

Chesapeake Bay Preservation Act Handbook for the Eastern Shore of Virginia



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This Handbook was developed to provide a comprehensive understanding of the Chesapeake Bay Preservation Act for interested citizens, property owners, realtors and developers on the Eastern Shore of Virginia. The Handbook is divided into three sections: Background, Local Bay Act Programs, and Residential Best Management Practices.

The first section provides a general overview of the Chesapeake Bay Preservation Act and how it protects the water quality of the Bay. The second section focuses on how the Bay Act is implemented on the Eastern Shore of Virginia, including requirements for new development. Measures which can be done on the property site to protect Bay water quality are explained in the last section. Also included is an appendix of beneficial plant species for the Eastern Shore.

One of the objectives of the Bay Act is to protect the water quality of the Bay from potentially harmful impacts of new development. On the Eastern Shore, single-family houses make up the vast majority of all new construction. Accordingly, this Handbook focuses on residential properties, although water quality protection efforts that are put forth for residential land parcels are equally beneficial for small commercial building lots.

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for the

Eastern Shore of Virginia

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Background: The Chesapeake Bay Preservation Act

In 1988, Virginia's General Assembly enacted the Chesapeake Bay Preservation Act (Bay Act) to improve the water quality of the Chesapeake Bay and its tributary streams. The Bay Act created a cooperative program between the Commonwealth of Virginia and Tidewater local governments to protect and enhance water quality through environmentally responsible land use management. Each local government in Tidewater Virginia (generally those localities that are east of the Interstate 95) help to protect the water quality in the Chesapeake Bay through local land use requirements which seek to minimize the sources of pollution into the Bay. The Bay Act affects development activities in both Accomack and Northampton Counties, as well as 15 of the towns on the Eastern Shore.

The Chesapeake Bay is the largest and most productive estuary in the United States, supporting over 2,500 species of animals and plants. The Bay has played an important role in the history of the Eastern Shore by providing valuable economic, environmental and recreational resources. However, pollution has caused the Bay's water quality to decline over the last several decades. Rapidly increasing population growth and development in coastal regions could create even more water quality problems in the future.

The health of the Bay began to decline in the 1950s, when underwater grasses started to disappear, and fish and shellfish populations decreased. The deteriorating water quality of the Bay is caused by pollution, which can be divided into two categories: point source pollution and nonpoint source pollution. Point source pollution results from discharge at a specific point or pipe into surface water, and includes such sources as sewage treatment plants and industrial discharges.

During the past several decades, point source pollution into the Bay has been greatly reduced, due to federal laws such as the Clean Water Act, and modern technology. Underwater grasses in the Bay have started to make a comeback, and several species, such as the striped bass, have recovered enough to be commercially viable. However, nonpoint source pollution is a major problem facing the Bay. Oyster and blue crab catches have continued to shrink, and some shellfish populations have declined.

NONPOINT SOURCE POLLUTION

Nonpoint Source pollution is not attributable to a distinct, identifiable source, but enters water indirectly. An example of nonpoint source pollution is stormwater runoff from developed land. Runoff occurs when rain water runs over land, picks up pollutants, and deposits them into surface waters. Residential and commercial development contain impervious surfaces, such as roads, parking lots and building rooftops, which don't allow rain water to seep into the ground. Instead, water accumulates and runs off the land in large amounts.

Common pollutants found in nonpoint source pollution include excess nutrients from fertilizers; herbicides and pesticides from developed areas and farmland; motor oil, grease and toxic chemicals from paved areas; sediment from erosion and construction sites; and bacteria and nutrients from pet wastes, faulty septic systems and livestock. The most serious and widespread pollution problems facing the Chesapeake Bay are nutrients and sediments.

On the Eastern Shore, 75% of the nutrient pollutants (nitrogen and phosphorus) come from nonpoint sources, including runoff from developed areas and farms. These pollutants harm fish and wildlife, kill native vegetation and underwater grasses, foul ground water supplies and make recreational areas unsafe. A purpose of the Bay Act is to improve water quality by reducing nonpoint source pollution.

UNIQUE LAND FEATURES

The unique land features of the Eastern Shore are important to consider for determining effective ways of reducing nonpoint source pollution. Virginia's Eastern Shore is a low lying area with tidal creeks and wetlands deeply indenting the shoreline. The soils are generally highly permeable (sandy) and hydric (wet), with a high seasonal water table, which can result in a high risk of ground water contamination from septic system failure. Farmland and forests dominate the landscape, with many farms adjacent to tributary creeks that flow into the Bay. Over 750 miles of tidal shores line the Bayside of Virginia's Eastern Shore.

All of these physical characteristics denote sensitive environmental land features which must be managed wisely in order to protect the water quality of the Bay. Because of the abundance of rural waterfront land, there is a great demand for waterfront real estate development with the potential result of reduced water quality. As new development occurs, it should be done in an environmentally sensitive manner that does not degrade water quality.

