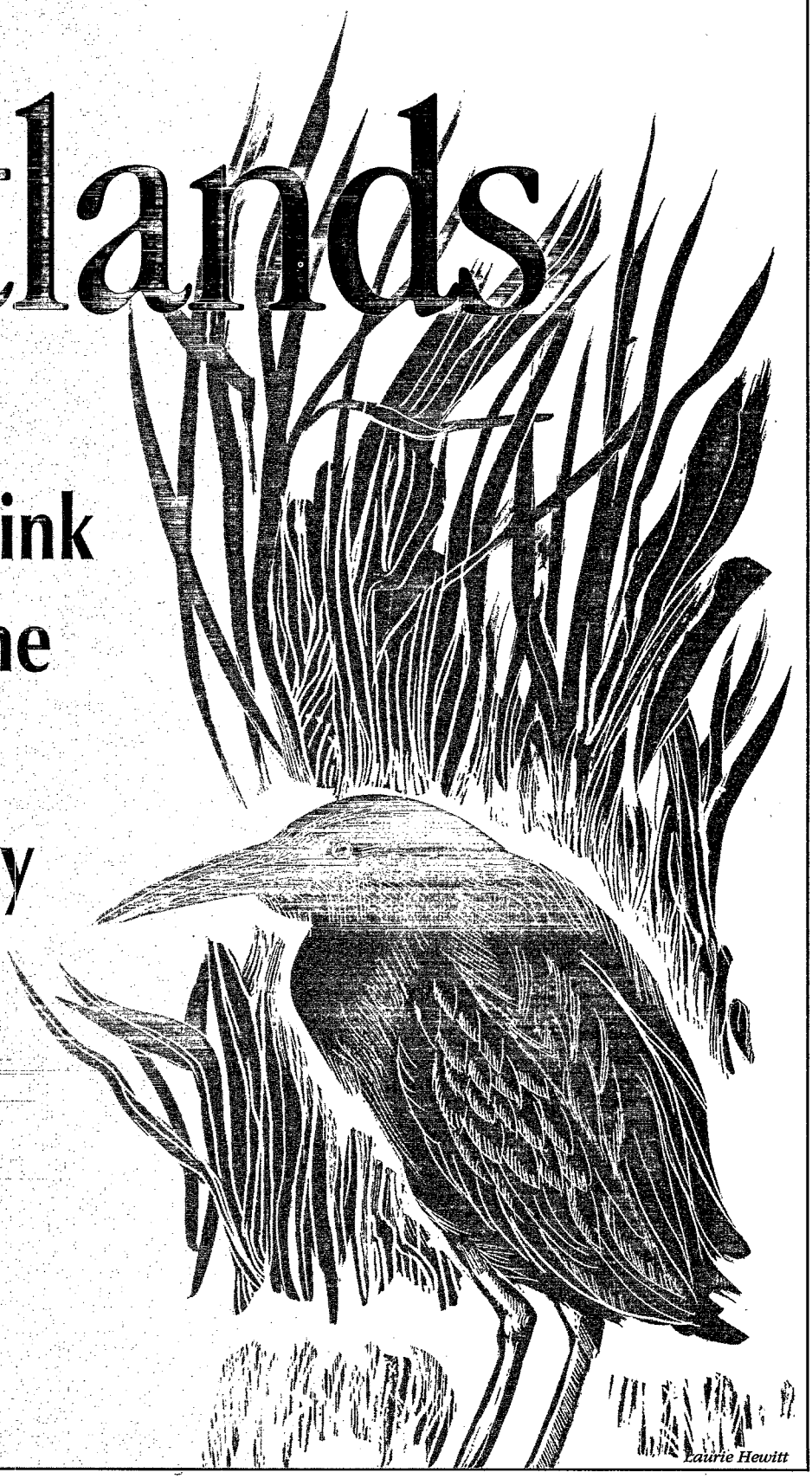
EPA 903-R-97-002 CBP/TRS-160/97

March 1997

Chesapeake Bay

Wetlands

The Vital Link Between the Watershed and the Bay



Laurie Hewitt

Chesapeake Bay Program

Chesapeake Bay Program

The Chesapeake Bay Program is a unique regional partnership leading and directing restoration of Chesapeake Bay since 1983. The Chesapeake Bay Program partners include the states of Maryland, Pennsylvania, and Virginia; the District of Columbia; the Chesapeake Bay Commission, a tri-state legislative body; the U.S. Environmental Protection Agency (EPA), which represents the federal government; and participating citizen advisory groups.

In the *1987 Chesapeake Bay Agreement*, Chesapeake Bay Program partners set a goal to reduce the nutrients nitrogen and phosphorus entering the Bay by 40% by the year 2000. In the *1992 Amendments* to the *Chesapeake Bay Agreement*, partners agreed to maintain the 40% goal beyond the year 2000 and to attack nutrients at their source--upstream in the tributaries. The Chesapeake Executive Council, made up of the governors of Maryland, Pennsylvania, and Virginia; the mayor of Washington, D.C.; the EPA administrator; and the chair of the Chesapeake Bay Commission, guided the restoration effort in 1993 with five directives addressing key areas of the restoration, including the tributaries, toxics, underwater bay grasses, fish passages, and agricultural nonpoint source pollution. In 1994, partners outlined initiatives for habitat restoration of aquatic, riparian, and upland environments; nutrient reduction in the Bay's tributaries; and toxics reductions, with an emphasis on pollution prevention.

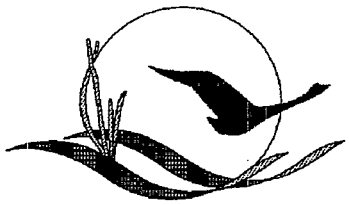
The 1995 *Local Government Partnership Initiative* engages the watershed's 1,650 local governments in the Bay restoration effort. The Chesapeake Executive Council followed this in 1996 by adopting the *Local Government Participation Action Plan* and the *Priorities for Action for Land, Growth and Stewardship in the Chesapeake Bay Region*, which address land use management, growth and development, stream corridor protection, and infrastructure improvements. A 1996 riparian forest buffers initiative furthers the Bay Program's commitment to improving water quality and enhancing habitat with the goal of increasing riparian buffers on 2,010 miles of stream and shoreline in the watershed by the year 2010.

