

New York

Wetland Resources

The diverse wetlands of New York have formed from the interaction of geologic events, climate, and hydrology. New York's freshwater and saltwater wetlands are important for fish and wildlife, environmental quality, human society, and the economy. Estuarine wetlands provide habitat for clams and oysters, and they provide spawning and nursery grounds for commercially important fish species, including alewife, blueback herring, bass, white perch, American shad, menhaden, bluefish, sea trout, and mullet. Many bird species, including osprey, peregrine falcons, snow and Canada geese, and pintail, canvasback, mallard, and black ducks, use New York's salt marshes for feeding, migration, and wintering grounds. Nesting bald eagles and the largest colony of great blue herons in New York live in the Iroquois National Wildlife Refuge. Beavers, muskrat, raccoons, river otters, foxes, and rabbits use wetlands as a source of food and shelter. Many reptile and amphibian species also live in the State's wetlands.

New York's wetlands are home to many threatened and endangered plants and animals. Of the 160 threatened or endangered plant species identified by the State's Department of Environmental Conservation, 50 percent are wetland species, as are 10 species of vertebrates (Alvin Breisch, New York State Department of Environmental Conservation, oral commun., 1993).

The environmental quality of aquatic habitats is enhanced by wetlands. Wetlands filter or absorb nutrients, and they also remove heavy metals and other contaminants from waters moving through them. Wetlands reduce turbidity and sediment loading, thereby slowing the siltation of harbors and navigable rivers and streams. The aquatic productivity of wetlands is very high—the amount of plant material produced per acre annually by an estuarine wetland (gross primary productivity) has been estimated to be about the same as that of a tropical rain forest (Odum, 1971). Salt marshes support a diverse community of animals that inhabit estuarine waters.

In addition to the habitat and environmental benefits of wetlands, they also provide socioeconomic benefits, including flood and storm-damage protection, erosion control, and the production of plants such as blueberries, cranberries, wild rice, salt hay, and timber. Wetlands also provide many recreational and educational opportunities, including hunting and fishing, nature study, boating, painting and drawing, and photography. The Hudson River National Estuarine Research Reserve (fig. 1) is a wetland-upland complex of national significance that provides outstanding opportunities for research and education.

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 New York 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 New York 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	Nontidal and tidal-freshwater 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.

Dahl (1990) has estimated that wetlands cover about 1.0 million acres of New York. Another estimate places the present-day acreage at 2.2 to 2.4 million acres (Patricia Riexinger, New York Department of Environmental Conservation, oral commun., 1993). Such estimates of wetland area are typically based on surveys that



Figure 1. Tivoli Bays, Hudson River National Estuarine Research Reserve. The reserve is managed cooperatively by the State of New York and the National Oceanic and Atmospheric Administration's Sanctuaries and Reserves Division. (Photograph by E.A. Blair, Hudson River National Estuarine Research Reserve.)

