and bogs), and emergent wetlands (nontidal and tidal fresh marshes).

Bottom-land hardwood forests cover about 2.7 million acres (U.S. Fish and Wildlife Service, 1992) and occur primarily in the Coastal Plain along the Roanoke, Tar, Neuse, and Cape Fear Rivers, as well as along other large interior streams (fig. 2A and 2B). The Roanoke River flood plain has one of the largest and least disturbed bottom-land hardwood forests in the mid-Atlantic region. Cypress, swamp gum, and black gum grow in the wetter areas of the flood plain, whereas temporarily or seasonally flooded bottom-land hardwood-forest wetlands are dominated by red maple, green ash, elm, sycamore, and sweet gum.

Fringe wooded swamps are the dominant shoreline type around Albemarle Sound; along the Alligator, Scuppernong, and lower Chowan Rivers; and in some locations along tributaries to Pamlico Sound. These swamps cover an area of about 400,000 acres (North Carolina Department of Environment, Health, and Natural Resources, 1994) and are vegetated primarily by cypress (Environmental Defense Fund, 1989).

Wet pine flatwoods possibly occupy more than 2 million acres, and pine savannas cover an area of about 28,000 acres (North Carolina Department of Environment, Health, and Natural Resources, 1994). Both ecosystems have a canopy of longleaf pine and occa-



**Figure 1.** Merchants Millpond, a forested wetland in northeastern North Carolina. (Photograph by Virginia Carter, U.S. Geological Survey.)



sional loblolly pine with an understory of wiregrass. Pine savannas have a greater density of trees than wet pine flatwoods, and pine savannas support orchids and various small vascular plants, such as pitcher plants, Venus flytrap, and sundews. Wet pine flatwoods are common throughout the western and middle regions of the Coastal Plain, except in the Sand Hills, whereas pine savannas are most common in the southeastern corner of the State (Schafale and Weakley, 1990).

Carolina bays are ovate depressions that occur across the Coastal Plain but are most common in the southeastern corner of the State (Sharitz and Gibbons, 1982). Most of the bays contain palustrine wetlands, but a few large Carolina bays, such as Lake Waccamaw, are lacustrine wetlands. The bays range in length from about 150 feet to more than 5 miles. Because of variability in size, depth, location, and substrate, Carolina bays are not characterized by a single vegetation type. These systems are unusual in their geographic orientation (northwest to southeast) and consistent shape (narrower at the southeast end).