Since its inception, the Chesapeake Bay Program's highest priority has been the restoration of the Bay's living resources--its finfish, shellfish, bay grasses, and other aquatic life and wildlife. Improvements include fisheries and habitat restoration, recovery of bay grasses, nutrient reductions, and significant advances in estuarine science.

Chesapeake Wetlands:

The Vital Link Between the Watershed and the Bay

March 1997



Chesapeake Bay Program

Printed by the U.S. Environmental Protection Agency
for the Chesapeake Bay Program

Table of Contents

Facts, Maps and Figures

Introduction

As the nation's largest estuary, Chesapeake Bay figures prominently in our country's history. When the Europeans first appeared, the Bay was used as a watery highway that stretched deep into uncharted lands. Soon, like the Native Americans had learned long before them, the settlers realized the seemingly boundless riches of the Bay. Year after year, the Bay offered up more and more of her fish, shellfish, and waterfowl to those willing to work her waters. For centuries, the supply seemed limitless.

Finally, by the late 1800s, there were signs that there was indeed a limit to the Bay's resources. Well into the 1900s, degradation of the Bay's water quality along with over-harvesting and rapid development combined to cause severe declines in the Bay's water quality and productivity. Several of the plant and animal populations plummeted to catastrophically low levels. The decline has continued until today, with many plants and animals now mere shadows of their historic abundance.

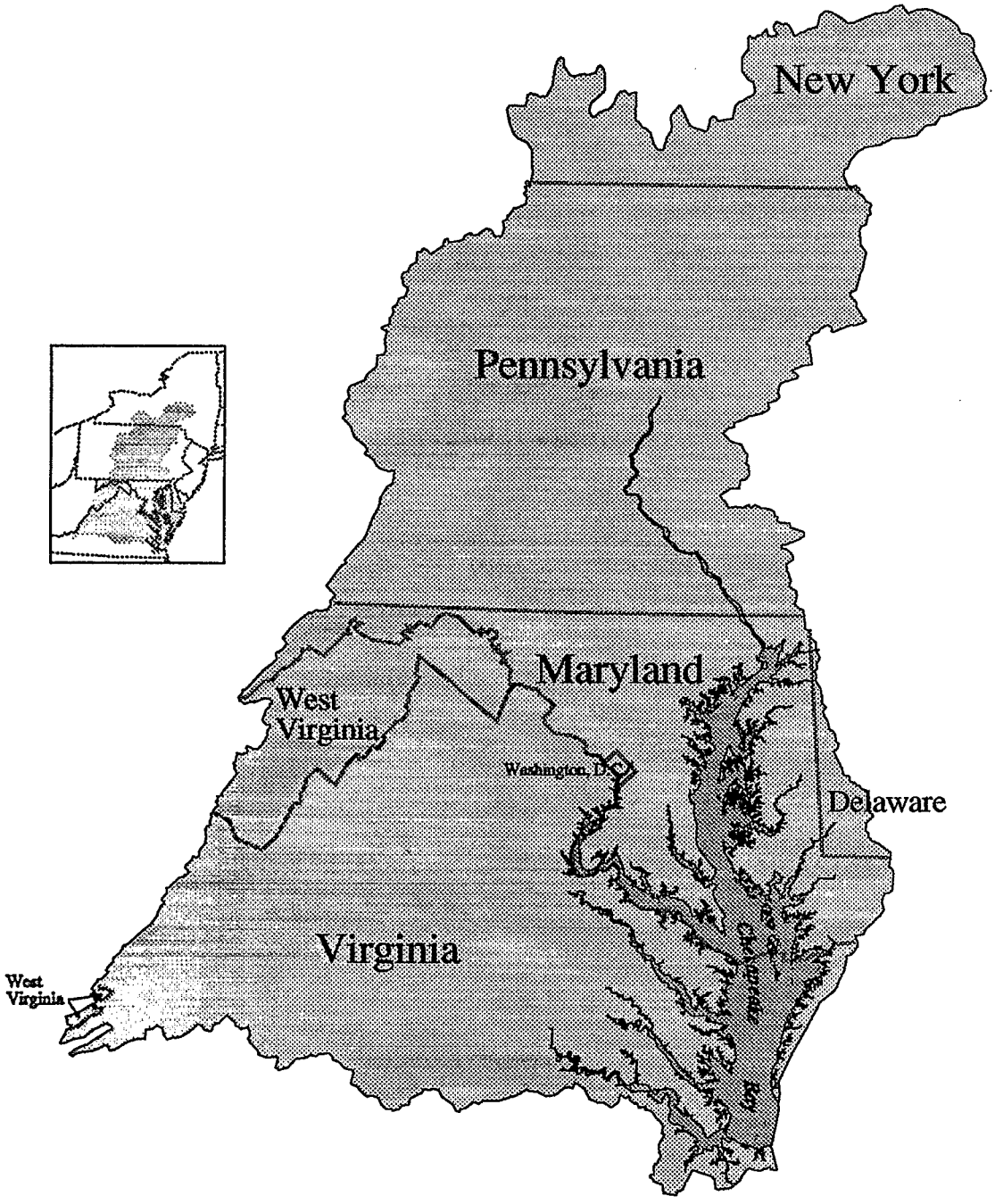
Recognizing the critical status of the Chesapeake, the Chesapeake Bay Program set forth specific goals in the *1987 Chesapeake Bay Agreement* to restore this great body of water– by controlling nutrients and toxics and restoring the plants and animals, along with their habitat. Scientists and managers are now focusing on protecting and restoring wetlands as part of this effort.

During the past 30 years, our knowledge about wetlands and their functions and values has increased greatly. We now know that wetlands are important natural resources that benefit society–not mere "swamps" that are best filled in. Wetlands are vital habitats for many plants and animals; the majority of our threatened and endangered plant species depend on these habitats for their survival. Wetlands are among the most productive natural ecosystems in the world, with certain types of wetlands rivaling corn fields. Wetlands also directly benefit people by improving water quality, reducing flood and storm damage, minimizing erosion, supporting tourism, hunting and fishing, and offering sustainable yields of timber.

Because wetlands are important to people, they are accorded a certain degree of protection under the law. Federal and state governments regulate development activities such as dredging and filling in wetlands. Despite these controls, wetlands, like other natural areas, remain under increasing pressure for development as our population increases.