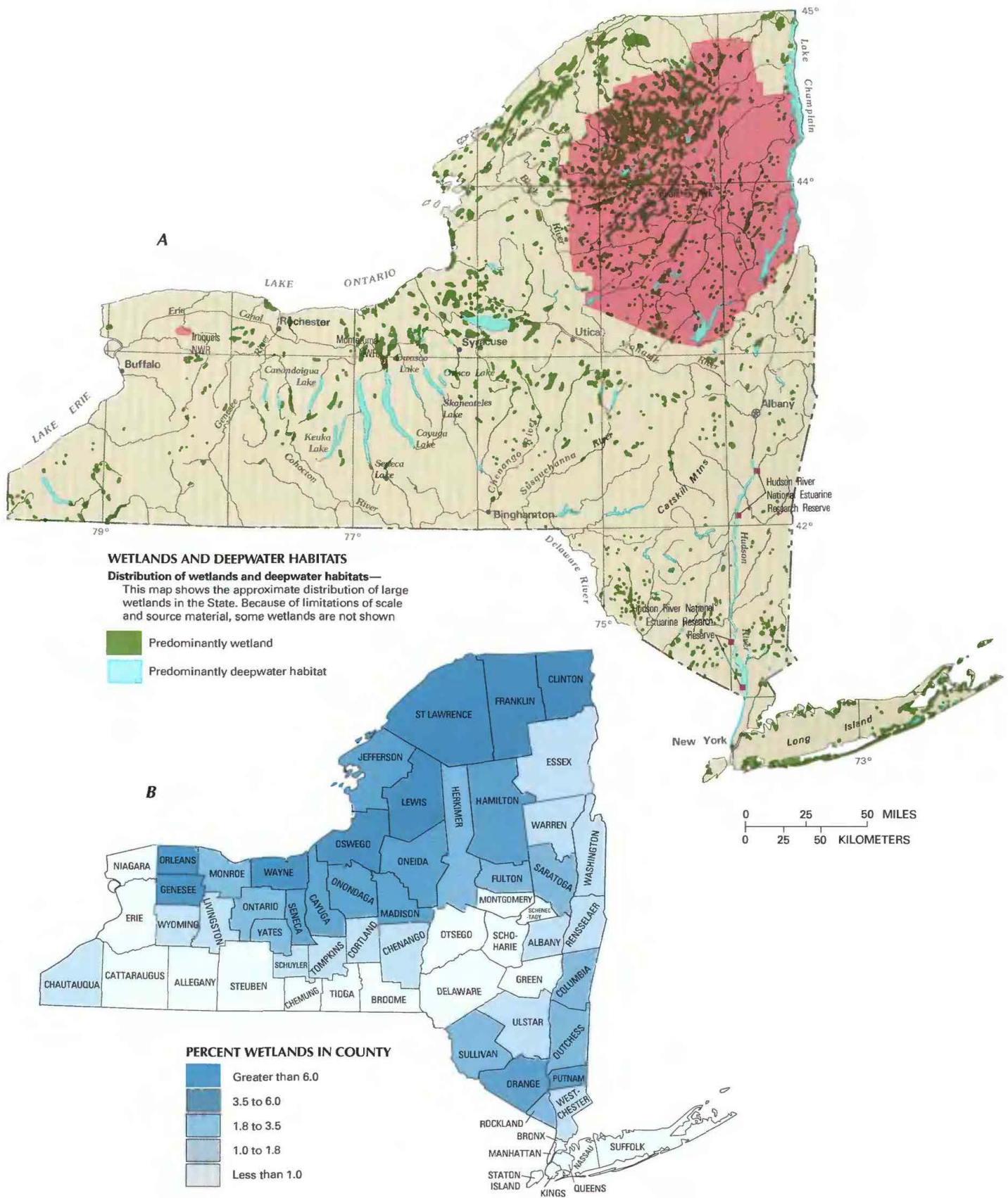


Figure 2. Wetland distribution in New York and physical and climatological features that affect wetland distribution in the State. **A**, Distribution of wetlands and deepwater habitats. **B**, Percentage area of New York counties that is wetland. (Sources: A, T.E. Dahl, U.S. Fish and Wildlife Service, unpub. data, 1991. B, O'Connor and Cole, 1989.)

have different minimum unit sizes, which could account, in part, for the disparity of these estimates.

About 75 percent of New York's wetlands occupy areas of less than 6 acres. O'Connor and Cole (1989) classified New York's freshwater wetlands of at least one-half acre into 14 cover types by use of aerial-photographic methods. Their study did not consider salt-water wetlands, which compose only a small percentage of the State's wetland acreage and are confined to the Long Island coast and the lower 30 miles of the Hudson River (Karl Schwartz, U.S. Fish and Wildlife Service, oral commun., 1993), but covers all other wetlands in the State. The five most common freshwater-wetland cover types in New York, in order of area, are flooded deciduous trees (palustrine forested wetland); flooded shrubs (palustrine scrub-shrub wetland); flooded coniferous trees (palustrine forested wetland); drained muckland, which is not considered wetland under the Cowardin and others (1979) classification system; and emergents (palustrine emergent wetlands or lacustrine or riverine nonpersistent-emergent wetlands). Together, these types constitute almost 88 percent of New York's freshwater wetland area.

The counties of upstate New York, including those in the Adirondack Mountains and the counties south and east of Lake Ontario, have the largest percentages of freshwater wetland area (fig. 2B). Among New York's counties, St. Lawrence County, which has about 21,000 acres of wetlands, has the largest area of freshwater wetland, and Wayne County, which contains 12 percent of the State's wetland acreage, has the highest percentage of wetland area. The urban counties of New York City and Long Island and the southern-tier counties along the State's border with Pennsylvania have the smallest percentage of wetland area. Counties in the Catskill Mountains also have relatively low areal percentages of wetlands.

