HARFORD COUNTY BILL NO. 22-012

Brief Title (Adoption-Chesapeake Bay Critical Area Program)

is herewith submitted to the County Council of Harford County for enrollment as being the text as finally passed.

CERTIFIED TRUE AND CORRECT

Council Administrator Date

ENROLLED Council President Date

BY THE COUNCIL

Read the third time.

Passed: LSD 22-020

Failed of Passage: _____

By Order NAU Council Administrator

Sealed with the County Seal and presented to the County Executive for approval this 22^{nd} day of June, 2022 at 3:00 p.m.



Council Administrator

BY THE EXECUTIVE COUNTY EXECUTIVE APPROVED: Date

BY THE COUNCIL

This Bill No. 22-012 having been approved by the Executive and returned to the Council, becomes law on June 23,2022.

EFFECTIVE: August 22,2022

COUNTY COUNCIL

OF

HARFORD COUNTY, MARYLAND

BILL NO. 22-012

Introduced by	Council President Vincenti at the request of the County Executive
· · · · · · · · · · · · · · · · · · ·	

Legislative Day No. <u>22-014</u>

_____ Date <u>May 3, 2022</u>

AN ACT to repeal and reenact, with amendments, Subsection A(1), Chesapeake Bay Critical Area Management Program, of Section 169-1, Adoption; legal status, of Chapter 169, Master Plan, of the Harford County Code, as amended; to adopt the Chesapeake Bay Critical Area Program, including the Zoning Code regulations, critical area maps and critical area manual, as part of the Official Harford County Master Plan.

by the Council, May 5, 202

Introduced, read first time, ordered posted and public hearing scheduled

on	: <u>June 7, 2022</u>	
at:	<u>7:00 PM</u>	
By Order:	Mylin A. Dixon, Council	Administrator

PUBLIC HEARING

Having been posted and notice of time and place of hearing and title of Bill having been published according to the Charter, a public hearing was held on June 7, 2022, and concluded on June 7, 2022.

Mylia 1. Dixon **Council Administrator**

EXPLANATION: CAPITALS INDICATE MATTER ADDED TO EXISTING LAW. [Brackets] indicate matter deleted from existing law. <u>Underlining</u> indicates language added to Bill by amendment. Language lined through indicates matter stricken out of Bill by amendment.

BILL NO. 22-012

1	Section 1. Be It Enacted By The County Council of Harford County, Maryland that Subsection	
2	A(1), Chesapeake Bay Critical Area Management Program, of Section 169-1, Adoption; legal status,	
3	of Chapter 169, Master Plan, of the Harford County Code, as amended, be, and it is hereby, repealed	
4	and reenacted, with amendments, all to read as follows:	
5	Chapter 169. Master Plan	
6 § 169-1. Adoption; legal status.		
7	A. 2016 Master Plan, Harford NEXT. The 2016 Master Plan, HarfordNEXT, as adopted by	
8	County Council Bill 16-016, is hereby declared to be the Official County Master Plan. The	
9	2016 Land Use Element Plan, the 2016 Transportation Plan, the 2016 Natural Resources	
10	Element Plan, and the 2016 Historic Preservation Element Plan are hereby incorporated into	
11	the 2016 Master Plan, HarfordNEXT and are hereby declared to be part of the Official Harford	
12	County Master Plan.	
13	(1) Chesapeake Bay Critical Area [Management] Program. [The attached Chesapeake	
14	Bay Critical Area Management Program, as enacted by Bill 01-36, along with all maps	
15	and appendices, including the amended land use management area maps as enacted by	
16	Bill 01-36, is incorporated herein by reference as part of this chapter as though it were	
17	fully stated herein, and the Chesapeake Bay Critical Area Management Program is	
18	hereby declared to be part of the Official Harford County Master Plan.] THE	
19	CHESAPEAKE BAY CRITICAL AREA PROGRAM, WHICH INCLUDES	
20	ZONING CODE REGULATIONS, ALL MAPS AND THE HARFORD COUNTY	
21	CHESAPEAKE BAY CRITICAL AREA PROGRAM MANUAL AND	
22	APPENDICES, IS INCORPORATED HEREIN BY REFERENCE AS PART OF	
23	THIS CHAPTER AS THOUGH IT WERE FULLY STATED HEREIN, AND THE	
24	CHESAPEAKE BAY CRITICAL AREA PROGRAM IS HEREBY DECLARED TO	

10

BILL NO. 22-012

1

BILL NO. 22-012

1 BE PART OF THE OFFICIAL HARFORD COUNTY MASTER PLAN.

- 2 Section 2. And Be It Further Enacted that this Act shall take effect 60 calendar days from the date
- 3 it becomes law.

EFFECTIVE: August 22, 2022

The Council Administrator does hereby certify that seven (7) copies of this Bill are immediately available for distribution to the public and the press.

Mylin A. Dixon

Council Administrator



SOURCE: HARFORD COUNTY DEPARTMENT OF PLANNING AND ZONING, 2022



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SOURCE: HARFORD COUNTY DEPARTMENT OF PLANNING AND ZONING, 2022



HARFORD COUNTY CHESAPEAKE BAY CRITICAL AREA PROGRAM MANUAL



Wetlands near US 40

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Chapter 1



INTRODUCTION TO HARFORD COUNTY'S CHESAPEAKE BAY CRITICAL AREA PROGRAM

Harford County's Critical Area Program was developed in response to the Chesapeake Bay Initiatives enacted by the State of Maryland. In particular, the Chesapeake Bay Critical Area Act of 1984, as amended, and the Chesapeake Bay Critical Area Program Development Criteria approved by the General Assembly in 1986 guided the development of the Critical Area Program. The Chesapeake Bay Critical Area Act was adopted in recognition of the many findings of the Chesapeake Bay Initiative.

Among these findings were that the Chesapeake Bay and its tributaries are natural resources of great significance to the State and the nation. The shoreline and adjacent lands constitute a valuable, fragile, and sensitive part of this estuarine system, where human activity can have a particularly immediate and adverse impact on water quality and natural habitats. The capacity of the shoreline and adjacent lands to withstand the continuing demands upon them, without further degradation to water quality and natural habitats, is limited.

National studies have documented that the quality and productivity of the Chesapeake Bay waters and tributaries have declined due to the cumulative effects of human activities that increase levels of pollutants, nutrients, and toxins in the Bay System.

Protective land uses such as forest and agriculture in the Bay region have declined. Those portions of the Chesapeake Bay and its tributaries within Maryland are particularly stressed by the continuing population growth and development activity concentrated in the Baltimore-Washington metropolitan corridor. The quality of life for the citizens of Maryland is enhanced through the restoration of the quality and productivity of the waters of the Chesapeake Bay and its tributaries.

Restoration of the Chesapeake Bay and its tributaries is dependent, in part, on minimizing further adverse impacts to the water quality and natural habitats of the shoreline and adjacent lands. The cumulative impact of current development is detrimental to these purposes. There is a critical and substantial State interest for the benefit of current and future generations in fostering more sensitive development activity in a consistent and uniform manner along shoreline areas of the Chesapeake Bay and its tributaries so as to minimize damage to water quality and natural habitats.

To address these findings, the Act required local governments to develop detailed management programs for those areas within 1,000 feet of tidal waters and tidal wetlands and any additional areas that the local jurisdiction deemed important to carry out the purposes of the Act.

GOALS AND OBJECTIVES

The goals and objectives of Harford County's Local Critical Area Management Program are:

- To minimize adverse impacts on water quality that result from pollutants being discharged from structures, or that have runoff from surrounding lands;
- > To conserve fish, wildlife and plant habitat; and
- ➤ To establish land use policies for development in the County's Chesapeake Bay Critical Area that accommodate growth, but acknowledge the fact that even if direct pollution of the Bay is controlled, the number and activity of persons in the Critical Area can still create adverse environmental impacts.

It should also be noted that Harford County's Critical Area Program was built upon the steps already taken by the County to protect its natural resources through such measures as its Natural Resources District, whose objectives are similar to those of the Chesapeake Bay Critical Area Act. The County's Critical Area Program has become the Master Plan element for the portion of the County it covers, and as such supports the visions of the Maryland Economic Growth, Resource Protection, and Planning Act of 2009, and the updated visions promulgated by the State in 2009.

Since the County's Critical Area is relatively small in proportion to the County as a whole, Harford County's Critical Area Program will also identify aspects of the Critical Area Program that are appropriate to adopt county-wide to protect the quality of the County's waters and natural resources. Particular attention will be focused on ways that the County's sediment control and stormwater management programs can be more effective since runoff from development activities outside of the Critical Area can have a major impact on the County's tidal waters and natural resources.

In addition, the area to be included in Harford County's Critical Area Program is dominated by the Aberdeen Proving Ground, which is not subject to local control. However, when the Critical Area Program was established, the Proving Ground developed an Addendum to the County's Critical Area Management Program describing how their activities will be carried out in a manner that is consistent with the Criteria to the maximum extent possible.

SUMMARY OF HARFORD COUNTY'S CRITICAL AREA PROGRAM

The focus of the County's Critical Area Program is the regulation of development activities to achieve the objectives of the Program. As described in detail in Chapter 2, the County's Critical Area is divided into three types of management areas in which different types and intensities of uses are permitted: Intensely Developed Areas (IDA), Limited Development Areas (LDA), and Resource Conservation Areas (RCA).

The Criteria also specify management actions that are to be taken with respect to the following types of activities: water dependent facilities, shore erosion protection, forestry, agriculture, surface mining, and natural park activities. The County's approach to the management of such activities within the Critical Area is discussed in Chapters 3 - 8, respectively.

In addition, the Criteria requires the protection of the following types of Habitat Protection Areas (HPAs), no matter where they occur in the Critical Area:

- A 100-foot Buffer adjacent to tidal waters, tidal wetlands, and tributary streams;
- Habitats of State-designated threatened or endangered species or species in need of conservation;
- Natural heritage areas;
- Colonial water bird nesting sites;
- Riparian forests and other forested areas utilized as breeding habitat by Forest Interior Dwelling Species;
- Historic waterfowl staging and concentration areas in tidal waters, tributary streams, or tidal and nontidal wetlands;
- Plant and wildlife habitats determined to be of local significance because they contain certain species uncommon or of limited occurrence in the jurisdiction or because species are found in unusually high concentrations;
- Anadromous fish propagation waters;
- Wetlands or other identified aquatic habitats; and
- Other areas that may, in the future, be identified by State and Federal agencies as important plant and wildlife habitat areas.

Harford County also protects nontidal wetlands in the Critical Area consistent with guidelines established in its Zoning Code. Section 267-63.7 discusses the measures used to ensure the protection of such areas. Harford County also recognizes nontidal wetlands as a significant environmental feature outside of the Critical Area. In addition to the State requirements, nontidal wetlands are protected through the County's Natural Resource District (NRD), observed in Section 267-62 of the Zoning Code.

Within each chapter of this document, you will find:

- I. A summary of the requirements of the Critical Area Criteria;
- II. An identification and analysis of significant issues and factors;
- III. A discussion of existing federal, State and local regulations and programs, utilized in their initially adopted or modified form in implementing the Critical Area Program; and
- IV. A discussion of modifications that were made to local regulations and programs to address Criteria requirements, including improvement of intergovernmental coordination.

A significant part of Harford County's Critical Area Program is the inventorying and mapping of the pertinent features of the County's Critical Area. Several series of the County's tax maps were developed to depict this information:

- Land Use Management delineating the location of the Critical Area boundary and the three types of Land Use Management Areas, IDA, LDA and RCA;
- Buffer Elements depicting the 100-foot minimum Critical Area Buffer, Modified Buffer Areas, soils and slopes (15% or greater) with developmental constraints and nontidal wetlands;
- Forest and Bird Resources showing wooded areas, forest interior dwelling bird species and riparian habitat, colonial waterbird nesting sites, and migratory waterfowl concentration areas;
- ➢ Habitats of Local Significance which include habitat protection areas of threatened and endangered species habitats; and
- Land Use/Land Cover in the Critical Area.

As part of the original Harford County Chesapeake Bay Critical Area Program adoption process in 1988, a substantial amount of public review was undertaken in order to ensure adequate opportunity for comment by pertinent State and local agencies, interested organizations, and the general public. The public review process for the 2022 update of the Program is presented in Appendix A.

As part of the Comprehensive Review described below, the Critical Area Maps are digitally updated on the County's Geographic Information System (GIS). The remapping process is described in more detail in Chapter 2. The current Harford County Critical Area Map is presented in Figure 1.

PROGRAM IMPLEMENTATION

Due to the comprehensive nature of the Critical Area Program requirements, many government agencies are involved in the implementation of the County's Critical Area Program. All of these agencies play a role in reviewing projects developed in the County's Critical Area. The Department of Planning and Zoning is charged with the lead role of coordinating project review and insuring conformance with the requirements of the local Program. These include:

- County Department of Planning and Zoning
- County Department of Public Works
- County Department of Parks and Recreation
- County Department of Inspections, Licenses and Permits
- Harford Soil Conservation District
- State Project Forester and County Forestry Board
- County Department of Health
- State Department of Natural Resources
- State Department of the Environment

FIGURE 1



The County's Critical Area Program was fully implemented upon approval by the State Critical Area Commission and subsequent County Council action. Originally approved in June 1988, the Program includes adoption of the local Management Program and required changes to the Zoning Code and Subdivision Regulations. The County's Master Water and Sewer Plan was also revised in a manner consistent with the Local Critical Area Program.

A comprehensive update of the Critical Area Program is required to be undertaken every 6 years per COMAR 8-1809(g). This comprehensive update must contain an updated resource inventory, an accounting of the growth allocation acreage, and any necessary amendments to the program or adopted maps for better consistency with the State criteria and regulations and to more effectively protect natural resources within the Critical Area. The County completed comprehensive updates in 1996, 2002, 2011, and 2022.

In the Spring of 2021, the State's Critical Area Program received an addendum with the passage of House Bill 1253 amending the provisions of Subsection 8-1808 of the Natural Resource Article of the Annotated Code of Maryland. Changes to the regulations were made in effort to address the State goal to achieve 50% renewable energy power by 2030. Because the County Council approved changes to the Zoning Code that restrict solar energy systems within the Critical Area, the State changes were not incorporated into the 2022 update of the Harford County Critical Area Program.



Much of the the Anita C. Leight Estuary Center is in the Resource Conservation Area of the Chesapeake Bay Critical Area.



Chapter 2

DEVELOPMENT IN THE CRITICAL AREA

I. REQUIREMENTS OF THE CRITICAL AREA CRITERIA

One of the principal objectives required of a local jurisdiction's Chesapeake Bay Critical Area Program is the minimization of both direct and secondary impacts of development activities on water quality and fish, wildlife, and plant habitats. Development activities are defined by the Criteria as "human activity that results in disturbance to land, natural vegetation, or a structure." Local jurisdictions are to achieve this objective by dividing their Critical Area into one of three designated land use management areas (IDA, LDA, or RCA) based upon land uses as of December 1, 1985.

The Criteria also require that local jurisdictions establish special provisions regarding the location of water dependent facilities (those facilities that require a location at or near the shore; i.e., within the minimum 100-foot Critical Area Buffer that is otherwise to be maintained in a natural condition). Harford County's approach to water dependent facilities is discussed in the next chapter.

DEFINITION OF THE LAND USE MANAGEMENT AREAS

The Criteria defines the three types of Land Use Management Areas within a local jurisdiction's Critical Area as follows:

Intensely Developed Area (IDA) is an area of at least 20 acres or the entire upland portion of the Critical Area within a municipal corporation, whichever is less, where residential, commercial, institutional, or industrial developed land uses predominate, and a relatively small amount of natural plant and wildlife habitat occurs. Additionally, the area has at least one of the following characteristics:

- A housing density of at least four (4) dwelling units per acre; or
- Is served by public water and sewer systems with a housing density of more than three (3) dwelling units per acre.