The Chesapeake Bay Program, in its effort to measure progress in protecting and restoring wetlands throughout the watershed, committed to performing a status and trends survey of Chesapeake wetlands every five years. The information from these surveys will guide the management actions needed to achieve the Chesapeake Bay Program's commitment to a "no-net loss" of wetlands in the short term, and ultimately, a "net gain" in wetlands across the watershed. This booklet summarizes the findings of the first survey.

The Chesapeake Bay Watershed



0 60 120 miles

The Bay's Wetlands

The Chesapeake Bay consists of an extremely diverse landscape of 64,000 square miles drained by an intricate network of freshwater and tidal rivers and streams. The Bay's watershed embraces six states: New York, Pennsylvania, Delaware, West Virginia, Maryland, and Virginia and the District of Columbia. It covers territory from the Appalachian Province through the rolling Piedmont Plateau, down to the flat Atlantic Coastal Plain. The differences in these provinces are reflected in the great variety of wetlands throughout the Chesapeake basin.

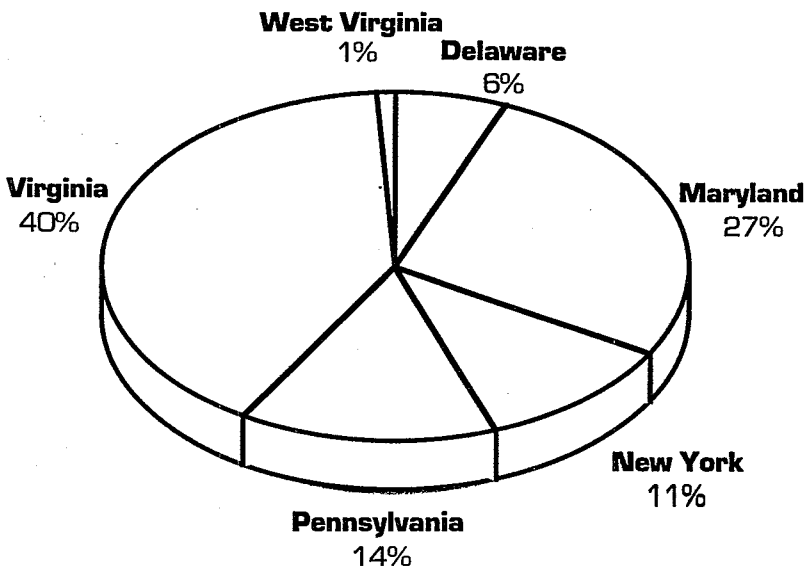
A fundamental knowledge of wetlands and their characteristics is critical in understanding the importance of these areas in our everyday lives. Many publications already have covered the basic science of wetlands in great detail, including thorough descriptions of wetland types, their characteristics, and the functions and values of wetlands. Since these important subjects have been covered elsewhere, this booklet explains them only briefly. Selected readings that cover wetland science more comprehensively are listed at the end of this booklet.

Wetland Types

Wetlands include marshes, swamps, and bogs as well as the shallow water portions of rivers, lakes, and ponds. They are lands that are permanently or regularly flooded or remain saturated for extended periods of time during the growing season. Although many wetlands border other water bodies, some are found in upland depressions where surface or groundwater pools or on the slopes of areas with groundwater discharge. The presence of water in these areas affects the development of soils and the types of plants and animals able to survive. Wetlands are, therefore, defined by the predominance of "hydrophytes" (plants adapted for life in wet soils) and the presence of "hydric soils" (periodically saturated or flooded soils).

Several wetland types occur throughout the Chesapeake watershed due to its variability in topography, climate, soil, hydrology, salinity, vegetation, and other factors. Scientists, however, often group wetlands into two general catego-

Distribution of Wetlands in the Chesapeake Watershed



ries: *estuarine wetlands* and *palustrine wetlands*. Estuarine wetlands are tidally flooded by salt or brackish water and are found chiefly along the shores of Chesapeake Bay and its tidal rivers. In contrast, palustrine wetlands are freshwater. They are situated on the floodplains bordering rivers and streams, fringing the shorelines of lakes and ponds, filling isolated depressions, and covering broad flat areas at or near sea level where water may collect (such as many areas on the Delmarva Peninsula). Some palustrine wetlands exist in the tidal freshwater portions of rivers such as the Potomac, Nanticoke, and James.

Wetlands are further characterized by their vegetation as: 1) *emergent wetlands* (commonly called marshes and wet meadows) dominated by grasses, sedges, and other herbaceous or non-woody plants; 2) *shrub wetlands* (including shrub swamps and bogs) characterized by low to medium-height woody plants; and 3) *forested wetlands* (largely wooded swamps and bottomland hardwood forests) dominated by trees.

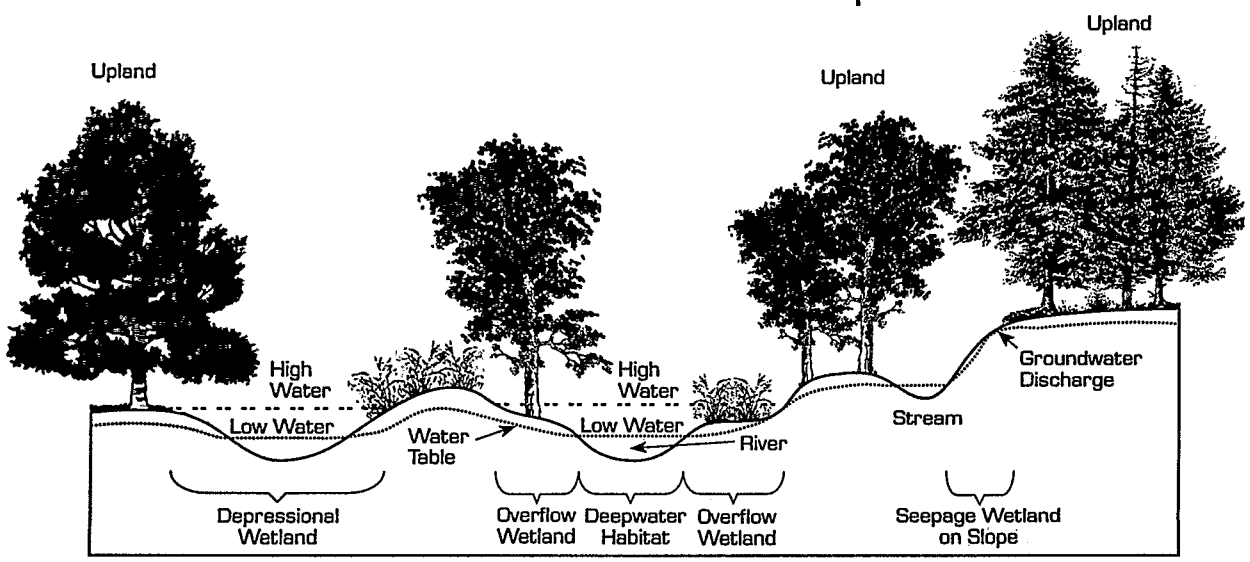
The Status and Trends of the Bay's Wetlands