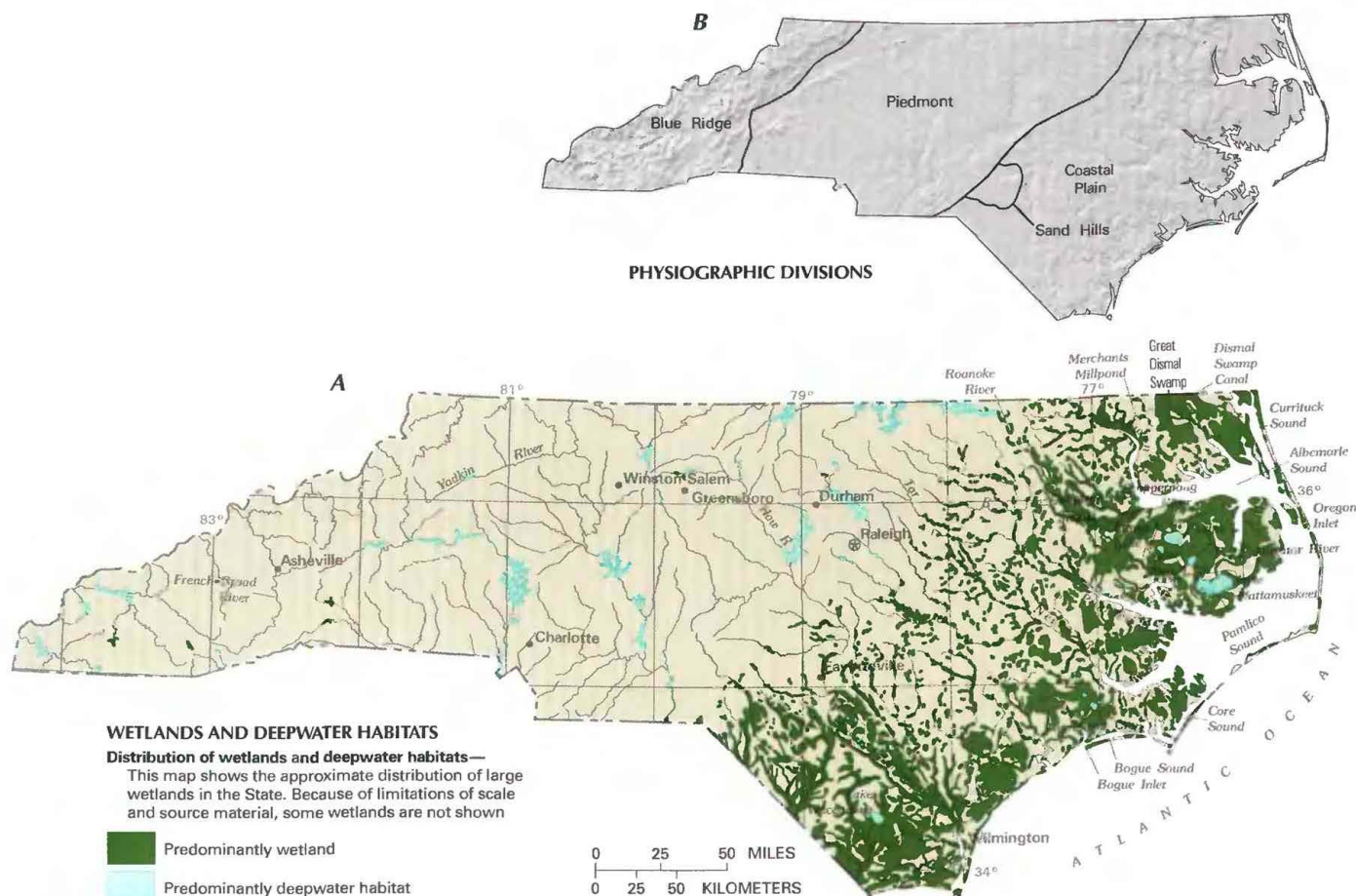
About 700,000 acres of pocosins remain in North Carolina (Environmental Defense Fund, 1989)—about 70 percent of the Nation's pocosin wetlands (Richardson and others, 1981). Pocosins form in poorly drained basins, including interior depressions of Carolina bays (Ash and others, 1983). The typical pocosin is classified as a scrub-shrub wetland. However, a pocosin can be a forested wetland, depending on the successional stage of the pocosin, which is commonly determined by hydrology or by fire and other disturbances (Hefner and Moorhead, 1991). Scrub-shrub pocosins are dominated by dense, almost impenetrable, growths of evergreens

such as titi and yaupon, thorny vines, and occasional taller pond pines projecting above the thicket. Forested pocosins are generally dominated by red bay, sweet bay, Atlantic white cedar, loblolly bay, and pond pine (Sharitz and Gibbons, 1982; Ash and others, 1983). Vegetation in large pocosins commonly grows in zones with shorter vegetation in the center.

Other types of palustrine wetlands include bogs and fresh marshes. Bogs, which occur throughout the Blue Ridge Province, have been subject to draining, impoundment, and clearing at lower elevation sites (Schafale and Weakley, 1990). Nontidal fresh marshes cover about 46,000 acres in the Coastal Plain (Field and others, 1991) and often grade upriver to cypress-gum swamps (forested wetlands). About 2,200 acres of tidal fresh marshes exist in North Carolina (Field and others, 1991).

**Lacustrine and Riverine Systems.**—Lacustrine wetlands comprise the shallows of natural lakes and reservoirs where there is no persistent emergent vegetation or trees. All of the State's natural lakes are located in the Coastal Plain, and many are associated with Carolina bays or peatlands. More than 100 water-supply and flood-control reservoirs have been constructed throughout the Piedmont and Blue Ridge Provinces (North Carolina Department of Environment, Health, and Natural Resources, 1992). Riverine wetlands constitute the entire channel of small, shallow streams and shallow areas near the banks in large, deep streams. The total area of lacustrine and riverine wetlands in the State is not known but is small relative to the area of palustrine wetlands.

**Estuarine and Marine Systems.**—North Carolina contains more than 3,000 miles of tidal (estuarine and ocean) shoreline (Clay



**Figure 2.** Wetland distribution in North Carolina 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; landforms data from EROS Data Center.)



and others, 1975). Between 183,000 (Cashin and others, 1992) and 236,000 acres (Moorhead, 1992) of salt marsh (emergent wetlands) are present in the State, which constitutes about 11 percent of the tidal salt marshes of the southeastern Atlantic coast (Wiegert and Freeman, 1990). Salt marshes, also known as "low marshes," are generally covered by smooth cordgrass. "High marshes" typically contain mixtures of species, including needlerush and shrubs such as wax myrtle and marsh elder. About 30,000 acres of high marsh are present in the State (Moorhead, 1992).

