

MARYLAND ENVIROTHON

Resource Packet and Study Guide

WETLANDS MANAGEMENT

Developed from Resources Provided by

U.S. Fish and Wildlife Service

U.S. Environmental Protection Agency
and the Chesapeake Bay Program

U.S. Department of Agriculture

And the Natural Resources Conservation Service

Maryland Department of the Environment

Maryland Department of Natural Resources

2000 (updated 2006)

PREFACE

Wetlands are rich and diverse ecosystems, providing many ecological and social benefits. These systems are often highly impacted by urbanization, agriculture and other human activities. The complexity of wetlands, and their functional and ecological values, is to be understood and addressed in land use planning decisions.



TABLE OF CONTENTS

I. INTRODUCTION -----	3
CHESAPEAKE BAY WATERSHED	
<u>Multi State Distribution (See Map 1)</u> -----	3
II. WETLANDS – DEFINITION -----	4
A. HOW TO IDENTIFY A WETLAND -----	5
WETLAND HYDROLOGY -----	5
WETLAND SOILS -----	6
WETLAND VEGETATION -----	8
B. WETLAND FORMATION and IDENTIFICATION OF WETLAND TYPES -----	9
III. WETLAND FUNCTIONS AND VALUES -----	12

WETLANDS MANAGEMENT

I. 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.

Maryland has lost much of its valuable wetlands. Since the 1940s, during a period of explosive growth, Maryland lost approximately 60,000 acres of wetlands. Many of these wetland losses occurred prior to public understanding of the vital contributions of these natural resources. Today we recognize the importance of wetlands, both economically and environmentally.

The health of the Chesapeake Bay ecosystem is directly linked to the abundance and condition of the wetlands in the Bay watershed. This includes all the wetlands within the Bay and its tributaries as well as inland wetlands throughout the State. Nontidal wetlands possess many of the same physical and biological characteristics as tidal wetlands. They perform similar ecological functions, which are of value to man.

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. Maryland is committed to a "no-net loss" of wetlands and ultimately, a "net gain" in wetlands across the State.

CHESAPEAKE BAY WATERSHED

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.

Currently, about 12 percent of the wetlands in the Chesapeake Bay watershed are classified as estuarine or coastal wetlands (Tiner et al. 1994). Coastal wetland losses continue to result from conversion to estuarine waters by rising sea levels, coastal erosion and dredging. Losses of coastal wetlands to agriculture have increased significantly since 1982.

The remaining 88 percent of wetlands in the Chesapeake Bay watershed are various types of inland wetlands. Sixty percent of the total wetlands in the Chesapeake Bay watershed are inland wetlands classified as palustrine (nontidal freshwater) forested wetlands. Actually, forested wetlands progress from forested wetlands to emergent wetlands to scrub-shrub wetlands and back to forested wetlands creating a sort of dynamic equilibrium as individual forests progress through the various plant successional stages in response to management activities or natural phenomena. Palustrine scrub-shrub wetlands and palustrine emergent wetlands make up 10 and 11 percent of the total wetlands respectively. Consequently, appropriate forest management activities have the potential to favorably effect more than 60 percent of the total wetlands in the Chesapeake Bay watershed.

II. WETLANDS – DEFINITION:

Wetlands occupy an important transitional position between land and water; and may have fresh, brackish or saline waters. They may be permanent, seasonal or temporary. They may be forested or open. A wetland can be defined as any area of land that is under water for all or part of the year, and supports biological activity adapted to a wet environment (Wetland Evaluation Guide 1992, North American Wetlands Conservation Council-Canada). Wetlands are usually defined by a combination of hydrology, soils and vegetation. Defining wetlands and delineating their boundaries can be difficult and controversial.

The term “wetlands” refers to lowlands covered with shallow and sometimes temporary or intermittent waters. They are referred to by such names as marshes, swamps, bogs, wet meadows, potholes, sloughs, fens and river overflow lands. Shallow lakes and ponds, usually with emergent vegetation as a conspicuous feature, are included in the definition, but the permanent waters of streams, reservoirs, and portions of lakes too deep for emergent vegetation are not included. Neither are water areas that are so temporary as to have little or no effect on the development of moist-soil vegetation.