The most up-to-date information on the status and recent trends in wetlands for the Chesapeake watershed comes from a U.S. Fish and Wildlife Service study funded by the Chesapeake Bay Program. Using a statistical sampling design, researchers determined changes in the watershed's wetlands between 1982 and 1989. Seven hundred and sixty sample plots of four square miles each were randomly selected within each state and evaluated for change using photointerpretation. By comparing an aerial photo of a plot taken at one time with a subsequent photo of the same area, scientists could determine the acreage of wetlands at each of the two times and quantify the amount of wetland loss or gain over that time period.

Due to the vast size of the Chesapeake Bay watershed, this study used a statistical approach to estimate total acres of wetlands. This approach is very useful but cannot attain the accuracy of more comprehensive methods such as those used by the National Wetlands Inventory (NWI). The Bay Program has committed to recording all wetlands in the watershed using NWI, to be completed in 1997.

The current study's statistical analysis provided critical information on the loss and gain of wetlands by state and physiographic region from 1982 to 1989. Since 1989, wetland management changes have further protected and restored wetlands. Consequently, potential improvements in wetland protection and restoration are unknown

Wetlands in the Landscape



and will be captured in subsequent status and trends reports. This document summarizes the study's findings on the status and recent trends of wetlands in the Chesapeake watershed.

Current Status of Wetlands

More than 1.5 million acres of wetlands exist in the Chesapeake watershed. This number represents about 4 percent of the 64,000-square mile basin, about 1.4 times the size of Delaware or one-quarter the size of Maryland. Most of the wetlands are palustrine (1.3 million acres), with only 200,000 acres of estuarine wetlands.

About 40 percent of the watershed's wetlands occur in Virginia, with another 27 percent in Maryland. The tidally flooded lowlands and relatively flat landscape of the Coastal Plain in the eastern portion of these states favor the formation of wetlands and result in significant wetland acreage in these states. New York and Pennsylvania account for another 11 and 14 percent of the watershed's wetlands, respectively. Delaware and West Virginia, combined, contribute about 7 percent.

Most of the estuarine and palustrine wetlands are found on the coastal plain; together these wetlands constitute over half of the watershed's total wetland acreage.

Common Recognizable Hydrophytes

Common Name	Botanical Name
Swamp white oak	*Quercus bicolor*
Northern white cedar	*Thuja occidentalis*
Green ash	*Fraxinus pennsylvanica*
Black spruce	*Picea marina*
Tamarack	*Larix laricina*
Water tupelo	*Nyssa aquatica*
Highbush cranberry	*Vaccinium trilobum*
Small cranberry	*Vaccinium oxycoccus*
Leatherleaf	*Chamaedaphne calyculata*
Buttonbush	*Cephalanthus occidentalis*
Swamp azalea	*Rhododendrum viscosum*
Winterberry	*Ilex verticillata*
Swamp privet	*Forestiera acuminata*
Swamp rosemallow	*Hibiscus moscheutos*
Royal fern	*Osmunda regalis*
Sensitive fern	*Onoclea sensibilis*
Common cattail	*Typha latifolia*
Soft-stem bulrush	*Scirpus validus*
Wool grass	*Scirpus cyperinus*
Skunk cabbage	*Symplocarpus foetidus*
Round-leaved sundew	*Drosera rotundifolia*
Pitcher plant	*Sarracenia purpurea*
American burreed	*Sparganium americanum*
Common arrowhead	*Sagittaria latifolia*
Common reed	*Phragmites autralis*
Purple loosestrife	*Lythrum salicaria*
Cardinal flower	*Lobelia cardinalis*
New York ironweed	*Vernonia noveboracensis*
Alligator weed	*Alternanthera philoxeroides*

From: Welsch, D.J., D.L. Smart, J.N. Boyer, P. Minkin, H.C. Smith, and T.L. McCandless, 1995, Forested Wetlands: Functions, Benefits, and the Use of Best Management Practices.

Causes of the Change

Wetlands are subjected to both human-induced and natural forces that either diminish or expand the amount of wetlands–that is, they result in a *loss* or *gain* in the acreage of a wetland. Three types of changes are discussed: *losses, alterations,* and *gains.*

Loss occurs when a wetland changes such that it no longer exhibits the characteristics of a wetland. For example, a wetland is lost when filled to create a shopping mall or excavated to become a pond. This type of change results in the elimination of a wetland. ***Alteration*** occurs when a wetland changes from one wetland vegetation type to another. These alterations can result from forestry, sea level rise, nutria foraging, beaver dams, fire, and succession. For example, a shrub wetland can be altered to an emergent wetland by clearing shrub vegetation and leaving only herbaceous plants. Such a change results in the loss of a shrub wetland with a simultaneous gain of an emergent wetland. Alterations may change a wetland's functions and values for several decades. ***Gain*** occurs when a new wetland is formed (either naturally or artificially) from upland or open water. This type of change results in the creation of a wetland. When development displaces wetlands, mitigation of that loss is often required by law through the creation of a new wetland elsewhere.

All of these losses and gains are totaled to estimate the net change in acreage of a wetland type. A net change can be either a net loss or a net gain. For example, the overall losses and gains of palustrine shrub wetlands between 1982 and 1989 were combined to yield the net change in palustrine shrub wetlands (which happened to be a net loss).

The major causes of wetland loss in the Chesapeake Bay watershed from 1982 to 1989 are outlined below:

Human Activities

- **Pond and lake construction** - impounding or excavating and flooding wetlands for water supply, flood protection, recreation, and other purposes.
- **Coastal impoundment construction** - diking and flooding coastal wetlands to create brackish water impoundments for waterfowl use, aquaculture, or other purposes.
- **Agriculture** - draining and clearing wetlands for crop production.
- **Urban development** - filling wetlands for houses, industrial facilities, ports, commercial buildings, highways, airports, and other purposes.
- **Other development** - Channelizing (excavating) wetlands for navigation and flood protection; timber harvesting; draining wetlands for farmland and urban land; sand and gravel mining; and mosquito ditching.

