Wetlands of Saratoga County New York

Vital Resources for People and Wildlife

A Cooperative National Wetlands Inventory Publication

Acknowledgments

THIS BOOKLET IS THE PRODUCT OF THE work of many individuals. Although it is based on the U.S. Fish and Wildlife Service's National Wetlands Inventory (NWI), this booklet would not have been produced without the support and cooperation of the U.S. Environmental Protection Agency (EPA). Patrick Pergola served as project coordinator for the wetlands inventory and Dan Montella was project coordinator for the preparation of this booklet. Ralph Tiner coordinated the effort for the U.S. Fish and Wildlife Service (FWS).

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I also thank those people who have contributed photographs. Photo credits are shown for each photo, except for those taken by the author

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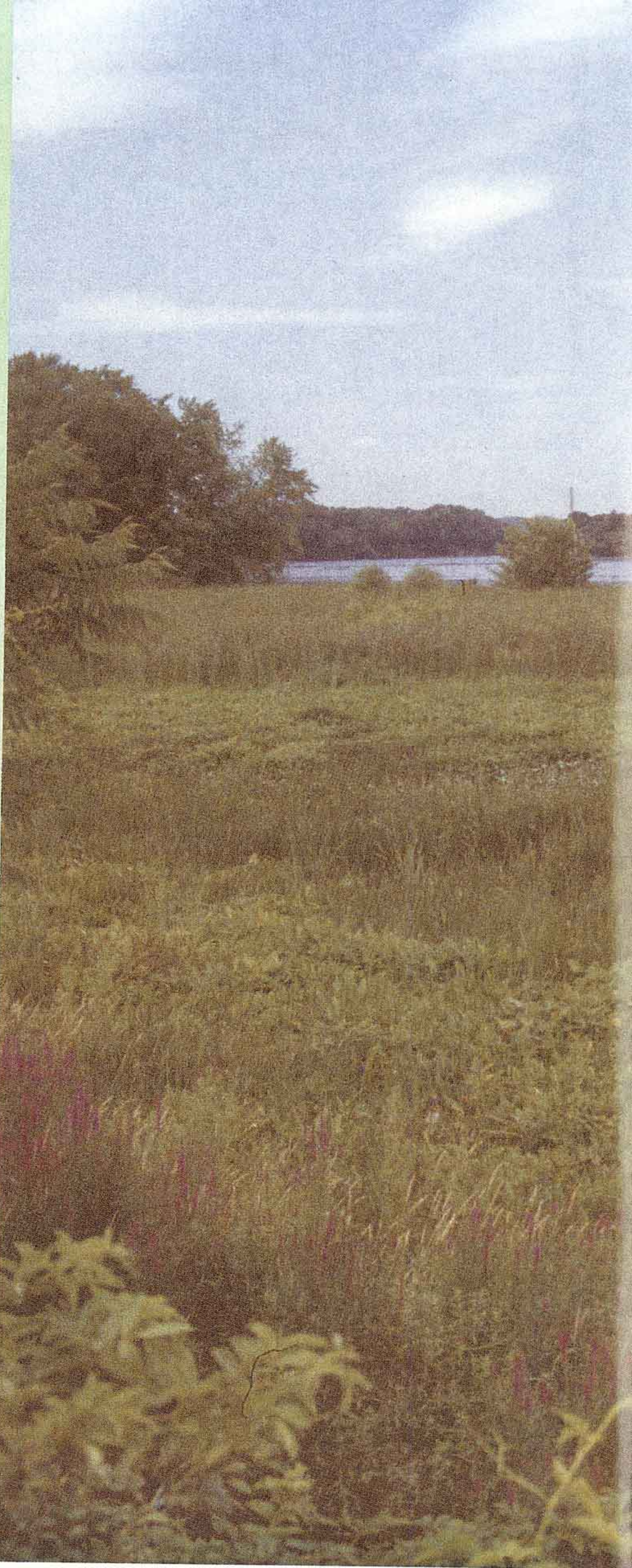

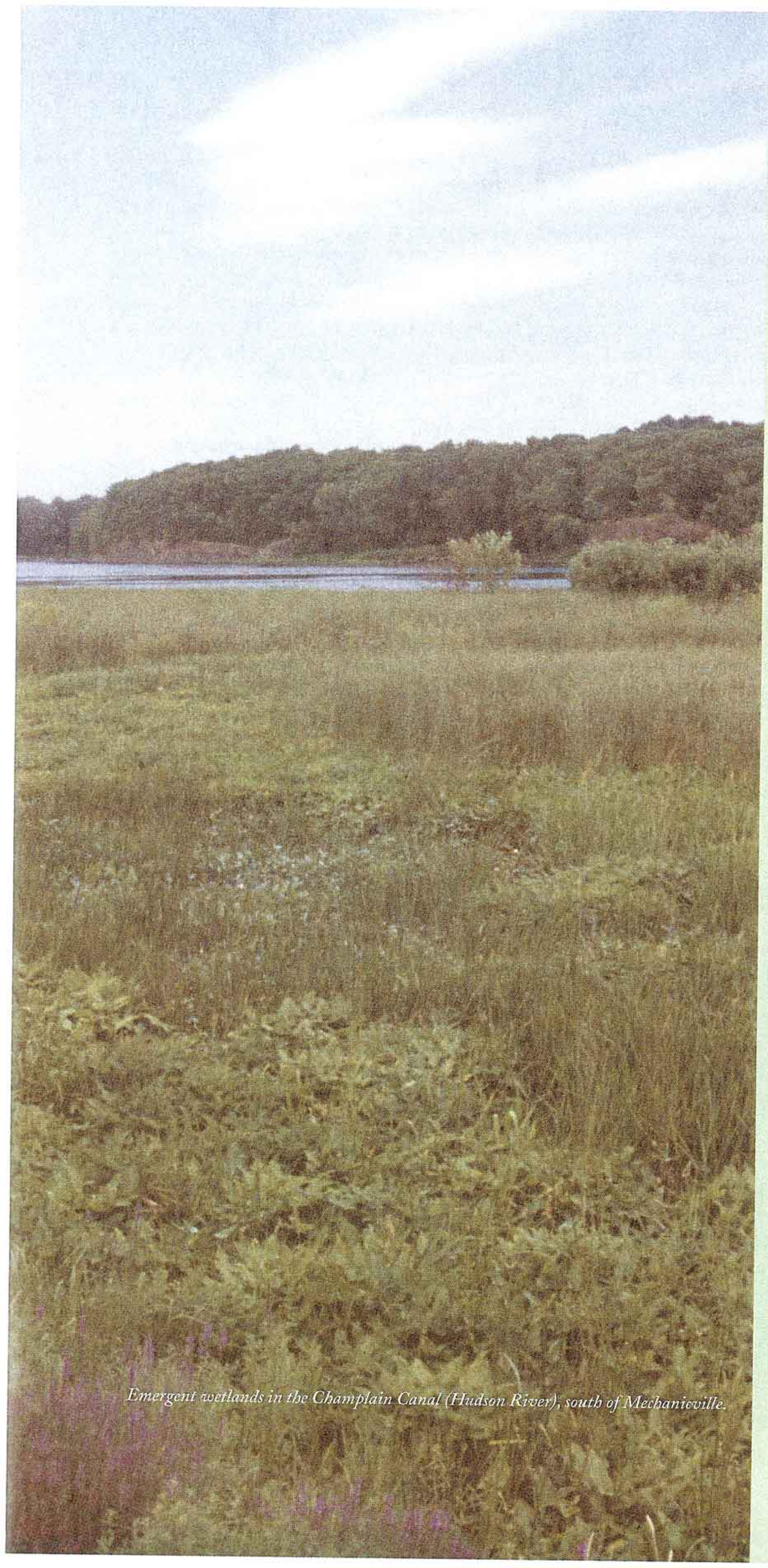

Emergent wetlands in the Champlain Canal (Hudson River), south of Mechanicville.

Wetlands of Saratoga County, New York

Vital Resources for People and Wildlife

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Contents

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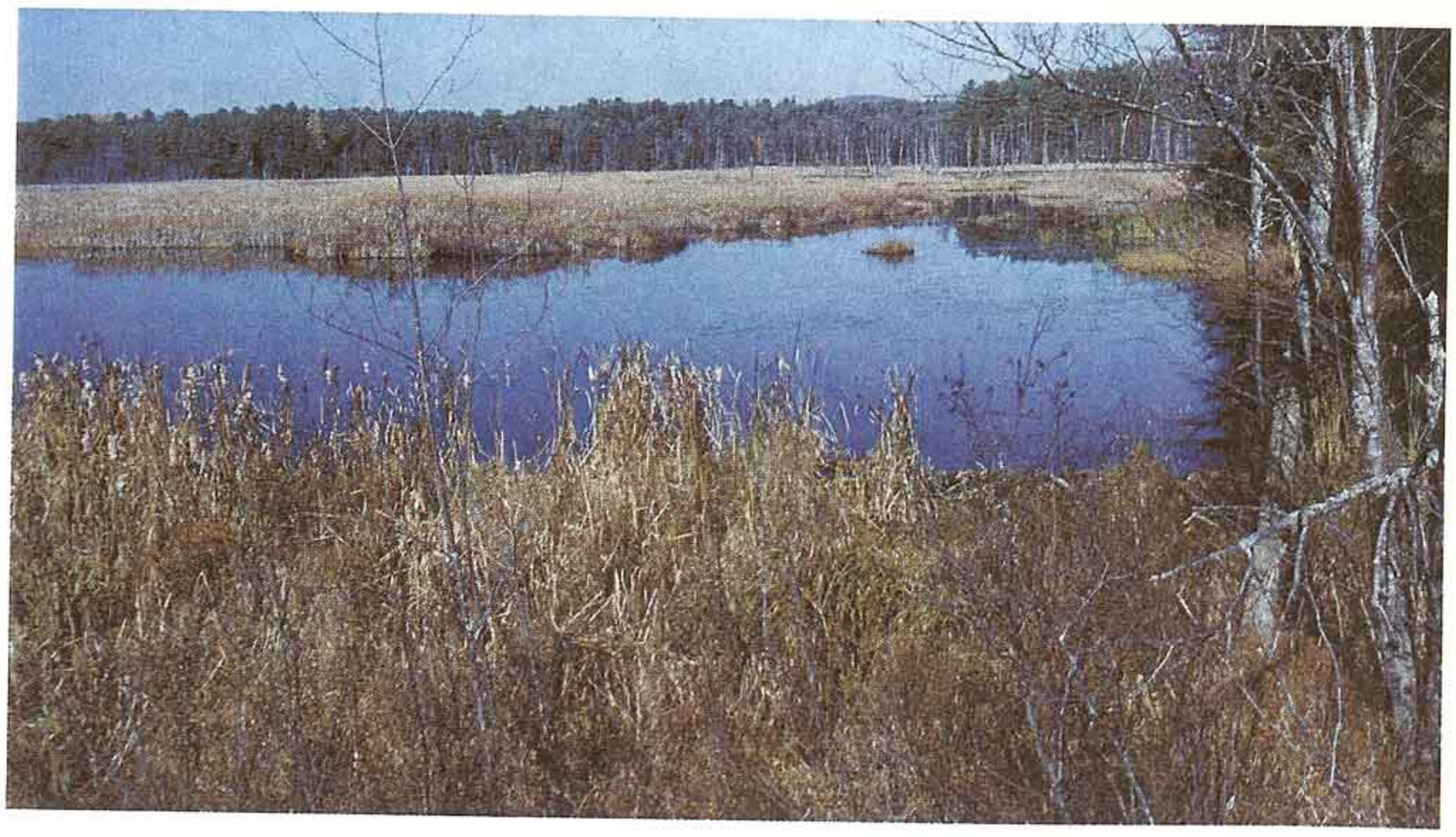
1 Although the information in this document has been funded wholly or in part by the U.S. Environmental Protection Agency under assistance agreement DW14941821-01-0 to the U.S. Fish and Wildlife Service, it may not necessarily reflect the views of the Agency and no official endorsement should be inferred.

Preface

THIS REPORT IS BASED LARGELY ON A wetlands inventory of Saratoga County, New York conducted by the U.S. Fish and Wildlife Service's National Wetlands Inventory (NWI) Program. The NWI is producing wetland maps and statistical information on the status and trends of the nation's wetlands. To date, wetland maps have been produced for approximately 90 percent of the coterminous United States (lower 48 states). The earliest NWI maps are based on 1970s aerial photography and need updating, while the newest maps are compiled from 1990s photography. The NWI was initiated to provide government agencies and the American public with information on the current status of wetlands to aid in resource decision-making. Wetlands provide many important functions (e.g., flood storage, water quality protection, shoreline stabilization, and habitat for many fish and wildlife) and are among the nation's most valuable natural resources. Since European colonization, the coterminous U.S. has lost more than half of its original wetlands. Further loss or degradation of remaining wetlands will jeopardize wetland functions and the values they provide society. The wetlands survey for Saratoga County was completed with support from EPA and the National Park Service.