Wetlands of the United States, Their Extent and Their Value for Waterfowl and Other Wildlife (Shaw and Fredine 1956)



“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...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. Classification of Wetlands and Deepwater Habitats of the United States (Cowardin et al. 1979)

The term “wetlands” means those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marches, bogs, and similar areas. Corps of Engineers Wetlands Delineation Manual (U.S. Army Corps of Engineers 1987)

Wetlands are areas where water covers or saturates the ground for all or part of the year and the vegetation the areas support is adapted to wet conditions. Maryland has a variety of tidal and nontidal wetland types – including marshes, wet meadows, wooded swamps, and bogs as well as the shallow water portions of rivers, lakes, and ponds – providing a wide array of environmental and economic benefits. It is important to know that there are several similar definitions in common use, but the one that currently applies for the regulatory purposes of the Clean Water Act is the 1987 Corps of Engineers definition.

A. HOW TO IDENTIFY A WETLAND

If a specific area meets the characteristics of these three parameters, hydrology, soils, and vegetation, it is identified as a wetland. Tidal wetlands are usually easy to identify because they are inundated as a wetland. In nontidal freshwater areas water levels are less than 6.6 feet deep (2 meters) and these wetlands can be more difficult to identify because they may only be inundated or saturated for a short period during the year. Wetlands are identified using the three mandatory criteria as follows:

WETLAND HYDROLOGY

(Water presence at or near the ground surface for a part of the year.)

Hydrology, the way in which a wetland is supplied with water, is one of the most important factors in determining the way in which a wetland will function, what plants and animals will occur within it, and how the wetland would be managed. Since wetlands occur in a transition zone where water based ecosystems gradually change to land based ecosystems, a small difference in the amount, timing or duration of the water supply can result in a profound change in the nature of the wetland and its unique plants, animals and processes. Forested Wetlands Functions, Benefits and the Use of Best Management Practices (USDA Forest Service 1995)

The presence of water is defined as the “permanent or periodic inundation, or soil saturation, for a significant period during the growing season.” It is the driving force that creates wetlands. All wetlands are



periodically wet but may be dry for long periods throughout the year. This is often the most difficult type of wetland to identify.

Sometimes data is available from monitoring wells, which have recorded the depth of subsurface water over a period of time. Aerial photographs, taken in different seasons, can also be obtained that may show areas of inundation or saturation. Most often, however, field data must be collected to identify the hydrology of any particular area. Field indicators of wetland hydrology include:

1. Inundation – is there ponded water?
2. Soil Saturation – is the soil soggy or does water drip through your fingers when you squeeze the soil?
3. Oxidized rhizospheres – channels along living plant roots that are orangish or reddish brown from iron oxide precipitate
4. Water marks – lines from the maximum level of inundation found on plants, fences, bridges, etc.
5. Drift lines – deposition of debris in a line along the wetland surface
6. Sediment deposits – waterborne sediment covering vegetation or other objects
7. Water stained leaves – mats of gray or blackish leaves on the forest floor
8. Surface scouring – areas with no vegetation or leaf litter
9. Drainage patterns – meandering or braided swales or channels
10. Wind thrown trees – caused by shallow roots
11. Morphological plant adaptations:
 - a) swollen (buttressed) tree trunks
 - b) multiple trunks
 - c) pneumatophores – Cypress “knees”
 - d) adventitious roots – arising from the stem above ground
 - e) shallow or exposed roots – often exposed at or above the ground surface
 - f) aerenchyma – air-filled tissue in roots and stems
 - g) floating leaves or stems – water lilies

WETLAND SOILS

(Soil development under wet conditions.)

Hydric soils (wet and low oxygen content) are those that have taken on specific characteristics due to their periodic saturation. When soils are saturated with water for more than a few days during the growing season, anaerobic conditions (lack of oxygen) develop in the upper part. These saturated conditions impede aerobic decomposition (or Oxidation) of the bulk organic materials, such as leaves, stems and roots, and encourage their accumulation as peat or muck over time. A hydric soil is a soil that is saturated, flooded or ponded long enough during the growing season to develop anaerobic conditions in the upper part.