THE IMPORTANCE OF VEGETATION

Nonpoint source pollution can be reduced by land use management practices which preserve the natural vegetation and minimize impervious surfaces. Under natural conditions, water running off the land soaks into the ground and is filtered by soils and vegetation root systems. Natural landscapes, such as forests and wetlands, trap rainwater and allow it to slowly filter into the ground. In addition, the plant roots absorb nutrients and prevent soil erosion.

Allowing the existing vegetation on a site to remain, particularly along waterways, helps to slow runoff, soak up pollutants, and protect the waterway from development. Multi-layered vegetated buffers, those with trees, shrubs and groundcover along waterways, are effective in reducing

pollution because the vegetative layers slow the speed of the water running off the land which allows the water to infiltrate into the ground and reduce the sediment from soil erosion and also enables nutrients in the ground water to be filtered through the roots of the plants. Buffers provide valuable wildlife habitats and help to control water temperature as well.

The Bay Act program enables local governments to protect water quality through local land use regulations that were created to minimize the impacts of development and redevelopment. The Chesapeake Bay Local Assistance Board and the Chesapeake Bay Local Assistance Department were both established by the Bay Act to assist localities in developing their own local Bay Act programs. Regulations have been developed by the Board for local governments to use as guidance for their local programs.

LOCAL BAY ACT PROGRAMS

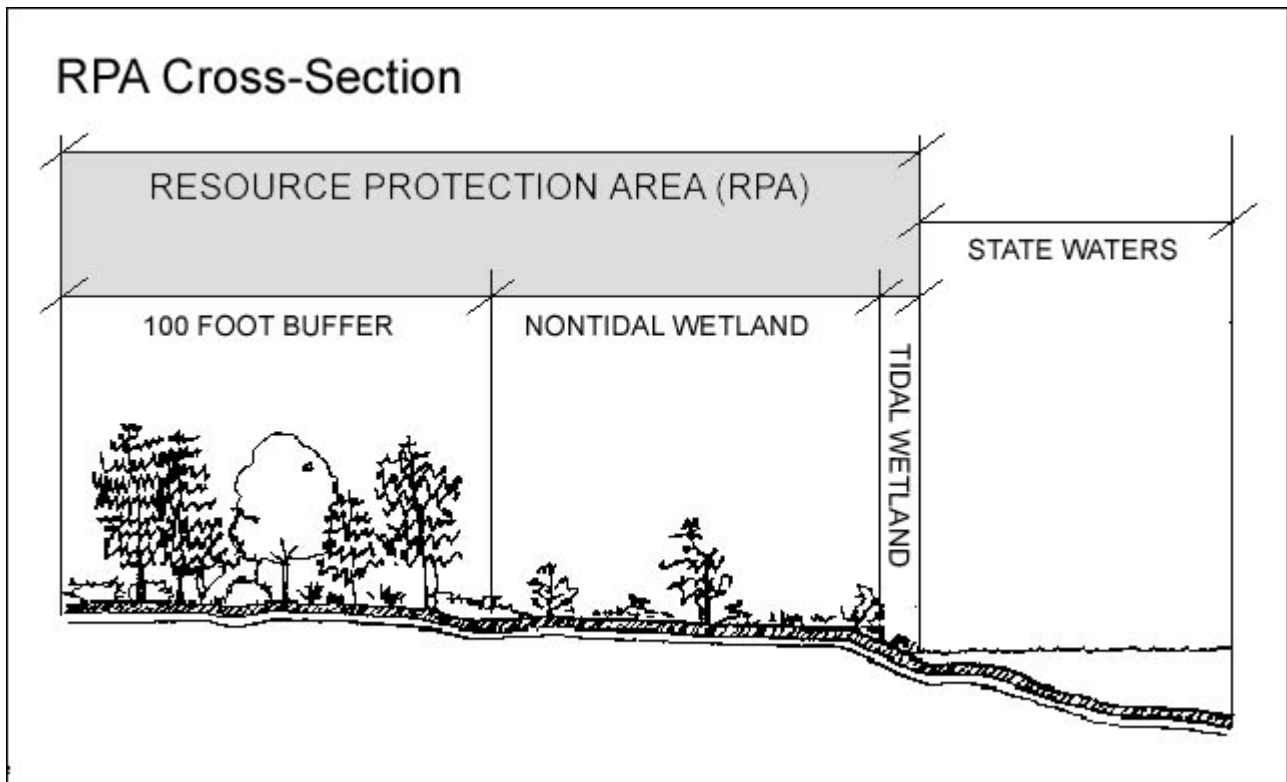
All localities on the Eastern Shore which are located within the Chesapeake Bay Watershed have their own local Bay Act Programs. Because land features and conditions are generally consistent throughout the Eastern Shore, the local Bay Act Programs of each locality are similar, and will be discussed as a whole. Eastern Shore localities with local Bay Act Programs include Accomack County, Northampton County, and the towns of Cape Charles, Cheriton, Eastville, Nassawadox, Exmore, Belle Haven, Painter, Melfa, Onley, Onancock, Parksley, Bloxom, Hallwood, Saxis and Tangier. The towns of Chincoteague, Keller, Wachapreague and Accomac are not included because they are not located within the Bay watershed; instead, they drain into the Atlantic Ocean. This Handbook was developed to address the Chesapeake Bay watershed portion of the Eastern Shore; however, water quality protection measures that apply to the Bay watershed are also beneficial for reducing nonpoint source pollution in the Atlantic Ocean watershed. Several Eastern Shore localities have included the Atlantic Ocean watershed as part of their local Bay Act programs. These localities include Northampton County, the Town of Cheriton, and the Town of Nassawadox.