The inventory was designed to determine the status of wetlands and deepwater habitats in Saratoga County. The inventory answers a few questions, including: (1) how much wetland acreage exists in the county?, (2) where are wetlands most abundant?, and (3) what types are most common? The inventory results are presented in a series of large-scale (1:24,000) maps (identifying the location, type, and shape of most wetlands larger than 1–3 acres in size), a technical report, and this booklet. The inventory utilized 1985/86 aerial photography to map wetlands. Wetlands were classified to various types, including emergent, scrub-shrub, and forested wetlands. For a full description of the NWI mapping process, including the classification system, please refer to the technical report *Wetlands and Deepwater Habitats of Saratoga County, New York: The Results of the National Wetlands Inventory* which is available from the U.S. Fish and Wildlife Service's Region 5 Office (see title page for address). Copies of individual maps may be ordered from: Cornell Institute for Resource Information Systems (IRIS), Resource Information Laboratory, 302 Rice Hall, Cornell University, Ithaca, New York 14853, (607) 255-4864 or 255-6520.

This booklet summarizes the results of the wetlands inventory for Saratoga County. It provides brief descriptions of the area's wetlands, their distribution, and their values. In addition, the booklet presents information on wetland protection, recommendations to improve management and conservation of wetlands, and lists of resource agencies and additional readings.



Emergent wetland and lacustrine deepwater habitat at Merry Vly (Adirondack Park).

What Are Wetlands?

WETLANDS ARE LANDS THAT ARE FLOODED or saturated at or near the ground surface for varying periods during the year. The term "wetland" is derived from two words, "wet" and "land." This implies that wetlands are lands that are at least periodically wet enough to limit uses of the land (e.g., usually can't farm without draining and can't build without filling). Wetlands are the collection of wet environments that occur on the landscape, including marshes, wet meadows, swamps, bogs, and seasonally inundated floodplains. Ponds and the shallow water zones of lakes are also considered wetlands, while open water areas deeper than 6.6 feet are classified as deepwater habitats.

The U.S. Fish and Wildlife Service, with wide scientific peer review, developed a technical definition of wetland for the purpose of conducting a nationwide inventory of wetlands—the National Wetlands Inventory (NWI). This definition forms the foundation for the Service's official wetland classification system which has been adopted as the federal standard for reporting on the status and trends of America's wetlands:

> Wetlands are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. For purposes of this classification wetlands must have one or more of the following three attributes: (1) at least periodically, the land supports predominantly hydrophytes; (2) the substrate is predominantly undrained hydric soil; and (3) the substrate is nonsoil and is saturated with water or covered by shallow water at some time during the growing season of each year.[2]

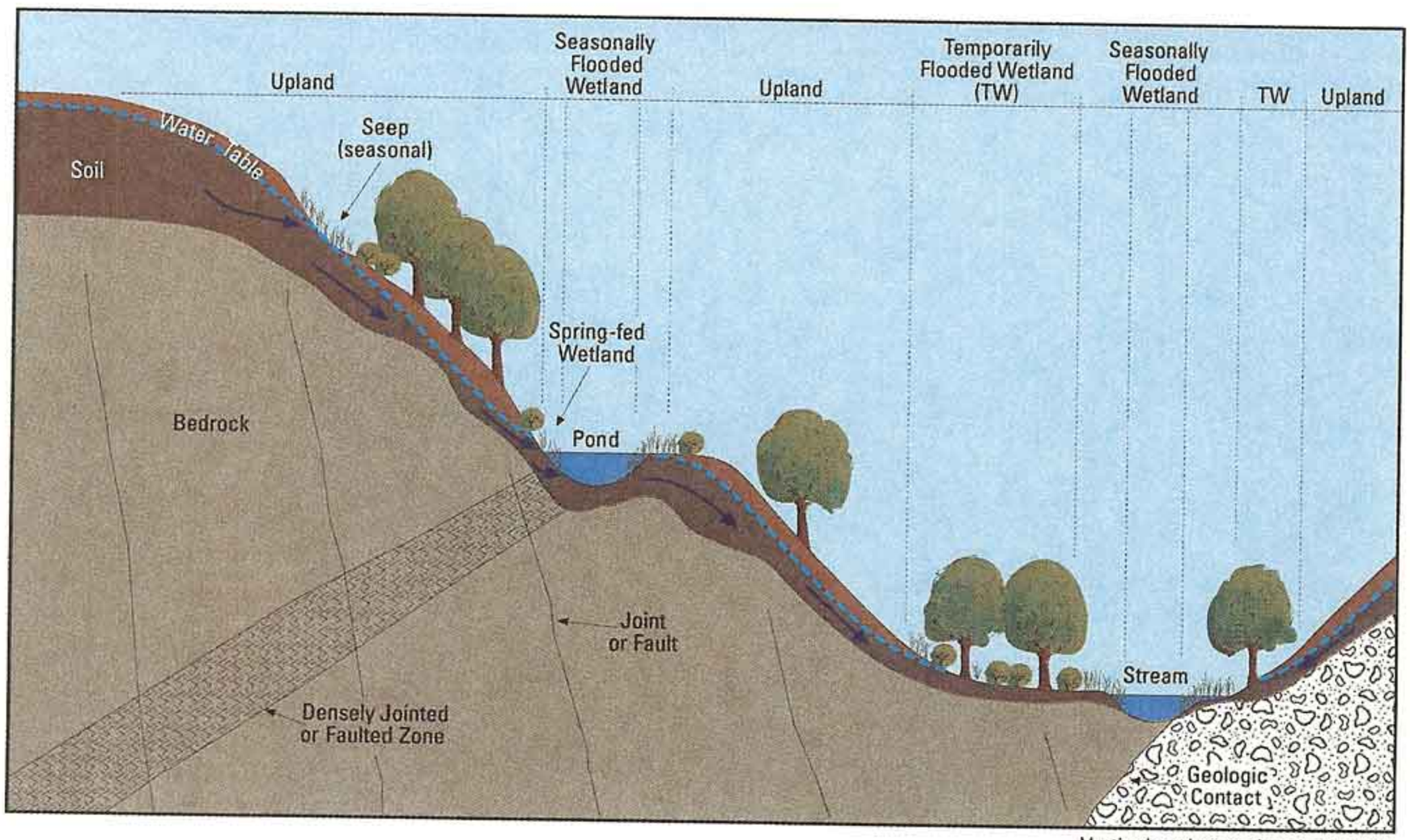
This definition focuses on three attributes: (1) the degree of flooding or soil saturation (wetland hydrology); (2) wetland vegetation (hydrophytes); and (3) wet soils (hydric soils). All areas considered wetlands must frequently have an excess of water for sufficient duration to stress plants and animals not adapted for life in water or periodically saturated soils.

Where Do Wetlands Form?

Wetlands form in areas subject to frequent flooding or prolonged soil saturation. These areas may be covered by surface water from river overflow or runoff from adjacent uplands. Waterlogging is often associated with high groundwater tables. For these wet conditions to have a significant impact on plants, animals, and soil properties, water must be present for an extended period on a recurring basis. Scientists have determined that the minimum wetness for a wetland is saturation within 1 foot of the ground surface for 2 weeks or more during the growing season in most years (every other year, on average).[3] These areas are also wet for

2 Source: *Classification of Wetlands and Deepwater Habitats of the United States* (1979) published by the U.S. Fish and Wildlife Service, Washington, DC 20240.

3 Source: *Wetlands Characteristics and Boundaries* (1995) published by National Academy Press, Washington, DC 20418.



Wetlands develop in places where ground water discharges and/or surface water accumulates. This cross-sectional diagram shows groundwater flow paths that create wetlands at different locations on the landscape. (Adapted from figure by Martha Hayes)

PETER VENEMAN

TOP

Jewelweed, an herb that is more common in wetlands than in uplands.

BOTTOM

Hydric mineral soil exhibiting typical gray subsoil.

extended periods during the "non-growing season" (late fall to early spring). The presence of ice-covered depressions is a familiar sight for those who visit Saratoga County's marshes and swamps in winter. Water entering wetlands comes from several sources including rainfall, snowmelt, river overflow, surface water runoff, lateral subsurface flow, springs, and other groundwater discharge. Besides flooding low-lying flat areas (e.g., floodplains) along waterbodies, water collects in depressions, at the toes of slopes, and even on slopes in association with drainageways, seeps, and springs.

When soils are flooded and/or saturated for a few days or longer, most soils become oxygen-deficient (anaerobic). This has a great impact on plants. Since all plants require oxygen for survival and growth, only plants with special adaptations can live in these periodically anaerobic soils. These water-tolerant plants ("hydrophytes") have developed special adaptations, like shallow root systems, air-filled organs (aerenchyma tissue), and physiological mechanisms (internal body processes), to cope with these oxygen-deficient conditions.[4] Out of all the vascular plants that grow in the United States, only a third can tolerate the prolonged and recurrent wetness imposed by wetlands. Surprisingly, most of these plants can also grow in uplands to varying degrees. Many are quite common in both wet and dry habitats and some are even cultivated for landscaping around houses (e.g., red maple and silver maple). Roughly one-quarter of the plants identified as potential hydrophytes grow exclusively in wetlands. These "obligate wetland" species include plants such as water lilies, cattails (frequent in roadside ditches), buttonbush (a shrub typical of shallow inland waters), leatherleaf (a low-growing evergreen bog shrub), and Atlantic white cedar (an evergreen tree).

Soil development is also affected by anaerobic conditions. Lack of oxygen causes the soil environment to become chemically reduced—a state where many elements like iron become soluble. Such soils typically lose all or most of the red, yellow, or orange color of iron oxides ("rust" color) characteristic of many well-drained (oxygen-rich) soils. As a result, many "hydric soils" are gray-colored and mottled with orange or yellow spots below the topsoil as iron is leached out of the soil or because iron occurs in a reduced state (ferrous iron). The more the water table fluctuates, the more orange to yellow colors occur in the gray soil. Dry or wet soils beneath evergreen trees (e.g., hemlocks) may also have a gray layer beneath the topsoil. This is due to leaching of iron by organic acids produced from decomposing needles and is not necessarily due to wetness (reduced conditions). These soils complicate hydric soil identification and require close examination by a soil specialist. In soils frequently flooded for very long periods, peat or muck accumulate at the surface because leaves and other organic matter do not readily decompose. Where the organic layer is thicker than 16 inches, the soils are called "organic soils". Soils with a thinner organic layer or lacking such layer are typically "mineral soils." Hydric mineral soils tend to have a thick grayish layer below the topsoil.[5]

How Are Wetlands Identified?

Given that water collects in certain places on the terrain, the landscape position (e.g., along waterbody) and landform (e.g., depressions, broad flats, floodplains, drainageways, or seepage slopes) often provide the first clues of the likely presence of wetland. There are also apparent signs of wetness, such as an area flooded for extended periods during the growing season or an area with saturated soils in the driest part of summer. Since many wetlands are dry for a significant portion of the year, they are mostly characterized by the presence of hydrophytes and hydric soils or substrates. The federal government has published lists of these plants and soils and has developed scientific techniques for identifying wetlands.[6] New York State has also developed similar procedures for delineating state-regulated wetlands. Field guides to wetland plants, hydric soils, or wetland identification have also been published to aid in recognizing wetlands (see *Additional Readings*). Wetland maps are available to help locate wetlands. These maps are mainly derived by interpreting aerial photographs and, therefore, tend to show the larger wetlands, with many small or narrow wetlands not designated. Potential wetlands may also be identified by locating hydric soil mapping units on soil maps produced by the U.S.D.A. Natural Resources Conservation Service.

In most cases, on-the-ground evaluation must be performed to accurately identify wetlands and their boundaries, especially if the question concerns defining the limits of wetlands regulated by federal, state, or local authorities. Hydrophytic vegetation and hydric soils plus other signs of prolonged saturation are used to identify "regulated wetlands" subject to the federal Clean Water Act regulations. Signs of wetland hydrology include observed water or soil saturation during the growing season, water marks, silt deposits, water-deposited debris (drift lines), water-stained leaves (blackened leaves in

4 For an indepth analysis of hydrophytes and their adaptations, consult *Wetland Indicators: A Guide to Wetland Identification, Delineation, Classification, and Mapping* (see *Additional Readings*).