Wetlands provide habitat for many threatened or endangered species. In New York, a species can be classified as threatened or endangered either by the State or by the Federal Government. Wetland plant species that are considered to be threatened or endangered in New York include heartleaf plantain, spreading globeflower, fringed gentian, and curlygrass fern. In addition to plants, a number of animal species are listed, including the red-shouldered hawk, osprey, bog turtle, and tiger salamander (Alvin Breisch, New York Department of Environmental Conservation, written commun., 1993).

HYDROLOGIC SETTING

New York's wetlands have formed primarily as the result of the interaction of geologic, physiographic, climatic, and hydrologic factors. Geologic history and climatic regime have influenced the State's physiography and hydrology, which largely determine the location and types of those wetlands.

During the last ice age, which ended about 18,000 years ago, glaciers covered most of New York. Erosion caused by movement of the glaciers and subsequent erosion and deposition by glacial meltwater and precipitation runoff shaped the present-day, topographically diverse landscape. The State's physiography (fig. 2C) ranges from lowlands to mountains, some having elevations higher than 5,000 feet in the Adirondack Mountains. Glacial drift (clay, sand, gravel, and boulders deposited by glaciers or transported by glacial meltwater) of varying thickness mantles the bedrock of most of the State and forms the floor of stream valleys and most other areas of low relief. Long Island is composed largely of glacial drift that was deposited at the edge of the glacier's farthest advance.

New York has 13.5 million acres of lakes (Zembrzuski and Gannon, 1986), which are most abundant in the St. Lawrence Valley, Adirondack, and Central Lowland physiographic provinces. These lakes were formed in three stages by glacial activity. First, the glaciers advanced, scouring the State's landscape. Then, as the glaciers retreated, large ice blocks were left behind and buried by glacial drift. These blocks subsequently melted, releasing their meltwater to form lakes. Other lakes, such as the Finger Lakes of west-central New York, are river valleys that have been deeply scoured by glaciers. Glacial lakes are most common in northern New York, especially in the Adirondack Mountains. Natural lakes of any kind are scarce in the Appalachian Plateaus of southwestern New York. There, rivers have cut deeply into the region's shale to form steep-sided valleys.

Noncoastal wetlands.—Most of New York's noncoastal wetlands have formed in and around glacial lakes. Some wetlands also occur along river and stream corridors and in other lowlands where deposits of fine-grained sediments provide an underlying impermeable layer that prevents water from percolating below the surface. Ground water and overland precipitation runoff are the principal sources of water for glacial-lake wetlands, and river flooding is an