CHESAPEAKE BAY PRESERVATION AREAS

All localities in the Bay Watershed have identified and mapped Chesapeake Bay Preservation Areas (CBPAs) as part of their local Bay Act programs. CBPAs are defined as lands that, if improperly developed, may result in substantial damage to the water quality of the Bay and its tributaries. The zoning maps of each locality show the general boundaries of the CBPAs. Whenever land inside a CBPA is developed or redeveloped, certain standards, or requirements, apply to the development in order to prevent a net increase in nonpoint source pollution. These standards are known as Bay Act performance criteria, and are specified in each locality's zoning ordinance. CBPAs consist of two categories: Resource Protection Areas and Resource Management Areas.

RESOURCE PROTECTION AREAS (RPA)

Resource Protection Areas (RPAs) are lands located at or near the shoreline which have important water quality value to the Bay, due to the ecological and biological processes they perform. RPAs include tidal shorelines, tidal wetlands, and non-tidal wetlands connected by surface flow to adjoining tidal wetlands or perennial streams. RPAs also include a 100-foot vegetated buffer area. The buffer area is the landward component of the RPA, and is measured inland from the edges of wetlands, shores or streams. The buffer area remains a minimum of 100 feet in width regardless of the presence of existing or permitted uses. The RPA serves as a minimum no disturbance area from the shoreline. RPAs filter pollutants from runoff before they enter the Bay or its tributary creeks.



RPAs are so close to the water that disturbing them could send large amounts of pollutants directly into the Bay. Because the land is so sensitive, development within RPAs is restricted to water-dependent uses, such as marinas and piers, or the redevelopment of already existing structures. Passive recreation facilities, such as trails and pathways, are also allowed in RPAs.

RESOURCE MANAGEMENT AREAS

Resource Management Areas (RMAs) consist of land types that, if improperly used or developed, have the potential for causing significant water quality degradation or for diminishing the functional value of RPAs. RMAs generally consist of the floodplain, isolated nontidal wetlands, and sensitive soils (highly permeable and highly following: all lands within the 100-year erodible soils). Growth and development are not limited in RMAs. Any development permitted by local zoning is allowed, but must be accomplished using Bay Act performance criteria. In Northampton County, the entire County is designated as an RMA (except for lands already in the RPA). In Accomack County, the RMA designation generally applies to all lands west of of the railroad.

INTENSELY DEVELOPED AREAS

Several localities have designated Intensely Developed Areas (IDAs) as part of their Chesapeake Bay Preservation Areas. IDAs are areas where heavily concentrated industrial or commercial development already exists, with little or no vegetation remaining. The IDA designation recognizes that there are areas where little of the natural environment is left because of past development, and provides localities with a tool to encourage redevelopment and infill activity. Five towns on the Eastern Shore have IDA designations, including Cape Charles, Onancock, Hallwood, Saxis and Tangier.

BEST MANAGEMENT PRACTICES

Best Management Practices (BMPs) are methods which reduce the increased stormwater runoff and nonpoint source pollutants caused by development. The use of BMPs to ensure that there is no increase in nonpoint source pollution from development is one of the Bay Act performance criteria. Generally, BMPs can be divided into two categories: structural and nonstructural.

Structural BMPs are manmade controls, such as infiltration trenches and stormwater ponds. Structural BMPs work by capturing stormwater in facilities and holding the runoff for a period of time before some water is released, or holding the water in a permanent pool of water to allow the filtering of pollutants (detention and retention facilities), or by filtering the stormwater through constructed filters of gravel, soil and other materials (infiltration trenches).

Nonstructural BMPs function by using vegetation to remove pollutants from runoff. Examples of nonstructural BMPs include vegetated buffers, and the preservation of existing vegetation on-site. The vegetation intercepts nutrients and soil particles as water travels through it. Nonstructural BMPs are extremely effective in reducing the amount of pollutants which reach waterways. BMPs which can be implemented by the landowner are discussed in more detail in the third section of this Handbook.