Most seagrass beds (aquatic beds) are subtidal and, thus, are classified as deepwater habitats. However, some seagrass beds in North Carolina are intertidal and are classified as wetlands. The most extensive beds, which typically contain eelgrass, shoalgrass, and widgeon grass, are in Bogue Sound, Core Sound, and eastern Pamlico Sound; seagrass beds also grow in the Pamlico River, Neuse River, and Currituck Sound. Ferguson and others (1989) estimated that 200,000 acres of seagrass beds are present between Bogue Inlet and Oregon Inlet.

Tidal flats usually consist of sand, silt, or clay regularly exposed and flooded by tides. The vegetation on tidal flats is minimal because of the unstable sediments. About 44,000 acres of tidal flats are present in North Carolina (Field and others, 1991), which is about 4 percent of the national total.

## HYDROLOGIC SETTING

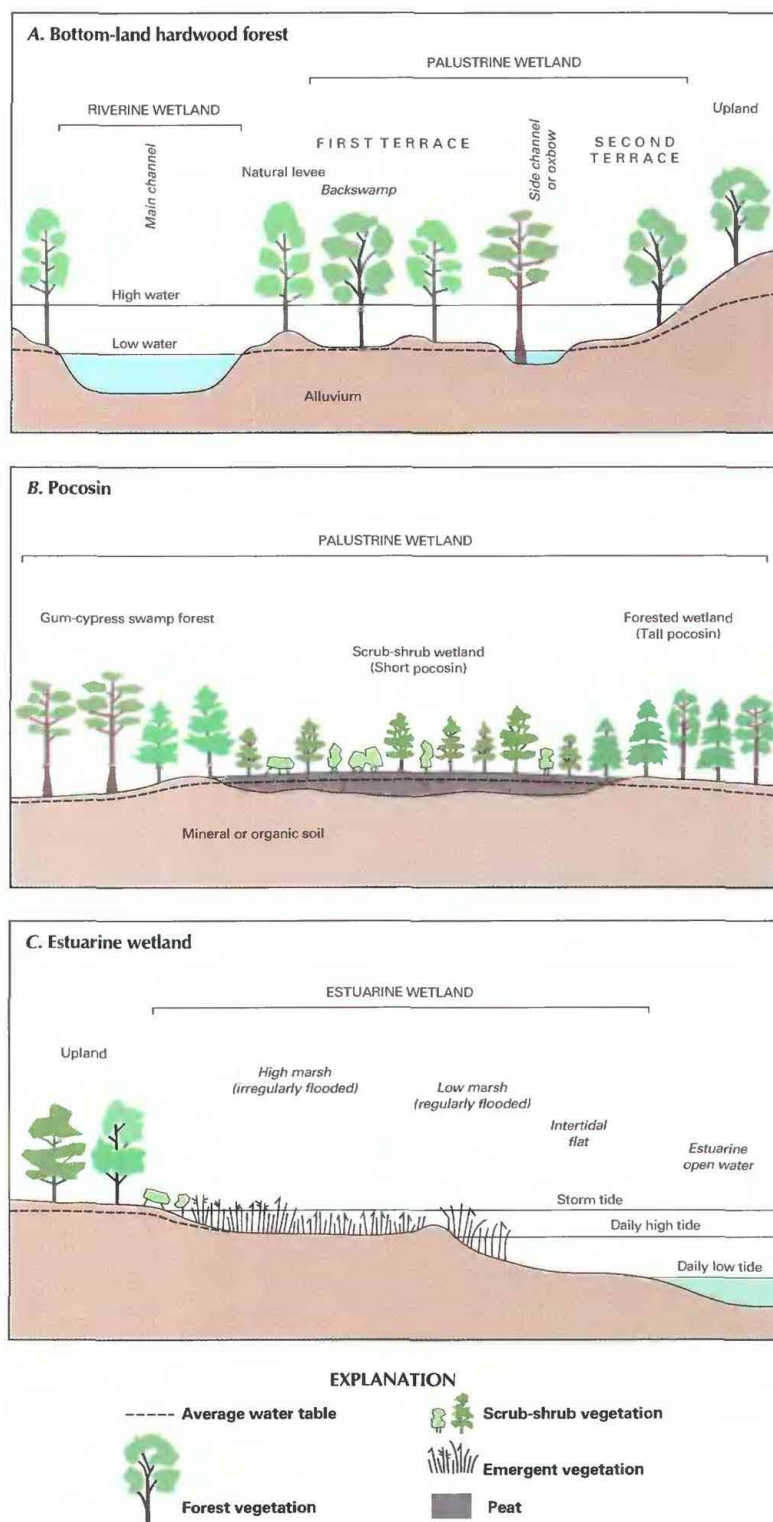
Abundant precipitation and flat terrain in the Coastal Plain are the most important factors that contribute to the abundance of wetlands in North Carolina. Fifty-nine percent of the State's palustrine wetlands are headwater wetlands (on streams having an average flow of less than 5 cubic feet per second), and 11 percent of palustrine wetlands are hydrologically isolated (North Carolina Department of Environment, Health, and Natural Resources, 1991).