5 Consult *In Search of Swampland* and *Wetland Indicators* for details (see *Additional Readings*).

6 For information on these lists and techniques, contact the U.S Army Corps of Engineers, U.S. Environmental Protection Agency, or other federal agencies listed at the end of this booklet.

depressions), and orange-stained soil around living roots (oxidized rhizospheres). In contrast, the State of New York first emphasizes hydrophytic vegetation for identifying state-regulated wetlands, but also uses other features (hydric soil properties and signs of wetland hydrology) for less obvious wetlands. Remember, however, that not all wetlands are vegetated—mud flats along exposed shores and shallow bottoms of rivers, lakes, and ponds may not be colonized by plants, but are still considered wetlands by scientists.

How Do Wetlands Differ?

A variety of wetland types exist due to differences in soils, hydrology, water chemistry, vegetation, and other factors. All of the wetlands in Saratoga County are inland (nontidal) wetlands—freshwater marshes, swamps, and bogs well beyond the reach of ocean-driven tides. They usually occur on floodplains along rivers and streams (i.e., lotic wetlands), in the shallow water zone and along the margins of lakes (i.e., lentic wetlands), in ponds and along their shores, and in isolated depressions surrounded by upland (i.e., terrene wetlands). Some wetlands are formed on slopes where groundwater seeps out of the soil (i.e., terrene slope wetlands).[7]

Most wetlands are colonized by plants and are commonly called "marshes", "swamps", and "bogs".[8] Their periodic wetness or shallow water habitat distinguishes them from "deepwater habitats" of lakes, rivers, and reservoirs. Often, wetland types are named after their dominant plant species, such as cattail marsh, red maple swamp, alder swamp, leatherleaf bog, and hemlock swamp. Other wetlands are nonvegetated, periodically exposed flats or shallow water areas along the shores of rivers, streams, ponds, and lakes.

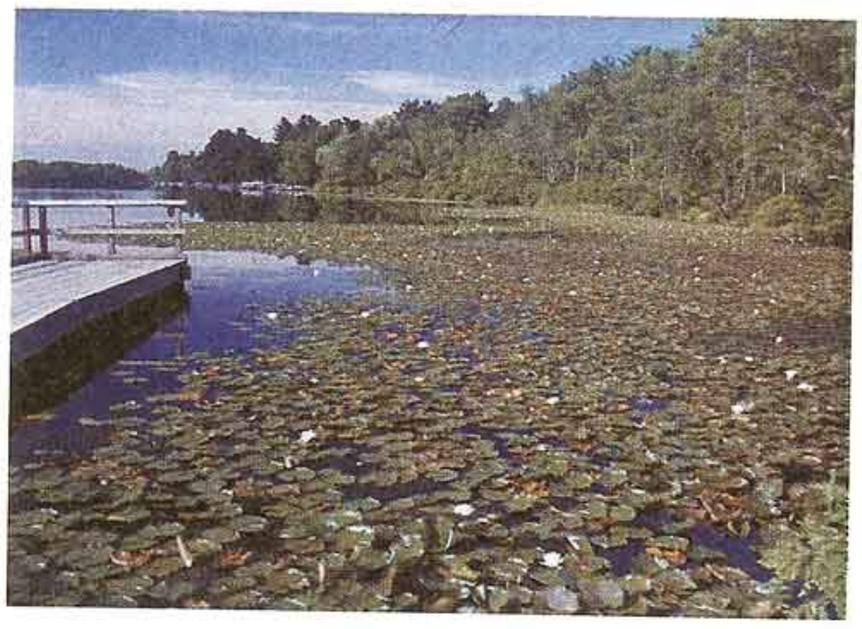
According to the U.S. Fish and Wildlife Service's wetland classification system, freshwater wetlands are divided into three ecological systems: palustrine, lacustrine, and riverine. The majority of inland wetlands are called palustrine wetlands. *Palustrine wetlands* are mostly vegetated wet areas (marshes, swamps, and bogs), but also include small, shallow ponds. Most of the other freshwater wetlands are *lacustrine wetlands* associated with the shallow water zone of lakes and reservoirs. Lacustrine wetlands are generally limited to aquatic beds, nonpersistent marshes (where herbaceous vegetation dies back every year), and the shallow water zone (less than 6.6 feet deep). *Riverine wetlands* may be similarly vegetated, but are contained within a river or stream channel. Most riverine wetlands are non-

7 Terms such as lotic, lentic, and terrene are furthered defined in *Keys to Landscape Position and Landform Descriptors for U.S. Wetlands (Operational Draft)* available from U.S. Fish and Wildlife Service (ES-NWI), 300 Westgate Center Drive, Hadley, MA 01035.

8 For descriptions and illustrations of wetland plants, see *In Search of Swampland* (listed under *Additional Readings*).

Lotic wetland along mountain stream in the Kayaderosseras Range.

White water lily bed in Ballston Lake.



BELOW, TOP TO BOTTOM

Cattail marsh.

Reed canary grass wet meadow.

Streamside alder swamp.

vegetated periodically exposed shores and shallow stream bottoms.

Vegetated wetlands may be separated into four major types based on their dominant vegetation: (1) *aquatic beds* of floating-leaved plants, free-floating plants, and submergent (underwater) plants, (2) *emergent wetlands* characterized by grasses, sedges, and other nonwoody plants, (3) *scrub-shrub wetlands* represented by low- to medium-height (less than 20 feet tall) woody plants, and (4) *forested wetlands* dominated by trees (woody plants 20 feet or taller).

Aquatic beds form in open waterbodies such as ponds, lakes, and slow-flowing rivers. White water lily beds are common in the shallow water zone of lakes and ponds, like Ballston Lake. Other characteristic aquatic bed species include spatterdock (yellow pond lily), water milfoil, water shield, and duckweeds. An invasive exotic species—water chestnut—occurs along the Mohawk River (Erie Canal) near Vischer Ferry and in Lake Lonely.

Emergent wetlands are represented by marshes and wet meadows. Marshes are usually flooded for most of the year. Organic soils (mucks) or mineral soils with high amounts of organic matter commonly develop in these wetlands. Dominant marsh species include broad-leaved cattail, purple loosestrife, big arrowhead, and eastern bur-reed. Arrow arum, soft-stemmed bulrush, wool-grass, tussock sedge, and blue flag (iris) also occur, along with various aquatic plants.

Wet meadows are seasonally wet fields including former pastures and cropland, abandoned beaver flowages, or recently clearcut wetlands. They usually have gray-colored hydric mineral soils reflecting prolonged saturation by high groundwater tables. Some meadows are inundated for brief periods. They typically have high water tables in winter and spring, often with pockets of standing water. In summer, the water tables are quite low and at times, no water can be found. Purple loosestrife (an invasive species) is perhaps the most conspicuous wet meadow species, especially in late summer when its purplish blooms attract attention. Other conspicuous flowering plants of wet meadows include goldenrods, jewelweed, blue vervain, Joe-Pye-weeds, boneset, and asters. Many of the typical meadow plants are inconspicuous grasses or grasslike plants such as reed canary grass, tussock and other sedges, bulrushes, soft rush, and sweet flag. Sensitive fern may occur in significant numbers. Shrubs and saplings of trees typical of woody wetlands may be interspersed in many wet meadows, especially those that haven't been recently grazed, mowed, or burned.

Scrub-shrub wetlands or simply, shrub swamps, are characterized by thickets of low woody growth (less than 20 feet tall). Speckled alder, red osier dogwood, common elderberry, northern arrowwood, broad-leaved meadowsweet, steeplebush, northern wild raisin, silky dogwood, common winterberry, willows, and swamp rose are typical species. An exotic honeysuckle escaped from cultivation may occur. Buttonbush, perhaps our wettest growing shrub, may be found in shallow water along pond margins and lake shores or in water-filled depressions within forested wetlands. Sweet gale occurs in the former places and in bogs. Shrub bogs are uncommon in Saratoga County, mostly found in the northwestern section. Rooted in a thick mat of living and decomposed peat moss are low-growing evergreen shrubs like leatherleaf, sheep laurel, and bog rosemary, with emergents such as northern pitcher-plant, cotton-grasses, and sundews. Wild cranberries may also be present.

Forested wetlands, the predominant wetland type in Saratoga County, are periodically flooded and/or saturated forests. They are dominated by deciduous trees (lose their leaves each fall), evergreen trees, or mixed stands. Red maple

Swamp white oak forested wetland.

swamp is perhaps the most common forested wetland type. Green ash and white pine may be co-dominants in these swamps. Eastern cottonwood, box elder, silver maple, American elm, swamp white oak, and black willow are common in floodplain wetlands. Black gum, black ash, and trembling aspen are other significant broad-leaved deciduous species. A cone-bearing tree with deciduous needle-leaves—called larch or tamarack—also occurs and may be a co-dominant in some forested wetlands, especially in the northern part of the County. It is most evident in the fall when its needles turn a yellowish color before dropping off. Eastern white pine and hemlock are the principal species of evergreen forested wetlands. Balsam fir, northern white cedar, and black spruce occur in lesser abundance. Several deciduous trees may be found in these evergreen swamp forests, including the ubiquitous red maple, green ash, yellow birch, and trembling aspen.

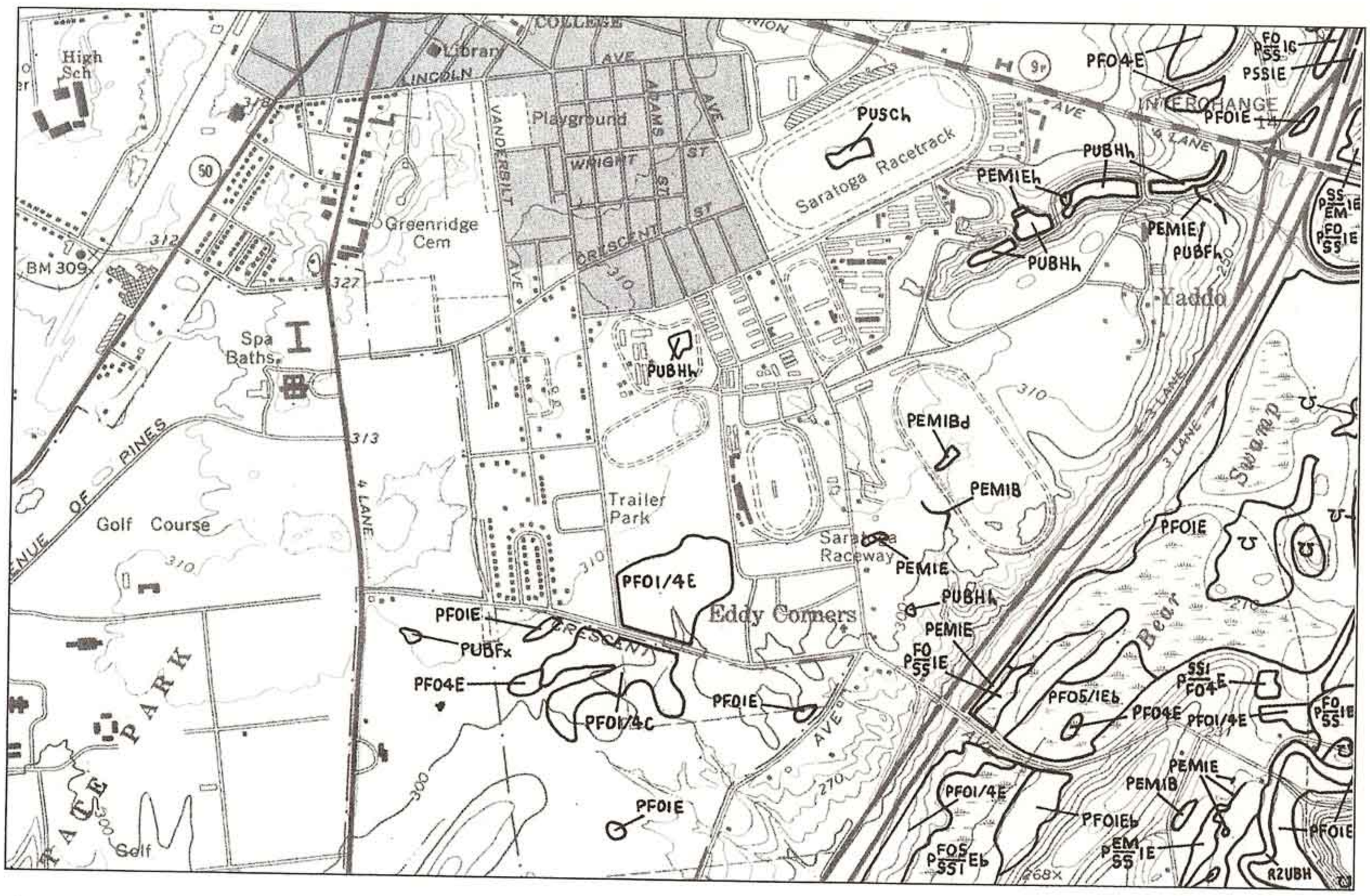
Many deciduous forested wetlands have an abundance of shrubs typical of shrub swamps (listed above) plus others like gray birch, gray dogwood, and highbush blueberry. Shrubs of evergreen swamps are usually less varied and include northern wild raisin, highbush blueberry, winterberry, spicebush, and speckled alder. Ferns, like cinnamon fern, royal fern, sensitive fern, and marsh fern, are common in many swamps. Sedges may also be plentiful, especially tussock sedge, fringed sedge, and bladder sedge. Other common herbs (nonwoody plants) in deciduous swamp forests include skunk cabbage (most evident in spring/early summer, whose crushed leaves yield a skunklike odor), marsh marigold (a bright yellow springtime wildflower), spring beauty, jewelweed, jack-in-the-pulpit, marsh horsetail, Canada mayflower, blue flag (iris), wood reed, and manna-grasses. In evergreen swamps, the herb layer is less diverse (mainly Canada mayflower, goldthread, cinnamon fern, and sensitive fern). Peat mosses may be common in depressions in wetter swamps. Within both forested wetlands and upland forests, small vernal pools may exist. These shallow ponds hold water from late fall through mid-summer and serve as vital breeding grounds for many woodland amphibians (e.g., spotted salamanders, newts, wood frogs, spring peepers, and gray tree frogs).