BUILDING IN THE CHESAPEAKE BAY PRESERVATION AREA

When any new development or redevelopment occurs in a CBPA, it is subject to the Bay Act performance criteria, which are specified in each locality's zoning ordinance. Zoning maps are used to determine the general boundaries of CBPAs; however, final determination of the boundaries often requires an on-site evaluation by the County Planning Department. Generally, there are two categories of development in CBPAs that are subject to the performance criteria: any development or redevelopment within the RPA, and development or redevelopment in

the RMA that exceeds 2,500 square feet of land disturbance.

BUILDING IN THE RPA

Land development in the RPA is allowed only when it is water-dependent or constitutes redevelopment. A water-dependent use as it applies to single-family residential would be a dock or pier, and the access path or walkway to this structure. Any other type of building or residence is not allowed within the RPA boundary. The exact, on-site location of the RPA boundary is determined by the property owner or their consultant but can be determined by the local Planning Department if requested. In most cases, the RPA includes a 100-foot vegetated buffer landward of the shoreline.

SHORELINE EROSION

Many new residents to the Eastern Shore do not realize the erosive power of the Chesapeake Bay. Hurricanes and nor'easters can take several feet of fastland in one storm event. Over time, the bank will erode, taking with it the environmental protection of the 100-foot buffer and the sense of safety from the Bay that the homeowner may have once felt. In some parts of the Eastern Shore, bluffs up to 30 feet high have eroded at a rate of two to three feet per year. This makes for a great view, but could mean that the "bay-view living room" could soon be in the water. It is important for residents to realize that their bank will erode and plan for this inevitability. New homebuilders should choose a home site that maximizes their margin of safety by moving their home back more than the mandated 100 feet. This is especially true in areas that have historically eroded at rates of more than two feet per year. Homeowners should also encourage the growth of marsh grasses, especially on tidal creeks. These grasses trap sand, build a protective beach, and repair themselves after a storm. For more information on controlling shoreline erosion, contact the local planning office or the Department of Conservation and Recreation's Shoreline Erosion Advisory Service at (757) 925-2467.

However, in the cases of pre-recorded lots (lots that were recorded prior to 1989) that are not large enough for the construction of a principle structure (house) and necessary utilities (septic tank, drainfield, water lines, etc.), the property owner may be able to build within the landward 50 feet of the buffer provided the following conditions are met:

- Encroachment into the buffer area shall be the minimum necessary to achieve a reasonable and appropriate buildable area for the structure.
- Where possible, an area equal to the area encroaching the buffer shall be established elsewhere on the lot to maximize water quality protection.
- Encroachment into the buffer shall never exceed 50 feet in width.

Prior to submitting an application to modify the buffer area, all options should have been exhausted so that the encroachment is the minimum necessary. For example, the proposed structure's footprint could be rotated so that the encroachment is decreased. Whenever development is proposed in an RPA, or the RPA is encroached upon, a *Water Quality Impact Assessment* is required.

WATER QUALITY IMPACT ASSESSMENT

A Water Quality Impact Assessment (WQIA) is required for any development or redevelopment proposed within an RPA, or for modification (clearing, grading, etc.) of any portion of the 100-foot RPA buffer. The WQIA is prepared by the applicant (property owner) or their agent and generally includes a site plan showing the RPA boundary, the location of all existing and proposed buildings, structures, driveways, and other impervious surfaces within the RPA.

The WQIA must also evaluate the water quality impacts of the proposed development as well as proposed mitigation for these impacts. Mitigation for water quality impacts can include both structural and non-structural BMPs which treat the stormwater runoff, but may also include enhanced landscape plantings, alternative design considerations, or alternative materials to reduce or compensate for water quality impacts.

DEVELOPMENT OVER 2500 SQUARE FEET

Development or redevelopment within an RMA that exceeds 2,500 square feet of land disturbance must comply with all applicable Bay Act performance criteria. The mechanism for local governments to review compliance with the performance criteria is the plan of development review process.

The plan of development is generally a site or plot plan that most often is required to show the parcel area and dimensions, location of all existing and proposed impervious surfaces such as driveways, buildings, accessory structures, porches, decks, etc., water features and wetlands, RPAs (if applicable), drainage patterns, existing vegetation including trees or stands of trees, and the limits of proposed clearing and grading. It is through the review of the plan of development that the three general performance criteria, limiting impervious cover and land disturbance and preserving existing vegetation, are reviewed by the local government. The general performance criteria are also discussed later as non-structural BMPs.

Property owners who are constructing new houses, additions to existing houses, accessory structures such as decks, garages and patios, etc. should check with the local government to see if a plan of development review is required. The plan of development is prepared by the applicant or their agent, and is submitted to the local Planning Department for review and approval. The Planning Department will consider site-specific factors from the site or plot plan to determine if the performance criteria are met and what

BMPs are needed for stormwater management to ensure that the development does not increase the amount of pollution running off the site.

It is important to contact the local Planning Department before removing vegetation from the building site. Local zoning regulations prohibit the removal of certain trees and vegetation within a CBPA. If a property owner or builder wants to cut down any trees on site, it is necessary that they notify the Planning Department so that staff can visit the site to determine which vegetation can be removed.