Limited Development Area (LDA) is an area with low or moderate intensity development that contain areas of natural plant and wildlife habitat, where the quality of runoff from such areas has not been substantially altered or degraded. Additionally, the area has the following characteristics:

A housing density ranging between one (1) dwelling unit per five (5) acres up to four (4) dwelling units per acre;

- ▶ Is served by a public water or sewer system;
- Is not dominated by agricultural land, wetlands, wooded area, barren land, surface water, or open space; or
- ▶ Is less than 20 acres and otherwise qualifies as an IDA.

Resource Conservation Area (RCA) is an area dominated by natural environments such as wetlands, surface water, forests, and open space. Additionally, the area may have at least one of the following characteristics:

- \blacktriangleright A housing density of no more than one (1) dwelling unit per five (5) acres; or
- Resource–based activities such as agriculture, forestry, fisheries, or aquaculture.

DEVELOPMENT RESTRICTIONS

The location of new or expanded solid or hazardous waste collection or disposal facilities, as well as sanitary landfills, are prohibited anywhere in the Critical Area unless no alternative outside of the Critical Area exists and the facility is needed to correct an existing water quality or wastewater management problem.

Replace any vegetation removed at a rate of 1:1, to include trees and large shrubs, or as amended in the County Ordinance, 2022.

Within each type of management area, the Criteria specify certain requirements that local jurisdictions are to place on activities occurring in that area.

Within IDA, a local jurisdiction is to:

- Develop a strategy for reducing the impacts that existing development has on water quality through public education programs, urban Best Management Practices (BMPs), urban forestry programs, etc;
- ➤ In the case of new development or redevelopment, pollution loadings are to be reduced by at least 10% from pre-development loadings through the use of stormwater management BMPs or offsets (measures to improve water quality undertaken off site);
- To the extent practicable, require future development to use "cluster" development as a means of reducing impervious areas and to maximize the amount of natural vegetation retained;
- > If practical, establish permeable areas in vegetation;
- Maintain existing public access areas and encourage the establishment of new public access to the shoreline, no more than three (3) feet wide, or six (6) feet wide for ADA accessibility;
- Locate ports and industries using water transportation near existing port facilities or in areas

identified as future port facility sites in accordance with the provisions of the Criteria; and

Maintain and enhance biological resources (particularly wooded areas) where possible for their positive effects on water quality and plant and wildlife habitat.

Within LDA, a local jurisdiction is to:

- Maintain and, if possible, improve the quality of runoff and groundwater entering the Chesapeake Bay and its tributaries through the implementation of effective sediment control, stormwater management measures, and the retention of natural areas;
- Limit the intensity of development to ensure that the prevailing character of an area as identified by the existing density and land use is maintained;
- Establish procedures to retain at least 80% of forest cover on sites proposed for development and maintain wildlife corridors to adjacent areas;
- Establish at least 15% of an unforested development site with afforestation;
- Prohibit development on slopes greater than 15%;
- Limit lot coverage to 15% of a site, except as provided for in Section 267-63.5 of the Harford County Zoning Code;
- Discourage development on soils with development constraints (highly erodible soils, soils with severe septic constraints, etc.) and only allow development on such soils if mitigation measures are applied to adequately address the identified constraints and to avoid significant adverse impacts on water quality or fish, plant or wildlife habitat; and
- Promote the use of cluster development to minimize the extent of lot coverage and maximize the retention of natural vegetation.

Within RCA, local jurisdictions are to:

- Limit development to a density of one (1) dwelling unit per 20 acres. However, the owner of an undeveloped parcel is allowed to build one (1) residential structure regardless of the density requirement, provided that the other provisions of the Criteria have been satisfied. Additionally, 5% of the amount of land designated as RCA in 1985 can be developed more intensely through growth allocation.
- > Promote the continuation of agriculture, forestry, and preserve natural habitats;
- Ensure that land use management practices are consistent with the Criteria pertaining to Habitat Protection Areas, agriculture, and forestry;
- > Prohibit any new industrial, institutional, and commercial uses; and
- > Promote agricultural land conservation easements to retain the existing character of the area.

II. SIGNIFICANT ISSUES AND FACTORS

The following items are major issues and factors regarding development activities in the Critical Area that were addressed by Harford County during the development of the Critical Area Program:

- ➤ The mapping of the three land use management areas and the identification of additional "expansion" areas that need to be included in Harford County's Critical Area in order to address the objectives of the Criteria;
- Improvement of the effectiveness of the County's existing sediment control and stormwater management programs by:
 - 1. The establishment of an approach for reducing pollutant loadings from development or redevelopment in IDA by at least 10% from pre-development conditions;
 - 2. The development of an urban stormwater retrofitting strategy for reducing the impacts on water quality from existing development; and
 - 3. The identification of modifications to sediment control and stormwater management practices and procedures needed to ensure the impacts of new development on water quality and fish, plant and wildlife habitat in the Critical Area are minimized.
- The identification of areas with steep slopes or areas containing soils with development constraints in which development must be restricted;
- The establishment of procedures for the conservation of wooded areas, particularly for the afforestation/reforestation of areas to replace wooded areas cleared for development in the LDA, RCA, and IDA (after 2008);
- The establishment of procedures for allocating new growth in LDA and RCA at densities greater than the Criteria would otherwise allow (an amount equal to 5% of the County's total RCA acreage is allowed: 2.5% in LDA and 2.5% in RCA, with a reservation of 20 acres to be utilized by Harford County); and
- The establishment of procedures relating to grandfathered projects, non-conforming uses, and other projects requiring special procedures because of site-specific or project-specific characteristics.

The approach that Harford County has taken to address each of these issues is discussed below.

MAPPING HARFORD COUNTY'S CRITICAL AREA

DATA COLLECTION AND ANALYSIS FOR DESIGNATION OF LAND USE MANAGEMENT AREAS

In the original mapping of the Critical Area, Harford County used 1980 aerial photograph prints at a 1 inch = 600 feet scale as the basic source of information for the delineation of the three types of land use management areas. These prints were large enough in scale and of sufficient clarity to allow an accurate representation of land use in the County's coastal areas. To identify any changes in land use that might have occurred since 1980, a videotape of the Critical Area was made in early 1986 using a helicopter and a video camera. This information was then used to create the County's tax maps designating the pertinent areas. The maps have been subsequently checked for consistency with 1986 aerial photos that were obtained subsequent to the initial mapping effort.

In order to accurately delineate tidal wetland boundaries and the Critical Area's 1,000-foot boundary, the Department of Natural Resources' wetlands maps showing the preliminary boundary determination at a scale of 1 inch = 200 feet were photographically reduced to 1 inch = 600 feet and the information was transferred to the tax map.

Harford County remapped its Critical Area in 1994-1995 in a digital format using the County's Geographic Information System (GIS). Harford County obtained copies of the State Wetland Maps from the Department of Natural Resources (DNR). These maps are aerial photographs at an approximate scale of 1 inch = 200 feet that show the authoritative boundary of the extent of tidal influence. The extent of tidal waters and tidal wetlands was copied from the State Wetland Maps onto mylar base maps generated by GIS for the County's Critical Area. These interpretations were verified by DNR, and were then digitized into the GIS. The digitized shoreline was then used to recalculate the 1000-foot Critical Area boundary using a program in the GIS. Expansion areas and boundaries between Land Use Management Areas were digitized from the original Program maps and were corrected according to descriptive text in the Critical Area Program documents. Maps of natural resources, sensitive environmental areas, and Critical Area regulatory features were then created using existing data in the GIS and data digitized from the original Program maps. Figures 2 and 3 show the Land Use Management designations for Harford County's northern and southern regions of Critical Area.

APPROACH USED TO DELINEATE THE LAND USE MANAGEMENT AREAS

The basic definition of each of the three types of management areas stated in Section I above was used as the major determinant in designating specific geographic areas as one of the three types of land use management areas. (For example, the basic definition of IDA is areas where institutional, and/or industrial developed land uses predominate, and where relatively little natural habitat occurs.) The characteristics listed after the basic definition were used as supplemental factors in characterizing specific areas where appropriate.

Analysis for designation purposes was undertaken on a community or sub-area basis, using changes in land cover and the type and intensity of land use to determine boundaries between the different types of land use management areas. Property lines were used as a supplemental factor for determining such boundaries where appropriate. To be used as a factor in delineating an area as LDA, water and sewer services had to have been actually in place on or immediately adjacent to a site as of December 1, 1985.

In the case of undeveloped areas located within existing developed areas, the following methodology was used:

- Areas under 20 acres were designated the same as the surrounding areas except that any areas of significant natural resource value, such as tidal wetlands, contained in such areas were mapped RCA;
- The designation of areas between 20 and 25 acres depended upon the significance of the natural features found on the site, the configuration of the site with respect to the shoreline and the pattern of development along the immediately adjacent shorelines; and
- Contiguous undeveloped areas 25 acres or greater were designated RCA.



In the 2022 update, county managed critical area expanded by about 12%. This excludes municipal and federal lands in the critical area. Most expansion occurred in Resource Conservation Land Use. This was caused by changes in mapping tidal wetlands and parks. There was minimal impact to private property


LAND USE MANAGEMENT AREAS IN THE SUSQUEHANNA RIVER & SWAN CREEK PORTIONS OF THE CRITICAL AREA

Intensely Developed Area (IDA)

May be developed with medium to high density housing, commercial, or industrial uses, according to the underlying zoning designation with special pollution limits, habitat protection, and a buffer at the shore.



Limited Developed Area (LDA) May be developed with low to medium density housing, commercial and small industrial uses according to the underlying zoning designation.





Resource Conservation Area (RCA) Limited to one dwelling unit per 20 acres, agricultural and forest uses and resource utilization according to the permitted use list.

EXPANSION OF HARFORD COUNTY'S CRITICAL AREA

As permitted by the Critical Area Law, Harford County has expanded the original 1000-foot boundaries of its Critical Area in several areas in order to more fully meet the objectives of the Chesapeake Bay Critical Area Act and Program. The reasons for such expansion are:

- To include certain contiguous nontidal wetlands;
- To ensure adequate protection for State designated Threatened and Endangered Species such as the Maryland Darter, and areas determined to be Habitats of Local Significance (as defined by the Criteria);

FIGURE 3



LAND USE MANAGEMENT AREAS IN THE GUNPOWDER RIVER & BUSH RIVER PORTIONS OF THE CRITICAL AREA

- To make the Critical Area boundary coincident with that of the 100-year floodplain in certain locations (within which development is already severely restricted by local regulations) or that of the County's Natural Resources District if it is extended further landward;
- > To include certain contiguous park land; and
- To provide protection to the headwaters of tributary streams that already are almost entirely located in the Critical Area.

ACREAGE OF THE LAND USE MANAGEMENT AREAS

With the original expansion areas, the total area in Harford County's Critical Area was 8,205 acres at the time of Program approval (June, 1988) with 6,178 acres designated as RCA (74.0%); 1,242 acres designated as IDA (14.9%); and 926 acres designated as LDA (11.1%). Through the Growth Allocation process from 1988 to 2010, 20.85 acres of RCA were converted to LDA, 96.65 acres of RCA were converted to IDA, and 71.57 acres of LDA were converted to IDA. Havre de Grace is allotted 20 acres of growth allocation to use from the designated RCA acreage, but have not used any of this growth allocation.

In 2021, 10.94 acres of a LDA parcel, owned by the Harford Land Trust in Aberdeen, was downzoned to RCA. Because the LDA parcel was an original designation at the time of the County's adoption of the Critical Area Program, the downzoned parcel was then calculated into the County's original Growth Allocation numbers for its RCA designations. Including the newly designated RCA parcel, the County's Growth Allocation amount is now 280 acres.

STORMWATER MANAGEMENT AND SEDIMENT CONTROL ISSUES

10% POLLUTANT REDUCTION LOADING IN IDA

Harford County's approach to meeting this requirement was originally based on the 1993 method developed by the Metropolitan Washington Area Council of Governments for the Chesapeake Bay Critical Area Commission. This formula was updated by the Center for Watershed Protection for the Critical Area Commission in the Fall of 2003, naming phosphorus as a keystone pollutant. An Excel worksheet has been supplied by the Critical Area Commission to calculate the formula and is described in Appendix B.

A simple formula is used to calculate pre-development and post-development pollutant loadings in an area. The formula considers the amount of rainfall occurring on the site, a runoff coefficient that is determined by the amount of impervious surface on the site prior to and after development, and a phosphorous runoff concentration value that is based on whether the proposed development is new development or redevelopment. For undeveloped sites that are proposed for intensive development through the growth allocation process, a fixed benchmark loading is established. Pollutant removal rates have also been established for various stormwater management measures that could be used to accomplish the required pollutant reductions.

If total compliance is not achievable through on-site measures, then the use of off-site measures will be required to make up the difference between the pollutant reduction required and the amount that can be

reduced through on-site measures. The use of off-site measures, outside of the Critical Area, will be considered if the measures provide pollutant reduction within the same sub-watershed or watershed as the project. If compliance cannot be accomplished on-site or off-site as stated above, then a fee in-lieu will be considered. A fee-in-lieu will be charged to developers based upon the amount of the uncontrolled pollutant load discharged from the site and the estimated cost of constructing and maintaining an off-site area.

URBAN STORMWATER RETROFITTING STRATEGY

The National Pollutant Discharge Elimination System (NPDES) Program is a Federally mandated program under the Clean Water Act. Under 1987 Amendments to the Clean Water Act, permit requirements were established for stormwater discharges from Municipal Separate Stormwater Sewer Systems (MS4s) or storm drain systems for municipalities with populations over 100,000 people. Harford County obtained its first municipal NPDES permit in 1994, with resubmittal and recertification required every five years. The initial application involved mapping of the County's stormwater sewer system, identifying stormwater facilities and implementation of a water quality monitoring program.

Components of the County's NPDES permit include stormwater management, erosion and sediment control, illicit discharge detection and elimination, road maintenance, and watershed assessment and planning. Once sources of pollutants are identified on a watershed basis, restoration projects are identified and implemented through the capital budget. Monitoring to determine the effectiveness of stormwater management and progress toward meeting water quality goals is an integral part of the NPDES program.

Restoration of impaired waters is addressed through the development of Total Maximum Daily Loads (TMDLs) by the Maryland Department of the Environment (MDE). TMDLs identify the maximum pollutant loading that a waterbody can assimilate and still meet water quality standards. MDE has determined that jurisdictions that implement the requirements of their municipal NPDES permit are controlling stormwater to the maximum extent practical, thereby meeting the waste load allocations specified in the TMDL. Continued monitoring and NPDES program assessment ensure that progress toward meeting water quality goals is achieved.

Sediment and Erosion Control in Harford County mandate that any disturbance of land 5,000 square feet or greater, or movement of more than 100 cubic yards of earth, must have an approved Erosion and Sediment Control Plan in order to receive a grading permit. The Harford County Department of Public Works, Planning and Zoning, and the Harford Soil Conservation District work jointly in approving Sediment Control Plans. The Harford County Department of Public Works issues the grading permit after the approval of the plan.

IDENTIFICATION OF AREAS WITH SIGNIFICANT DEVELOPMENT CONSTRAINTS

The Criteria identified two major types of areas with significant development constraints: steep slopes and sensitive soils. Development is prohibited on slopes greater than 15% in the LDA and RCA. Development is only allowed on soils having development constraints if the proposed project includes mitigation measures that adequately address the identified constraints and it is shown that such development will not have significant adverse impacts on water quality and plant, fish or wildlife habitat.