BELOW
Hemlock swamp.

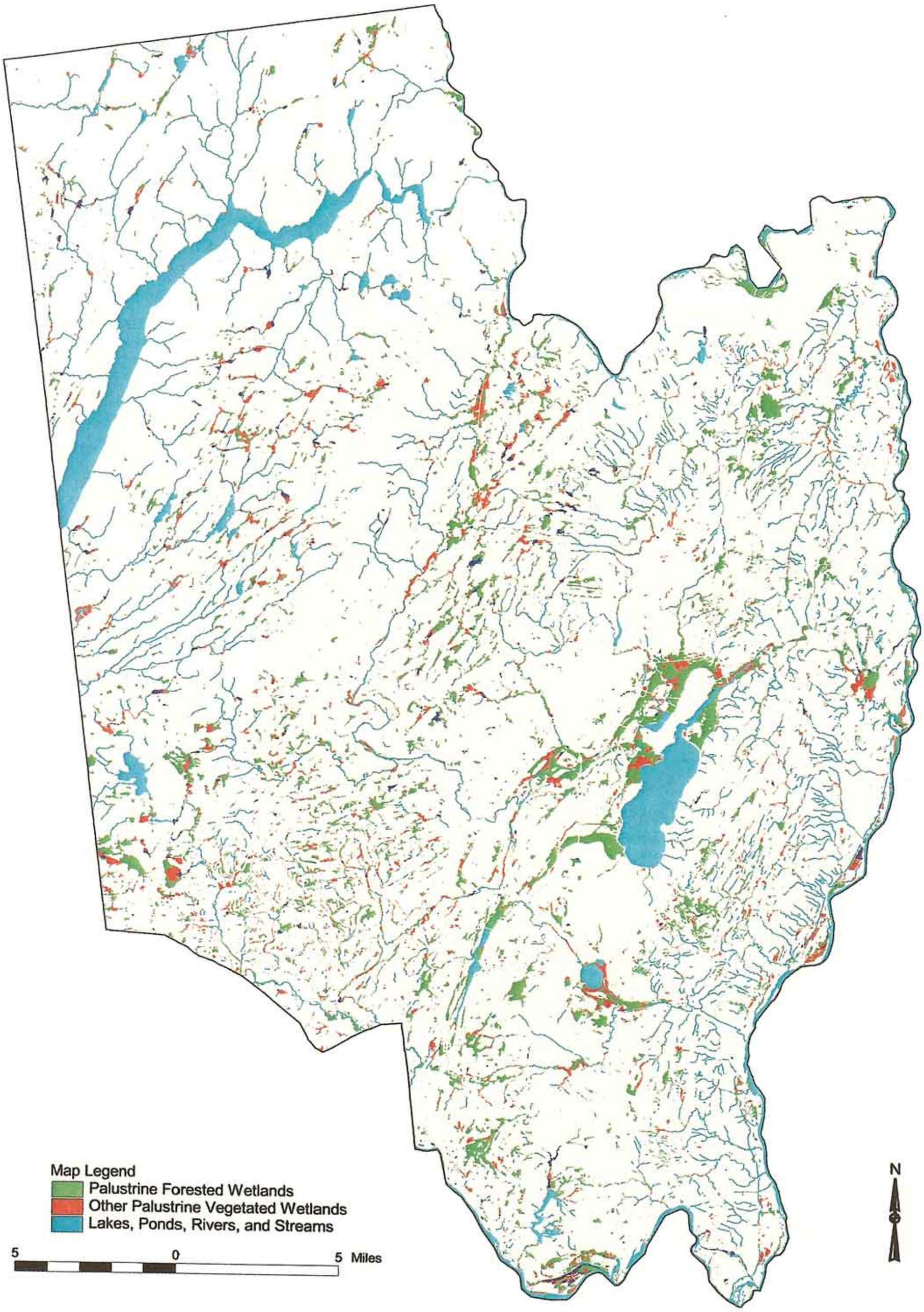
BOTTOM
Red maple swamp.

Wetland Maps

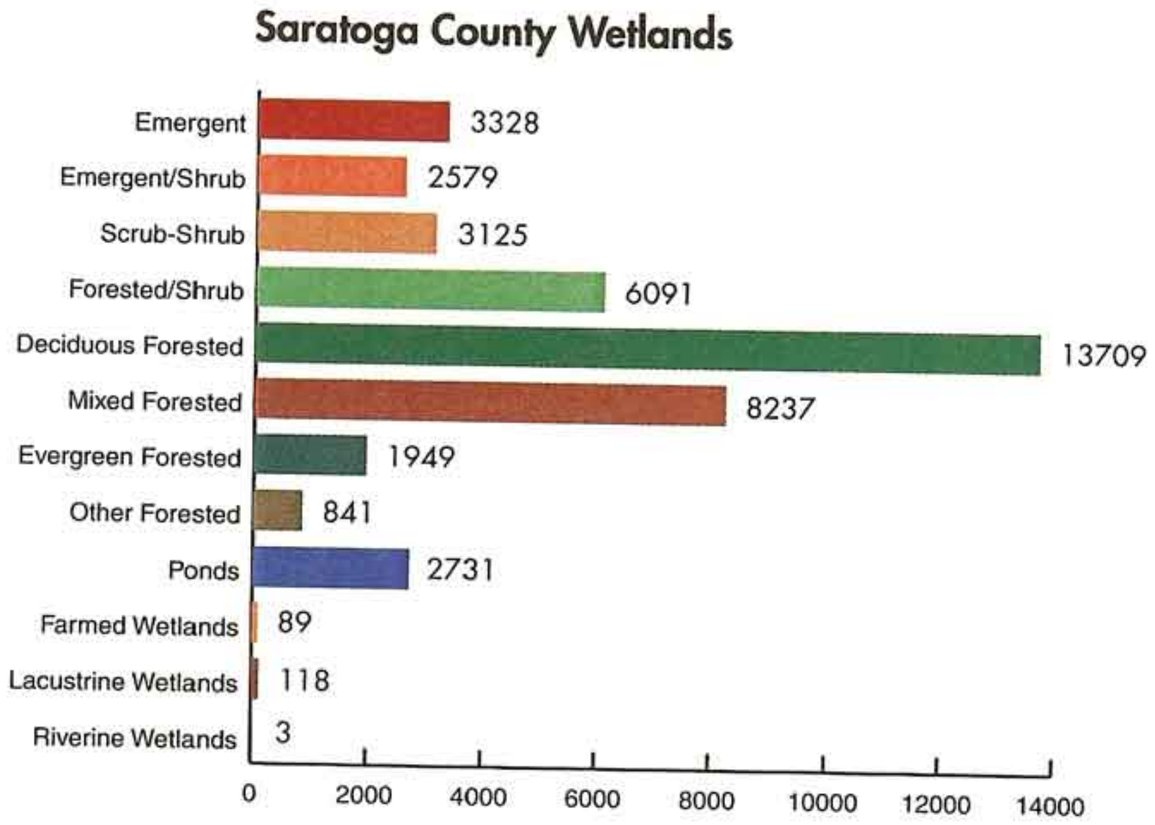
A TOTAL OF 27 LARGE-SCALE (1:24,000) National Wetlands Inventory (NWI) maps were prepared for Saratoga County. These maps show the general location of wetlands and deepwater habitats throughout the county. These habitats were identified through photointerpretation of 1985/6, 1:58:000 color infrared aerial photography. With this scale imagery, most wetlands larger than 1–3 acres in size are likely to be mapped, along with smaller conspicuous depressional wetlands (such as ponds). Wetlands are classified by their vegetation type or substrate (for nonvegetated areas), predicted water regime (hydrology), and other features. The maps use an alpha-numeric code (a series of letters and numbers) to designate different types. For example, palustrine emergent wetlands are classified in categories of increasing wetness as PEM1A (temporarily flooded type), PEM1C (seasonally flooded), PEM1E (seasonally flooded/saturated), and PEM1F (semipermanently flooded). Palustrine scrub-shrub wetlands are designated as PSS-types (e.g., PSS1E for shrub swamps like alder swamps, or PSS3Ba for evergreen shrub bogs), whereas forested wetlands are shown as PFO-types (e.g., PFO1E for broad-leaved deciduous swamps like red maple swamps, or PFO4E for needle-leaved evergreen swamps dominated eastern white pine or hemlock). For more information on the codes, see *NWI Maps Made Easy: A User's Guide to National Wetlands Inventory Maps of the Northeast Region* (available from the U.S. Fish and Wildlife Service). An example of a portion of an NWI map for the Saratoga Springs quadrangle is shown below. Copies of the NWI maps are available for purchase from the Cornell Institute for Resource Information Systems (IRIS), 302 Rice Hall, Ithaca, NY 14853. In addition, for use in geographic information systems, NWI maps are available in digital form and may be downloaded from the Internet (http://wetlands.fws.gov). Try out the Wetlands Interactive Mapper at this website to obtain information on the location of wetlands in your neighborhood or another area of interest. You may also be able to view an aerial photo of such areas through the Terraserver View at this site.

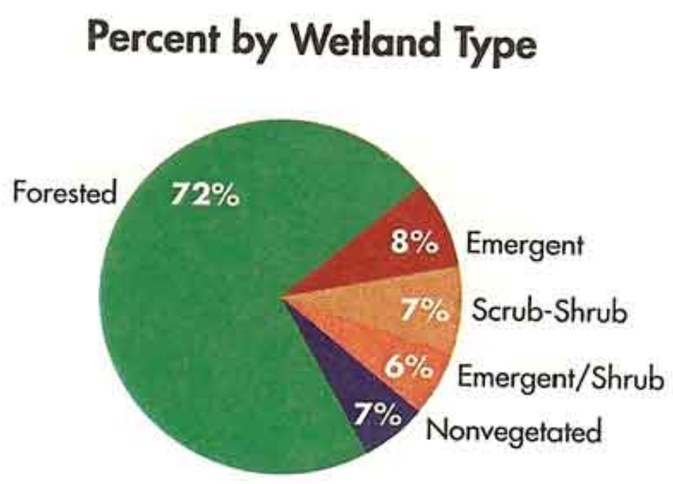


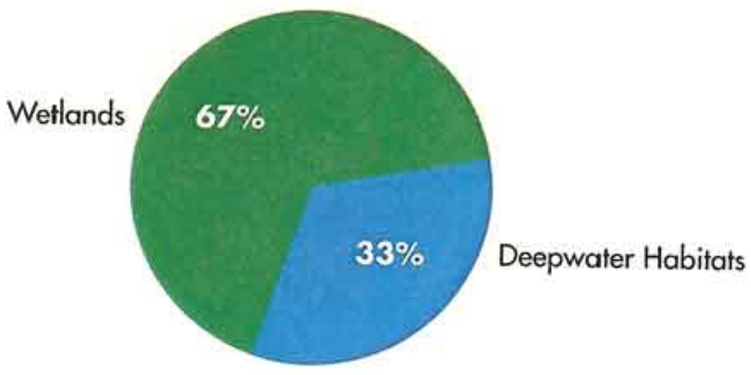
General Distribution of Wetlands and Deepwater Habitats

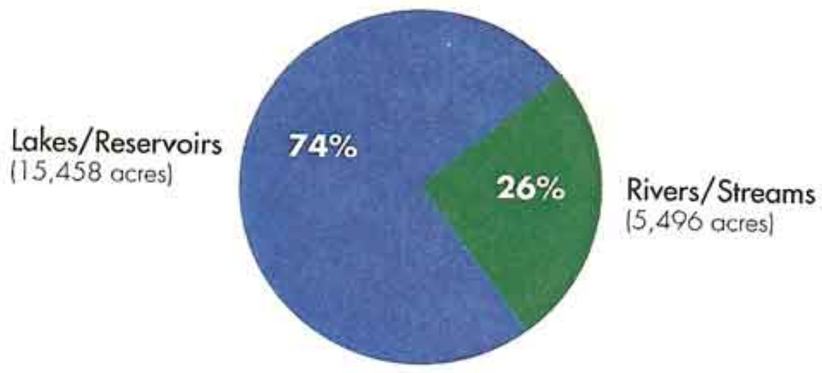


Wetlands Inventory Acreage Summaries









*Includes all river and stream channels, but excludes shallow water zone wetlands of lakes.