SEPTIC TANK PUMP-OUT

The Bay Act also requires that all septic systems within a CBPA be pumped out at least once every five years. This applies to all existing homes and businesses, as well as new development. In

addition, a reserve septic drainfield is required for all new development.

These measures protect ground water quality, and also protect the water quality of the Bay. Throughout the Eastern Shore, water moves quickly through the sandy soils, reaches the ground water table, and moves laterally into creeks and the Bay. The Eastern Shore's high water table and sandy soils result in a considerable amount of ground water inflow into surface waters. Consequently, ground water contamination from failing septic systems can threaten the water quality of the Bay.

The next section of the Handbook discusses different types of BMPs which landowners can use to reduce nonpoint source pollution on their property. Emphasis is placed on nonstructural BMPs which improve water quality through the use of vegetation.

Residential BMPs

As stated earlier, Best Management Practices (BMPs) are measures or controls which improve water quality by reducing stormwater runoff and nonpoint source pollutants. The Bay Act performance criteria require the use of BMPs for managing runoff from new development within a CBPA. This section of the Handbook focuses on BMPs which can be implemented by the residential property owner. These BMPs are also appropriate for small-scale commercial sites.

Generally, BMPs are either structural or nonstructural. Structural BMPs are man-made controls, such as infiltration trenches and stormwater retention basins, which trap and filter runoff. Nonstructural BMPs, also known as vegetative BMPs, use vegetation for filtering nonpoint source pollutants.

For residential and small commercial sites on the Eastern shore, vegetative BMPs are more economical and practical for managing stormwater runoff than structural BMPs, which can be expensive and require special engineering techniques. Also, the high water table and variety of unsuitable soil types limit the effectiveness of structural BMPs on the Eastern Shore.

BAY ACT PERFORMANCE CRITERIA

Minimize impervious cover

Minimizing impervious surfaces will reduce stormwater runoff and therefore, nonpoint source pollutants by increasing the infiltration of stormwater through the ground.

Minimize land disturbance

Erosion will be reduced by minimizing land disturbance

Preserve existing vegetation

Retaining the natural or existing vegetation onsite will prevent erosion, allow stormwater runoff to filter through the ground and will reduce the application of fertilizers, pesticides and supplemental watering.

No-net increase in stormwater pollutant loadings for new development; and 10% reduction in stormwater pollutant loadings for redevelopment

To ensure that runoff from development and redevelopment does not increase the amount of pollution reaching waterways

Evidence of all wetlands permits prior to any clearing or grading

For better coordination of wetlands permitting among different levels of government

Plan review for development that exceeds 2,500 square ft.

Ensures that all the Performance Criteria are implemented and to depict the onsite delineation of Resource Protection Areas.

Erosion and sediment control for land disturbances exceeding 2,500 square ft.

Reduces erosion by addressing the cumulative impact of many small land disturbances

Septic tank pump-out every five years

Pump-out will prevent septic failure and ensure effective treatment of wastes

Reserve septic tank drainfield for all new development

To ensure that in the event of septic failure, an alternate drainfield is readily available

Several different types of BMPs are discussed below which are appropriate for managing stormwater on residential sites. These BMPs are well suited for the conditions of the Eastern Shore, and are a cost-effective way to provide for the stormwater treatment required under the Bay Act.

PRESERVE EXISTING VEGETATION

Not removing the vegetation on a building site is the easiest and most economical way to protect the water quality of the Bay. Preserving the existing vegetation helps to control nonpoint source pollutants by reducing the amount of runoff entering nearby waterways.

It is important to preserve the vegetation on the building site before any construction or land disturbing activity occurs. Saving existing vegetation is much less expensive than reestablishing it once it has been removed. The vegetation will also help to prevent erosion and reduce sediment pollutants during the construction process. In addition, preserving the vegetation on a building site will reduce landscaping costs while preserving critical wildlife habitat. This is especially important for lands near the shoreline, which are designated as Resource Protection Areas.

PROTECTING TREES DURING CONSTRUCTION

Trees on a construction site are vulnerable to heavy equipment and toxic materials such as gas and oil. Machinery that runs over the root system even once can kill a tree through compaction, which collapses the soil and limits the supply of water and oxygen reaching the roots. Heavy soil spread on the root system can also kill a tree. The best way to protect trees is through fencing off the dripline around the tree that are to be saved. Any type of fencing material can be used to delineate the drip line, as long as all workers regard the fencing as a barrier to machinery, clearing, grading, and storage of materials.



When it is necessary to remove a tree, the best method is to cut the trunk flush to the ground, and then grind the stump. If a tree is pulled from the ground by the roots, erosion will occur, and the intertwined root systems of surrounding trees will be damaged.