**Bottom-land hardwood forests.**—Water and sediment carried by rivers are responsible for the origin, character, and maintenance of bottom-land hardwood-forest wetlands. Erosional and depositional processes typically result in a sinuous river channel located within a broad flood plain (fig. 3A). Sources of water to the wetlands include overbank flow during seasonal flooding, precipitation, runoff from upland areas, ground water from regional and local aquifers, and tidal flow (Wharton and others, 1982). Seasonal flooding is the primary hydrologic factor responsible for the existence of these wetlands. At times, streamflow can actually decrease in the downstream direction because water spreads through the flood plain providing increased opportunity for evapotranspiration or loss to the shallow ground-water system.

**Wet pine flatwoods and pine savannas.**—Wet pine flatwoods and pine savannas occur on flat or nearly flat, wet organic or sandy soils. The soils are saturated seasonally by a high water table, although some sites are wet most of the year. These wetlands, particularly the savannas, also form on gently sloping hillsides where ground-water seepage occurs (Schafale and Weakley, 1990).

**Pocosins.**—Because pocosins generally are isolated from streams, direct precipitation is the primary moisture source. Pocosins having a thick layer of peat near the center of the wetland are nutrient poor, and

ground water seldom extends into the root zone. Under these conditions, vegetation generally consists of low shrubs and scattered trees (fig. 3B). Near the outer edges of the pocosin, where the peat layer is thinner, vegetation grades into a mixture of hardwoods and evergreens because of the increased availability of nutrients from



**Figure 3.** Cross-sectional diagrams of typical North Carolina wetlands. **A.** Bottom-land hardwood forest. **B.** Pocosin. **C.** Estuarine wetland. (Sources: A, Wharton and others, 1982; Tiner, 1984. B, Ash and others, 1983. C, Tiner, 1984.)

ground and surface water. In some cases, however, pocosins are entirely forested without the gradation from scrub-shrub to forested wetland. Vertical water movement through the peat is slight, resulting in little loss of water to the ground-water system. Lateral water movement also is typically slow, which accounts for the important role of pocosins in preventing rapid surface runoff and, thus, in filtering sediment and nutrients from runoff before it enters the estuary.

*Tidal freshwater and salt marshes.*—With the exception of the Cape Fear River, North Carolina's large coastal rivers drain to sounds rather than to the open ocean. Consequently, tides in these rivers are small in magnitude, resulting in limited tidal flooding and a small area of tidal fresh marsh in comparison to other Southeastern States.

Salt marshes in areas that have high tidal amplitudes can have natural berms or levees, which are formed by tidal sedimentation and consist of coarse-grained material. Water flows through the berms in small breaks or over the berms during extremely high tides (fig. 3C) to flood the area landward of the berm. Vegetation characteristics landward of the berm are determined by the periodicity of flooding, the salinity level in the soil, the frequency of occurrence of oxygen-poor conditions, and the contribution of ground water. In salt marshes with low tidal amplitudes, such as those in estuaries and sounds protected by barrier islands, berm formation is limited because of low sedimentation rates.

## TRENDS

Before colonization by Europeans, the area that now is North Carolina contained about 11 million acres of wetlands (Dahl, 1990). Dahl estimated that in the mid-1980's, about one-half, or 5.7 million acres, remained.

Because of the absence of reliable historical data, wetland loss can be difficult to assess. Moreover, most surveys consider the alteration of a wetland from its natural condition to be a "loss," whereas many pine plantations and some agricultural lands on converted wetlands retain some of their original wetland functions and support limited wetland uses. North Carolina evaluates wetland resources in terms of use support rather than areal coverage (North Carolina Department of Environment, Health, and Natural Resources, 1991).