ACREAGES OF WETLANDS AND DEEPWATER habitats for Saratoga County were compiled from digital NWI map data using a geographic information system. The data include wetlands and deepwater habitats generally 1–3 acres in size and larger—the target mapping unit of the NWI maps prepared for this geographic area. Wetlands that escaped detection because they were too small, too narrow, or too difficult to identify through conventional aerial photointerpretation techniques are not included.[9] Miles of small streams mapped during the survey are also reported for the County. These numbers should not, however, be considered the total stream miles, since many intermittent and smaller streams were not inventoried.

Saratoga County encompasses about 850 square-miles in eastern New York. The Hudson River forms the eastern boundary and part of the northern border of the County, separating it from Washington and Rensselaer Counties on the east and from Warren County to the north. The Mohawk River separates the County from Albany and Schenectady Counties to the south. Other major rivers and streams in this watershed are Kayaderosseras Creek, Snook Kill, Dwaas Kill, Alplaus Kill, and Anthony Kill. Lakes are especially common in the County, with Saratoga Lake, Round Lake, Galway Lake, and Ballston Lake being among the larger ones. The Great Sacandaga Lake behind the Conklingville dam is located in the Adirondack Park in the northwestern part of the County. The Saratoga National Historical Park occurs in the eastern section. Most (88%) of Saratoga County is upland—forests, agricultural lands, and villages, with about 12 percent represented by aquatic resources (wetlands and deepwater habitats).

Wetlands occupy 42,800 acres of Saratoga County, amounting to 8 percent of the County. Vegetated wetlands predominate with almost 40,000 acres inventoried (93% percent of the wetlands). Forested wetlands are the most abundant type representing almost three-quarters of the County's wetlands, but emergent wetlands, ponds, and shrub swamps are also common. Only 118 acres of lacustrine wetlands and 3 acres of riverine wetlands were mapped. Narrow linear wetlands following hillside drainageways accounted for over 260 miles of habitat: 161 miles of forested wetlands, 57 miles of emergent wetlands, and 48 miles of shrub wetlands.

Deepwater habitats represent 20,954 acres or 4 percent of the County. Most (74%) of these habitats are lakes and reservoirs, with the remainder being rivers and streams. Saratoga County includes over 450 miles of linear streams that were inventoried by the NWI.

9 For other NWI map limitations, contact the U.S. Fish and Wildlife Service's NWI Program (see *Wetland Resource Guide*).

Why are Wetlands Worth Saving?

WETLANDS SUPPLY NUMEROUS ECOLOGICAL, economic, and cultural benefits to local communities, including water quality protection, flood control, erosion control, fish and wildlife habitat, aquatic productivity, and opportunities for recreation, aesthetic appreciation, and education. It must be recognized that all wetlands are not alike in form or function. Differences in vegetation, soils, hydrology, landscape position (e.g., streamside, lakeside, or isolated), landform (e.g., depression, slope, or flat), and other factors greatly influence wetland functions. Different parts of a single wetland may be performing different functions or at different levels than the rest of the wetland. While functions are performed by individual wetlands, it must be recognized that each wetland works in combination with other wetlands as part of a complex, integrated hydrologic and ecological system. Consequently the value of the total wetland resources in a given watershed or region is greater than the sum of the values of individual wetlands. Any assessment of a particular wetland must take this critical interrelationship into account.

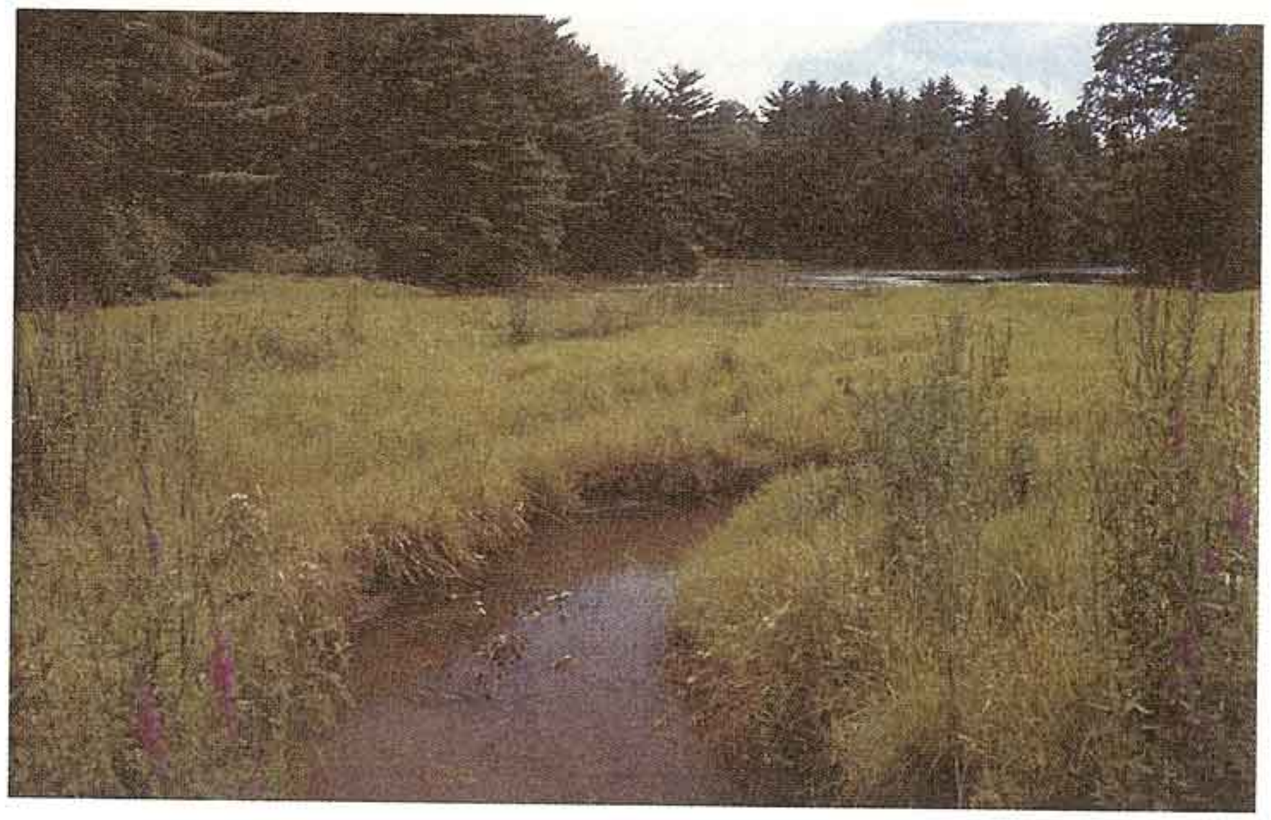
Water Quality and Source Protection

One of the most important functions of wetlands is their ability to help maintain good surface water quality in rivers, streams, and reservoirs and to improve degraded waters. Wetlands do this in several ways, by removing and retaining nutrients, processing chemical and organic wastes, and reducing sediment loads to receiving waters.

Wetlands are particularly good water filters. Their position between upland areas and deep water allows wetlands to both intercept surface water runoff from land before it reaches open water and help filter out nutrients, wastes, and sediments from flooding waters. These functions are important in urban, suburban, and agricultural areas. A 100- to 150-foot vegetated buffer strip along a stream can significantly improve water quality in many areas. Wetlands upstream of reservoirs like Stony Creek Reservoir serve as important water filters, helping protect public water supplies.

In some places, wetlands contribute to the recharge of groundwater sources for drinking water (e.g., floodplain wetlands along the Mohawk River). During periods of heavy runoff, such as major storms or snowmelt in the spring, wetlands adjacent to streams and in depressions collect excess water. When the water table drops, the water held in the wetland may slowly percolate through the soil and eventually into the aquifer, replenishing groundwater. When streams are channelized and adjacent wetlands eliminated in the process of land development, stormwater moves off the landscape more quickly, and groundwater recharge is diminished. Many Saratoga County residents depend on groundwater aquifers for potable water. Wilton's Miller Swamp is the headwater of Bog Meadow Brook which is a public water source for the City of Saratoga Springs during droughts. Whether obtaining drinking water supply from groundwater or from reservoirs fed by surface waters, it is important for communities to protect the many functions wetlands serve in maintaining water quality. Since wetlands can improve water quality, they are not only being protected, but new ones are being constructed for stormwater management or tertiary treatment of wastewater in many places across the country. The City of Saratoga Springs is building a wetland along Spring Run to help reduce water quality degradation from stormwater and combined sewage overflow.

Many wetlands are active points of groundwater discharge. Some are the sources of streams and are aptly named "headwater wetlands." These wetlands provide a source of water important for aquatic life as well as filtered water for downstream reservoirs. Headwater wetlands of the Kayaderosseros Creek watershed maintain water quality, quantity, and temperature required to support one of Saratoga County's best trout fisheries.



Lotic (streamside) wetland dominated by rice cutgrass.

Aerial view of Vischer Ferry floodplain wetlands along the Mohawk River. (Note: On color infrared photos, green vegetation appears red.)