Only organisms that are specifically adapted to life with reduced oxygen supplies can survive in hydric soils. It is important to note that the gleying and mottling (features reflecting soil wetness) formation processes are strongly influenced by the activity of

certain soil microorganisms. These microorganisms reduce iron when the soil environment is anaerobic, that is, when virtually no free oxygen is present, and when the soil contains organic matter. Organic carbon serves as an energy source for these organisms. If the soil conditions are such that free oxygen is present, organic matter is absent, or temperatures are too low (below Freezing) to sustain microbial activity, gleization will not proceed and mottles will not form, even though the soil may be saturated for prolonged periods of time. Consequently, some hydric soils do not exhibit strong evidence of gleying and mottling. This is particularly true for sandy soils. Sandy soils, red parent material soils, and others can be hydric but not exhibit evidence of gleying due to basic lack of reducible iron or inherently iron-rich soil, but not due to water levels.

Hydric soils are separated into two major categories on the basis of soil composition: (1) organic soils (Histosols) and (2) mineral soils. In general, soils having 20 percent or more organic material by weight in the upper 16 inches are considered organic soils. All of Maryland's organic soils are hydric soils. When organic matter does not accumulate thicker than 18 inches, mineral soils have developed. These mineral soils have less organic content and higher contents of sand, silt, and clay. The three most widely recognized features reflecting soil wetness are gleying, mottling, and accumulation of organic matter (peat or muck). Characteristics of hydric organic and mineral soils include:

1. Gleyed colors – the predominate color is neutral gray
2. Low chroma of colors – the soil color is dull, not bright and occasionally greenish or bluish gray
3. Mottles – iron oxide precipitates out of the soil to form “ribbons” or stains of orangish or reddish-brown mineral deposits (rust)
4. Concretions – black or brown nodules of manganese precipitate or sometimes yellow, orange, or reddish-brown iron nodules
5. Sulfitic material – odor of rotten eggs caused by anaerobic conditions

Soil hues (color groups), values (color lightness), and chromas (degree of brightness) are measured using a Munsell Soil Color Charts book (Munsell). The book contains color charts for most temperate soil types. A ped (piece) of soil is held behind a hole next to each color until the closest match possible is made. If the chroma of the soil sample is 2 or less, the soil may be hydric. The Munsell is an essential piece of equipment for identifying wetlands.



When examining wetland soils, a test pit is dug to a depth of 18 to 24 inches. Samples from each soil horizon are measured with the Munsell. In general, if the soil sample in the B horizon or in the root zone is gleyed and has a low chroma and mottles, it has met the hydric soil characteristic.

Better drained soils that are frequently flooded for short

intervals (usually less than one week) during the growing season, or are saturated for less than two weeks during the growing season are not considered hydric soils.

WETLAND VEGETATION

(A preponderance of plants adapted to wet conditions.)

Wetland plants are technically referred to as “hydrophytes” or “hydrophytic vegetation.” Hydrophytic vegetation is defined as plants that have adapted to growing in saturated soils with low levels of dissolved oxygen. People making wetland determinations must be able to identify the dominant plant species in each stratum (layer of vegetation) of the plant community.

The U.S. Fish and Wildlife Service recognizes four types of indicator plants that occur in wetlands. Obligates, and three facultative types that can be found in both wetlands and uplands to varying degrees as follows:

OBLIGATE HYDROPHYTES. Obligate species (OBL) are those plants that are almost always found in wetlands more than 99 percent of the time under natural conditions.

FACULTATIVE WETLAND. Facultative wetland species (FACW) are usually found in wetlands about 67% to 99% of the time.

FACULTATIVE (Pure). The purely facultative plants (FAC) show no affinity to wetlands or uplands and are equally likely to occur in wetlands or uplands about 34% to 66% of the time.

FACULTATIVE UPLAND. These plants usually occur in upland, but are present in wetlands between 1% to 33% percent of the time. When present in wetlands, they are often in drier wetlands including wetlands with sandier soils where they become dominate.

There are also obligate upland plants (UPL) that occur 99% of the time in upland plant communities and only 1% of the time in wetlands. If a plant is not on the List it is generally a UPL.