Harford County has reviewed information provided by U.S. Department of Agriculture's Natural Resources Conservation Service to identify areas with slope and soil constraints. Table 1 lists the type of soils having one or more development constraints, as defined in COMAR 27.01.01.B(30) and (32): hydric soils, soils with hydric components, potentially highly erodible soils, highly erodible, potentially steep slopes, and steep slopes.

Hydric soils are identified as being wet frequently enough to periodically produce anaerobic conditions, thereby influencing the species composition or growth, or both, of plants. However, it should be noted that soils not on the survey list, but which meet hydric criteria, may be found in the field. Areas with hydric soils consisting of any size are classified as nontidal wetlands by Harford County, and thus, are unsuitable for development. Soils with hydric components are considered soils with significant development constraints.

Highly Erodible Soils are identified as having a slope greater than 15 percent, or those with a Kw factor of .35 or greater and a slope of 5% or greater. Soils with a slope range including 15% or greater, or with a Kw factor of .35 or greater and a slope range including 5% or greater, are listed as potentially highly erodible soils for which site specific analyses will have to be made.

Steep slopes are identified by analysis of the soil classifications in the soil surveys. This was done based upon assurance from the Harford County District Conservationist that such soil classifications were an accurate representation of areas with steep slopes. Slope characteristics can be found on soils having a slope range between 8% and 20% and are therefore listed as potentially steep slopes for which on-site analysis will be needed. When applications are submitted, additional detailed topographical information is required to accurately identify steep slope areas. Steep slope analysis is evaluated through the County GIS.

Hydric soils, highly erodible soils, and steep slope areas have been mapped to assist in identification of areas with significant development constraints due to geomorphological characteristics.

TABLE 1

SOIL TYPES WITH DEVELOPMENT CONSTRAINTS

Map Unit Symbol	Soil Series Name	Kw ("wholesoil") Factor	Percent of Hydric Components	Surface Textural Class	Designated Class	SlopeRange
AdA	Aldino	0.49	5	silt loam	hydric components	0-3
AdB	Aldino	0.49	5	silt loam	hydric components, potentially highly erodible, potentially steep slopes	3-8
AdC	Aldino	0.49	5	silt loam	hydric components, highly erodible, steep slopes	8-15

TABLE 1 CONTINUED							
SOIL TYPES WITH DEVELOPMENT CONSTRAINTS							
AsB	Aldino	0.20	5	very stony silt loam	hydric components, potentially steen slopes	0-8	
BaA	Baile	0.37	85	silt loam	hydric soils	0-3	
ВаВ	Baile	0.37	85	silt loam	hydric soils, potentially highly erodible, potentially steep slopes	3-8	
BeA	Beltsville	0.37	0	silt loam		0-2	
BeB	Beltsville	0.37	5	silt loam	hydric components, potentially highly erodible	2-5	
BeC	Beltsville	0.43	0	silt loam	highly erodible, potentially steep slopes	5-10	
BrC2	Brandywine	0.17	0	gravelly loam	potentially highly erodible, steep slopes	8-15	
BrD3	Brandywine	0.17	0	gravelly loam	highly erodible, steep slopes	15-25	
BrE3	Brandywine	0.17	0	gravelly loam	highly erodible, steep slopes	25-45	
CcA	Chester	0.32	5	silt loam	hydric components	0-3	
CcB2	Chester	0.32	0	silt loam	potentially steep slopes	3-8	
CcC2	Chester	0.32	0	silt loam	potentially highly erodible, steep slopes	8-15	
CgB2	Chester	0.28	0	gravelly silt loam	potentially steep slopes	3-8	
CgC2	Chester	0.28	0	gravelly silt loam	potentially highly erodible, steep slopes	8-15	
CgD2	Chester	0.28	0	gravelly silt Ioam	highly erodible, steep slopes	15-25	
ChB2	Chillum	0.32	0	silt loam		2-5	
CkC2	Chillum- Neshaminy	0.49	0	silt loam	highly erodible, potentially steep slopes	5-10	
CrE	Chrome	0.24	0	silty clay loam	highly erodible, steep slopes	15-45	
Cu	Codorus	0.32	15	silt loam	hydric components	0-3	
Cv	Comus	0.37	5	silt loam	hydric components	0-3	
DcA	Delanco	0.37	0	silt loam		0-3	

TABLE 1 CONTINUED						
	SOIL T	YPES WITH	DEVELOPM	ENT CONSTI	RAINTS	
DcB	Delanco	0.37	0	silt- loam	potentially highly erodible, potentially steep slopes	3-8
EhB2	Elioak	0.37	0	silt loam	potentially highly erodible, potentially steep slopes	3-8
EhC2	Elioak	0.37	0	silt loam	highly erodible, steep slopes	8-15
En	Elkton	0.43	95	silt loam	hydric soils	0-2
EsA	Elsinboro	0.49	0	loam		0-2
EsB2	Elsinboro	0.49	0	loam	potentially highly erodible	2-5
EsC2	Elsinboro	0.49	0	loam	highly erodible, potentially steep slopes	5-10
EvC	Evesboro	0.05	0	loamy sand	potentially highly erodible, steep slopes	5-15
FgaA	Fallsington	0.28	85	loam	hydric soils	0-2
GcB2	Glenelg	0.24	0	loam	potentially steep slopes	3-8
GcC	Glenelg	0.24	0	loam	potentially highly erodible, steep slopes	8-15
GcC3	Glenelg	0.24	0	loam	potentially highly erodible, steep slopes	8-15
GcD	Glenelg	0.24	0	loam	highly erodible, steep slopes	15-25
GcD3	Glenelg	0.24	0	loam	highly erodible, steep slopes	15-25
GgB2	Glenelg	0.20	0	channery loam	potentially steep slopes	3-8
GgC2	Glenelg	0.15	0	gravelly loam	potentially highly erodible, steep slopes	8-15
GgC3	Glenelg	0.15	0	gravelly loam	potentially highly erodible, steep slopes	8-15
GgD2	Glenelg	0.15	0	gravelly loam	highly erodible, steep slopes	15-25
GgD3	Glenelg	0.15	0	gravelly loam	highly erodible, steep slopes	15-25
GnA	Glenville	0.37	10	silt loam	hydric components	0-3

TABLE 1 CONTINUED							
SOIL TYPES WITH DEVELOPMENT CONSTRAINTS							
GnB	Glenville	0.37	10	silt loam	hydric components, potentially highly erodible, potentially steep slopes	3-8	
Hb	Hatboro	0.43	85	silt loam	hydric soils	0-3	
HcA	Hatboro- Codorus	0.49	60	silt loam	hydric soils	0-3	
ЈрВ	Јорра	0.10	0	gravelly sandy loam		2-5	
JpC	Јорра	0.10	0	gravelly sandy loam	potentially steep slopes	5-10	
КеВ	Kelly	0.49	5	silt loam	hydric components, potentially highly erodible, potentially steep slopes	3-8	
KeC2	Kelly	0.49	5	silt loam	hydric components, highly erodible, steep slopes	8-15	
KfD	Kelly	0.17	5	very stony silt loam	hydric components, potentially highly erodible, steep slopes	3-25	
КрА	Keyport	0.49	5	silt loam	hydric components	0-2	
КрВ	Keyport	0.49	5	silt loam	hydric components, potentially highly erodible	2-5	
KrA	Kinkora	0.43	100	silt loam	hydric soils	0-3	
KrB	Kinkora	0.43	100	silt loam	hydric soils, potentially highly erodible, potentially steep slopes	3-8	
LeB2	Legore	0.37	0	silt loam	potentially highly erodible, potentially steep slopes	3-8	
LeC2	Legore	0.37	0	silt loam	potentially highly erodible, steep slopes	8-15	
LeD2	Legore	0.37	0	silt loam	highly erodible, steep slopes	15-25	
LeE	Legore	0.37	0	silt loam	highly erodible, steep slopes	25-45	
LfC	Legore	0.15	0	very stony silt loam	potentially highly erodible, steep slopes	0-15	

TABLE 1 CONTINUED							
SOIL TYPES WITH DEVELOPMENT CONSTRAINTS							
LfD	Legore	0.37	0	very stony silt	highly erodible,	15-25	
LfE	Legore	0.37	0	very stony silt	highly erodible,	25-45	
LgC3	Legore	0.37	0	silty clay loam	highly erodible,	8-15	
LgD3	Legore	0.37	0	silty clay loam	highly erodible, steep slopes	15-25	
Lr	Leonardtown	0.37	85	silt loam	hydric soils	0-2	
MbB2	Manor	0.28	0	loam	potentially steep slopes	3-8	
MbC	Manor	0.28	0	loam	potentially highly erodible, steep slopes	8-15	
MbD	Manor	0.28	0	loam	highly erodible, steep slopes	15-25	
McB2	Manor	0.15	0	channery loam	potentially steep slopes	3-8	
McC2	Manor	0.17	0	channery loam	potentially highly erodible, steep slopes	8-15	
McC3	Manor	0.17	0	channery loam	potentially highly erodible, steep slopes	8-15	
McD2	Manor	0.17	0	channery loam	highly erodible, steep slopes	15-25	
McD3	Manor	0.17	0	channery loam	highly erodible, steep slopes	15-25	
MdE	Manor	0.28	0	very stony loam	highly erodible, steep slopes	25-45	
MfE	Manor	0.17	0	channery loam	highly erodible, steep slopes	25-45	
MgC	Manor and Glenelg	0.15	0	very stony loam	potentially highly erodible, steep slopes	3-15	
MgD	Manor and Glenelg	0.15	0	very stony loam	highly erodible, steep slopes	15-25	
MkA	Matapeake	0.49	0	silt loam	· ·	0-2	
MkB	Matapeake	0.49	0	silt loam	potentially highly erodible	2-5	
MlaA	Mattapex	0.49	5	silt loam	hydric components	0-2	
MlaB	Mattapex	0.49	5	silt loam	hydric components, potentially highly erodible	2-5	
MsA	Montalto	0.37	0	silt loam		0-3	
MsB2	Montalto	0.37	0	silt loam	potentially highly erodible, potentially steep slopes	3-8	

TABLE 1 CONTINUED								
	SOIL TYPES WITH DEVELOPMENT CONSTRAINTS							
MsC2	Montalto	0.37	0	silt loam	highly erodible, steep slopes	8-15		
NeA	Neshaminy	0.37	0	silt loam		0-3		
NeB2	Neshaminy	0.37	0	silt loam	potentially highly erodible, potentially steep slopes	3-8		
NeC2	Neshaminy	0.37	0	silt loam	highly erodible, steep slopes	8-15		
NsC	Neshaminy and Montalto	0.17	0	very stony silt loam	potentially highly erodible, steep slopes	0-15		
NsD	Neshaminy and Montalto	0.17	0	very stony -silt loam	highly erodible, steep slopes	15-25		
NsE	Neshaminy and Montalto	0.32	0	very stony silt loam	highly erodible, steep slopes	25-45		
Ot	Othello	0.43	95	silt loam	hydric soils	0-2		
RuB	Russett	0.32	5	fine sandy Ioam	hydric components	0-5		
RuD	Russett	0.32	0	fine sandy loam	potentially highly erodible, steep slopes	5-15		
RuE	Russett	0.32	0	fine sandy loam	highly erodible, steep slopes	15-30		
ShaB	Sassafras	0.20	4	sandy loam	hydric components	2-5		
ShaC	Sassafras	0.20	4	sandy loam	hydric components, potentially steep slopes	5-10		
SIB2	Sassafras	0.32	4	loam	hydric components	2-5		
SIC2	Sassafras	0.32	0	loam	potentially steep slopes	5-10		
SsD	Sassafras and Joppa	0.32	0	loam and gravelly sandy loam	potentially highly erodible, steep slopes	10-15		
SsE	Sassafras and Joppa	0.32	0	loam and gravelly sandy loam	highly erodible, steep slopes	15-30		
Sw	(Swamp)	0.05	100	-	hydric soils	0-1		
Tm	(Tidal marsh)	-	100	mucky peat	hydric soils	0-1		
WaA	Watchung	0.28	90	silt loam	hydric soils	0-3		
Wab	watchung	0.28	90	silt loam	nydric solls, potentially steep slopes	3-8		
WcB	Watchung	0.17	100	very stony silt loam	hydric soils, potentially steep slopes	0-8		
WhB	Whiteford	0.20	0	silt loam	potentially steep slopes	3-8		
WhC2	Whiteford	0.20	0	silt loam	potentially highly erodible, steep slopes	8-15		
WoaB	Woodstown	0.32	7	loam	hydric compon.	2-5		

FOREST CONSERVATION MEASURES

One of the major objectives of the Critical Area Program is to maintain and, where possible, improve the quality and quantity of the wooded resources located in the Critical Area because of their value for water quality protection, wildlife habitat, recreation, etc.

DEVELOPMENT REQUIREMENTS IN IDA

All permanent disturbance, including new impervious surfaces and removal of vegetation, must be replaced at a 1:1 square footage basis. The 15% afforestation requirement does not apply in the IDA.

DEVELOPMENT REQUIREMENTS IN LDA AND RCA

The Criteria established specific requirements for the retention of forest cover, replacement of forest cover that is removed, and afforestation of presently unforested areas in the LDA and RCA.

No more than 20% of forest cover on a site may be removed and the amount of forest cover removed must be replaced on a 1:1 basis either on-site or elsewhere in the Critical Area. Up to 30% of the forest cover on a site may be removed, if the amount of forest cover removed is replaced on a basis of 1.5 times the total amount removed. Removal of forest cover is to be undertaken in a manner that minimizes the impact on the value of the forest cover for wildlife habitat, water quality protection, aesthetic enhancement, and recreation. In particular, wildlife corridors are to be maintained between existing on-site forested areas and forested areas adjacent to the site to provide continuity of existing plant and wildlife habitat.

Any wooded area cleared or cut prior to County approval, including any areas beyond which was permitted, is required to be replanted on a basis of three times the amount of land cleared or cut.

Areas that are presently unforested or those that have less than 15% of the area in existing in forest cover are required to have 15% of the total area afforested (planting of forest cover in areas presently unforested) and bonded through Harford County at \$4.00 per square foot.

In undertaking afforestation efforts, priority will be given first to establishing Buffer areas along tidal waters and tributaries where they do not exist, and second to the afforestation of areas in a manner that would maximize their value for wildlife habitat and water quality protection. A mixture of trees, shrubs and ground cover will be planted as part of such afforestation efforts.

In replacing forest cover that was removed, priority shall be given to replacing the forest cover on-site in a manner that maximizes its value for wildlife habitat and water quality protection. If on-site replacement is not feasible, the developer has the option of finding a suitable location elsewhere in the Critical Area or paying a fee-in-lieu to cover the costs of afforestation efforts elsewhere in the County's Critical Area. Such a fee-in-lieu fee will cover the cost of the landpurchases, trees, associated shrubs, and ground cover as appropriate, ground preparation, labor, maintenance and monitoring. The fee will be \$4.00 per square foot of area cleared. Such in-lieu fee afforestation efforts will be undertaken as part of the County's Critical Area Forestry Program.

The long-term protection of the wooded areas that are retained and areas that are afforested must be guaranteed through the use of final plat restrictions, conservation easements, homeowner agreements, or similar instruments, as a condition of approval of a proposed development.

The above requirements will be implemented through use of a Forest Conservation Plan approved as part of the development review process by the Harford County Department of Planning and Zoning with technical assistance provided by the Maryland Department of Natural Resources. The contents of such a Forest Conservation Plan, including the procedures to be followed in undertaking afforestation efforts, are described in Appendix C, as amended.