Flood Control

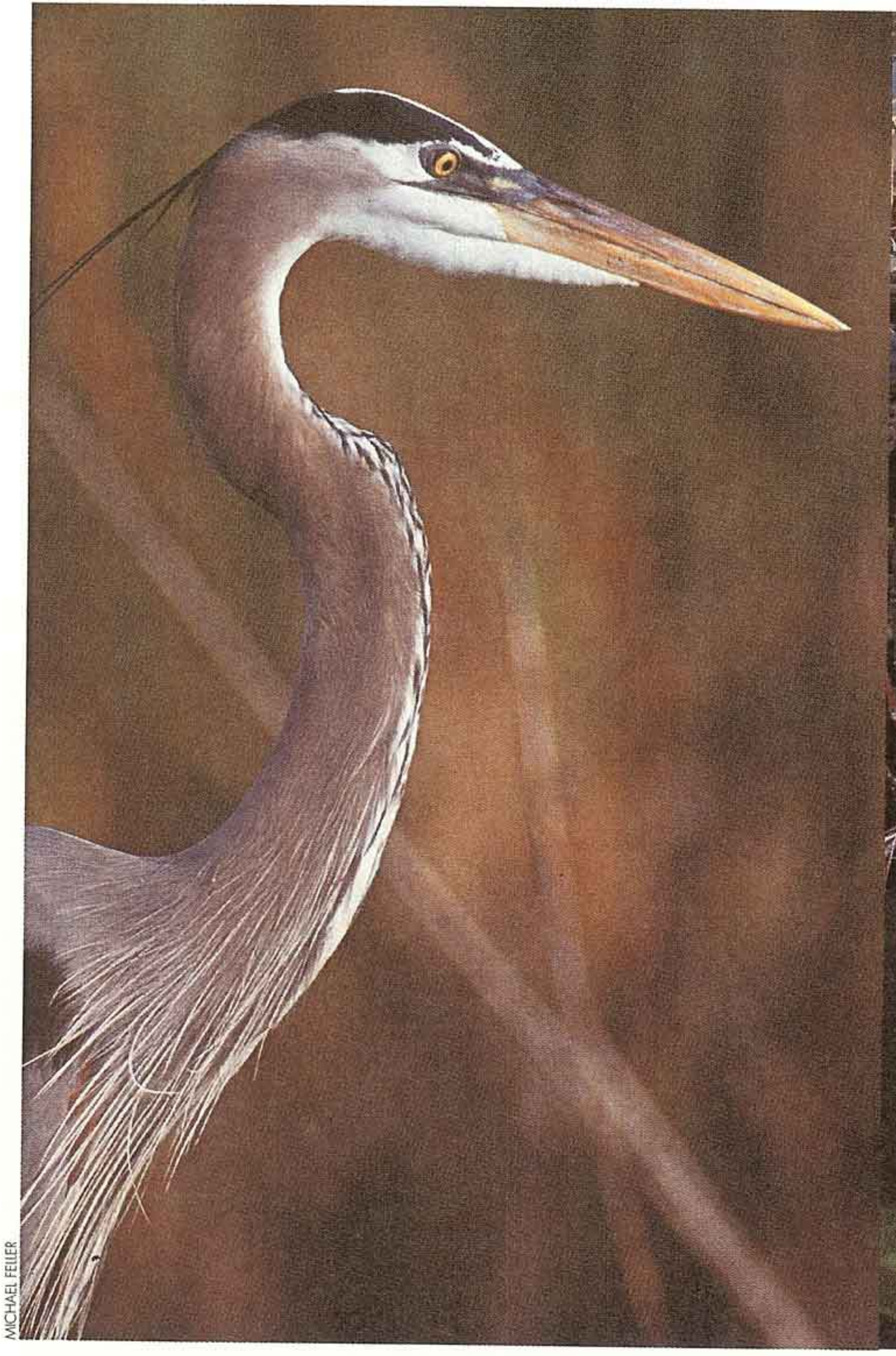
Wetlands have often been referred to as "natural sponges" that absorb flooding waters, yet they actually function more like "natural tubs," storing water that overflows riverbanks or collects in isolated depressions. This temporary water storage helps protect adjacent and downstream property owners from flood damage. Trees and other wetland plants also help slow the speed of flood waters. This action combined with water storage allows wetlands to lower flood heights and reduce the water's erosive force. Wetlands in and downstream of urban areas (e.g., Saratoga Lake and Fish Creek wetlands) are especially valuable for flood protection, since urban development (impervious surfaces) increases the rate and volume of surface water runoff, thereby increasing the risk of flood damage downstream. Upstream floodplain wetlands are important too, since they serve to hold back water that would otherwise flood low-lying development unwisely built on floodplains. In agricultural areas, upstream wetlands help reduce the likelihood of flood damage to crops planted on floodplains. Wetlands along Kayaderosseras Creek and Snook Kill temporarily store flood waters and help lessen the number of destructive floods.

Erosion Control and Shoreline Stabilization

Located between rivers and high ground, many wetlands are in a good position to buffer the land against erosion. Wetland plants are most important in this regard, since they increase the durability of the sediment through binding soil with their roots, dampen wave action by friction, and reduce current velocity through friction. Lakeside and streamside wetlands are important shoreline stabilizers, thereby preventing erosion of sediments that could jeopardize important fish habitat and water quality. Wetland plants are so effective at stabilizing the soil that planting of wetland vegetation is being used to control shoreline erosion in many places across the country. Bioengineering techniques (e.g., biodegradable mats with wetland plants) are preferable to structural erosion control measures (e.g., rock rip-rap), especially from an environmental standpoint because they provide habitat and aesthetic values while protecting the shoreline.

Aquatic Productivity

Wetlands are among the most productive natural ecosystems in the world and some types of wetlands may be the highest, rivaling our best cornfields in biomass production. Many marshes produce more than 10 tons of organic matter per acre every year. Wetlands can be regarded as the farmlands of the aquatic environment since they produce great volumes of food (plant material) for aquatic organisms. Although direct grazing of most wetland plants is generally limited, their major food value comes from dead leaves and stems that break down in the water to form small particles of organic material called "detritus." This detritus serves as the principal food for many small aquatic invertebrates and forage fishes that are food for larger predatory fishes, such as pickerel,



MICHAEL FEILER

USFWS/TIM MCCABE

USFWS/FRED KNAPP

USFWS

pike, walleye, bass, and trout. These larger fishes are, in turn, consumed by people. Thus, wetlands provide a source of food for people as well as for aquatic animals.

Fish and Wildlife Habitat

Wetlands are critical habitats, providing food, water, cover, breeding grounds, or nursery areas for many species.[10] Some wetland-dependent animals breed in wetlands and spend a considerable amount of time in uplands, such as vernal pool breeders (e.g., wood frogs, spring peepers, and spotted salamanders). Others like turtles live in wetlands and waterbodies and nest in uplands. An estimated 43 percent of the nation's threatened and endangered species rely directly or indirectly on wetlands for their survival.

Most freshwater fishes feed in wetlands or upon wetland-produced food and use wetlands as nursery grounds. Almost all important recreational fishes spawn in the aquatic portions of wetlands. Northern pike, pickerel, and perch spawn in shallow-water wetlands. Among the more significant spawning areas for these species in Saratoga County are wetlands associated with the outlets of Saratoga Lake and Ballston Lake and the shoreline of Round Lake. The Manning's Cove wetland complex of Saratoga Lake is vital to maintaining one of the state's most productive warmwater fisheries. Walleye spawn in streams associated with the Kayaderosseras Creek watershed. Forested and shrub wetlands fringing mountain and lowland streams provide vital shade that cools and moder-

CLOCKWISE FROM LEFT

Great blue heron.

Wood ducks.

Yellow warbler with nestlings.

Spring peeper.

10 For descriptions and illustrations of wetland animals, consult *In Search of Swampland* (listed under *Additional Readings*).

USFWS/TOM SMYLIE

Beaver.

ates water temperatures, thereby increasing dissolved oxygen and protecting the aquatic habitat of important coldwater species such as rainbow, brown, and brook trout.

A variety of birds are associated with Saratoga County wetlands, including typical wetland species such as great blue herons, green herons, wood ducks, mallards, Canada geese, and red-winged blackbirds, along with a large number of songbirds (e.g., ovenbird, swamp sparrow, yellow warbler and yellowthroat) that feed, nest, and raise their young in these areas. A great blue heron rookery is located in beaver flowages in the outlet of Ballston Lake. Woodcock are often found in alder swamps where they feed on earthworms. Wetlands in the White Oak Nature Area (Clifton Park) are managed for woodcock. Forested wetlands are habitat for ruffed grouse and many other birds. Turkeys can be seen eating sensitive fern, while downy and pileated woodpeckers can be heard searching for insects in wetland trees.

Muskrat and beaver are the most familiar aquatic mammals. Snowshoe hares and cottontail rabbits also frequent Saratoga's wetlands. White-tailed deer, a traditional upland game mammal, seek out wetlands for food and shelter. Hemlock swamps in the northern part of Saratoga County are winter deer yards, crucial to deer survival. Black bears also find refuge and food in forested and shrub swamps. Other mammals observed in wetlands include raccoon, coyote, and fox.

Natural Products

A wealth of natural products are derived from wetlands, including timber (lumber and firewood), fish and shellfish, wildlife, blueberries, and peat moss. Wetland grasses have been cut for winter livestock feed. During spring and summer, livestock graze on grasses and other plants in some of Saratoga County's wet meadows. Freshwater fisheries in Saratoga Lake alone have an estimated value of $2.8 million. Hunting for waterfowl and wildlife also provides a source of recreation and food for residents and visitors as well as revenue for local sporting goods stores.

Quality of Life

Outdoor recreational activities take place in and around wetlands: fishing, hunting, bird watching, nature photography, hiking, boating, ice skating, cross-country skiing, and snowshoeing. Many people simply enjoy the beauty and sounds of nature and spend time walking on trails around and through wetlands.[11] Wetlands are great places for outdoor study and gaining an appreciation of natural history and ecology by students of all ages. In residential areas, wetlands often provide a privacy barrier between neighbors. Many times, properties bordering wetlands have higher property values than those that do not. Urban wetlands are often among the few remaining pieces of "natural habitat" providing residents with some sense of wildness and open space.

11 Consult *Saratoga County Wetlands Guidebook* (1998) by the Land Trust of the Saratoga Region, Inc. (Saratoga Springs, NY) for some recommended sites to visit.

Grazed wet meadow in Stillwater.

ABOVE
Floodplain forested wetland along the Hudson River.

BELOW
Excavated wetland in southeastern Saratoga County.

How are Wetlands Changing?

WETLANDS ARE SUBJECTED TO NATURAL processes as well as to pressures from land development (human activities). These forces may result in wetland alteration (destruction or creation of wetlands) and changes in wetland functions (e.g., damage the quality of remaining wetlands). Natural conditions affecting wetlands include ecological succession of one wetland type to another, erosion, droughts, fire, beavers, hurricanes, and other major storms. These changes tend to be relatively short-term—mostly changes in vegetation patterns. Human activities, however, tend to create more lasting effects, especially the loss and degradation of wetlands. Major human impacts to wetlands include: (1) filling for building construction, (2) excavating and channelizing wetlands for navigation and flood control projects, (3) draining and clearing for agriculture, (4) pond construction, (5) damming for reservoirs and impoundments, (6) direct or indirect discharge of pollutants, including pesticides, herbicides and other chemicals, sediment, domestic sewage, and agricultural wastes, and (7) introduction of exotic species (e.g., Eurasian water milfoil and zebra mussels in Saratoga Lake, water chestnut in Lake Lonely, and purple loosestrife in many wetlands). Due to the significance of human actions on wetlands, various levels of government have established mechanisms to protect and restore wetland resources.

How Are Wetlands Being Protected?

WETLAND PROTECTION EFFORTS TYPIcally involve acquisition, regulation, and restoration. Public education is essential to increase awareness and understanding of the natural functions provided by wetlands, including the protection of local and regional water quality. An informed public should be able to make the best choices regarding natural resource utilization. Trained staff from numerous environmental agencies can provide information and sometimes technical assistance to local governments and community/environmental groups interested in developing local wetland protection strategies (see *Wetland Resource Guide*).

Wetland Acquisition

Acquisition of wetlands and other aquatic resources is an effective way to protect declining natural resources. A wetland can be protected by direct purchase or by securing conservation easements (e.g., acquiring specific development rights). Protected wetlands are often maintained as wildlife refuges, sanctuaries, or conservation areas by government agencies and private conservation organizations (including land trusts). Stewardship agreements between property owners and various agencies recognizing the many values of wetlands can also promote wetland conservation. Acquisition of adjacent buffer areas are also important to protecting wetland functions and values. A 300-foot vegetated buffer around wetlands and along streams may provide adequate protection of wildlife habitat and help maintain high-quality aquatic habitat.

Some examples of federal, state, and local government efforts to protect wetlands through acquisition include the following. Although aimed at preserving important historic sites, Saratoga National Historical Park contains numerous wetlands. State parks and forests such as Moreau Lake State Park, Saratoga Spa State Park, and Old Homestead State Forest protect many wetlands from development. In 1977, the New York State Department of Transportation and the town of Clifton Park established the 400-acre Vischer Ferry Nature and Historic Preserve containing considerable floodplain wetland acreage along the Mohawk River. Saratoga County Reforestation Lands also include numerous wetlands. Some communities have set aside wetlands as nature preserves such as Bog Meadow Brook Nature Trail (Saratoga Springs), Veteran's Memorial Park (Clifton Park), and the Woods Hollow Nature Preserve (Milton). Private land trusts, like the Land Trust of the Saratoga Region, have been active wetland conservationists.

Open water–marsh complex along Alder Creek, south of Lake Desolation.

Wetland Regulation

While acquisition is critical to protecting many wetlands, regulations that limit the effects of various activities on and adjacent to wetlands are also necessary to prevent degradation of natural resources and property. In the 1970s and 1980s, the federal government and several eastern states, including New York, enacted laws to regulate activities that adversely affect wetlands. These laws, plus local wetland zoning ordinances, provide government jurisdiction over certain uses of wetlands (e.g., filling, excavation, and impoundment) and require that permits be secured before engaging in such activities. For information on federal, state, and local regulatory requirements, contact the appropriate resource agency (see *Wetland Resource Guide*).

Through Section 404 of the federal Clean Water Act, the U.S. Army Corps of Engineers (Corps) regulates the discharge of dredged or fill material into waters of the United States, including wetlands. The U.S. Environmental Protection Agency (EPA) oversees this program given its mandate to protect and improve the quality of our nation's waters. Wetlands of virtually any size may be regulated if they meet certain regulatory criteria.