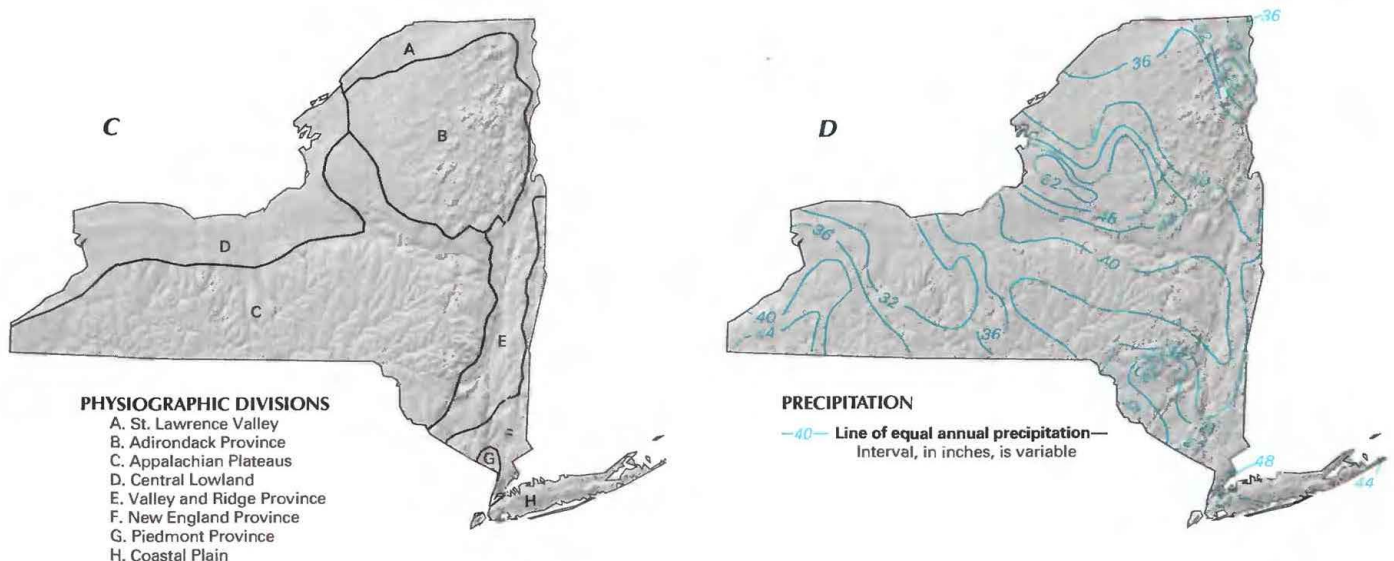


Figure 2. Continued. Wetland distribution in New York and physical and climatological features that affect wetland distribution in the State. **C.** Physiography. **D.** Precipitation. (Sources: **C.** Physiographic divisions from Fenneman, 1946; landforms data from EROS Data Center. **D.** Zembrzuski and Gannon, 1986.)

additional source for wetlands along rivers and streams. Annual precipitation in the State ranges from 28 inches to the west of Lake Champlain to more than 50 inches in the Adirondack and Catskill Mountains (fig. 2D). Annual precipitation substantially exceeds annual evapotranspiration, resulting in an annual moisture surplus and ample water to maintain wetlands.

Ground water flows into wetlands from either glacial drift, fractures in crystalline bedrock, or solution cavities in carbonate bedrock, depending on local geological characteristics. Most recharge to ground-water systems occurs in upland areas, where precipitation percolates through the surficial sediments and into the underlying aquifers. In stream valleys containing valley-fill aquifers that are composed of glacial deposits, precipitation runoff from valley walls also is a common source of recharge. From recharge areas, ground water flows to areas of lower elevation, discharging to streams, ponds, lakes, and wetlands.

Vegetated wetlands formed in New York's glacial lakes when the lakes filled with sediment and organic material, providing a substrate for rooted plants. Partially decomposed wetland vegetation accumulates in the wetlands, forming a continually thickening layer of organic matter called peat. Such wetlands are known as peatlands (Mitsch and Gosselink, 1986), of which bogs (forested, scrub-shrub, or emergent wetlands) and fens (similar wetland classes to bogs but different vegetation composition) are common types in New York. Bogs receive most or all of their water from precipitation and have a characteristic plant community that is composed of peat (sphagnum) moss and other plants tolerant of acidic conditions. Fens receive at least some water from ground water and are less acidic than bogs. Peatlands can evolve into uplands through an ecological process called succession, wherein the vegetative composition of the wetland changes over time. The plant community gradually evolves from one in which wetland plants predominate to one having more upland species. Although succession of some kind occurs in most ecosystems, it is possible that a wetland will never reach a steady-state condition. It can instead cycle through forested, open-water, emergent, and shrub phases several times as the community evolves (Virginia Carter, U.S. Geological Survey, written commun., 1994). Lakes undergo a similar process, called eutrophication, in which they fill in with decaying organic matter, which then forms the substrate for plants that make up the next stage in the successional process.

Coastal wetlands.—Nearly all of New York's coastal wetlands are in the intertidal zone in the bays of Long Island and comprise mostly salt marshes, aquatic beds, and tidal flats. These wetlands receive their water from the ocean, streams, and ground-water seepage and are subject to hydrologic and salinity regimes that vary daily with the tides and seasonally with precipitation and streamflow. The bottom material of coastal wetlands in the Northeastern United States generally consists of peat and fine sediments derived from the glacial drift that covers upland areas. Salt-marsh plant communities contain species physiologically adapted to dynamic conditions of moisture and salinity. Plant-species composition changes along a gradient that corresponds to frequency of inundation and to salinity range. Production of plant material is high in coastal marshes owing to a constant supply of nutrients (mostly nitrogen and phosphorus). Much of the plant material in estuarine marshes is washed into the estuary during the high tides of winter and becomes part of the detrital food web of the estuary (Virginia Carter, U.S. Geological Survey, written commun., 1994).

TRENDS

New York's wetlands have been drained and filled since settlement by Europeans began in the 1600's. Filling of wetlands increased markedly following World War II. Between about the 1780's and the 1980's, New York lost an estimated 60 percent of its wetlands (Dahl, 1990).