Each vegetative stratum of a plant community must have its dominant species identified when making a nontidal wetland determination. These strata are:

1. Tree – trees are greater than 5.0 inches diameter at breast height (DBH) and greater than 20 feet tall
2. Sapling – 0.4 inches to less than 5.0 inches and greater than 20 feet tall
3. Shrub – usually 3 feet to 20 feet tall including multi-stemmed, bushy shrubs and small trees and saplings
4. Woody vine – such as grape or trumpet vine
5. Herb – any plant less than 3 feet tall

If greater than 50% of the dominant plant species found in each plant stratum are facultative, facultative wet, or obligate plant species, the site has met the hydrophytic vegetation characteristic.

If the area that you have examined has met all three of these characteristics, it is classified as a wetland.

B. WETLAND FORMATION – TIDAL AND NONTIDAL and IDENTIFICATION OF WETLAND TYPES

Many events have led to the creation of wetlands throughout Maryland. The formation of floodplains along major rivers was responsible for the establishment of many wetlands. Current events, such as rising sea level and erosion and accretion processes, continue to build, shape, and even destroy wetlands. Construction of ponds, impoundments, and reservoirs also may create wetlands, but often involve wetland destruction as well. Thus, two groups of water regimes are identified. Tidal water regimes are driven by oceanic tides, while nontidal regimes are largely influenced by surface water runoff and groundwater discharge.

Ecological Systems

Nontidal wetlands form in low, flat or depressional places and in areas of groundwater discharge, such as seepage slopes and toes of slopes. Many wetlands have formed on floodplains (areas of accretion—sediment build-up along most rivers and large streams) in Maryland. These nontidal wetlands are located inland and are not subject to tidal inundation. The soils are either organic or mineral. Vegetation may be aquatic, emergent, scrub-shrub, forested, or in combinations.

Coastal wetlands are dominant features along Maryland's tidal shorelines. They have formed much differently than the nontidal wetlands. During the "Ice Age" that occurred more than 15,000 years ago, much of the world's ocean waters were stored in the form of glacial ice. At that time, sea level was as much as 425 feet lower than present levels. As the glaciers melted, water was released back into the oceans, thereby raising sea levels. As sea level rose, barrier islands migrated landward and river valleys were submerged. Coastal marshes behind these barrier islands were submerged along with other low-lying areas, but other coastal wetlands eventually reformed behind the barrier islands when they finally stabilized about 3,000 to 4,000 years ago. Tidal marshes are still forming along the Maryland coast in areas of accretion.

Rising sea level has recently transformed former nontidal freshwater wetlands and low-lying uplands into coastal marshes. These tidal wetlands are inundated daily by tidal action and can be saltwater, brackish, or freshwater. The soils are usually organic and the plants are usually herbaceous. Former agricultural fields cultivated before the Civil War are now covered by 10 inches of salt marsh peat. Today, sea level continues to rise along the U.S. coastline at average rates between four and ten inches per century, with local variations.

Maryland's wetlands fall within the following five ecological systems:

MARINE. The Marine System is represented by wetlands generally limited to sandy intertidal beaches along the Atlantic Ocean from Ocean City south. Vegetation is sparse and scattered along the upper zones of beaches. Vascular (woody or herbaceous) plants, such as rocket, seaside broomspurge, saltwort, beach grass, seabeach orach, and beach bean may occur in these areas.

ESTUARINE. The Estuarine System consists of salt and brackish tidal waters and contiguous wetlands where ocean water is at least occasionally diluted by freshwater runoff from the land. It extends upstream in tidal rivers to freshwater where no measurable ocean-derived salts (less than 0.5 parts per thousand) can be detected during average annual low flows.

From a salinity standpoint, Maryland estuaries can be divided into three distinct reaches:

- (1) polyhaline – strongly saline areas (18-30 PPT)
- (2) mesohaline (5-18 ppt)
- (3) oligohaline – slightly brackish areas (0.5-5ppt)

Vegetation patterns are greatly affected by salinity levels and by differences in the duration and frequency of tidal flooding. Major estuarine wetland types in Maryland include:

- (1) intertidal flats
- (2) emergent wetlands
- (3) scrub-shrub wetlands
- (4) forested wetlands
- (5) aquatic beds



In the coastal areas of Maryland, the estuarine marshes (including salt and brackish marshes and tidal mud flats) are most abundant along Chesapeake, Chincoteague, and Assawoman Bays. The shallow water zones of Maryland's estuaries, especially Chesapeake Bay and its tributaries, often contain aquatic beds. Most of these beds are submerged aquatic vegetation.