GROWTH ALLOCATION

AREA AVAILABLE FOR GROWTH ALLOCATION

As noted above, development in the RCA is limited to a density of one dwelling unit per 20 acres. Since this is a severe restriction on development, the Criteria included a provision for allowing some additional growth in undeveloped areas. An amount of land equal to 5% of the total amount of land designated as RCA at the start of the Program (subtracting any areas that were designated as tidal wetlands) can be developed at a higher density than would otherwise be allowed by the Criteria.

One half (2.5%) of this higher density development can be located in areas currently designated as RCA and the other half is to be located in areas currently designated as LDA. In Harford County, 6,178 acres were designated as RCA at the start of the Program, including 137 acres within the corporate limits of Havre de Grace. After adding the 10.94 acres of RCA from the downzoning of the Harford Land Trust property in 2021, the County now has 6,189 acres of RCA that was part of the original Critical Area maps. Subtracting 595 acres of tidal wetlands located in the RCA, this allows a total growth allocation of 280 acres (140 acres being available for use in the RCA and 140 acres being available for use in the LDA).

As of the time of this Program update (2022), the available growth allocation acreage for Harford County (including Havre de Grace) is 22.5 acres to be used in the RCA and 68.43 acres to be used in the LDA.

Any alteration to the RCA by the construction of facilities that are approved by the State rather than the County, (i.e., power plants), will not be counted against a County's growth allocation.

In evaluating applications for growth allocation in Harford County, the following policies and sitespecific factors will be considered in making any allocation awards:

GENERAL GROWTH ALLOCATION POLICIES

Due to the unique nature of the growth allocation process, and in order to maximize opportunities for a variety of projects with the greatest public benefits, growth allocation shall be awarded to projects that can initiate construction within 36 months of receiving the award. Construction shall be considered initiated when infrastructure plans and permits have been approved and on-site construction has commenced. Extensions of the time to initiate construction may be granted by resolution of the County Council. An extension shall not exceed 24 months.

Failure to initiate construction or obtain the necessary extensions will cause the growth allocation project approval to become null and void. The applicant must reapply for project approval through the Department of Planning and Zoning and the Chesapeake Bay Critical Area Commission. Furthermore, the designated land use area boundaries shall remain in effect unless revoked by legislative action of the County Council. Such a revocation shall be initiated by the Department of Planning and Zoning, and enacted by the County Council as a legislative amendment to the Critical Area Program. This action will require a change in the Critical Area Maps and the assessment of available growth allocation.

In acknowledgement of the responsibility that the County has under the Critical Area Program to ensure some continued opportunity for the expansion of the City of Havre de Grace within the Critical Area, a minimum of 20 acres of the total growth allocation available to the County for upgrade from RCA to other land use designations shall be reserved for the City. This allocation will be reevaluated when the County undertakes a comprehensive review of its program. Official notification of the review will be provided to the City. Upon notification of the review, the City must request in writing that any remaining reserved acreage be maintained for their use. All other policies and site-specific factors outlined in this program shall also apply to the review of growth allocations within the City of Havre de Grace. In 2021 the City provided written notification to the County to maintain the 20 acres of growth allocation for the City's use.

Due to the need to ensure that any projects receiving a growth allocation shall be developed as originally represented by the applicants in the Critical Area Assessment Reports, all growth allocation awards shall comply with such conditions of approval as determined by the County for each project or suffer revocation of their growth allocation award.

REQUIREMENTS FOR THE USE OF GROWTH ALLOCATION

When locating new Intensely Developed or Limited Development Areas, the following requirements shall apply:

- > The County is limited to one growth allocation envelope per parcel unless:
 - 1. Having more than one growth allocation envelope will provide a benefit to water quality or habitat; and
 - 2. The Commission approves more than one growth allocation envelope.
- No more than one-half of the County's original growth allocation shall be located in Resource Conservation Areas;
- The County shall not approve a growth allocation in the Resource Conservation Area unless the development potential within the remaining Resource Conservation Area acreage outside the growth allocation envelope supports a minimum density of one dwelling per 20 acres;
- A new Limited Development Area shall only be located adjacent to an existing Limited Development Area or Intensely Developed Area;

- A new Intensely Developed Area shall only be located in a Limited Development Area or adjacent to an existing Intensely Developed Area, or is an existing grandfathered commercial, industrial, or institutional use;
- A new Intensely Developed Area shall only be located where impacts to the defined land uses of the Resource Conservation Area are minimized;
- A new Intensely Developed Area shall be at least 20 acres in total;
- ➤ A new Intensely Developed Area or Limited Development Area shall be located in a manner and incorporate measures to protect and optimize benefits to water quality and nearby Habitat Protection Areas as defined in the Harford County Zoning Code and in COMAR 27.01.09;
- New Intensely Developed or Limited Development Areas shall be located to minimize impacts to forests and developed woodlands. All wooded area removed shall be replaced as specified in the Zoning Code, and in accordance with the Forest Management Guide found in Appendix C of the Critical Area Program;
- A new Intensely Developed Area or a Limited Development Area in a Resource Conservation Area shall be located at least 300 feet beyond the landward edge of wetlands or tidal waters, and this 300 feet shall be established as Buffer; and
- New Intensely Developed Areas or Limited Development Areas shall conform to all of the criteria of Harford County's Code and Critical Area Program, and shall be so designated on the County's Critical Area Maps.

SPECIFIC FACTORS FOR GROWTH ALLOCATIONS

In reviewing map amendments or refinements involving the use of growth allocation, the County shall demonstrate that:

- The proposed classification change is consistent with the County's comprehensive plan and the growth allocation will implement the goals and objectives of the comprehensive plan;
- Public improvements shall be provided with the proposed development and may include, but are not limited to:
 - 1. Public access facilities to waterfront areas;
 - 2. Acceleration of the provision of public water and sewer services to areas with existing health problems; and
 - 3. Dedication of lands to public park purposes.
- A new Intensely Developed Area shall:
 - 1. Be served by a public wastewater system;

- 2. Have an allowed average density of at least 3.5 units per acre;
- 3. Be located in a preferential funding area if greater than 20 acres; and
- 4. Have a demonstrable economic benefit to the area.
- A new Limited Development Area shall:
 - 1. Be served by a public wastewater system or septic system that uses the best available nitrogen removal technology;
 - 2. Be clustered; and
 - 3. Be a completion of an existing subdivision, or an expansion to an existing business.
- Innovative site design and construction features shall be incorporated to minimize the disturbance of natural areas and reduce the impacts to Habitat Protection Areas, Resource Conservation Areas, and the adjacent communities. Such features may include the use of:
 - 1. Cluster development;
 - 2. Low-impact development practices as described in the articles of the U.S. Department of Housing and Urban Development, Office of Policy Development and Research, The Practice of Low Impact Development (July 2003); Prince George's County, Maryland Department of Environmental Resources, Low-Impact Development Design Strategies: An Integrated Design Approach (June 1999); and Prince George's County, Maryland Department of Environmental Resources, Low-Impact Development Hydrologic Analysis (July 1999);
 - 3. Shallow-marsh creation stormwater management measures;
 - 4. Buffer areas to minimize impacts on existing habitats and wildlife corridors and protect adjacent natural and developed areas from impacts of development;
 - 5. Landscaping plans and materials to enhance the establishment of vegetated Buffer areas on-site; and
 - 6. Conservation easements to permanently protect natural areas.
- > The proposed classification change will use existing public infrastructure, where practical;
- The proposed classification change is consistent with State and regional environmental protection policies concerning the protection of threatened and endangered species and species in need of conservation that may be located on-site or nearby;
- > There shall be no impacts on a priority preservation area, as defined under §2-518 of the

Agriculture Article;

- There shall be no environmental impacts associated with wastewater and stormwater management practices or discharges to tidal waters, wetlands, tributary streams, or other Habitat Protection Areas; and
- There shall be no environmental impacts associated with location to a coastal hazard area or an increased risk of severe flooding attributable to the proposed development.
- There will be strict compliance with the standards for growth allocation as described in the Zoning Code.
- Since the Criteria require that the amount of forest removed from areas designated as RCA and LDA not be reduced (and if possible, increased), all projects given a growth allocation will have to replace forest removal at a ratio of one-to-one or greater, on-site or off-site within the Critical Area. If such replacement is not feasible, an in-lieu fee of \$4.00 per square foot of area cleared shall be paid to the County.
- Since adverse impacts on water quality from such projects are to be minimized, pollutant loading from projects granted growth allocation will have to be maintained at pre-development levels, and in the case of new IDAs reduced 10% from pre-development levels. To the maximum extent possible, pollutant reduction measures shall be constructed on-site within the Critical Area. Consideration of the establishment of treatment facilities outside of the Critical Area will be given if the proposed treatment facility provides water quality benefits to the same sub-watershed or watershed.

GROWTH ALLOCATION APPROVAL PROCESS

In order for the County to adequately evaluate requests for growth allocations, an application for growth allocation must be filed with the Department of Planning and Zoning, meeting all of the requirements described in the Zoning Code and in COMAR 27.01.02.06-1. In addition, the information required for concept plan or preliminary plan approval in the Critical Area (as appropriate) must be submitted and accompanied by a statement from the applicant regarding how the proposed development addresses the policies and factors noted above. Applications for growth allocation will be considered an amendment to the designated land use area boundaries shown on the County tax maps.

Preliminary review and comment shall be requested from the Maryland Department of the Environment, Maryland Department of Natural Resources, United States Fish and Wildlife Service, Maryland Historical Trust, and U.S. Army Corps of Engineers regarding:

- Rare, threatened, and endangered species;
- > Forest interior dwelling birds and colonial water birds;
- Anadromous fish and their propagation waters and any other aquatic species located onsite;
- > Plant and wildlife habitat and historic waterfowl staging and concentration areas;

- Submerged aquatic vegetation;
- ▶ Riparian forests and tidal and nontidal wetlands; and
- > Natural heritage areas and other historical and cultural resources.

The Department of Planning and Zoning shall hold a pre-application meeting with the applicant and notify the applicant in writing of the sufficiency of their application within 30 days of receipt. If the Department of Planning and Zoning determines the application to be insufficient, the applicant shall submit the additional information within 30 days of notification; otherwise, the application shall be considered null and void.

The Department of Planning and Zoning shall present a recommendation report to the Planning Advisory Board and the Environmental Advisory Board within 90 days of determination of a complete application.

The Department of Planning and Zoning shall present an updated recommendation report to the County Council that includes all recommendations from the Planning Advisory Board and the Environmental Advisory Board, within 90 days after having presented to the Board members.

The County Council shall hold a public meeting in the following manner:

- 1. The Department of Planning and Zoning shall publish a notice of the date, time, and place of the hearing in two local County newspapers, at least two weeks prior to the hearing;
- 2. The Department of Planning and Zoning shall send notice of the hearing to all property owners wholly or partially within, or immediately adjacent to, the requested area of change;
- 3. The County Council shall establish conditions of approval that are consistent with the intent of the County's Critical Area Program, which may include a Buffer Management Plan or Habitat Protection Plan; and
- 4. At any time after the hearing, the County Council may approve or deny the proposed change in classification.

An applicant may not submit a new application for the same request for two years following a denied application.

Within 30 days of the County Council's approval, the application shall be sent to the Critical Area Commission for review. No application shall be considered final until written approval is received from the Critical Area Commission. Any application sent to the Critical Area Commission shall be accompanied by pertinent findings, plans, environmental reports, and studies as described below:

A written finding that ensures the requested change is consistent with the purposes, policies, goals, and provisions of the Critical Area Law and all Criteria of the Critical Area Commission;

- All information and documentation relevant to the local jurisdiction's determination that the project meets the standards listed under Natural Resources Article, §8-1808.1(c)(2), Annotated Code of Maryland, Section 267-63.7 of the Harford County Zoning Code, and Appendix K of the Harford County Critical Area Program;
- All information and documentation that addresses the factors to be considered by the Critical Area Commission under Natural Resources Article, §8-1808.1(c)(4), Annotated Code of Maryland, Section 267-63.7 of the Harford County Zoning Code, and Appendix K of the Harford County Critical Area Program;
- A conceptual site development plan and environmental features map in accordance with COMAR 27.01.02.06-1.B;
- An environmental report that includes the following, when applicable:
 - 1. A Buffer Management Plan and/or Habitat Protection Plan in accordance with COMAR 27.01.02.06-2.B and C;
 - 2. The preliminary stormwater management plan for compliance with the 10% pollutant reduction rule, including all worksheets and supporting documentation;
 - 3. Comments from the Maryland Department of the Environment, Maryland Department of Natural Resources, United States Fish and Wildlife Service, Maryland Historical Trust, and U.S. Army Corps of Engineers; and
 - 4. A landscape plan demonstrating any proposed removal of vegetation from the site and the proposed replacement and/or addition of vegetation.
- A map that shows the land area where the local jurisdiction proposes a change of Critical Area land classification; and
- Verification that the acreage proposed for reclassification is accurately depicted on the map and is equal to the amount of acreage to be deducted from the local jurisdiction's existing total allotment of growth allocation, when applicable.

If the reclassification is approved by the Critical Area Commission with one or more conditions, the County has 60 days to notify the Critical Area Commission of its intent to adopt the conditions.

Prior to approving the final site plan or subdivision plat, the County shall ensure that:

- 1. All conditions of approval are incorporated into the final plan, public works agreement, deed covenants, etc; and
- 2. A note is added on the final plan or plat to ensure that the approved change in Critical Area classification shall be considered null and void, and shall return to its prior classification if an applicant fails to start the approved project or to request a timeline extension within two years of the project approval date.

a. A timeline extension may be approved by the County, not to exceed an extension greater than two years time. No more than one extension shall be granted.

The County's official Critical Area maps shall be amended to reflect the new land classification, and a copy of the new map shall be provided to the Critical Area Commission within 120 days of the Commission's approval.

CALCULATING GROWTH ALLOCATION DEDUCTIONS

The use of growth allocation shall be deducted from the available growth allocation in the following manner:

- ➤ When a 300-foot setback from wetlands and tidal waters is not provided, as in a case where existing non-conforming or grandfathered structures are located in the setback, the County shall require the deduction of the area of the Buffer;
- ➢ For growth allocation used in the Limited Development Area, the acreage deducted shall match the acreage of the area shown (growth allocation envelope) on the official Critical Area map as amended by the County and Critical Area Commission; and
- The County shall deduct the acreage of the entire Resource Conservation Area parcel that is used for growth allocation, whether or not it is all used for growth allocation.

The County may exclude the following from a growth allocation deduction:

- 1. The remaining Resource Conservation Area outside the growth allocation envelope, if at least 20 acres remains;
- 2. The remaining Resource Conservation Area outside the growth allocation envelope if it is less than 20 acres but contiguous to a permanently protected Resource Conservation Area on another parcel, and the sum of the remaining Resource Conservation Area and protected Resource Conservation Area is at least 20 acres;
- 3. The acreage of a 300-foot setback; and
- 4. The acreage of tidal wetlands on the parcel.

GRANDFATHERED PROJECTS AND OTHER PROJECTS REQUIRING SPECIAL EVALUATION PROCEDURES

The Criteria require that special conditions be applied to projects approved prior to formal adoption of a Critical Area program, in the case of non-conforming uses and structures, and other projects deserving special consideration because of site-specific characteristics.

GRANDFATHERED PROJECTS

As discussed in more detail in Appendix D, development that was approved in the Critical Area prior to formal adoption of the County's Critical Area Program is counted against the County's available growth allocation unless certain conditions are complied with. To avoid any reduction in the County's total growth allocation, Harford County took the following approach concerning grandfathered projects.