Natural Forces

- **Rising sea level**
- **Erosion and accretion**
- **Animal activities** - (e.g., muskrat, nutria, and goose "eat-outs" and beaver impoundments)

Human activities are particularly important in determining the fate of wetlands. Unfortunately, most of these activities are harmful to wetlands–converting them to farmland or dry land for development or degrading their quality by

pollution–but some changes can be reversed. Restoration of previously drained wetlands can return these areas to valuable habitat. Government agencies are restoring hundreds of acres of wetlands in the watershed through programs such as Maryland's "Waterfowl Habitat Improvement Program," the U.S. Fish and Wildlife Service's "Partners for Wildlife Program," and the U.S.D.A. Natural Resources Conservation Service's "Wetland Reserve Program." Private organizations, notably Ducks Unlimited and The Nature Conservancy, also provide significant assistance in restoring wetlands in the Chesapeake Bay area. (See Resources Section, on the last page for organizations.) Those wetland protection efforts that regulate impacts to wetlands help to maintain and enhance our wetland resources despite mounting pressures to convert them to other uses. Under the North American Waterfowl Management Plan, valuable wetland habitats are purchased. The National Wetlands Coastal Conservation Grants Act of 1987 provides for similar purchases.

Wetland Functions and Values

The terms "functions" and "values" are sprinkled liberally throughout the text of government documents, scientific textbooks, and scholarly treatises on wetlands. Yet to many, these terms are confusing and the words often are used incorrectly or interchanged. The functions of a wetland are simply the physical and biological processes operating within the wetland habitat. Values, on the other hand, are the perceived benefits of a particular wetland based on human needs, making them subjective assessments of a wetland's worth.

The functions of a wetland will vary depending on the wetland's topographic location, size, substrate, position relative to other water bodies, dominant plant species, and other factors. The variation in these factors at each site means that every wetland has its own distinctive ecology. Some common functions of wetlands include: groundwater recharge and discharge, floodwater storage, water quality improvement, buffering of the shoreline from erosion, sediment trapping, habitat for fisheries and wildlife, and recreation.

A wetland's value is directly related to the functions it performs. For example, a wetland that functions as a habitat for fur-bearing animals has potential value for those who may want to harvest these animals. Or, a wetland that is topographically situated to act as a temporary reservoir for a stream's floodwaters may have significant value to a town located downstream of the wetland. The values of any given wetland, therefore, are dependent upon the needs and wishes of those living close to the wetland or those wanting to exploit its resources.

Trends in Wetlands

Between 1982 and 1989, over 37,000 acres of wetlands were turned into dry land or open water in the Chesapeake watershed. This acreage—an area about the size of Washington, DC—represents the elimination of 2.5 percent of the palustrine and estuarine wetlands in the watershed. Most of the losses (24,000 acres) were in the Virginia portion of the watershed.

Trends in Estuarine Wetlands

From 1982 to 1989, about 1,000 acres of estuarine emergent wetlands (salt marshes)—nearly two square miles—were lost. Most of the acreage was lost in Maryland (more than 700 acres), principally through the conversion of these wetlands to open water. This conversion occurred because of erosion, rising sea level and coastal subsidence, and dredging. Impoundment construction (i.e., ponds) was also a significant contribution. Agriculture and other development were also major causes of estuarine wetland loss. Regulation of urban expansion into wetlands has reduced the impacts of urban development since the 1970s.

Trends in Palustrine (Freshwater) Wetlands

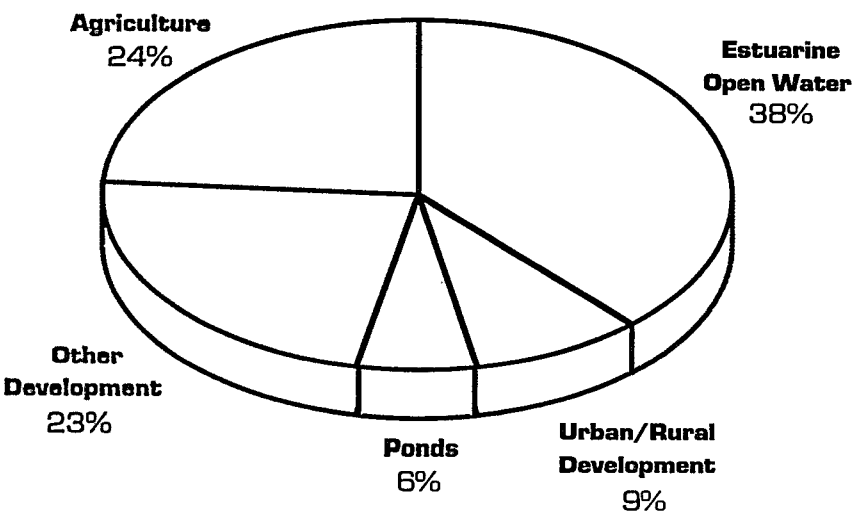
Palustrine Emergent Wetlands

Recently, palustrine emergent wetlands (freshwater marshes) have experienced a net loss of over 4,000 acres in the Chesapeake watershed.

Agricultural conversion of these emergent wetlands was the most significant factor in their decline, accounting for over half of the loss. Diking and excavation for pond construction was also a major cause of emergent wetland loss. All states except Pennsylvania had net losses in these wetlands. The net gain in Pennsylvania of 3,000 acres resulted primarily from sediment accretion and the revegetation of ponds and the shallow water portions of lakes and reservoirs.

Causes of Estuarine Marsh Loss

1982 to 1989



Changes in the Vegetated Wetlands for the Portions of Each State Within the Bay Watershed and for the Entire Watershed

State	Vegetated Wetland Type	1982 Acres	1989 Acres	Acres Changed to other Veg. Wetlands	Acres Changed from other Veg. Wetlands	Acres Destroyed	Acres Gained from other Habitats	Net Change
Delaware	Palustrine	102, 103	99,176	–	–	3,207	281	-2,927
Maryland	Palustrine	307,546	303,223	397	315	5,358	1,115	-4,323
	Estuarine	117,635	117,076	315	397	733	92	-559
New York	Palustrine	163,881	163,980	–	–	0	99	+99
Pennsylvania	Palustrine	203,926	208,609	–	–	3,977	8,660	+4,683
Virginia	Palustrine	558,492	541,021	6	72	23,474	5,937	-17,471
	Estuarine	79,690	79,346	72	6	412	133	-344
West Virginia	Palustrine	17,716	18,004	–	–	16	304	+288
Chesapeake Watershed	Palustrine	1,353,664	1,334,012	403	387	36,033	16,397	-19,652
	Estuarine	197,326	196,422	387	403	1,145	225	-904

Palustrine Shrub Wetlands

From 1982 to 1989, palustrine shrub wetlands showed a net loss of 1,000 acres throughout the watershed.