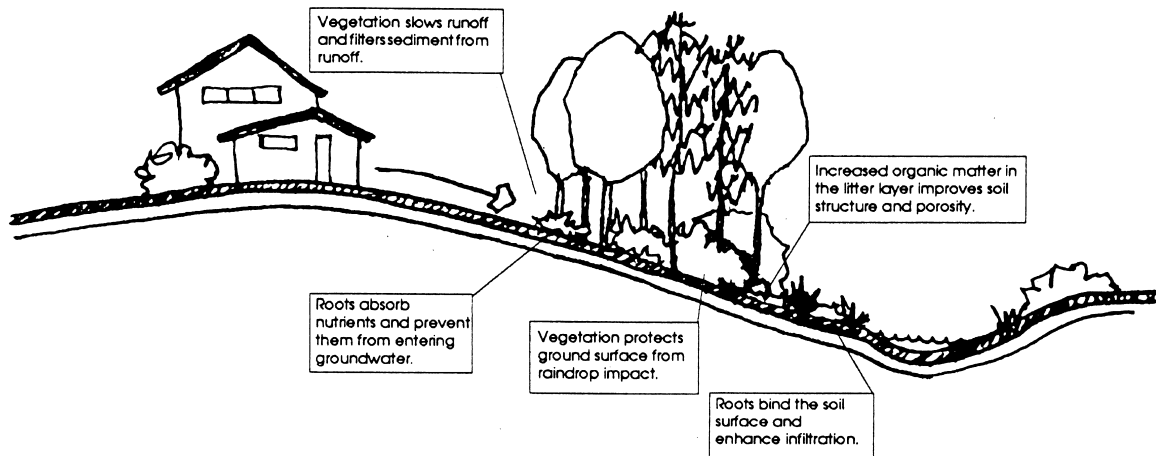
VEGETATED BUFFERS

Vegetated buffers are areas of undeveloped, vegetated land which act as natural filters for stormwater runoff pollutants. Resource Protection Areas (RPAs) include 100-foot vegetated buffers along Chesapeake Bay waterways and tributaries. The vegetated buffer will reduce the quantity of

the runoff, as well as slow its velocity before reaching the waterway. Controlling soil erosion and absorbing excess nutrients are other important functions of the buffer.

Forested buffers are the most effective type of vegetated buffers, because they provide the most efficient physical barriers for intercepting runoff. The organic leaf litter provides a porous layer that traps sediments and absorbs excess nutrients, which are taken in by tree roots. As a result, the runoff contains a less concentrated pollutant load by the time it reaches the waterway, and its rate of flow is reduced, resulting in less soil erosion.

Vegetation Benefits



In addition to filtering surface water, trees also filter the water table aquifer. The deep root systems of trees tap into the water table and absorb nutrients, thereby reducing the amount of nutrients discharging from ground water into surface water.

The vegetated buffer is the last safeguard for managing runoff before it enters the waterways, and its importance cannot be overstated. Planting vegetation in the buffer is not required unless the existing vegetation has been removed without permission from the local government. However, planting additional vegetation in all buffers will help to enhance the water quality protection function of the buffer.

PLANTING ADDITIONAL VEGETATION

The addition of trees, shrubs and groundcover after the site has been developed will offer beneficial stormwater management functions to the property. Landscaped areas of trees, shrubs and groundcover can result in 50% more reduction of runoff than grass lawns.

The best types of plants to use for buffers and landscaping are species which are native to this area, because they are well-suited to the climate and environment of the Eastern Shore. Native plants add biological diversity to the landscape, and have many advantages over non-native species, which often require more care and maintenance. Non-native plant species can also be invasive.

The Appendix of this Handbook contains a list of plants which grow well on the Eastern Shore, and are commercially available.

Included are plants which are beneficial for reducing runoff because they are erosion resistant, drought resistant and disease resistant. These low-input characteristics require less fertilizers and pesticides which can add to runoff pollution.

When creating a vegetated buffer on the property site, careful landscape design and selection of plant species are important for effective management of runoff. Three categories, or layers, of plants should be used when creating or enhancing a vegetative buffer:

(1) *Grasses and groundcovers*. This layer of vegetation is generally under 3' high and serves to intercept and filter the stormwater. The vegetation should be planted densely and be resistant to flooding. Grasses should be a deep-rooted variety to effectively respond to the high velocities of runoff.

(2) *Shrubs*. The second layer consists of shrubbery which provides protection beneath the tree canopy. Shrubby generally ranges in height from 3' to 20'. A mixture of evergreen and deciduous varieties, whose leaves fall off in the fall, is most effective. The shrubby root systems stabilize the soil as well as regulate temperature and moisture. Shrubs also help to create an organic layer of humus and leaf litter, known as "duff," which is important for managing runoff.

(3) *Trees*. The third layer of vegetation includes species of trees which will grow to a height of 20' or higher. The large root systems of the trees will reach the lower depths of the soil to absorb water and nutrients, and anchor the soil in place. Roots also aerate the soil for increased absorption of runoff.