Provided that Habitat Protection Areas, as identified in Chapter 9 of this document, are protected and the requirements relating to water-dependent facilities and adequate stormwater management measures are complied with – withstanding the density limitation that would otherwise be applied – the following types of developments are considered grandfathered:

- Construction of a single family dwelling on an undeveloped, legal parcel of land that existed as of December 1, 1985;
- Construction of subdivisions that received final approval prior to June 1, 1984, provided that lots not individually owned are consolidated or reconfigured to comply with the provisions of Harford County's Critical Area Management Program to the maximum extent possible;
- Construction of subdivisions that received final approval between June 1, 1984 and December 1, 1985;
- Construction of subdivisions that received final approval after December 1, 1985, and prior to the date of approval of Harford County's Critical Area Management Program (1988). Such subdivisions shall be consistent with the provisions of the County's Critical Area Management Program or the development of such areas must utilize a portion of the County's growth allocation; and
- The expansion by no more than 50% of commercial uses on parcels designated LDA because they did not meet the minimum 20-acre size required for IDA designation.

NONCONFORMING USES AND VARIANCE PROVISIONS

Provisions will be made for the continuation of non-conforming uses in the Critical Area provided that any intensification or expansion of such uses are only allowed through a variance granted in accordance with conditions that ensure that the objectives of the County's Critical Area Program are still being addressed, particularly those relating to protection of water quality and fish, plant, and wildlife habitat. In addition to non-conforming uses, such variance procedures may also be utilized in cases where because of unusual site-specific conditions, literal application of the requirements of the Program would place an unreasonable hardship on a landowner.

MODIFIED BUFFER AREAS

The County has mapped certain sections of the shoreline that meet the conditions for a Modified Area as described in COMAR 27.01.09.01-8. These areas – that would otherwise be designated as the previously described 'Buffer' – are largely or totally developed, or they include undeveloped lots of record that are 200 feet or less in depth, the development of which is grandfathered under the provisions of COMAR 27.01.09.01.07, and they meet the provisions of the County's Critical Area Program. In such areas, the existing pattern of residential, industrial, commercial or recreational development prevents the Buffer from fulfilling the water quality and habitat protection objectives set forth in COMAR 27.01.09.01.

In lieu of the Buffer requirements, the County administers a set of rules for development and redevelopment, as outlined in Section 267-63 of the Zoning Code. An offsetting program is also established whereby the adverse effects of any new lot coverage created are mitigated.

The following standards apply when mapping new areas as 'Modified Buffer':

- Only lots of record as of December 1, 1985 are eligible for mapping as Modified Buffer Areas (MBAs);
- > The parcel or lot being considered for MBA status shall contain a Buffer that was significantly impacted by development at the time of program adoption and that prevents the Buffer from fulfilling its functions;
- Developed parcels or lots shall contain a Buffer intrusion by the principal structures (excluding utilities or septic systems);
- Undeveloped or vacant parcels or lots (i.e., infill) may be designated as a MBA if development within the Buffer cannot be avoided based on the size of the parcel or lot, area of the parcel or lot within the Buffer, or the surrounding pattern of development;
- ➢ If only part of a parcel or lot meets the criteria for designation as a Modified Buffer Area, then only portions of the parcel or lot shall be designated as a Modified Buffer Area. The portion of the parcel designated as a Modified Buffer Area will be subject to the Modified Buffer Area requirements. Portions of the property that are not designated as a Modified Buffer Area shall comply fully with the 100-foot Buffer restrictions; and
- Any proposal by the County for designation of an area as a MBA shall include, at a minimum, a written evaluation and supporting reasons which demonstrate the degree to which the proposed MBA does not perform each of the following Buffer functions:
 - 1. Provide for the removal or reduction of sediments, nutrients, and potentially harmful or toxic substances in runoff entering the Bay and its tributaries;
 - 2. Minimize the adverse effects of human activities on wetlands, shorelines, stream banks, and aquatic resources;
 - 3. Maintain an area of transitional habitat between aquatic and upland communities;
 - 4. Maintain the natural environment of streams; and
 - 5. Protect riparian wildlife habitat.

III. EXISTING REGULATORY AND MANAGEMENT PROGRAMS

The County's development review process through which proposed developments are reviewed in accordance with the County's Subdivision Regulations and Critical Area Ordinance is the principal

program that is pertinent to the regulation of development in the Critical Area. Federal and State regulatory programs may place restrictions on a proposed activity because of its impacts on water quality, flooding, or significant natural resources such as tidal and nontidal wetlands or rare and threatened species habitat, but they generally do not otherwise place restrictions on the density or location of a proposed activity.

COUNTY DEVELOPMENT REVIEW PROCESS

The Department of Planning and Zoning is responsible for the approval of all subdivision of land. The subdivision process in Harford County is organized into a step-by-step approach. Concept plans are required for larger projects so that major issues associated with these projects can be resolved early, eliminating costly delays in the later stages of the review of a project. These larger projects requiring concept plans, subdivision plans or site plans, require that a community input meeting be held prior to plan submittal. Any projects proposed for development within the Critical Area must have a Critical Area Report as part of the submission to the County. All subdivision plans, special exceptions, rezonings and variances must comply with the Critical Area Criteria. Concept plans are approved by the Department of Planning and Zoning after they have been circulated among relevant State and local agencies for their review and comment. Review agencies include the Department of Public Works, Health Department, Board of Education, Department of Parks and Recreation, State Highway Administration, Soil Conservation District, and other relevant Federal, State, and County agencies.

At the preliminary plan stage, sufficiently detailed information, including Critical Area Criteria, is to be provided concerning the project so that a decision can be made on the acceptability of the project subject to the review of engineering design information submitted as part of the final plan review. Preliminary plans are reviewed by a Development Advisory Committee (DAC) composed of local and State agencies in addition to the Department of Planning and Zoning. DAC meetings are held to address concerns identified by the reviewing agencies. These concerns may then need to be resolved. prior to the project being approved. Any approved preliminary plan must be consistent with the concept plan submitted for the project.

Engineering designs of the location of proposed lots, building setbacks, roads, public utilities, etc., developed in accordance with the approved preliminary plan must be submitted at the final plan stage. The final plan is generally accompanied by a Public Works Agreement and/or Public Works Utility Agreement that specifies the developer's commitment to ensure that public utilities, roads, etc., will be provided in accordance with the final plan, along with a bond or other surety agreement to allow the County to take remedial action if they are not adequately constructed. Building permits are reviewed for zoning conformance by the Department of Planning and Zoning. Appeals of subdivision and building permit decisions by the Department of Planning and Zoning may be made to the County Administrator and the Circuit Court. The Department of Public Works, with technical assistance from the Soil Conservation District, is responsible for review of sediment control and stormwater management plans that are to be approved before the final plat is signed. The Department of Public Works is also responsible for development and revision of the County's Water and Sewer Plan.

Requests for rezonings are acted upon by a Hearing Officer, acting as an agent of the County Council. The Department of Planning and Zoning provides technical information and policy recommendations to the Hearing Examiner for consideration in making a decision. Prior to submittal to the Hearing Examiner, proposed rezonings are reviewed by the Planning Advisory Board, which may make additional recommendations. The County Council hears appeals of the Hearing Officer's decisions and makes the

final decision on Comprehensive Rezonings and revisions to Comprehensive Plans, and County Ordinances based upon the recommendation of the Department of Planning and Zoning and other pertinent local agencies. The County Council's decision on these matters may be appealed to the Circuit Court.

IV. MODIFICTAIONS MADE TO LOCAL REGULATIONS AND PROGRAMS

THE NATURAL RESOURCES DISTRICT

The Critical Area Ordinance is fully consistent with the detailed requirements of the Critical Area Program. The criteria for Habitat Protection Areas protects the resources within the Critical Area and the Natural Resource District criteria protects the same resources outside of the Critical Area.

SUBDIVISION REGULATIONS

The County's Subdivision Regulations play an important role in meeting the Critical Area Program Development Criteria, particularly in terms of the information required for a concept plan or preliminary plan application, the factors to be considered in approving such plans, and the information that must be provided on final plats and supporting documents.

APPLICATION REQUIREMENTS FOR SUBDIVISIONS

With regard to information requirements for concept plans and preliminary plans, the most important requirement is that adequate information be supplied on the nature, location, and density of the proposed development. To cover projects both inside and outside of the Critical Area, this includes conceptual plans for sediment and erosion control, stormwater management, and information on the geomorphological and natural features found on or immediately adjacent to the site, including the following:

- ➤ Topography;
- Soils present, including identification of the location of soils with development constraints (highly erodible soils, hydric soils, etc);
- Steep slopes between 15% and 25%, and slopes greater than 25%;
- 100-year floodplain as identified in the FEMA flood insurance study or in more detailed studies undertaken or approved by the County;
- > Perennial and intermittent streams and tidal waters;
- ➤ Tidal wetlands;
- Nontidal wetlands identified by existence of predominantly hydric soils or obligate, facultative wet hydrophytic vegetation;

- Extent of mapped Natural Resources District including any required Buffer areas;
- Extent of Critical Area including required Buffer/Modified Buffer areas;
- Extent of limit of disturbance;
- > Vegetative cover (particularly wooded areas); and
- Important areas as have been identified by the State or County. Maps showing the geographical location of these areas are available for review at the Harford County Department of Planning and Zoning. Such areas include the following:
 - 4. Habitats of State Designated Threatened or Endangered Species, Species of Local Significance, and Species in Need of Conservation;
 - 5. State Natural Heritage Areas;
 - 6. Anadromous fish spawning and nursery areas;
 - 7. Submerged aquatic vegetation beds;
 - 8. Other areas identified by State and Federal agencies as important plant or wildlife habitat areas; and
 - 9. Habitats determined to be of special significance because they contain uncommon species or those of limited occurrence in the jurisdiction, or the habitat contains an unusual diversity of species, or species are found in unusually high concentrations.

PLAN APPROVAL REQUIREMENTS FOR SUBDIVISIONS

Factors that shall be considered in determining whether proposed concept plans and preliminary plans will be approved include:

- Location of the site and distribution of land use on or adjacent to the site;
- Consistency with the Critical Area regulations;
- Potential impacts on water quality;
- Potential impacts on significant natural features (tidal and nontidal wetlands, wooded areas, plant and wildlife habitat identified as State or local importance, etc.);
- Limitations on development due to soil or slope constraints;
- Existing and proposed roads and transportation networks;
- Proposed open space;

- Location and adequacy of proposed utilities; and
- > Proposed sediment and erosion control and stormwater management plans.

Regarding the approval of final plats, detailed information is required on lot lines, building setbacks, roads, utilities, and natural features to be left undisturbed, including any Buffer areas needed to address requirements of the Natural Resources District (outside of the Critical Area) or the Critical Area. It shall also be required that the final plat be accompanied by a Public Works Agreement certifying that sediment control and stormwater management plans have been approved, and that measures such as conservation easements, homeowner agreements, or similar instruments have been instituted to ensure that Buffer areas, nontidal wetlands, and other significant natural features are protected in perpetuity.





Chapter 3

WATER DEPENDENT FACILITIES

I. REQUIREMENTS OF THE CRITICAL AREA CRITERIA

The Criteria defines water-dependent facilities as "those structures or works associated with industrial, maritime, recreational, educational, or fisheries activities that require location at or near the shoreline within the Buffer." Examples of such facilities are ports, the intake and outfall structures of power plants, water-use industries, marinas and other boat docking structures, public beaches, and other public water-oriented recreation areas (ie, community and con-commercial activity areas), and fisheries activities.

According to the Criteria, water dependent facilities can be located in the Buffer area of those lands designated as IDA or LDA if it can be shown that:

- The facility is water-dependent;
- > The project meets a recognized private right or public need;
- Adverse effects on water quality, fish, plant, and wildlife habitat are minimized;
- Insofar as possible, nonwater-dependent structures or operations associated with water-dependent projects or activities are located outside of the Buffer.

Facilities associated with public beaches and other public water-oriented recreation/education areas, fisheries activities, or scientific research efforts can be located in the Buffer of lands designated as RCA provided that certain conditions are met.

To ensure that the potential adverse impacts of water-dependent facilities are minimized, the Criteria require that local jurisdictions develop a planning process to ensure that the following factors are considered in determining areas suitable for new or expanded water-dependent facilities:

- The activities shall not significantly alter existing water circulation patterns or salinity regimes;
- The water body upon which the activities are proposed has adequate flushing characteristics in the area;
- Disturbance to wetlands, submerged aquatic vegetation, or other areas identified as important aquatic habitat will be firstly avoided or minimized;

- Adverse impacts to water quality that may occur as a result of the activities, such as nonpoint source run-off, sewage discharge from land activities or vessels, or pollutant run-off from boat cleaning and maintenance operations, are firstly avoided or minimized;
- Shellfish beds shall not be disturbed or be made subject to discharge that will render them unsuitable for harvesting;
- Dredging shall be conducted in a manner, and using a method, which causes the least disturbance to water quality and aquatic and terrestrial habitats in the area immediately surrounding the dredging operation or within the Critical Area, generally;
- Dredged spoil shall not be placed within the Buffer or elsewhere in that portion of the Critical Area that has been designated as a Habitat Protection Area except in previously approved channel maintenance disposal areas or as used for shore erosion protection measures;
- > Interference with the natural transport of sand shall be firstly avoided minimized.

The Criteria also establish specific conditions relating to the following types of water-dependent facilities: ports, industrial facilities, marinas and other commercial maritime facilities, community piers and other related noncommercial boat docking and storage facilities, public beaches and other public water-oriented recreation or education areas, scientific research facilities and commercial fishing facilities.

New commercial marinas and related maritime facilities are not allowed in RCA. However, existing commercial marinas located within the RCA may be permitted to expand if it can be shown that the expansion will result in an overall improvement in water quality at the marina site or a reduction in the pollutant loading from the marina. New marinas, which can be located in LDA or IDA, must establish a means of minimizing the discharge of bottom wash waters into tidal waters as a condition for their approval. New and existing marinas must meet the sanitary requirements for such facilities established by the Maryland Department of the Environment (MDE).

New or expanded community marinas and other noncommercial boating, docking, and storage facilities may be located in the Buffer throughout the Critical Area if they meet the following conditions:

- The facilities do not offer food, fuel, or other goods and services for sale and do provide adequate and clean sanitary facilities;
- The facilities are community-owned, established, and operated for the benefit of the residents of a platted and recorded riparian subdivision;
- > The facilities are associated with a residential development and are consistent with all of the standards and regulations for the Critical Area;
- Disturbance to the Buffer is the minimum necessary to provide a single point of access to the proposed facilities (3 feet wide, or 6 feet wide to accommodate Americans With Disabilities (ADA) wheel chair access);

- If community piers or slips are provided as part of a development built or constructed after June 24, 1988, private piers in the development are not allowed. Private piers are not otherwise regulated by the Criteria; and
- > The number of slips or piers, permitted at the facility shall be the lesser of a or b below:
 - a. One slip for each 50 feet of shoreline in the subdivision in the IDA and LDA, and one slip for each 300 feet of shoreline in the subdivision in the RCA; or
 - b. A density of slips or piers according to the following:

Number of Platted Lots or Dwellings in the Critical Area Subdivision	Number of Permissible Slips and Private Piers
up to 15	1 for each lot
16 - 40	15 or 75%, whichever is greater
41 - 100	30 or 50%, whichever is greater
101 - 300	50 or 25%, whichever is greater
Over 300	75 or 15%, whichever is greater

Public beaches or other public water-oriented recreation or education areas including, but not limited to, publicly owned boat launching and docking facilities and fishing piers are allowed in the Buffer within Intensely Developed Areas, as well as areas for passive recreation, nature study, hunting and trapping, and for education. Elsewhere in the Critical Area Buffer, they must meet the following conditions:

- Adequate sanitary facilities are provided;
- Service facilities are located outside the Buffer;
- > Permeable surfaces are used as the primary surfacing material;
- > Disturbance to vegetation is firstly avoided or otherwise minimized;
- Habitat Protection Areas are protected; and
- All nonwater-dependent structures or facilities associated with these projects are located outside of the Buffer.