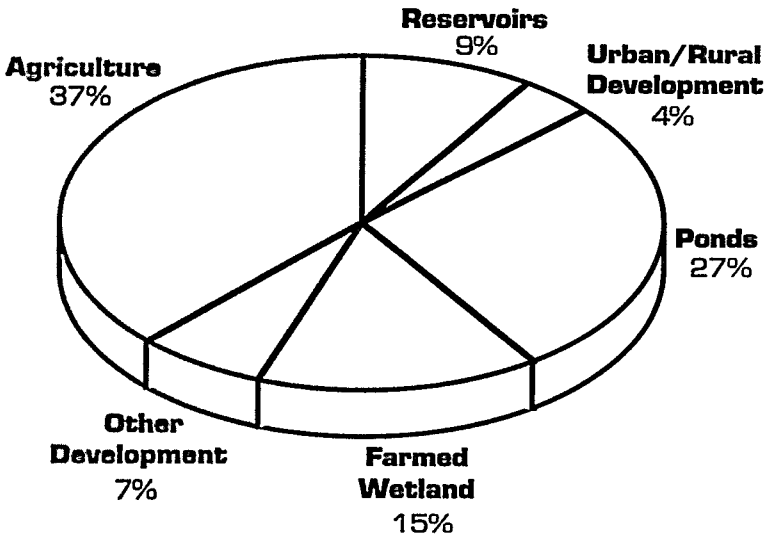
Over 80 percent of the palustrine shrub wetland loss resulted from conversion of the wetlands to open water, mostly for reservoirs. Agricultural conversion also contributed significantly to shrub wetland loss.

Palustrine Forested Wetlands

Palustrine forested wetlands experienced the greatest net loss of all wetland types in the Chesapeake watershed. From 1982 to 1989, they showed a net loss of over 14,000 acres. Nearly 26,000 acres of forested wetlands were altered to become emergent or shrub wetlands—18,000 acres of these alterations resulted from timber harvest. Some of these new emergent or shrub wetlands will eventually revert to forested wetlands if they are managed for silviculture.

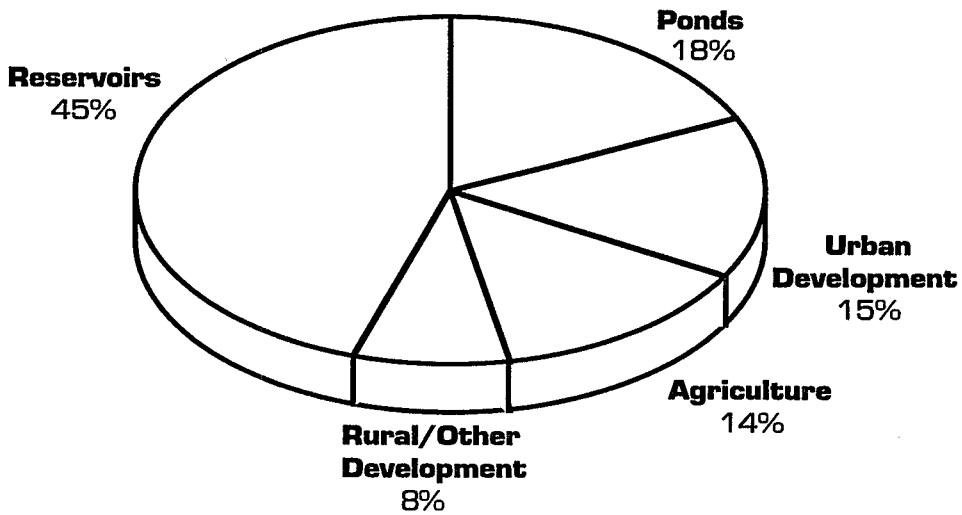
The heaviest losses in forested wetlands occurred in Virginia, where about 11,000 acres were lost through conversion to dry land or open water. About 2,500 acres were lost in Maryland with about 1,000 more lost in Delaware's portion of the Chesapeake watershed. Almost two-thirds of the lost forested wetlands were turned into open water with half of these conversions from reservoir construction. Only 200 acres were lost in Pennsylvania, while the state experienced a net gain of 2,548 acres of forested wetlands due to the natural succession of scrub-shrub wetlands.

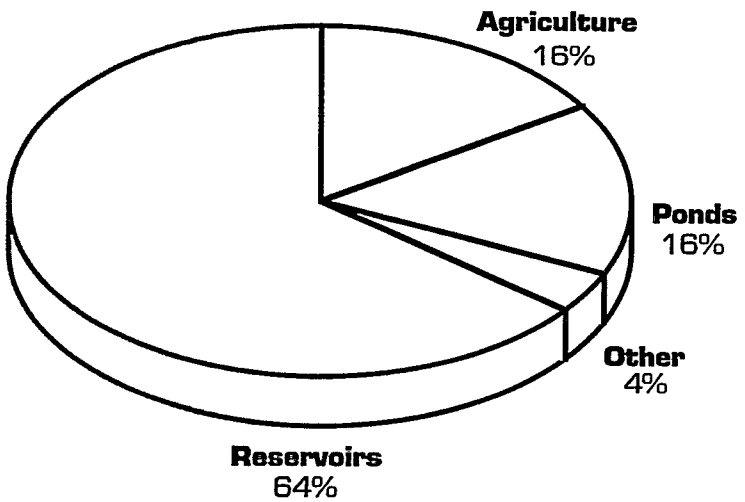
Urban development and agricultural conversion also contributed significantly to the losses of palustrine forested wetlands. Of all the vegetated wetlands, forested wetlands were most affected by urban development.