These three layers of vegetation should be mixed together, rather than be planted in three distinct bands. Combining the three layers will replicate the biodiversity of a forest ecosystem, and will maximize the buffer's ability to reduce runoff.

Planting additional vegetation after the site has been developed will offer many benefits to the property site, in addition to improving water quality. For instance, appropriate landscaping and plant species can lower air temperature, provide shade, serve as windbreakers, attract beneficial wildlife and improve the value of the property.

VEGETATIVE FILTER STRIPS

Vegetative filter strips are not "natural," but are specifically designed and planted for removing pollutants from stormwater runoff. Filter strips can be planted with different types of natural vegetation, but are most commonly composed of grasses. Filter strips are not as effective as vegetated buffers at controlling the volume of runoff. However, they are beneficial when used in addition to vegetated buffers, and have good infiltration capabilities when used on lands with highly permeable soils. Filter strips perform best when they are planted with dense vegetation of erosion resistant plant species, with root systems that hold soils together. Taller grasses are more effective in controlling runoff; when grasses are cut, their filtering capability is greatly reduced.

GRASSED SWALES

Grassed swales are commonly used in residential neighborhoods instead of curb and gutter drainage systems. Swales are shallower and wider than drainage ditches, and are usually vegetated with grass. Grassed swales have a moderate capacity for filtering pollutants from runoff, and are most beneficial for areas of highly permeable soils, which allow infiltration. To increase the infiltration rates, slopes should not be greater than 5%. The effectiveness of the swale can be enhanced through the use of check dams, which are designed to temporarily pond the stormwater runoff, allowing water to sink into the ground over a longer time period. Reed canary grass is recommended for use in swales because it is water-tolerant and erosion resistant. Grassed swales are most effective when the grasses and other vegetation are not mowed, but are allowed to grow high. Native wildflowers are an attractive and effective type of vegetation for swales in residential areas. (Appropriate plant species are listed in the Appendix.)

ALTERNATIVE PAVEMENT SURFACES

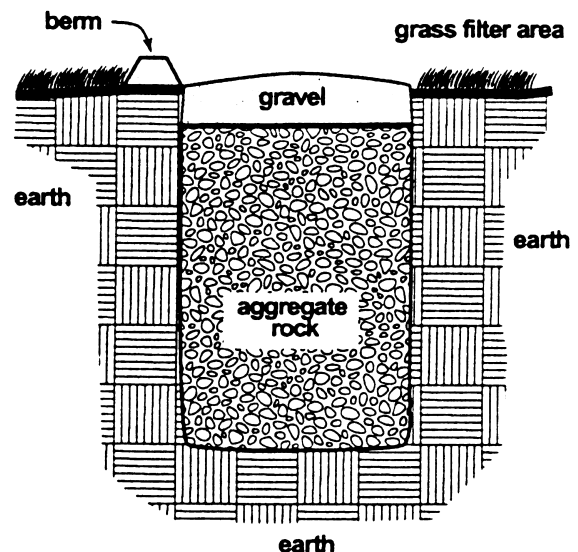
Minimizing impervious surfaces on residential sites will protect water quality by reducing surface runoff and nonpoint source pollutants. Driveways, sidewalks and parking areas which are made of concrete and asphalt are impenetrable and contribute to runoff.

By using alternative pavements which are permeable, stormwater can soak into the ground. A variety of permeable pavement materials are available which offer attractive and cost-effective alternatives to impervious paving.

Bricks, concrete lattice, gravel (not compacted), flagstone and concrete pavers can allow the infiltration of rainwater. These materials are usually laid over a layer of sand for added infiltration capabilities. The highly permeable soils which characterize the Eastern Shore are ideal for using alternative pavements.

FRENCH DRAINS/DRY WELLS

French drains, also known as dry wells, are sometimes required for buildings which encroach the 100-foot buffer of the RPA. A french drain is a type of infiltration trench which captures the runoff from the building's rooftop, filtering pollutants and reducing the amount of runoff entering surface water. The drain consists of an excavated pit with a depth of approximately three feet, lined with filter fabric and filled with gravel or stone. Runoff from the rooftop is directed into the french drain by means of a gutter or roof leader which extends to an inflow pipe in the drain. The highly permeable soils of the Eastern Shore add to the effectiveness of french drains at controlling surface runoff from building rooftops.