Water-dependent scientific research facilities operated by governmental agencies or educational institutions can be located in the Buffer as long as all associated nonwater-dependent structures or facilities are located outside of the Buffer.

Commercial water-dependent fisheries facilities including, but not limited to, structures for crab-shedding, fish off-loading, docks, and shore-based facilities necessary for fisheries activities are allowed in the Buffer throughout the Critical Area.

II. SIGNIFICANT ISSUES AND FACTORS

The major issues associated with water-dependent facilities are development of a planning process for identification of areas suitable for sites of water-dependent facilities, and development of an implementation program for ensuring that new or expanded facilities are developed in a manner that minimizes adverse impacts on the Buffer, on water quality and on fish, plant and wildlife habitat.

DEVELOPMENT OF PLANNING PROCESS FOR THE LOCATION OF WATER-DEPENDENT FACILITIES

There are two existing commercial/industrial facilities that require intrusion into the Buffer. The Vulcan Materials quarry operation along the Susquehanna River has docking facilities to allow water transport of the rock, sand, and gravel materials mined there. The other facility is the Exelon Power Company electric generating plant on the Perryman peninsula, which requires a utility corridor for secondary intake and output water pipes.

Table 2 lists the existing marinas, boat launching ramps and associated facilities in Harford County's Critical Area. Figures 4 and 5 show the locations of these facilities in the Critical Area. The potential for additional marinas in the County is not great because of the shallow water depths, extensive marsh areas, and the limitation on large boat transit into the Chesapeake Bay due to the Amtrak bridges that cross the Gunpowder and Bush Rivers.

TABLE 2

EXISTING MARINAS AND OTHER RECREATIONAL BOATING FACILITIES IN HARFORD COUNTY'S CRITICAL AREA

MARINAS		PIERS AND LAUNCHES	
Bush River Yacht Club	3 acres,	Elks Club	pier
Long Bar Harbor Road	145 slips	Riverview Drive	
Abingdon, MD 21009	_	Abingdon, MD	
410-676-1122		-	
Gunpowder (Oasis Marina)	11 acres,	Freys Landing	undeveloped launch
510 Riviera Drive	290 slips,	Freys Road	
Joppa, MD 21085	1 launch,		
	180 storage spaces		
Otter Point Yacht Club	PRIVATE	Mariner Point Park	39 acres,
600 Otter Point Road	0.3 acres,	Kearney Drive	4 launches
Abingdon, MD 21009	58 slips,	Joppa, MD 21085	developed park land
410-676-1744	32 parking spaces		
Flying Point Marina	10 acres,	Otter Point Landing	1 acre,
324 Flying Point Road	119 slips,	Otter Point Road	1 fishing pier,
Edgewood, MD 21078	125 parking spaces,		1 launch
410-676-7311	1 launch		
Long Bar Harbor Marina	7.5 acres,	Willoughby Beach	1.3 acres,
4228 Birch Avenue	32 slips,	Public Landing	pier,
Abingdon, MD 21009	parking spaces	Kennard Avenue	launch
410-679-0880			
			1
		Susquehanna State	launch
		Park	
		(Lapidum)	
	TT		1
		Flying Point Park	fishing pier,
		Kennard Avenue	2 launches
		Edgewood, MD	

Sources: Harford County Chamber of Commerce Harford County Parks and Recreation Harford County Department of Planning and Zoning

FIGURE 4



MARINAS AND PUBLIC LANDINGS IN THE SUSQUEHANNA RIVER & SWAN CREEK PORTIONS OF THE CRITICAL AREA

FIGURE 5



MARINAS AND PUBLIC LANDINGS IN THE GUNPOWDER RIVER & BUSH RIVER PORTIONS OF THE CRITICAL AREA Grounds. Nevertheless, Harford County shall consider several factors when evaluating proposals for new or expanded marinas (or other water-dependent facilities) in the Critical Area, detailed below:

- Significant impacts to submerged aquatic vegetation beds, marsh areas, spawning or nursery areas of anadromous fish, the habitats of rare or threatened species and species of local significance, or habitats of local significance are not unacceptable. Less severe impacts require mitigation. In addition, mitigation must be provided for any significant impacts on shallow water habitats (areas with depths of less than four feet) from dredge or fill operations.
- Areas with high shoaling and sedimentation rates or long access channels shall be avoided as sites for water-dependent facilities due to the significant amount of dredging required. The impacts of the proposed dredging on aquatic habitat, circulation pattern, salinity regimes, and the availability of appropriate dredge material disposal sites shall also be considered. Areas designated as Habitat Protection Areas, including all Buffers, are not acceptable areas, except where there is an existing channel maintenance dredged material disposal area, or where the dredged material is used for shore erosion protection. Utilization of the Best Management Practices for reducing impacts associated with dredging operations, as described in Appendix E, is required.
- Interference with navigation, as determined by Maryland Department of the Environment, caused by the proximity of a boating facility near State or federally maintained channels constitutes grounds for denial of a proposed project.
- Location of new facilities in areas with flushing rates of five days or greater as determined by using the EPA flushing model documented in the publication, *Coastal Marinas Assessment Handbook* are considered unacceptable. Projects in proposed areas with poor to fair water quality conditions, as determined by State Water Quality Standards, are required to show that stormwater management measures and associated Best Management Practices instituted as part of the project will result in a net improvement in water quality conditions. Projects proposed in good water quality conditions are required to show that they will not result in a deterioration of water quality conditions.
- ➤ New nonwater-dependent facilities must be located outside of the Buffer. Adequate road access to the site must be available, and appropriate stormwater management measures and sewage disposal facilities must be provided. The location of new marinas and commercial or industrial operations will be prohibited in areas designated as RCA. As a condition for approval of the expansion of existing marinas in the RCA, appropriate measures to improve the water quality conditions are required. Water quality conditions at the site and the quality of the runoff from the site shall be improved. Such improvement may include the installation of pump-out facilities.

DEVELOPMENT OF AN APPROPRIATE IMPLEMENTATION PROGRAM

In order to ensure that the potential adverse impacts of new or expanded water-dependent facilities are adequately addressed, provisions enacting the considerations discussed in the previous section have been included in the Zoning Code. The type of information required of an applicant so that the Department of Planning and Zoning can adequately review proposed projects is discussed in detail in Appendix E. Such information includes the relationship of the proposed site to submerged aquatic beds, wetlands, and other

significant fish, plant, and wildlife habitats, existing substrate conditions, existing water depths, water quality conditions, and the characteristics for the on-shore portion of the facility.

It is also important to ensure that appropriate Best Management Practices are utilized for activities at the marinas in order to minimize adverse impacts on water quality and aquatic resources. Best Management Practices include the use of porous surfaces and retention of vegetation wherever possible, provision of adequate toilet facilities and trash receptacles, and in the case of boat washing facilities, the use of measures to prevent discharge of foulants, oil/grease, and detergents to tidal waters, etc. In addition, provision has been made for review by the Department of Planning and Zoning for proposed community piers and public access facilities to ensure that the conditions of the Criteria described in Section I above are met.

III. EXISTING REGULATORY AND MANAGEMENT PROGRAMS

FEDERAL REGULATORY PROGRAMS

In accordance with Section 10 of the Rivers and Harbor Act of 1899 and Section 404 of the Clean Water Act of 1977, the U.S. Army Corps of Engineers, in conjunction with other federal agencies, regulates any construction, excavation, or deposition of materials in navigable waters and the discharge of fill or dredged material in all other waters of the United States, including adjacent wetlands. Thus, marinas, piers, mooring buoys, boat launching ramps, and any other facilities placed in wetlands, tidal waters, or streams must receive a permit from the Corps of Engineers. The roles of various federal agencies in this regulatory process are shown in Table 3. In making decisions regarding proposed projects, the Corps also considers any comments submitted by State and local agencies, interested organizations, or the public. The main factors considered by the Corps when reviewing proposed projects are:

- Keeping waterways open to navigation;
- > Prohibiting obstruction of channels or access to navigable waters;
- > Potential impact of the project on fish and wildlife resources;
- > Potential impact of the project on water quality;
- Protection of historical, scenic, and recreational areas;
- Impacts of dredging activities; and
- Selection of appropriate dredged material disposal areas.

As noted below, the Corps must receive water quality certifications and Coastal Zone Management consistency determinations from the State prior to approving project proposals.

TABLE 3

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AGENCY	AUTHORITY	FUNCTION
U.S. Army Corps of Engineers	Section 404, Federal Clean	Reviews and evaluates
	Water Act	applications, issues public
	Section 10, Rivers and Harbors	notices, coordinates with other
	Act of 1899	agencies at all levels, issues or
	National Environmental Policy	denies permits.
	Act	
	Fish and Wildlife Coordination	
	Act	
U.S. Department of the Interior:	National Environmental Policy	Reviews and evaluates projects
Fish and Wildlife Service	Act	based upon the impacts to fish
	Fish and Wildlife Coordination	and wildlife.
	Act	
Environmental Protection	Federal Clean Water Act	Reviews and evaluates the
Agency		impacts on water quality and
		aquatic resources. Has final
		authority regarding these
		concerns.
National Marine Fisheries	Fish and Wildlife Coordination	Reviews and evaluates projects
Service	Act	based upon the impacts to
		marine fisheries and shellfish
		fisheries.

FEDERAL AGENCIES INVOLVED IN REVIEW OF MARINAS AND OTHER WATER-DEPENDENT FACILITIES

STATE REGULATORY PROGRAMS

All activities proposed to be undertaken in tidal waters or tidal wetlands must receive a State wetlands permit or license from the State of Maryland. Specifically, activities occurring below the mean high tide line require a wetlands license from the Board of Public Works. Activities proposed in areas containing marsh vegetation that are periodically flooded (at least once a year) require a permit from the Department of Environment. In both cases, application is made to the Wetlands Permits Division of the Department of Environment since it advises the Board of Public Works on wetlands applications. The Wetlands Permits Division coordinates its review of proposed projects with the Corps of Engineers and considers comments made by other State agencies, local governments, and other interested parties in making its decisions. The roles played by the various State agencies in reviewing proposed projects, including marinas and other related facilities, are summarized in Table 4. The factors considered by the Wetlands Division in making a decision on proposed projects include the following:

> The location of a boating facility or its associated activities should be such that it does not create
or aggravate:

- a. Adverse impacts on wetlands, aquatic resources, and navigation;
- b. Congestion and safety problems;
- c. Turbidity or other adverse water quality impacts;
- d. Shore erosion problems; and/or
- e. Other adverse environmental impacts.
- Encouragement of centralized, common boating facilities for subdivision developments or communities;
- Limitations on artificial channeling and avoidance of dead-end or deep canals;
- Encouragement of extending docking facilities to deep water as an alternative to dredging, when feasible;
- Ecologically sound design of bulkheads and shore erosion protection measures (e.g., placement behind, rather than in front of, a marsh fringe, use of vegetative measures/rip rap whenever possible), and normally not permitting such work where it would adversely affect navigation, surface drainage, significant flora or fauna, and the like;
- Use of only such filling as is necessary for a shore protection work and prohibition on filling to create fast land;
- Denial of nonwater-dependent uses of wetlands (i.e., residential structures, parking lots, restaurants or factories);
- > Prohibition of navigational or water exchange obstructions; and
- Encouragement of the siting of boat facilities in areas with optimum conditions (e.g., location in lower tributary is preferred over headwater areas to encourage flushing and proximity to deep water; a location site that does not interfere with existing fishing, water recreation, bridges, and the like; location to avoid necessity of crossing vegetated wetlands; and limitation of structural encroachment into channels).

TABLE 4

STATE AGENCIES INVOLVED IN REVIEW OF	
MARINAS AND OTHER WATER-DEPENDENT FACILITIES	

AGENCY	AUTHORITY	FUNCTION
Maryland Department of Environment	Title 16, Environment Article	Reviews and evaluates applications for issuance or denial of wetlands licenses and
	Tidal Wetlands Acts	permits, provides recommendations for wetland protection and preservation.
	Section 401 & 404, Federal Clean Water Act	Reviews and evaluates COE permit applications for compliance with water quality standards, issues Water Quality Certificates.
Maryland Department of Environment, Nontidal Wetlands Division	Title 9, Environment Article	Reviews and evaluates applications for wetland permits, coordinates with COE for Section 404 Wetlands Joint Application Permits, issues or denies wetland permits.
Board of Public Works	Tidal Wetlands Acts	Reviews and issues wetland licenses for work in State wetlands, provides advisory comments from State Wetlands Permits Division.
Department of Natural Resources & Critical Area Commission	Section 10.2A.03, Natural Resources Article COMAR 27.01.09.03 COMAR 27.01.09.04 COMAR 27.02.05.12	Reviews permits for impacts to State's rare, threatened, or endangered species, colonial waterbird nesting sites, historic waterfowl staging areas, and forest interior dwelling birds.
Department of Natural Resources Fisheries Service	Section 4.2.A.03, Natural Resources Article COMAR 27.01.09.04 COMAR 27.02.05.12	Reviews permits for impacts to anadromous fish.

LOCAL REGULATIONS

Within the Chesapeake Bay Critical Area, the County's Natural Resources District (NRD) regulations have been replaced with the Critical Area Program Ordinance, as described above in Chapter 2. County regulations also limit the extension of structures from the shoreline such as docks, piers, or boathouses to no more than 25% of the distance to the opposite shore or two hundred fifty (250) feet, whichever is less. Presently, marinas, boat launching facilities, and storage and repair facilities are permitted by right in areas zoned B3, CI or GI (General Business, Commercial and General Industrial Districts) and by Special Exception in other areas.

IV. MODIFICATIONS MADE TO LOCAL REGULATIONS AND MANAGEMENT PROGRAMS

As part of its Critical Area Program, Harford County has instituted a planning process for the review and approval of proposed new or expanded water-dependent facilities. Proposed facilities will be reviewed to ensure that their adverse impacts are minimized on water quality, water circulation regimes, wetlands, submerged aquatic vegetation and their important aquatic habitats, longshore transport, and the Buffer and other Habitat Protection Areas. The location of new marinas will be prohibited in areas designated as RCA. Appendix E contains a description of the information that will be required for proposals for water dependent facilities and the best management practices that new or expanded facilities will be required to utilize.

Provision has also been made in the Critical Area for review and approval by the Department of Planning and Zoning of community piers to ensure that they meet the slip limitations of the Criteria, namely that they serve the residents of riparian subdivisions approved in accordance with the provisions of the Criteria (discussed in Chapter 2 and elsewhere), do not offer food, fuel, etc. for sale, provide adequate sanitary facilities, and are used instead of private piers.

Non-water dependent structures, including boat houses and renewable energy generating systems, shall not be permitted on piers, whether or not they are privately, publicly, or commercially owned.

The Zoning Code contains the following requirements for public beach areas or other public wateroriented recreation or education areas to be located in the Buffer including publicly owned boat launching and docking facilities:

- Adequate sanitary facilities shall be present;
- Service facilities are located outside of the Buffer;
- > Permeable surfaces are used wherever possible (not eligible for mitigation credit); and
- > Disturbance to natural vegetation is firstly avoided or otherwise minimized.