PALUSTRINE. Maryland's Palustrine System of wetlands are represented by fresh water marshes and swamps, including tidal and nontidal fresh water wetlands. Structurally, palustrine wetland communities can be divided into four major types based on predominant vegetation:

- (1) forested wetlands characterized by woody vegetation 20 feet or taller
- (2) scrub-shrub wetlands dominated by woody plants less than 20 feet
- (3) emergent wetlands represented by erect, herbacious (non-woody) plants
- (4) aquatic beds of various floating-leaved, free floating or submerged plants

RIVERINE. The Riverine System encompasses all of Maryland's fresh water rivers and their tributaries, including the freshwater tidal reaches of coastal rivers such as the Nanticoke and Chester Rivers where salinity is less than 0.5 ppt. This system is composed largely of deepwater habitats and nonvegetated wetlands, with the riverine wetlands occurring between the riverbank and deep water (6.6 feet and deeper). Riverine wetlands are, by definition, largely restricted to shallow bottoms and aquatic beds within the channels and to fringing nonpersistent emergent plants growing on river banks or in shallow water. Contiguous wetlands dominated by persistent vegetation (i.e., trees, shrubs, and robust emergents) are classified as palustrine wetlands.

LACUSTRINE. The Lacustrine System is principally a deepwater habitat system of freshwater lakes, reservoirs and deep ponds. Consequently, wetlands are generally limited to shallow waters and exposed shorelines, as in the Riverine System. A variety of vegetation can be recognized:

- (1) free-floating aquatic plants -- Duckweeds
- (2) rooted vascular floating-leaved aquatic plants -- white lily, spatterdock, water shield, and pond weed
- (3) submerged aquatic plants – pondweeds, bushy pondweeds, water-milfoils, mermaidweeds, coontail, and fanwort
- (4) nonpersistent emergent plants – common three-square, yellow-eyed grass, pipeworts, arrow arum, pickerelweed, bur-reeds, arrowheads, water parsnip, three-way sedge, smartweeds, and spike-rushes. Some of these plants are usually persistent, but along lake shores they may be subject to ice-scouring and therefore, may be considered nonpersistent.

In many areas, persistent plants like cattails, rose mallows, reed canary grass, bluejoint, water-willow, buttonbush, swamp rose, black willow, and others may form part of the lacustrine boundary. These persistent plants, however, represent palustrine wetlands along the lake shore.

Nontidal Palustrine Wetland Vegetation Communities

The Maryland Department of the Environment defines a nontidal wetland as:

An area that is inundated or saturated by surface water or ground water at a frequency and duration sufficient to support, and that under normal circumstances does support, a prevalence of vegetation typically adapted for life in saturated soil conditions, commonly known as hydrophytic vegetation.

Nontidal wetlands can be classified into three broad categories of wetland types, based on the growth form of plants:

- (1) marshes, where mostly nonwoody plants such as grasses, sedges, rushes, and bullrushes grow
- (2) shrub wetlands, where low-growing, multi-stemmed woody plants such as swamp azalea, highbush blueberry and sweet pepperbush occur
- (3) forested wetlands, often called swamps or wooded wetlands, where trees are the dominant plants.

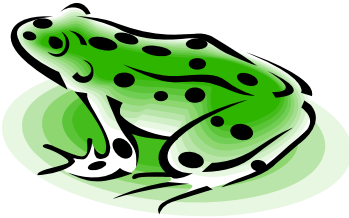
FORRESTED WETLANDS often resemble neighboring upland forest with their wetland status evident only from understory wetland plants such as skunk cabbage.

SCRUB-SHRUB WETLANDS are characterized by low woody vegetation and may include forested wetlands that have been harvested and are in the process of regeneration to forest. Two types of shrub swamps occur in western Maryland: Wet thickets and shrub bogs peat-dominated, with an abundance of peat mosses and haircap moss.