Causes of palustrine emergent wetland loss from 1982 to 1989

Causes of palustrine forested wetland loss from 1982 to 1989





Causes of palustrine shrub wetland loss from 1982 to 1989

Wetland Loss Hot Spots

Scientists have identified seven regions in the Chesapeake watershed as "hot spots," where enormous human-induced losses of vegetated wetlands occurred between 1982 and 1989. These hot spots require increased wetland protection to minimize further losses. Wetlands in all of these areas are in urgent need of additional protection compared to the amount received prior to 1989.

Southeastern Virginia
Nearly 4,000 acres of forested wetlands were lost and turned into housing developments and farmland. Seasonally saturated and temporarily flooded palustrine forested wetlands were the areas most affected. These types of forested wetlands are not being regulated by the federal government since they fail to meet all the requirements for regulated wetlands.

Piedmont of Virginia
About 17,000 acres of palustrine vegetated wetlands were lost, representing a 10 percent loss of the emergent wetlands, 23 percent of the shrub wetlands, and 4 percent of the forested wetlands that existed in 1982. Reservoir and lake construction were responsible for over 80 percent of the losses, with pond construction affecting another 10 percent.

Eastern Shore of Maryland
Over 4,000 acres of palustrine vegetated wetlands were lost—mostly forested and emergent wetlands. The 1,700 acres of emergent wetlands lost represent a 17 percent loss since 1982. Agricultural conversion and pond construction caused most of these losses. Forested wetland losses resulted from various activities, ranging from agriculture and open water construction to urban and rural development.

Western Delaware
Nearly 2,000 acres of palustrine emergent wetlands were lost, almost half of the emergent wetlands that existed in this part of the state in 1982. These impacts were due primarily to agricultural conversion. Simultaneously, almost 700 acres of forested wetlands were destroyed, also largely due to agricultural conversion.

Coastal Plain of Virginia
Almost 2,000 acres of palustrine vegetated wetlands were lost. Nearly 1,300 acres of these losses were due to the loss of forested wetlands; more than half of these forested wetlands were converted to ponds.

Western Virginia - Blue Ridge/Appalachian
This area lost 34 percent of its palustrine emergent wetlands from 1982 to 1989. About 80 percent of the 1,500 lost acres were converted to cropland.

Northeastern Pennsylvania
This area lost about 10 percent of its palustrine vegetated wetlands from 1982 to 1989. More than half of the losses were due to pond construction, with the remainder attributed to agricultural conversion.

Future of the Bay's Wetlands

During the 1980s, we saw a dramatic improvement in the status of estuarine wetlands along with a continued significant decline in palustrine wetlands. Estuarine wetlands clearly benefited from stricter regulations imposed by the Clean Water Act in 1977 at both the federal and state levels. State regulating agencies put similar regulatory measures in place. Palustrine wetlands, however, continued to receive inadequate protection. Protecting wetlands through regulatory mechanisms requires the use of a clear definition of a wetland.

Many areas technically qualify as wetlands, but may not qualify legally under current regulatory definitions. The Corps of Engineers, for example, did not regulate many of these wetland areas prior to 1989. One common type of forested wetlands—"winter wet woods"—did not satisfy the hydrologic requirement for a wetland based on the Corps' wetland delineation manual. These areas still are not being regulated despite their common occurrence.

Managers widely use two approaches to protect existing wetlands: acquisition and regulation. Government agencies and private conservation organizations often purchase wetlands or easements on wetlands and then establish wildlife refuges, sanctuaries, or conservation areas. Funding for these efforts, however, is limited and the remaining wetlands cannot be protected by acquisition alone.

Regulatory programs that control activities in wetlands are, therefore, vital in protecting the functions and values of wetlands. Since 1982, wetland regulations have changed dramatically at both the state and federal level throughout the watershed. Maryland has joined Pennsylvania by adopting statewide wetland regulations. While Delaware and Virginia's wetland protection laws have significantly reduced the loss of tidal wetlands, these states do not have similar protection for nontidal wetlands. Virginia, however, has established a program to enhance the protection of nontidal wetlands through Section 401 of the federal Clean Water Act. In some cases, federal administration of Section 404 of the Clean Water Act has become more stringent, such as the restriction of land-clearing activities in wetlands. Nevertheless, many of the losses reported in this document have occurred due to actions outside the authority of existing regulations. Consequently, we must not only examine our existing regulatory and acquisition programs, but also strengthen other efforts that will minimize the future loss of wetlands.

Many actions—both public and private—can be taken to address the alarming trend of wetland loss. Cooperation among public agencies, private citizens, and the private sector is essential to secure a promising future for our wetlands. Individual landowners and corporations are in a key position to determine the fate of wetlands on their properties. Every citizen—landowner or not—can help wetlands by supporting the wetland conservation initiatives. Listed below are some necessary steps for the Chesapeake Bay region to meet the goals of "no net loss of wetlands," and "long-term gain" in acreage and function.

Achieving the Wetlands Goals

This subsection lists several important actions needed to achieve the Chesapeake Bay Program's wetland goals.

- **Management Programs.** Continue to improve existing wetlands management programs and to promote better coordination between federal and state management efforts.
- **Market-based Incentives.** Develop and implement market-based incentives for wetlands conservation that enhance the benefits for developing in non-wetland areas.
- **Mitigation Banking.** Develop and implement mitigation banks that streamline the permitting process and protect the overall functions of wetlands in the watershed.
- **Best Management Practices.** Encourage the use of best management practices for land development, forestry, and agriculture to minimize adverse impacts on wetlands.
- **Land Development.** Encourage local governments to conserve wetlands through comprehensive plans and local ordinances. Encourage private developers to use innovative development designs that preserve wetlands and other open spaces.
- **Government-sponsored Projects.** Minimize the impact of government-sponsored projects on wetlands and—when damage cannot be prevented—replace lost wetland acreage and the associated functions.
- **Wetlands Restoration.** Identify and prioritize (preferably on a watershed basis) areas where wetlands can be restored, enhanced, or created.
- **Buffer Areas around Wetlands.** Provide incentives that encourage private landowners to voluntarily maintain and establish vegetated buffers around wetlands and along other water bodies.
- **Data on Wetlands.** Accurately measure the status and trends of wetlands acreage and functions in all areas of the Bay watershed.
- **Public Education.** Continue to encourage and promote public outreach efforts that inform citizens of the watershed about the importance of wetlands.
- **Research.** Promote research to increase our understanding and knowledge of the complex functioning of wetland ecosystems.