The first major alteration of wetlands in North Carolina was associated with the completion of a canal between Phelps Lake and the Scuppernon River in 1787 (17 years before the Dismal Swamp Canal) that lowered the lake level and permitted farming around the lake (Heath, 1975). The State Literary Board encouraged settlement on swamplands in the 1830's by providing funds for drainage canals around Lake Mattamuskeet, Pungo Lake, and New Lake. Several other large-scale wetland alteration projects, including the drainage of the 43,000-acre Lake Mattamuskeet, occurred in the late 1800's and early 1900's (Heath, 1975). Wilson (1962) estimated that more than 1 million miles of drainage ditches and canals were constructed throughout the Coastal Plain to drain wetlands.

About one-third of the wetland alteration in the Coastal Plain has occurred since the 1950's (Cashin and others, 1992). Cashin and others (1992) found that in the Coastal Plain, conversion to managed forests was responsible for 53 percent of the wetland alteration during that period, and conversion to agriculture was responsible for 42 percent.

About 2.5 million acres of pocosins existed before colonization (Richardson and others, 1981). Wilson (1962) reported that about 2.2 million acres of pocosins existed in the early 1960's and estimated that more than 100,000 acres of pocosins were drained between 1950 and 1960. Between 1962 and 1972, 33 percent of the State's remaining pocosin habitat was converted to agriculture or managed forests. About 700,000 acres of pocosins remain unaltered in North Carolina (Environmental Defense Fund, 1989).

Atlantic white cedar was once common in Coastal Plain wetlands, particularly in pocosins. However, as much as 200,000 acres of white cedar forest has been harvested from the Great Dismal Swamp and from the peninsula between Albemarle and Pamlico Sounds. Nonetheless, the area around the Alligator River still contains the most extensive white cedar forest in the world, including approximately 10,000 acres of high-quality cedar swamp forest protected as a North Carolina Natural Heritage Area (Laderman, 1989).

Estuarine wetlands have been altered less extensively than palustrine wetlands (Cashin and others, 1992). Stockton and Richardson (1987) reported that there was a decrease in the area of coastal wetland (salt marsh) alteration after the State adopted a strong coastal-wetland protection program.

Some land-use practices have created new wetlands or enlarged existing ones. Reservoir construction has increased the acreage of lacustrine wetlands, although usually at the expense of palustrine wetlands. Farm ponds constructed on previously upland areas in one Piedmont Province county account for about 1 percent of the total area of the county (Newcomb, 1993). Similar conditions likely exist throughout the Piedmont region of the State. Interest is increasing within the State for the use of created wetlands for treating wastewater.

## CONSERVATION

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

*Federal wetland activities.*—Development activities in North Carolina 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; the 1986 Emergency Wetlands Resources Act; and the 1972 Coastal Zone Management 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 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 (EPA), 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 (NRCS) (formerly the Soil Conservation Service) determines compliance with Swampbuster provisions and assists farmers in the

**Table 1.** Selected wetland-related activities of government agencies and private organizations in North Carolina, 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
<b>FEDERAL</b>						
Department of Agriculture						
Consolidated Farm Service Agency .....	•	•	•	•	•	•
Forest Service .....	•	•	•	•	•	•
Natural Resources Conservation Service .....	•	•	•	•	•	•
Department of Commerce						
National Oceanic and Atmospheric Administration .....	•	•	•	•	•	•
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 .....	•	•	•	•	•	•
<b>STATE</b>						
Department of Agriculture .....	•	•	•	•	•	•
Department of Environment, Health, and Natural Resources						
Division of Coastal Management .....	•	•	•	•	•	•
Division of Environmental Health .....	•	•	•	•	•	•
Division of Environmental Management .....	•	•	•	•	•	•
Division of Forestry Resources .....	•	•	•	•	•	•
Division of Marine Fisheries .....	•	•	•	•	•	•
Division of Parks and Recreation .....	•	•	•	•	•	•
Division of Planning and Assessment .....	•	•	•	•	•	•
Division of Soil and Water Conservation .....	•	•	•	•	•	•
Division of Water Resources .....	•	•	•	•	•	•
Department of Transportation .....	•	•	•	•	•	•
Museum of Natural Science .....	•	•	•	•	•	•
Wildlife Resources Commission .....	•	•	•	•	•	•
<b>SOME COUNTY AND LOCAL GOVERNMENTS</b> .....	•	•	•	•	•	•
<b>PRIVATE ORGANIZATIONS</b> .....	•	•	•	•	•	•

identification of wetlands and in the development of wetland protection, restoration, or creation plans.