Similarly, water-dependent research facilities and activities proposed within the Buffer are required to ensure that adverse impacts are minimized on water quality, significant fish, plant, and wildlife habitat, and ensure that associated nonwater-dependent structures or facilities are located outside of the Buffer.



Chapter 4

SHORE EROSION PROTECTION

I. REQUIREMENTS OF THE CRITICAL AREA CRITERIA

The Criteria require that local jurisdictions designate and map the following shoreline areas:

- Shoreline areas where no significant shore erosion occurs;
- Shoreline areas of erosion where nonstructural measures would be a practical and effective method of erosion control; and
- Shoreline areas of erosion where only structural measures would provide effective and practical erosion control.

Areas of significant erosion are defined as those areas that erode two feet or more per year. The Criteria further provide that structural control measures shall be used only in areas where nonstructural measures are impractical or ineffective. Where structural erosion control is necessary, the measure that best provides for conservation of fish and plant habitat shall be used where practical and effective.

II. THE LIVING SHORELINE PROTECTION ACT OF 2008

In 2008, the Living Shoreline Protection Act was passed by the Maryland General Assembly. It required that improvements to protect a person's property against erosion shall consist of nonstructural shoreline stabilization measures that preserve the natural environment, except in certain situations. The Maryland Department of Environment will identify and map the areas that are appropriate for structural shoreline stabilization (ex. bulkheads/rip rap). Structural measures may be permissible in some areas where the property owner can demonstrate to Maryland Department of Environment's satisfaction that nonstructural measures are not feasible due to heavy tides, excessive erosion, and/or areas that are too narrow for effective use of nonstructural shoreline stabilization measures.

APPROPRIATE USE OF STRUCTURAL AND NONSTRUCTURAL MEASURES FOR SHORELINE EROSION CONTROL

It should be noted that most of the County's tidal shorelines, particularly those along the Chesapeake Bay, are located on the Aberdeen Proving Ground that is in the jurisdiction of the federal government. Significant portions of the County's shoreline are bordered by marsh areas, have no appreciable erosion, and thus need no shore erosion protection. Therefore, according to the Criteria, nonstructural measures must be the first type considered along the remainder of the shoreline when selecting an appropriate shore erosion protection measure. A description of historical shore erosion processes in Harford County can be found in Appendix F.

The final determination of whether a nonstructural measure would be appropriate at a particular site will require field analysis by the Maryland Department of Environment. Nevertheless, certain decisions can be made as to whether nonstructural measures are appropriate in a given area. Along certain shorelines, the use of nonstructural measures may not be appropriate because of a predominance of existing structural measures or the presence of a water-dependent facility requiring a bulkhead for its operation.

Nonstructural shore erosion protection can take several forms. The simplest method involves planting existing shores with marsh grass throughout the intertidal zones as well as above the high tide line. Such an approach is likely to be appropriate in cases where the shores are sandy, with an appropriate near-shore profile and a continued source of sand is available for long-shore transport. In other cases, new shores can be created by sloping the existing bank seaward and placing stone containment structures at the edge of the new shore. Stabilization of the new shore is accomplished by planting appropriate vegetative materials. In all cases, at least six hours of direct sunlight along the shoreline is needed to ensure appropriate vegetative growth.

There are certain situations located along the shoreline where slope stabilization should occur. These areas are defined as where erosion of the slope in the Buffer is occurring above mean high water. Stabilization of the slope may only occur in accordance with an approved Buffer Management Plan reviewed and approved by Planning and Zoning, and in consultation with the Soil Conservation District and the Critical Area Commission.

ENSURING APPROPRIATE USE OF SHORE EROSION PROTECTION MEASURES

The Criteria require that nonstructural measures be used whenever possible in order to conserve and protect plant, fish, and wildlife habitat. In cases where structural measures must be used, the measure that is practical and effective while best providing for conservation of fish and plant habitat shall be used. In most cases, the use of stone revetments (rip-rap) would be most appropriate. They can be designed to fit the existing shape and height of the shoreline, with the slope and rough surface area reducing wave energy. Also, a revetment's increased surface area (compared to a bulkhead) and surface irregularities produce excellent habitat for marine animals and do not create a barrier for the movement of creatures between upland areas and the water.

Provisions in the Zoning Code require an Erosion and Sediment Control Plan to be submitted to Planning and Zoning where structural measures must be used. The information required by the Army Corps of Engineers and the Department of the Environment for a 404 Joint Permit Application is sufficient for submission as an Erosion Control Plan.

III. EXISTING REGULATORY AND MANAGEMENT PROGRAMS

STATE AND FEDERAL REGULATORY PROGRAMS

STATE WETLANDS PERMIT/LICENSE

Building a shore erosion control structure usually involves construction at, or seaward of, mean high tide, and therefore, compliance with State requirements for wetland alteration is necessary. The State Wetlands Law (Environment Article, Title 16) requires property owners to obtain permission from the State before altering tidal wetlands. Alterations include any form of filling or dredging; construction of bulkheads, revetments, boat ramps, below-ground utilities, storm drain structures, groins, breakwaters, jetties, and similar structures or activities.

A State wetlands license is required from the Board of Public Works in the case of projects proposed below mean high tide. A State wetlands permit is required from the Maryland Department of Environment in the case of projects proposed waterward of the mean high tide line (ie, projects in or over the water) that are subject to periodic flooding (at least once a year), or that support aquatic growth. In the case of both types of projects, application should be made to the Department of Environment since it makes recommendations to the Board of Public Works on projects requiring a State wetlands license. In its review of such projects, the Department of Environment examines the project's potential adverse environmental impacts, particularly those affecting vegetated marsh areas and areas of submerged aquatic vegetation.

U.S. ARMY CORPS OF ENGINEERS PERMITS

A Section 10 and/or Section 404 permit from the U.S. Army Corps of Engineers is also likely to be required for installation of shore erosion control measures. In the use of nonstructural measures and revetment (rip-rap) structures, a general permit may be obtained which gives automatic approval to a project if certain conditions are met and State approval is obtained.

EROSION AND SEDIMENT CONTROL PLAN

If a shore erosion project involves any substantial soil disturbance, an Erosion and Sediment Control Plan for the project must be approved by the Soil Conservation District and the County.

STATE TECHNICAL AND FEDERAL ASSISTANCE PROGRAMS

LIVING SHORELINES PROGRAM

Maryland Department of Natural Resources distributes funds for this program and provides technical and financial assistance to property owners with shore erosion problems. The office responds to requests by inspecting the property, where inspectors will give the property owner a package that includes a loan application, and explainthe loan process. Under the authority of Natural Resources Article 8-1001 et. seq., individual landowners, municipalities, and counties may apply for 5, 15, and 20 year interest-free loans for living shoreline projects. Landowners who do not receive loans can still receive technical assistance and advice from the Department of Natural Resources and the Department of the Environment.

IV. MODIFICATIONS MADE TO LOCAL REGULATIONS AND MANAGEMENT PROGRAMS

Harford County has a two-step approach to ensuring that appropriate shore erosion protection measures are used along its shorelines. First, a provision of the Critical Area requires that shore erosion problems be addressed by considering nonstructural measures first, then revetments, and then bulkheads to be used only where they are needed as part of a water-dependent facility or where nonstructural or revetment measures would be impractical or ineffective. These provisions were strengthened per the requirements of the Living Shorelines Protection Act of 2008, mentioned previously.

Secondly, staff in the Department of Planning and Zoning undertake a public awareness/educational program by meeting with landowners with eroding shorelines in order to let them know that nonstructural measures are the preferred approach and that interest-free funding can be obtained from the State Nonstructural Shore Erosion Control Program. As mentioned earlier in this chapter, structural measures will only be permitted in certain circumstances. Maryland Department of the Environment will decide if structural shore erosion control is the best option by taking into account all conditions and factors found on site.



Chapter 5

FOREST AND WOODLAND AREAS

I. REQUIREMENTS OF THE CRITICAL AREA CRITERIA

The protection and maintenance of wooded areas is a major objective of the Chesapeake Bay Critical Area Program's Development Criteria. Wooded areas are important because of their value for water quality protection (through sediment and nutrient removal, shading of streams, etc.), wildlife habitat, watershed protection, recreation, timber production, and aesthetic enhancement.

The Criteria recognizes two types of wooded areas: forests and developed woodlands. Forests are defined as "biological communities dominated by trees and other woody plants, excluding orchards, covering a land area of 10,000 or more square feet, including an area having at least 100 trees per acre, if at least 50% of the trees have a DBH of 2 inches or more, and may have been cut, but is not cleared." Developed woodlands are defined as "an area of trees or natural vegetation that may be interspersed with residential, commercial, industrial, institutional, or recreational development". The same protection measures required for areas designated as forest are also required for those areas designated as developed woodlands.

The Criteria specify the following requirements regarding wooded areas in the Critical Area. In addition, it should be noted that Chapter 2 contains other requirements regarding limitations on the clearing of wooded areas for development, and the requirements for canopy replacement under specific conditions:

- Forests and developed woodlands shall be identified and mapped in the Critical Area;
- Wooded areas that have Habitat Protection Areas shall be identified and mapped (see Chapter 9);
- Incentives shall be provided through the utilization of programs to convert current land uses to forested conditions;
- ➢ Forest Management Plans shall be developed for all timber harvesting operations affecting one acre or more of forest or developed woodland. Such plans are to include measures to protect surface and groundwater quality, Habitat Protection Areas, and the continuity of habitat (particularly through scheduling the location, size, timing and intensity of harvest cuts, and through the use of afforestation and reforestation). Timber harvesting is not permitted in the Buffer or expanded Buffer. Appendix C, as amended, describes the information required for a Forest Management Plan;

- Sediment Control Plans shall be developed for all timber harvests involving land disturbance of 5,000 square feet or more, including harvests on agricultural land. Appendix C, as amended, describes the information required for a Sediment Control Plan; and
- A Buffer Management Plan shall be prepared for any disturbance of land within the Critical Area Buffer, including any expanded Buffer areas, as specified in Appendix K. Clearing is not permitted in the Buffer.

II. SIGNIFICANT ISSUES AND FACTORS

The following are major factors pertaining to wooded areas in the Critical Area, other than those discussed in Chapter 2 relating to development activities:

- Identification and mapping of wooded areas in the Critical Area, including those containing Habitat Protection Areas; and
- > Implementation of programs to encourage conversion of other lands to forested conditions.

IDENTIFICATION AND MAPPING OF FORESTED AREAS IN THE CRITICAL AREA

With assistance from the Department of Natural Resources, wooded areas were originally mapped by the Society of American Foresters through aerial photography interpretation and selective site visits. Wooded areas were remapped in digital format during the 1995 Comprehensive Review of the Critical Area Program. The vegetation layer of the GIS was used to map the extent of forest, as determined from aerial photographs taken in 1990. The forested areas of the County were again mapped in 2009 as part of the Natural Resources Plan update, using 2004 County GIS data.

It should be noted that mapped forest data will have to be refined using information obtained by field investigation at the time an individual Forest Management Plan is developed.

PROGRAMS TO ENCOURAGE WOODLAND STEWARDSHIP

The County promotes the creation of new wooded areas. Emphasis is placed on re-vegetating areas within the 100-foot Buffer adjacent to tidal waters and perennial and intermittent streams beyond the Critical Area. This will promote the stabilization of eroding lands and the planting of trees and shrubs in developed areas to create wildlife habitat. Cooperative efforts with community associations are undertaken to locate unstable areas and to carry out the actual planting and cultivation of the trees, shrubs, and other appropriate vegetation.

III. EXISTING REGULATORY AND MANAGEMENT PROGRAMS

FORESTRY INCENTIVE PROGRAMS

In addressing the requirements of the Criteria, Harford County will utilize the following existing programs that promote the retention or conversion of lands as forestland.

FOREST CONSERVATION AND MANAGEMENT PROGRAM

The Forest Conservation and Management Program is a voluntary program administered by the Maryland Department of Natural Resources for owners of contiguous forested parcels of five acres or more excluding the home site. The intent of this program is to preserve forestlands from alternative uses and conserve the resource using the principles of scientific forest management. Under this program, the property owner's tax assessment is reduced to or kept at an agricultural land assessment. To be eligible, the property owner must agree to follow an approved Forest Management Plan prepared by a registered professional forester for at least fifteen years. Newly planted land must be fully established (400 live, well-spaced seedlings per acre) for one year before it qualifies.

WOODLAND INCENTIVES PROGRAM

The Woodland Incentives Program, also administered by the Department of Natural Resources, provides up to 565% of the cost of reforestation, afforestation, and timber stand improvement. Non-industrial, private woodland owners are eligible for the program if they own 5-1,000 contiguous acres of private woodland. The landowner must have a Forest Management Plan that describes and specifies the location of the property on which the practices are to be implemented, and documents the landowner's commitment to use cost-share funds to implement the practices. The landowner must not be receiving or applying for federal cost-share for the same practice on the same acreage, and must agree to limit cost-share funds to a maximum of \$5,000 each year or \$15,000 for a three-year accomplishment. The owner must also commit to at least fifteen years of management, and allow access to his/her property for periodic inspections.

CONSERVATION BUFFER INITIATIVE PROGRAM

The Conservation Buffer Initiative Program, administered by the Maryland Department of Agriculture, has been established to encourage the planting of streamside buffers on farm land. Farmers who plant wooded or grass buffers along streams or field ditches with fencing, or who provide watercourse access between a waterway and an active livestock pasture with protective fencing, will be eligible for a one-time payment of up to \$3,500 per acre. Soil Conservation Districts provide free technical assistance to install the buffer. The farmer must agree to cease all nutrient applications in the planted buffer areas for a contract period of 5 or 10 years. Applications are accepted in the Spring and projects must be completed by the following Summer.

TREE-MENDOUS MARYLAND PROGRAM

The primary purpose of this program is to expand tree planting efforts by encouraging corporations, community groups, service organizations, and individuals to invest in tree planting. Individuals can purchase trees in honor or in memory of friends or loved ones that are planted in memorial groves in the region where the honoree lives/had lived. Community groups can purchase trees for planting on public open spaces.

CONSERVATION RESERVE PROGRAM

This is a federal incentive program to convert highly erodible land from agricultural commodity production to less intensive uses, such as pasture, permanent grass, legumes, forbs, shrubs, trees, or other permanent wildlife cover. Cost-share funding of 50% is available to agricultural producers for tree establishment, as well as annual rental payments for ten years while the practice is being maintained. A Conservation Plan, which covers 10-15 years, must be developed with, and approved by the Soil Conservation Service.

STATE CONSERVATION RESERVE PROGRAM

Maryland's Conservation Reserve Program provides technical and financial assistance to farmers to address soil, water, and other related natural resource concerns on their land. The Program encourages the conversion of highly erodible farm land and other environmentally sensitive areas to permanent woodland, grasses, filter strips, riparian forest, or shallow water habitat. The State Conservation Reserve Program offers \$50 per acre of land converted.

CONSERVATION RESERVE ENHANCEMENT PROGRAM

This is a federal-state initiative that pays farmers and landowners to remove environmentally sensitive cropland from production and plant streamside buffers or create wetlands. Landowners must sign a contract agreeing to take these sensitive lands out of production for a 10-15 year period. During this time they must agree to maintain grass, shrubs, trees, or wetlands. The Conservation Reserve Enhancement Program offers a one-time signup bonus of \$250 an acre, plus a soil rental rate. Participants in this program also have the option of selling a permanent easement on their land to the state of Maryland. This can be done directly or through cooperative contracts with the Rural Legacy Program. The local Soil Conservation District, the Department of Natural Resources, local government, or local land trust may administer the easements. Cost sharing is also available for the installation of best management practices on lands enrolled by the Conservation Reserve Enhancement Program.