The New York State Department of Environmental Conservation (NYSDEC) primarily regulates activities in freshwater wetlands that are 12.4 acres or larger (plus smaller wetlands of unusual local importance) and an adjacent area—a 100-foot "buffer" from the delineated boundary. All wetlands regulated by New York State are shown on an official Freshwater Wetlands Map, although boundaries may be modified based on field inspections. These maps may be reviewed at NYSDEC Regional Offices and county and local government offices. Permits are required for activities including filling, draining, dredging, excavation, erection of structures, clearcutting, and discharge of pollutants.

The Adirondack Park Agency (APA) administers the state's freshwater wetlands act within Park boundaries (i.e., the northwestern section of Saratoga County). Jurisdictional wetlands include wetlands of any size if associated with a permanent water body or wetlands at least one acre in size if isolated. Regulatory wetland maps are not available. Landowners are encouraged to contact the APA for a binding wetland determination or information on regulated activities.

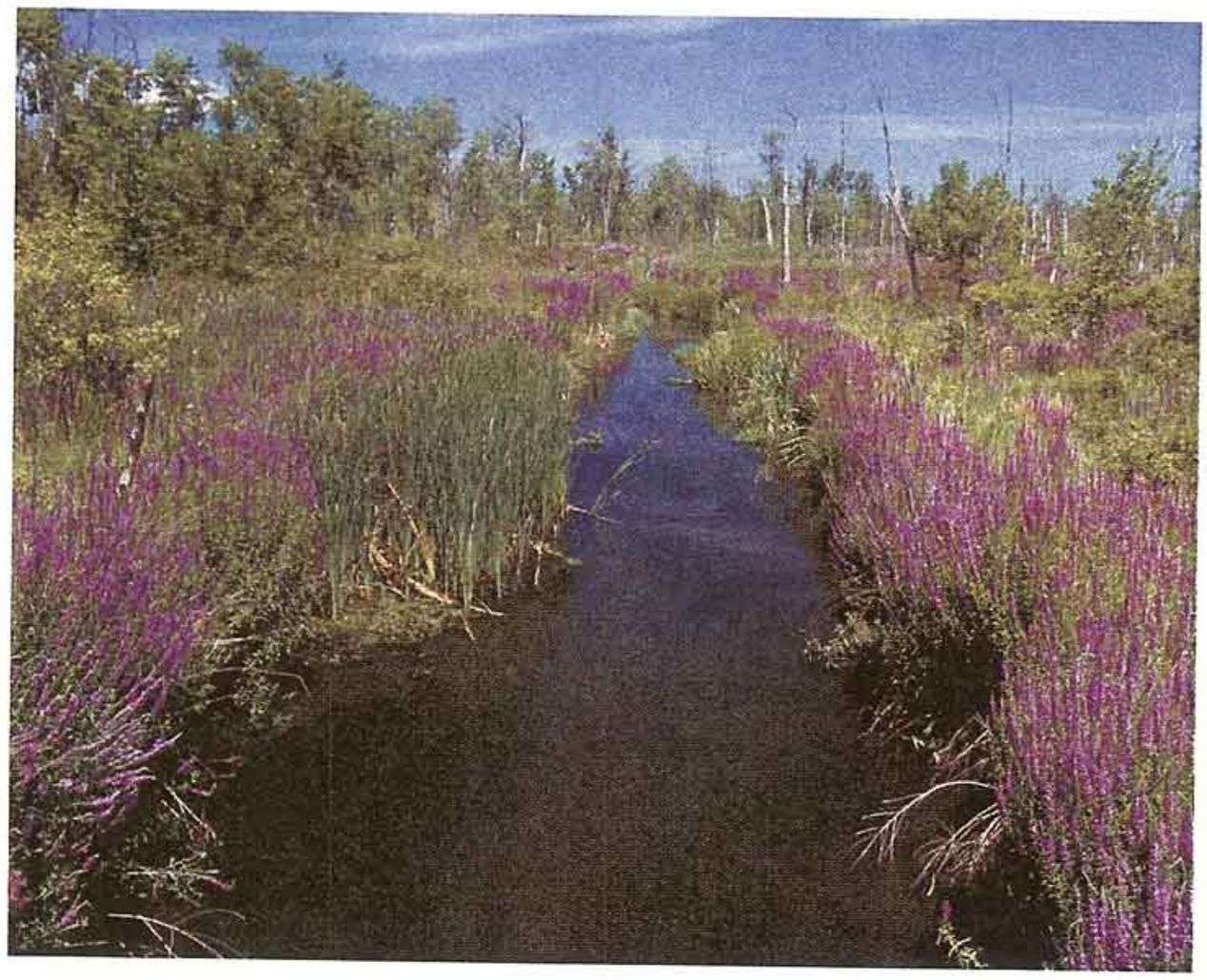
Because state regulations typically exclude most small wetlands, municipalities in New York State are encouraged to adopt local ordinances that are more stringent (e.g., regulate activities affecting wetlands smaller than 12.4 acres). These smaller wetlands play critical roles in the local environment (e.g., flood storage, streamflow maintenance, and wildlife habitat), especially since most are part of a larger network of wetlands. Local wetland protection can also be achieved by including specific wetland protection provisions in zoning, subdivision, or site plan review ordinances.

Albia Pond shrub bog with beaver lodge (Adirondack Park).

Wetland Restoration

During the past decade, there has been increasing interest in restoring natural communities. It seems that we have reached a point in our history where we have developed a heightened sense of appreciation of the natural world around us. Nature, once viewed as an entity to be conquered and put into cultivation, habitation, or other human use, is now regarded by many people as desirable in its own right without human manipulation. Working within the natural fabric of the land is becoming a standard building practice in many areas, but this philosophy needs to be more widely adopted.

Wetland restoration involves returning a wetland to a place where one once existed or rehabilitating a damaged wetland. The first situation requires locating former wetland sites (e.g., agricultural lands on drained hydric soils, filled areas lacking any structures, impoundments not supporting wetland vegetation, and excavated areas in existing wetlands). The goal of restoration in these cases would be to re-establish a vegetated wetland of any kind at these sites. The second type of wetland restoration involves repairing a significantly altered wetland (e.g., diked wetlands, partly drained wetlands, wetlands subject to excess sedi-



Saratoga Springs wetland invaded by purple loosestrife.

mentation, wetlands receiving leachate from a neighboring landfill, and wetlands invaded by exotic or invasive species) to improve its functions by restoring hydrology, native vegetation, or soil quality, for example.

Riparian habitat restoration typically requires streambank revegetation to improve water quality and wildlife habitat. The U.S. EPA estimates that 50–70 percent of the nation's threatened or impaired surface waters are due to agricultural nonpoint pollution, and 5–15 percent is attributed to urban runoff. Both grassy and woody buffers can help improve water quality by removing sediments and taking up excess nutrients from surface runoff and groundwater. In general, the steeper the slope, the wider the buffer needed. A buffer of 100–150 feet is generally acceptable for protecting water quality and aquatic habitat. A 300-foot buffer is recommended to maintain sufficient habitat for wetland-dependent species and to protect areas designated as critical wildlife habitat. Even larger buffers are suggested for some species. To protect fish and wildlife species associated with wetlands and other aquatic habitats, we need to think beyond the limits of these habitats and provide adequate woody buffers and connections between suitable habitat areas. By maintaining and restoring vegetated buffers around wetlands and waterbodies, we can greatly help conserve and improve their biological integrity and critical functions.

Government programs exist to aid private individuals interested in restoring wetlands and other natural habitats. For example, the U.S. Fish and Wildlife Service's Partners for Fish and Wildlife Program is devoted to providing technical assistance and financial support for restoring wetlands, grasslands, riparian (streamside) vegetation, and endangered species habitat (e.g., Karner Blue butterfly habitat). The Partners Program has worked with the County Soil and Water Conservation District on several wetland restoration projects. The U.S.D.A. Natural Resources Conservation Service also has programs to restore wetlands on farmland (Wetlands Reserve Program), to improve wildlife habitat (Wildlife Habitat Improvement Program), and to reduce nonpoint pollution in the suburbs (Backyard Conservation Program). If you are interested in restoring wetlands or other natural habitats, contact one of these agencies (see *Wetland Resource Guide*).

Saratoga County Wetlands Initiative

The Saratoga County Wetlands Initiative is a cooperative interagency effort to promote wetland protection in the County. Participating parties include the Land Trust of the Saratoga Region, Saratoga County Environmental Management Council, Saratoga County Soil and Water Conservation District, Association of State Wetland Managers, Adirondack Park Agency, N.Y. State Department of Environmental Conservation, U.S.D.A. Natural Resources Conservation Service, U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers, and U.S. Environmental Protection Agency. Soil maps, National Wetlands Inventory (NWI) maps, and revised state wetland maps were identified by the group as priority information tools and these maps were subsequently prepared. They provide excellent guidance on the locations of wetlands that may be subject to regulation. Two public workshops were held to familiarize county residents with these tools and state and federal wetland permitting programs. The County's Environmental Management Council is conducting a study of the Saratoga Lake watershed to develop and implement plans for maintaining water quality and recreational values of the lake. Grant monies have been used to support wetland outreach efforts such as producing a wetland guidebook of publically accessible wetlands, creating interpretative trails, working with local schools on wetland activities, and initiating a volunteer wetland monitoring program. A tool kit for local planners to aid in wetland planning will soon be available.

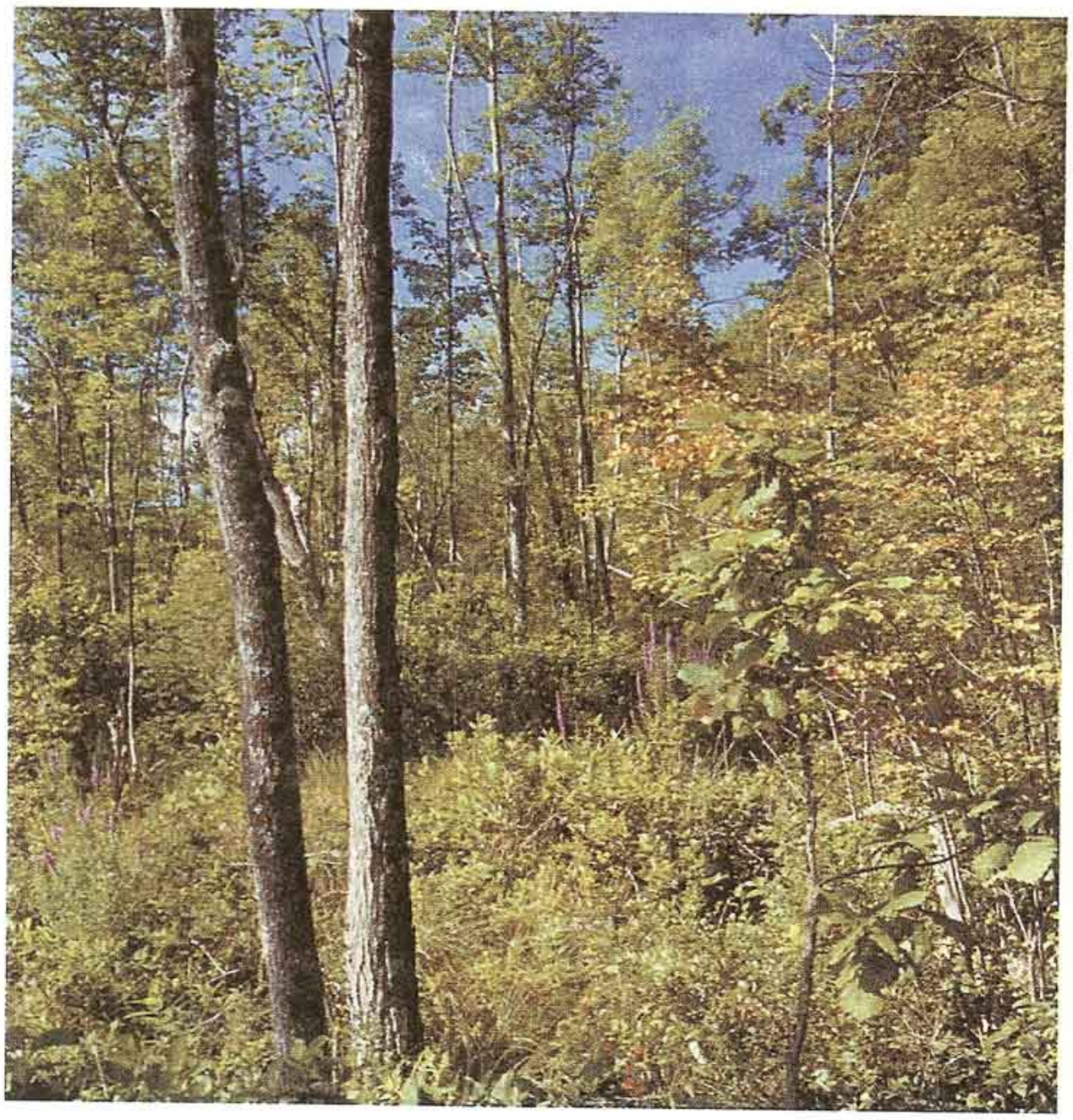
Red maple swamp with dense sedge undergrowth.