The 1986 Emergency Wetlands Resources Act and the 1972 Coastal Zone Management Act and amendments encourage wetland protection through funding incentives. The Emergency Wetland Resources 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 (NPS) provides guidance to States in developing the wetland component of their plans. Coastal States that adopt coastal-zone management programs and plans approved by the National Oceanic and Atmospheric Administration are eligible for Federal funding and technical assistance through the Coastal Zone Management Act.

Large tracts of land, many containing wetlands, are managed by the FWS, the U.S. Forest Service, the U.S. Department of Defense, and the NPS. The management plans for these lands are subject to a review process that allows local groups and individuals to have input into the planning process.

North Carolina is one of nine States participating in the U.S. Department of Agriculture's (USDA) Pilot Wetlands Reserve Program. The purpose of the program is to restore 1 million acres of cultivated land to wetlands by 1995. Landowners receive easement payments from USDA, which pays 75 percent of the restoration costs. The NRCS and FWS assist in completion of the restoration plans.

About 15,000 acres of cultivated land in North Carolina were enrolled in the program in 1992 (Darby, 1993).

**State wetland activities.**—The State has adopted a strong coastal-wetlands program as part of a broader coastal zone management effort. The North Carolina Coastal Area Management Act of 1974 includes provisions for local land-use planning, regulation for Areas of Environmental Concern (including estuarine waters and coastal wetlands), and permit coordination within the 20 counties affected by the act. Uses that are not water dependent are not permitted in wetlands, but uses that are water dependent may be permitted. The Division of Coastal Management administers the act and also administers the National Estuarine Research Reserve and North Carolina Coastal Reserve systems in the State. About 32 percent of all Coastal Plain wetlands are publicly owned (North Carolina Department of Environment, Health, and Natural Resources, 1991).

No State regulations exist specifically to protect freshwater wetlands. Moreover, Clean Water Act Section 404 regulations allow up to 10 acres of headwater wetlands to be filled without a permit or public review. However, section 401 of the Clean Water Act requires that any applicant for a Federal permit or license first obtain certification that the proposed activity, including those in wetlands, will comply with water-quality standards in the affected State. The Division of Environmental Management has developed a preliminary rating system for freshwater wetlands to assist in making permitting decisions as part of the section 401 program (North Carolina Department of Environment, Health, and Natural Resources, 1993). Some additional measure of protection of wetlands is provided by other classifications and designations, including Outstanding Resource Waters, Nutrient Sensitive Waters, High Quality Waters, Shellfishing Waters, Primary Nursery Areas, and Secondary Nursery Areas.

In 1986, the North Carolina Department of Transportation, in cooperation with the North Carolina Wildlife Resources Commission, the FWS, and The Nature Conservancy, purchased Company Swamp, a 1,436-acre tract of bottom-land hardwood-forest wetland on the Roanoke River. The wetland is being used to mitigate unavoidable wetland losses associated with individually permitted section 404 activities that the Department conducts in bottom-land hardwood forests and that cannot be mitigated on site. This mitigation bank avoids the need to establish numerous small mitigation efforts and protects a valuable wetland resource.

**County and local wetland activities.**—Many local governments, particularly in the 20 counties affected by the Coastal Area Management Act, have wetland-protection policies in their land-use plans. Local governments also use the purchase of greenways through bond issues (for example, Mecklenburg County, which contains Charlotte) or as a required part of the development process (for example, Raleigh) to protect wetlands. Carteret County (which contains Morehead City) is participating in the Advanced Identification Program, an EPA program which attempts to identify wetland parcels inappropriate for disposal of fill material and, in some cases, wetlands that could serve as disposal sites.

**Private wetland activities.**—Private organizations in North Carolina are active in public education, lobbying for wetland protection, land acquisition, and public participation in permit review and policy development. The Nature Conservancy, North Carolina chapter, has purchased wetlands in North Carolina for preservation, and ownership of some of these lands has been transferred to Federal and State agencies. The North Carolina Coastal Federation, the Pamlico-Tar River Foundation, the Neuse River Foundation, the Sierra Club, the National Wildlife Federation, the Environmental Defense Fund, Ducks Unlimited, and others provide services to educate the public on wetland issues and provide input to State and Federal agencies on wetland issues.

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