EMERGENT WETLANDS (Marshes) often form along the shallow edges of lakes and streams and are characterized by grasses, sedges, rushes and other herbs, such as cattail, growing with their lower stems in the water.

III. WETLAND FUNCTIONS AND VALUES

A given wetland, based on its physical and biological characteristics, can have many ecological functions. It can store water and carbon; it may act as a toxic chemical buffer; it may regulate water flow; and it definitely provides wildlife habitat (such as nesting and feeding sites for many species). Wetlands also provide significant benefits to human society such as clean drinking water, places to canoe, swim and watch wildlife, reduction of flood damage intensity, or harvests of plants and animals. Alteration of a wetland in any fashion may remove or interrupt the ability of that wetland to provide life support, social/cultural or production functions.



Until recently, wetlands were often viewed as wastelands, useful only when drained or filled. Now, the common wisdom has changed. We know that wetlands benefit people and the natural world in remarkable ways. These characteristics are commonly called “wetland functional values.” – Wetland Functional Values (Wisconsin Department of Natural Resources 1993)

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. 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 whom 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.

FISH and WILDLIFE HABITAT. Wetlands provide essential habitat for many wildlife species in Maryland. Many migratory birds – such as ducks, geese, and swans – depend on wetlands for food and protection. Wetlands serve as nursery areas for blue crabs, fish and shellfish. At least one-third of America’s threatened or endangered species live in wetland areas. Wetlands are among the most productive natural ecosystems in the world, with certain types of wetlands rivaling corn fields and others offering sustainable yields of timber. Nontidal wetlands also produce natural crops. The most valued commercial product is timber, an important industry on the Eastern Shore. Common species include Loblolly Pine, Oak and Red Maple. People also harvest crops of blueberries, cranberries and crayfish for individual consumption.

WATER QUALITY. Wetlands directly benefit people by improving water quality – trapping sediment and filtering nutrients and other pollutants such as waterborne chemicals, which improves and protects our water resources.

Wetland plants and soils have the capacity to store and filter pollutants ranging from pesticides to animal wastes. Calm wetland waters, with their flat surface and flow characteristics allow particles of toxins and nutrients to settle out of the water column. Plants take up certain nutrients from the water. Other substances can be stored or transformed to a less toxic state within wetlands. As a result, our lakes, rivers, and streams are cleaner and our drinking water is safer. Larger wetlands and those that contain dense vegetation are most effective in protecting water quality. If surrounding land uses contribute to soil runoff or introduce manure or other pollutants into a watershed, the value of this function may be especially high.-- Wetland Functional Values (Wisconsin DNR 1993)

EROSION and STORMWATER CONTROL. Wetlands buffer shorelines, protecting coastal and river environments from damage due to erosion. By intercepting and storing stormwater and slowly releasing it, wetlands decrease peak stormwater flows.

Trout streams and other high quality waterways often depend on shoreland wetlands to protect their characteristic clear waters. Without this wetland buffer, the shoreline becomes undercut and collapses. When this happens streams often become wider, shallower and turbid. Water temperatures rise and habitat quality deteriorates.

A wetland that reduces erosion can also reduce sedimentation to nearby waterways. If the waterway is a navigational channel, the reduction in sedimentation can help to reduce the frequency of maintenance dredging.-- Wetland Functional Values (Wisconsin DNR 1993).

AESTHETICS and OPEN SPACE. Wetlands are part of the natural heritage and natural beauty of Maryland supporting tourism. Wetlands offer opportunities for many activities that Marylanders enjoy such as fishing, hunting, wildlife watching, environmental education, hiking, canoeing, and photography. Some of Maryland's most beautiful views include a mist rising from, or a sun setting over, a wetland.

Wetlands provide exceptional educational and scientific research opportunities because of their unique combination of terrestrial and aquatic life and physical/chemical processes. Wetlands located within or near urban settings and those frequently visited by the public are especially valuable for the social and educational opportunities they offer. Open water, diverse vegetation, and lack of pollution also contribute to the value of specific wetlands for recreational and educational purposes and general quality of life.