BENEFICIAL PLANT SPECIES FOR THE EASTERN SHORE OF VIRGINIA

W = value to wildlife

TREES - SMALL

Hackberry	30-40 ft	round, rapid grower, corky knobs on bark,	W
Redbud	40 ft.	very attractive flower clusters before April, tolerates light shade	
Sweetbay Magnolia	12-20 ft	large white flowers, red fruit in fall, prefers sandy wet loams	
Fringetree	30 ft	slow growing, fragrant June flower, tolerates light shade,	W
Flowering Dogwood	30 ft	May flowers, small red fruits, well-drained, acid soil	W
Paw Paw	20 ft	prefers partial shade, moderate moisture,	W
Sassafras	40 ft	yellow clusters in April, blue berries in Aug, drought tolerant	W

TREES - MEDIUM TO LARGE

Persimmon	50-75 ft.	edible golden fruit in Sept, drought tolerant,	W
American Holly	45 ft,	evergreen, red berry, needs moist, acid soil,	W
Loblolly Pine	20-60 ft	tolerates sandy soils, salt spray,	W
Eastern Red Cedar	80 ft	pyramidal, thick branches, dense foliage, tolerates poor soils	
Red Maple	75 ft	fast growing, early red blossom, prefers wet but tolerates dry soil	
Honey Locust	80 ft	very attractive, fast growing, fine foliage, tolerates any soil type	
White Oak	60-90 ft	round-headed, largest of oaks, tolerates range of soils,	W
Black Oak	70-80 ft,	globular, prefers moist, well-drained soils, drought tolerant	W
Pin Oak	50-75 ft	prefers wet, silty clay, loamy soils, tolerates poor drainage,	W
Willow Oak	50 ft,	fast growing, fine textured foliage, tolerates wet or dry soil	
Sourwood	40-60 ft	flower tassels in July, glossy foliage, striking fall color	

SHRUBS

Inkberry	3-15 ft,	globular, black berry, tolerates sandy, peaty, acid soil	
Creeping Juniper	2 ft,	many cultivars, foliage change of color, tolerates any type soil	
Bayberry	4-8 ft,	persistent leaves, aromatic, tolerates dry, sandy soils,	W
Wax Myrtle	25-30 ft	persistent leaves, grayish-waxy fruit, inconspicuous flowers,	W
Red Chokeberry	9 ft	flowers May-June, tolerates wet acid or dry soil,	W
Black Chokeberry	3-6 ft	oval, black berries, tolerates wet acid or dry soil,	W
Sweet Pepperbush	6 ft	fragrant flowers July-Aug., tolerates acid wet or dry soil,	W
Gray Dogwood	8-15 ft	clustered flower June-July, white berry, tolerates any soil type,	W
Arrowwood	6-12 ft	white flowers in May, tolerates range of soils and shade,	W
Winterberry	4-9 ft	flowers in May, red berries, tolerates any soil and some shade,	W
Highbush Blueberry	3-10'	edible blue berries, brilliant fall color, tolerates poor soil,	W
Swamp Azalea	9-15 ft	needs moist, acid soil, tolerates light sun	
Elderberry	6-12 ft	flowers June-July, needs deep, well drained soil and sun,	W
Black-Haw	10-25 ft	attractive flower clusters, blue fruit, tolerates range of soils,	W
Witch Haze	4-10 ft	partial sun, tolerates shade, drought tolerant	

HARDY GROUND COVERS

Common Bearberry	3-6 ft	creeping habit, needs sun, tolerates dry soil and drought
Bird-Foot Violet	2-6 ft	purple flowers, tolerates some shade, dry soil and drought
English Ivy	6 inches,	evergreen, tolerates sun or shade
Pachysandra	8 inches,	evergreen, prefers shade
Periwinkle	6 inches,	evergreen, blue flowers, tolerates sun or shade
Violet Wood Sorrel	4-8 ft	tolerates some shade, drought
Sand Myrtle	3 ft	evergreen, white flowers, prefers sun and boggy, acid soils

ORNAMENTAL GRASSES

Wild Rice	3 ft	avored by migratory waterfowl during migration, tol. wet soils
Switch Grass	5 ft	dried flowers, screen, needs sun, tolerates dry soil and drought
Ribbon Grass	2 ft	groundcover, needs sun, tol. wet soil, not drought-tolerant
Cord Grass	4-6 ft	dried flowers, sand binder, needs sun, not drought-tolerant

FLOWERING PERENNIALS

Butterfly Weed	3 ft	attracts butterflies, orange flower, needs sun, tolerates drought
Threadleaf Coreopsis	2 ft	yellow star-shaped flower, needs sun, tol. dry soil and drought
Wild Sweet William	2 ft	crowded flowers, color all summer, needs sun, tolerates drought
Black-eyed Susan	3 ft	yellow flower, needs sun, tolerates dry soil and drought
Wild Bergamot	3 ft	purple flowers, prefers dry soils
Cardinal Flower	5 ft	bright scarlet flowers, prefers moist soil, partial shade
Wild Columbine	2 ft	prefers loamy soil, partial shade
Joe Pye Weed	3-5 ft	tolerates partial shade, prefers full sun
Marsh Mallow	2-4 ft	pink/white flowers late summer, prefers moist soil, marsh, sun
Queen Anne's Lace	2-3 ft	delicate texture, white bloom, tolerates dry soil and drought
Beach Pea	2 ft	perennial vine, lavender flowers, drought resistant, tol. wind and salt

FOR MORE INFORMATION

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Virginia Native Plant Society, (757) 481-2285
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