Ways the Public can Help Achieve the "No Net Loss" Goal

- **Identify** wetlands on your property and avoid these areas during any project construction.
- **Learn** about the habitat values of wetlands on your property and the types of plants and animals that inhabit or frequent the area.
- **Maintain** vegetated buffer areas around wetlands to conserve their habitat values for fish and wildlife.
- **Encourage** local governments and private developers to adopt innovative land use planning that would conserve wetlands.
- **Comment** on public notices and attend public hearings concerning wetland permits and regulations.
- **Donate** wetlands or funds for the purchase and management of wetlands to private conservation agencies.
- **Restore** wetlands on your property where former wetlands have been destroyed or degraded (government financial and technical assistance is often available).
- **Conserve** wetlands and their values whenever possible. When planning to use wetlands for production, such as hunting, trapping, or forestry, consult federal and state agencies (e.g., the U.S. Fish & Wildlife Service and your state departments of conservation and forestry) to learn how you can minimize the impacts of these activities on your wetlands.

The Bottom Line

Wetlands are the vital link between the land and water, helping to improve water quality, storing water temporarily to prevent downstream flooding, stabilizing shorelines, and providing several other beneficial functions. If we are to continue receiving these benefits, the trends observed in the 1980s and earlier must be reversed.

We must continue to support those wetland conservations efforts that have already dramatically slowed the loss of estuarine wetlands. Our attention, however, must now focus on the palustrine wetlands which remain under the onslaught of development pressures.

The plants and animals of Chesapeake Bay depend on the health of these wetlands which help filter excess nutrients, sediments, and other pollutants, preventing these potentially deleterious materials from reaching the Bay. We must strengthen wetland protection and initiate wetland restoration efforts to improve the quality of the Bay for its plants and animals, for ourselves, and for future generations.

Laurie Hewitt

For information on the federal and state wetland regulations, contact the following agencies:

Federal

U.S. Environmental Protection Agency
Wetlands Section
841 Chestnut Building
Philadelphia, PA 19107
(215) 566-9800
Wetlands Hotline (800) 832-7828

U.S. Army Corps of Engineers

District Engineer
Baltimore District
Corps of Engineers
P.O. Box 1715
Baltimore, MD 21203
(410) 962-3670

District Engineer
Pittsburgh District
Corps of Engineers
Federal Building
1000 Liberty Avenue
Pittsburgh, PA 15222
(412) 644-4204

District Engineer
Norfolk District
Corps of Engineers
Fort Norfolk,
803 Front Street
Norfolk, VA 23510
(804) 441-7652

State

Delaware Dept. of Natural Resources and Environmental Control
Division of Water Resources
Dover, DE 19903
(302) 739-4691

Maryland Dept. of the Environment
Water Management Admin.
2500 Broening Highway
Baltimore, MD 21224
(410) 631-8094

New York Dept. of Environmental Conservation
50 Wolf Road
Albany, NY 12233
(518) 457-7424

Pennsylvania Dept. of Environmental Protection
Bureau of Dams, Waterways and Wetlands
P.O. Box 8554
Harrisburg, PA 17105
(717) 787-6827

Virginia Marine Resources Commission
P.O. Box 756
Newport News, VA 23607
(804) 247-2200

Virginia Dept. of Environmental Quality
Water Division
Virginia Water Protection Permit Program
P.O. Box 10009
Richmond, VA 23240
(804) 527-5000

West Virginia Division of Natural Resources
P.O. Box 67
Elkins, WV 26241
(304) 637-0245

Selected Readings

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. *Classification of Wetlands and Deepwater Habitats of the United States*, U.S. Fish & Wildlife Service Special Rpt. FWS/OBS 79/31. 131 pp.

Johnson, C.W. 1985. *Bogs of the Northeast*. Univ. Press of New England. 269 pp.

Magee, D.W. *Freshwater Wetlands: A Guide to Common Indicator Plants of the Northeast*. 1981. University of Mass. Press. 245 pp.

Mitsch, W.J. and J.G. Gosselink. 1986. *Wetlands*. Van Nostrand Reinhold Co., Inc. 539 pp.

Neiring, W.A. 1988. *Wetlands: Audubon Society Nature Guide*. Alfred A. Knopf. New York. 638 pp.

Tiner, R.W. 1987. *A Field Guide to Coastal Wetland Plants of the Northeastern United States*. University of Mass. Press. 285 pp.

Tiner, R.W., I. Kenenski, T. Nuerminger, J. Eaton, D.B. Foulis, G.S. Smith, and W.E. Frayer. 1994. *Recent Wetland Status and Trends in the Chesapeake Watershed (1982-1989)*. Technical Rpt. Prepared by U.S. Fish & Wildlife Service for the Chesapeake Bay Program, U.S. Environmental Protection Agency. Annapolis, MD. 88 pp.

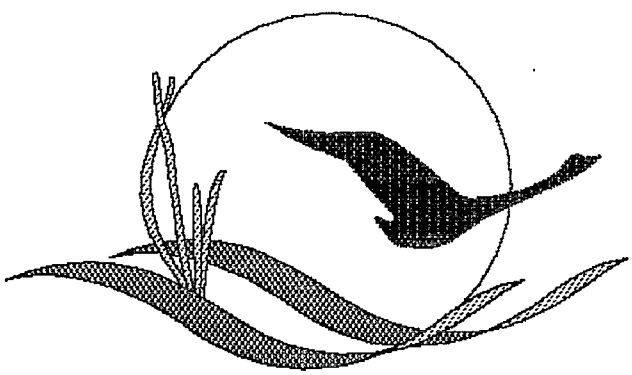
Silberhorn, G.M. 1976. *Tidal Wetland Plants of Virginia*. Education Series No. 19. VA Institute of Marine Sciences, Gloucester Pt., VA. 86 pp.

Weller, M.W. 1981. *Freshwater Marshes: Ecology and Wildlife Management*. University of Minnesota Press. 146 pp.

Copies of this booklet
may be obtained from:

Chesapeake Bay Program
U.S. Environmental Protection Agency
410 Severn Avenue, Suite 109
Annapolis, Maryland 21403
(800) YOUR BAY

U.S. Fish and Wildlife Service
177 Admiral Cochrane Drive
Annapolis, Maryland 21401
(410) 573-4500



Chesapeake Bay Program
http://www.epa.gov/chesapeake