Wetlands have been drained for crop production and pasture, and they have been filled for transportation, industrialization, housing, and landfills (Tiner, 1984). Dredging for navigation and the construction of reservoirs, harbors, and marinas also have adversely affected New York's wetlands. In addition to the acreage losses caused by these activities, wetlands have been degraded by point and nonpoint discharges to surface waters from agriculture, logging, industry, municipal sewerage, and urban runoff, which add contaminants and silt to surface waters.

Some wetlands have been created as a result of the activities of beavers and humans. By impounding streams, beavers can create wetlands in areas that were formerly uplands. In the last century, beavers were trapped in some parts of the Northeast for their pelts. The reduction of the population led to deterioration of their dams and to subsequent wetland loss. In more recent times, beavers have reestablished their population and their impoundments and the associated wetlands. Humans also have created wetlands, intentionally through the construction of artificial wetlands and inadvertently through dam and farm-pond construction. These additions, however, probably have not compensated for the losses of natural wetlands (Tiner, 1984).

CONSERVATION

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

Federal wetland activities.—Development activities in New York wetlands are regulated by several Federal statutory prohibi-

Table 1. Selected wetland-related activities of government agencies and private organizations in New York, 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		•				
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		•			•	•
STATE						
Adirondack Park Agency		•	•		•	•
Department of Environmental Conservation						
Division of Fish and Wildlife		•	•			•
Department of State			•			
PRIVATE ORGANIZATIONS						
Ducks Unlimited	•		•	...	•	•
Finger Lakes Land Trust			•		
The National Audubon Society	•		...	•
The Nature Conservancy	•		•	•	•	•
The Open Space Institute			•		
Scenic Hudson	•	...	•	•	...	•

tions 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, 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 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 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 (NOAA) are eligible for Federal funding and technical assistance through the Coastal Zone Management Act.

State wetland activities.—State laws governing New York's wetlands include the 1973 Tidal Wetlands Act, the 1975 Freshwater Wetlands Act, the Protection of Waters Act, and the Waterfront Revitalization and Coastal Resource Act. Of these, the first three are administered by the New York Department of Environmental Conservation, and the fourth is administered by the New York Department of State. Wetland activities in the Adirondack Park are regulated by the Adirondack Park Agency under the 1975 Freshwater Wetlands Act.

The State has extended protection to many wetlands within its borders. By far the largest protected area containing wetlands is the Adirondack Park in northern New York. The wetland acreage within the park is not precisely known because the Adirondack Park Agency wetlands inventory is not complete. In addition to park wetlands,

the State has protected a number of wetlands of unusual local importance (mostly in down-State areas). A major cooperative effort is underway among Federal and State agencies and private organizations to acquire more than 20,000 acres of wetlands and associated uplands to the north of the Montezuma National Wildlife Refuge. This area will be a major protected wetland resource for the State. Also, many State wildlife-management areas are wetland-upland complexes that are managed for wetland values. The Hudson River National Estuarine Research Reserve is a federally designated wetland system that is managed cooperatively by the New York Department of Environmental Conservation and NOAA. The reserve consists of four sites totaling 5,000 acres of mostly wetlands that are distributed along the salinity gradient of the Hudson River. The reserve's purposes are protection, research, and education.

County and local wetland activities.—Under the Freshwater Wetlands Act, a county, town, village, or municipality can take over responsibility for wetland management with oversight by the Department of Environmental Conservation. Under this provision, local governments review and process permit applications. The Department approves the local procedures and also reserves the right to oversee Class 1 wetlands, which are wetlands considered most in need of protection because they provide benefits that make them particularly valuable. Any municipality is allowed to pass regulations that are more restrictive than the Department's guidelines. When such regulations are passed, the Department defers to the local authority. To date, only two towns and one village have taken over wetland-management responsibility, and no county government has opted to preempt the Department's regulations (Russell Cole, New York State Department of Environmental Conservation, oral commun., 1993).

Counties may facilitate wetland acquisition through the funding of bond acts. Such acts have been used extensively on Long Island for this purpose (Sarah Davidson, The Nature Conservancy, Long Island Chapter, oral commun., 1993).

Private wetland activities.—Among the private organizations that are active in the conservation of New York's wetlands are Ducks Unlimited, The Nature Conservancy, the National Audubon Society, Scenic Hudson, the Open Space Institute, and the Finger Lakes Land Trust. Privately organized and funded land trusts exist in many New York counties, and these can enable wetland acquisition and protection (Peggy Olson, The Nature Conservancy, Eastern New York Chapter, oral commun., 1993).

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