What More Can Be Done to Conserve and Restore Wetlands?

SARATOGA COUNTY HAS EXPERIENCED significant population growth in the last two decades and such growth will likely continue due to its proximity to Albany. From 1980 to 1990, the County's growth rate was 17.9 percent—the highest rate in the State Capital District and third highest statewide.[12] With this growth comes increasing pressure on the region's natural resources. More development and impervious surfaces at the expense of forests, nonregulated wetlands, and other natural areas will likely increase local flooding and demand for water. In advance of such development, we must examine ways to minimize adverse impacts of soil erosion and stormwater runoff on waterbodies as well as means of reducing the effects of this runoff, water diversions, and groundwater withdrawals on existing wetlands.

Numerous opportunities exist for citizens, non-profit organizations, government agencies, and the business community to help accomplish shared objectives with limited resources. Some strategies to improve the status of wetlands are outlined below (for more ideas, consult Appendix A of *In Search of Swampland*).

12 Source: *Saratoga County Watershed Protection Study* (1996) prepared by The Capital District Regional Planning Commission, 214 Canal Square, Schenectady, NY 123205



Open-canopied forested wetland at outlet of Ballston Lake.

Government Strategies

- Develop, implement, and promote a consistent public policy to identify, protect and restore wetlands.
- Ensure proper implementation of existing state and federal statutes and local ordinances that protect wetlands through interagency coordination, adequate staffing, training, and enforcement capabilities.
- Accelerate wetland restoration on public lands and on private lands with voluntary landowner support.
- Develop comprehensive master plans for cities and towns that include wetland conservation as a major goal.
- Consider techniques to improve local wetland protection such as partnering with municipal programs for water quality/stormwater management, green space, and recreation.
- Develop strategies and implement plans to control the spread of invasive species.
- Establish cost-sharing programs to support acquisition of wetlands and associated buffers by land trusts.
- Provide tax and other economic incentives to private landowners and industry to promote wetland preservation and restoration.
- Scrutinize cost-benefit analyses and justifications for flood control projects that involve channelization of wetlands and watercourses.
- Increase public awareness of wetland values and the status of wetlands through various media.

Individual and Corporate Strategies

- Maintain existing privately-owned wetlands as open space.
- Seek non-wetland sites for development projects and avoid or minimize wetland and buffer impacts during project construction.
- Donate wetlands or funds to purchase wetlands to private land trusts or public agencies.
- Support wetland protection and restoration initiatives by government agencies and non-profit conservation organizations.
- Attend public meetings on wetlands and participate in the decision-making process on the use of these natural resources.
- Work with public agencies and others to restore previously degraded wetlands on your property.
- Construct ponds and vernal pools in uplands and manage them to support wetland and aquatic species.
- Communicate the importance of wetland protection to family members, friends, neighbors, company executives, and policy-making government officials.
- Purchase federal and state duck stamps to support wetland acquisition.

WETLANDS ARE AN IMPORTANT PART OF our natural heritage—they are the vital link between our land and water resources. Wetlands help preserve the quality of drinking and recreational waters and protect property from flooding, while providing unique habitats for diverse flora and fauna. Extensive wetland acreage has been lost and degraded in the Northeast making the remaining wetlands even more valuable. We need to work towards preserving wetlands and their functions and, wherever possible, restoring wetlands, streams, and their buffers. These goals can only be achieved through cooperation between government, the business community, and private citizens. By working together to keep wetlands wet and wild, we can give future Saratoga County residents an inheritance of a priceless natural resource.

Wetland Resource Guide

Additional Readings

To learn more about wetlands, visit your local community or college library and check out the following.

Field Guide to Nontidal Wetland Identification (1988) by R. Tiner, reprinted by the Institute for Wetland & Environmental Education & Research, P.O. Box 288, Leverett, MA 01054; 413-548-8866. (technical guidebook for identifying wetland plants and hydric soils; Northeast focus; includes 198 color plates)

Freshwater Wetlands: A Guide to Common Indicator Plants of the Northeast (1981) by D. Magee, University of Massachusetts Press, P.O. Box 429, Amherst, MA 01004; 413-545-2219. (technical field guide to wetland plants; Northeast focus)

Handbook for Wetlands Conservation and Sustainability (1998) by K. Firehock, L. Graff, J. Middleton, K. Starinchak, and C. Williams, Save Our Streams Program, Izaak Walton League of America, 707 Conservation Lane, Gaithersburg, MD 20878-2983; 800-BUG-IWLA. (guide to protecting, restoring, and monitoring wetlands)

In Search of Swampland: A Wetland Sourcebook and Field Guide (1998) by R. Tiner, Rutgers University Press, P.O. Box 5062, New Brunswick, NJ 08903; 732-445-1970. (layperson's guide to wetland ecology and wetland plant, hydric soil, and wetland animal identification; Northeast U.S. focus; includes 38 color plates)

Our National Wetland Heritage: A Protection Guide (1996) by J. Kusler and T. Opheim, Environmental Law Institute, 1616 P Street NW, Suite 200, Washington, DC 20036; 202-939-3800. (guide to wetland protection strategies for local governments)

Saratoga County Wetlands Guidebook (1998) by the Land Trust of the Saratoga Region, Inc., 110 Spring Street, Saratoga Springs, NY 12866; phone 518-584-9934 (list/description of publically accessible wetlands to explore in the county)

Wetland Indicators: A Guide to Wetland Identification, Delineation, Classification, and Mapping (1999) by R. Tiner, Lewis Publishers, CRC Press, 2000 Corporate Boulevard NW, Boca Raton, FL 33231; 561-994-0555. (textbook with indepth reviews of listed topics; 55 color plates)

Wetlands (1994) by W. Niering, National Audubon Society Nature Guide, Alfred A. Knopf, Inc., New York, NY. (introduction to wetlands and field guide to wetland plants and animals; national focus; color plates)

Wetlands (1993) by W. Mitsch and J. Gosselink, Van Nostrand Reinhold, 115 Fifth Avenue, New York, NY 10003. (textbook on wetland ecology)

Wetlands: Characteristics and Boundaries (1995) by Committee on Characterization of Wetlands, National Academy Press, 2101 Constitution Avenue NW, Washington, DC 20418; 800-624-6242. (reference book on wetland delineation and related topics)

Winter Guide to Woody Plants of Wetlands and Their Borders: Northeastern United States (1997) by R. Tiner, Institute for Wetland & Environmental Education & Research, P.O. Box 288, Leverett, MA 01054; 413-548-8866. (field guide to winter plant identification)

Wetland Contacts

For additional information on wetlands, also contact the following agencies:

Wetland Regulation and Policies

U.S. Army Corps of Engineers
Albany Field Office
Regulatory Branch
1 Bond Street
Troy, NY 12180
(518) 270-0588

U.S. Environmental Protection Agency
Region II
Wetlands Protection
290 Broadway
New York, NY 10007-1866
(212) 637-3801

New York State Department of Environmental Conservation
Wetlands Program
50 Wolf Road
Albany, NY 12233-4756
(518) 457-0698

NYSDEC Region 5S
Hudson Street Extension
Warrensburg, NY 12885
(518) 623-3671

Adirondack Park Agency
P.O. Box 99
Ray Brook, NY 12977
(518) 891-4050

Saratoga County Environmental Management Council
Saratoga County Municipal Center
Ballston Spa, NY 12020
(518) 884-4705

Soil and Water Conservation District
50 West High Street
Ballston Spa, NY 12020
(518) 885-6900

Wetland Restoration

U.S. Fish and Wildlife Service
New York Field Office
3817 Luker Road
Cortland, NY 13045
(607) 753-9334

U.S.D.A. Natural Resources Conservation Service
50 West High Street
Ballston Spa, NY 12020
(518) 885-6900

Wetland Maps

Cornell Institute for Resource Information Systems
Resource Information Lab
302 Rice Hall
Ithaca, NY 14853
(607) 255-4864

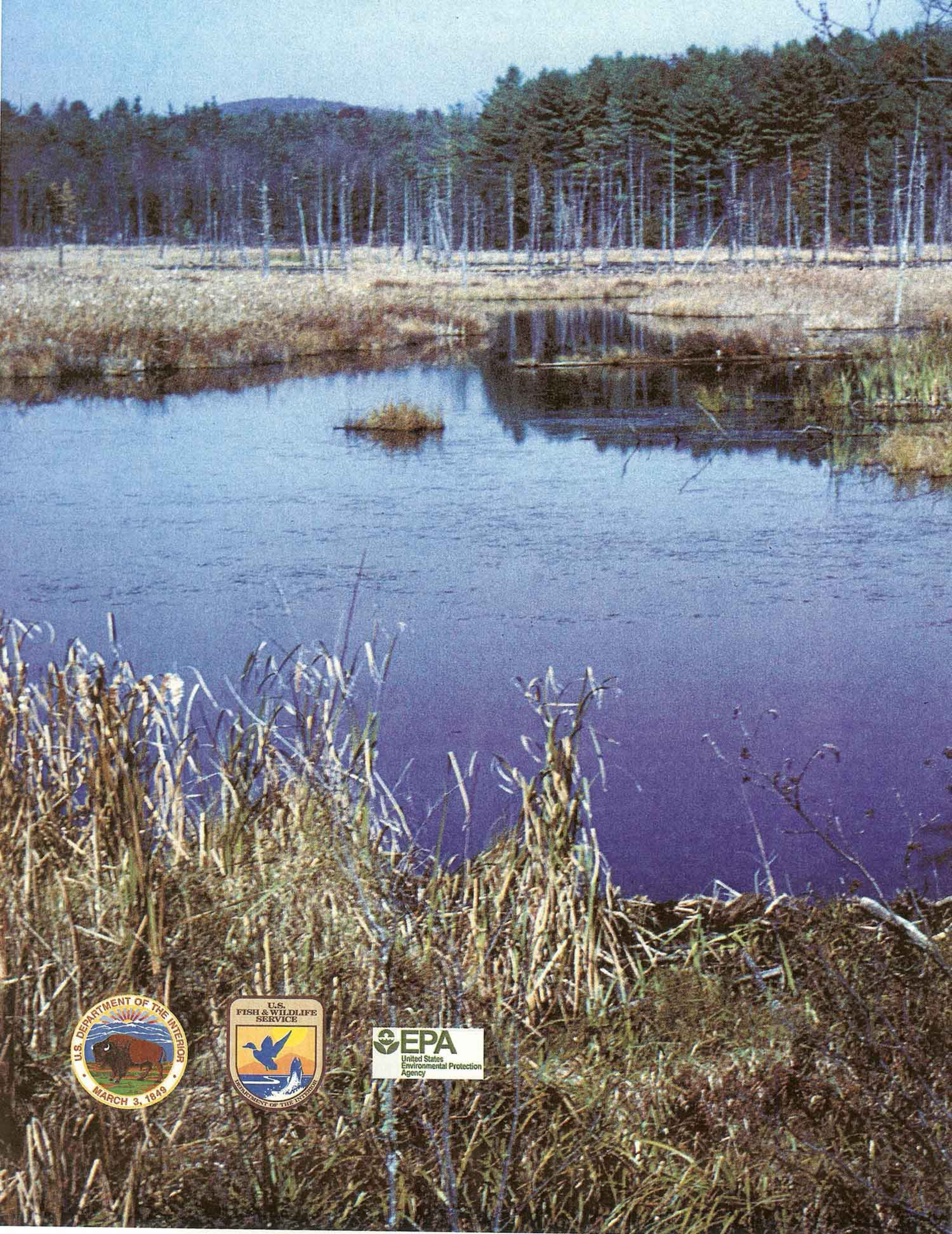
NWI home page: *wetlands.fws.gov*

Wetland Publications and Related Information

U.S. Fish and Wildlife Service
Ecological Services (NWI)
300 Westgate Center Drive
Hadley, MA 01035
(413) 253-8616

EPA Wetland Protection Hotline
1-800-832-7828
http://www.epa.gov/OWOW/wetlands/wetline.html

Vernal Pool Information Website
http://earth.simmons.edu/vernal/pool/vernal.html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