FOREST LEGACY PROGRAM

The Maryland Forest Legacy Program will pay willing private landowners fair market value to acquire permanent conservation easements on their forested lands. To be eligible, the private forest must be located within a forest legacy area. Forest legacy areas must contain forested land that is at risk for conversion to non-forest uses. Also, these areas must provide one or more important public values such as scenic beauty, recreation, streamside forests, fish and wildlife habitat, and threatened and endangered species. Finally, forest legacy areas must allow for the continuation of traditional forest uses such as forest legacy area will take two steps. First, the landowners will sell or transfer some land rights, e.g., development rights or public access rights, while retaining ownership and the right to use the property in any way consistent with the easement. Second, the landowners participate in Maryland's Forest Stewardship Program through the development of forest stewardship plans, if they plan to manage an easement area.

Private landowners may contact their local forester for information on how to apply to the Forest Legacy Program. Applications will be prioritized and applicants will be notified if the Forest Service approves the application.

CONSERVATION EASEMENTS

The Maryland Environmental Trust is authorized to grant permanent easements on large acreages and significant habitat areas. Conditions for management are negotiable. An easement donation eligible for certain tax benefits.

MARYLAND AGRICULTURAL COST SHARE

The Maryland Department of Agriculture's program for control of water pollution provides cost- share assistance for approved Best Management Practices, including windbreaks and buffers, to control water pollution from soil erosion, nutrient runoff, and animal waste on agricultural land.

TREE FARM PROGRAM

The Tree Farm Program is a voluntary program administered in cooperation with the American Forest Council for property owners who have at least 10 acres. The purpose of the Tree Farm Program is to promote forestry awareness and forest stewardship through public education and through the recognition of landowners who enhance their forest resources using sound forest management practices. To be eligible, a property needs a written Forest Management Plan by a registered professional forester and a record of active management of the property as a tree farm.

INCOME TAX DEDUCTIONS

The Federal Income Tax Regulations allow limited annual deduction of operating or investment costs with special treatment for reforestation expenses. The regulations also allow the depletion of the owner's investment at the time of a timber harvest. In addition, public law 96-451 permits up to \$10,000 of capitalized reforestation costs each year to be eligible for a 10% tax credit (subtracted from taxes owed) and 7-year amortization (subtracted from gross income to compute adjusted gross income).

The State Income Tax Regulations allow owners or lessees of 10-500 acres of commercial forestland that is capable of growing more than 20 cu. ft./acre/year to deduct double the cost of reforestation or timber stand improvement operations from their federal adjusted gross income on their State Income Tax.

REGULATORY PROGRAMS

CHESAPEAKE BAY CRITICAL AREA MANAGEMENT PROGRAM

The Critical Area Management Program requires replacement of wooded areas lost to development within the IDA, LDA, and RCA by mitigation on either a 1:1 or 1:1.5 basis. Wooded areas cleared in violation of the Critical Area regulations within the Buffer must be replaced by mitigation at a rate of 4:1, and any wooded clearing violation outside of the Buffer requires mitigation at a rate of 3:1.

STATE REFORESTATION LAW 5-103

This law requires State, local, and private entities receiving State funds to minimize impacts and mitigate

for forest land lost, including all governmental units within the State and low income housing that receive State funds. Forest loss shall be minimized through adjustments in construction plans. If designs cannot be altered and forest land is lost, that loss must be replaced on a 1:1 basis on other government lands.

SEED TREE LAW 5-501

The objective of the law is to ensure reforestation of cut or cleared land. The law applies to areas of five acres or more where loblolly, short leaf, or pond pines constitute 25% or more of the live trees on each acre. Landowners can clear-cut, however, only after securing approval from the State Forester by agreeing to carry out an effective reforestation plan.

ROADSIDE TREE LAW

The purpose of this law is to ensure proper care of roadside trees in the interest of promoting and maintaining healthy trees and safe, unobstructed, and aesthetically pleasing public roads and rights-of-way. Any tree that grows in, or partly in, the right of way of any public road is considered a roadside tree. Under this law, a person may not undertake any treatment to any roadside tree without a permit from DNR except if the tree is uprooted; branches are broken and contacting wires; the tree is in a condition that presents an immediate danger to persons or property; or the tree is located along an unimproved dirt road.

SEDIMENT CONTROL REGULATIONS

Harvesting is explicitly included under the provisions of the State Sediment Control Program. Any forest harvest operations that disturb more than 5,000 square feet of land, requires crossing a stream that has a drainage area greater than 400 acres, or requires crossing a trout stream that has a drainage area greater than 100 acres, must have an Erosion and Sediment Control Plan as part of the forest harvest permit. The Harford Soil Conservation District, Harford County Department of Planning and Zoning, and the Harford County Department of Public Works, and Sediment Control Division must approve the forest harvest permit.

A Standard Erosion and Sediment Control Plan has been developed by the State Department of Natural Resources that can be used instead of a customized plan if:

- 1. Road cuts or fills are less than 3 feet wide;
- 2. Roads and trails have grades less than a 15%; and
- 3. Landings are located on slopes having less than 10% grade.

Among other provisions, the Standard Plan requires:

- Stabilization of access points to a site;
- Uncut buffer zones of at least 50 feet wide adjacent to perennial and intermittent streams, rivers, lakes, ponds, bogs, or marsh with an additional buffer required as the slope on the adjacent land increases. Cutting within the Critical Area Buffer is allowed in accordance with a special Buffer Management Plan designed by a registered professional forester in accordance with guidelines

established by the DNR;

- The laying out of haul roads and skid trails along natural land contours to avoid excessive cuts, hills, and grades;
- The avoidance of crossing perennial and intermittent streams by installing temporary bridges or culverts. Where such crossings cannot be avoided (in the case of streams with a drainage area greater than 400 acres, or designated trout streams with a drainage area greater than 100 acres), a permit from the Maryland Department of the Environment is required for such temporary crossings; and
- The prohibition of haul roads or skid trails in the Buffer area except those needed to provide access to required stream crossings.

IV. MODIFICATIONS MADE TO LOCAL REGULATIONS AND MANAGEMENT PROGRAMS

CHESAPEAKE BAY CRITICAL AREA

To be consistent with the provisions of the Criteria pertaining to wooded areas, the County has established a Forest and Woodland Protection Program with the following components:

- A Forest Conservation Element consisting of the application of the Roadside Tree Law and the measures described in Chapter 2, particularly the use of Forest Conservation Plans, in order to minimize the clearing of wooded areas for development purposes and requiring their replacement if the development occurs in the Critical Area;
- A Forest Management Element requiring the development of Forest Management Plans for timber harvesting activities in the Critical Area including those on agricultural lands. Such plans include provisions that recognize the Criteria limitations on harvesting operations and provide protection for Habitat Protection Areas, as well as ensuring the maintenance of the wooded areas for water quality protection and wildlife habitat values.

This Program was instituted through the Subdivision Regulations, and by inclusion of appropriate provisions in the Chesapeake Bay Critical Area Ordinance. A Standard Erosion and Sediment Control Plan is available for forest harvesting operations in the Critical Area that reflect the Criteria's requirement for a minimum 100-foot Buffer in which hauling roads or skid trails are not permitted, and in which no cutting can occur within 100 feet of tidal waters, tidal wetlands, or perennial streams.



Chapter 6

AGRICULTURAL ACTIVITIES

I. REQUIREMENTS OF THE CRITICAL AREA CRITERIA

"Agriculture" is described by the Criteria as "an activity related to the production or management of livestock, crops, vegetation, or soil, including tillage, harvest, fertilization, pest management, cropping, pasturing; or production of an agricultural product, including livestock, poultry, plants, trees, sod, food, feed, and fiber; or an activity that directly contributes to the production, conversion, processing, storage, or sale of agricultural products primarily generated onsite."

The objectives of the Criteria with respect to agricultural activities are to maintain agricultural lands in agricultural use to the maximum extent possible, and to ensure that agricultural activities do not adversely affect water quality or important plant and wildlife habitats identified as Habitat Protection Areas (see Chapter 9). Local governments are to develop measures for encouraging the preservation of agricultural lands and are to ensure that:

- > New agricultural land is not created by:
 - 1. Destroying seasonally flooded water regimes or wetlands;
 - 2. Clearing forests or woodlands on highly erodible soils or on slopes greater than 15%; or
 - 3. Clearing land that would adversely affect the Critical Area Buffer or other Habitat Protection Areas.
- Animal feeding operations (including retention and storage ponds, feed lot waste storage, and manure storage) minimize the contamination of water bodies;
- Habitat Protection Areas on agricultural lands are protected;
- Forest Management Plans are developed for timber harvesting on agricultural lands; and
- Soil and Water Conservation Plans are developed and implemented for all agricultural lands in the Critical Area.

There are special provisions of the Criteria relating to undertaking agricultural activities in the Critical Area Buffer, in addition to the prohibition of clearing vegetation as noted above. A 25-foot vegetated "filter strip" comprised of trees with a dense ground cover or a thick sod grass is to be maintained adjacent to tidal waters or tidal wetlands, the width of which is to be expanded by a distance of 4 feet for every 1%

of slopes greater than 6%. The Criteria allow the use of authorized measures to control noxious weeds including Johnson grass, Canada thistle, and multiflora rose, if they occur in the filter strip. In addition, the feeding or watering of livestock is prohibited within 50 feet of tidal waters, tidal wetlands, and tributary streams. All farming activities, including the grazing of livestock, are not to disturb stream banks, tidal shorelines, or Habitat Protection Areas. This requirement is not interpreted as requiring the fencing of streams unless a significant water quality problem exists.

II. SIGNIFICANT ISSUES AND FACTORS

The following are the major issues/factors associated with agricultural activities in the Critical Area:

- > Identification, inventory, and mapping of agricultural lands in the Critical Area;
- Methods for maintaining agricultural land in agricultural use;
- The development and implementation of soil and water conservation plans that ensure that Habitat Protection Areas are protected and that impacts on water quality are firstly avoided or otherwise minimized;
- Development of Forest Management Plans for timber harvesting on farms that are consistent with the provisions of the criteria; and
- Development measures to ensure that agricultural activities, particularly agricultural feeding operations, do not adversely affect water quality.

INVENTORY AND MAPPING OF AGRICULTURAL LANDS

With the assistance of the County Agricultural Preservation specialist and the Soil Conservation District, the agricultural lands in the Critical Area were identified and mapped. These agricultural lands fell into two categories: active farms and land leased for agricultural activities on an interim basis whose original purpose is nonagricultural (land in State and local parks, the site of the Baltimore Gas and Electric power plant, etc.). The main crop type is grain with some beans, hay grain, and some livestock being kept on several farms. As a result, there are no significant problems associated with animal waste operations in the Critical Area. Figures 6 and 7 show the location of farmed lands in the Critical Area of Harford County.

FIGURE 6



AGRICULTURAL LANDS IN THE SUSQUEHANNA RIVER & SWAN CREEK PORTIONS OF THE CRITICAL AREA

FIGURE 7



AGRICULTURAL LANDS IN THE GUNPOWDER RIVER & BUSH RIVER PORTIONS OF THE CRITICAL AREA

METHODS FOR MAINTAINING AGRICULTURAL LAND IN AGRICULTURAL USE

The majority of the agricultural lands in the Critical Area are zoned Agricultural (AG) which allows a development density of one unit per 10.99 acres. All of the agricultural lands have been included in the RCA portion of the Critical Area and have a density of one unit per 20 acres. As discussed in the next section, the County has an active agricultural land preservation program.

SOIL AND WATER CONSERVATION PLANS

Agricultural issues relating to protection of Habitat Protection Areas, development of Forest Management Plans, and protection of water quality are addressed by the Soil Conservation District. The Soil Conservation District works with owners or operators of agricultural lands in the Critical Area to develop Soil Conservation and Water Quality Plans. These plans have been developed for all of the agricultural properties in the Critical Area to address habitat protection, water quality concerns, and to refer property owners to the Department of Natural Resources to create a Forest Management Plan prior to the consideration of commercial timber harvesting.

This cooperative approach with landowners in the development and implementation of Soil Conservation and Water Quality Plans shall fully address the requirements of the Criteria regarding agricultural operations. If enforcement action is necessary to address water quality problems, the procedures discussed in the next section that have already been established by the Maryland Department of Environment and Department of Agriculture shall be utilized. The destruction or inappropriate alterations of Habitat Protection Areas on agricultural lands shall be considered a violation of the Critical Area Program and shall thus be pursued as a zoning violation.

III. EXISTING REGULATORY AND MANAGEMENT PROGRAMS

COOPERATIVE SOIL AND WATER CONSERVATION PLAN DEVELOPMENT AND IMPLEMENTATION

As noted previously, the development of Soil and Water Conservation Plans through a cooperative effort between the Harford Soil Conservation District and owners of agricultural lands is the keystone of the County's efforts to address the provisions of the Chesapeake Bay Critical Area Program Criteria relating to agricultural activities.

Financial assistance from Maryland's Agricultural Water Quality Cost Share Program can been sought to help finance the implementation of measures or best management practices needed to address water quality concerns identified in the Soil and Water Conservation Plans. The Program provides funding for such measures up to 87.5% of the total cost.

COUNTY AGRICULTURAL PRESERVATION PROGRAM

Harford County has been an active participant in the Maryland Agricultural Land Preservation Foundation and Maryland Environmental Trust Programs since 1977. Both programs rely on the voluntary sale of development rights and the placement of easements on the land. As a participant in the preservation programs, the County receives funding from the Maryland General Assembly to purchase development rights and place easements on volunteer land. When these initial funds have been used up, the State will provide 60% of the additional funds if the County contributes 40% of the funds required to purchase additional development rights and install easements.

COUNTY PRESERVATION DISTRICT

In 1993, Harford County also established its own agricultural preservation program. To qualify, participants must have a minimum acreage of 50 acres or more, unless the property is adjoining land that currently resides in the preservation district. The property must also meet the qualifications of having Class I, II, or III soils, and have extra development rights available on the parcel.

RURAL LEGACY PROGRAM

The Rural Legacy Program was created by the Department of Natural Resources in 2000. Participants in the Program must meet County and State approvals that will protect natural and scenic resources to foster rural industries such as agriculture and forestry. Applicants may apply annually to receive funding and protective easements.

REGULATION OF WATER POLLUTION CAUSED BY AGRICULTURE

The State Departments of Agriculture and Natural Resources and the Office of Environmental Programs have established procedures for addressing water pollution caused by agriculture. When a water quality problem is identified as a result of a citizen complaint or observance by State enforcement personnel, it is first referred to the local Soil Conservation District for a voluntary compliance approach. However, formal enforcement action is taken if one of the following conditions exists:

- A point source discharge is involved which lacks a National Pollutant Discharge Elimination System (NPDES) permit (i.e. a measurable, direct, surface-water discharge through a pipe, trench, or other structure that may be continuous or intermittent);
- Agricultural chemicals, crop by-products, or wastes have been dumped or placed in surface waters; or
- A condition exists which, if not corrected immediately, will result in locally significant or catastrophic pollution (including, but not limited to, failure of structures).

Under the voluntary compliance approach, contact is made by the local Soil Conservation District with the owner/operator of the property to identify the best management practices that will eliminate or greatly reduce the problem and make plans for their installation. If the owner/operator does not agree to the installation of the best management practices, then they will be formally notified by letter that they are in violation of State water quality standards and that remedial action is required. If the owner/operator still does not take remedial action, then legal enforcement action will ensue.

Food, Conservation Energy Act of 2008

In 2008, new legislation was passed and named The Food, Conservation, and Energy Act of 2008. This bill replaced the Food Security Act of 1985. The Food, Conservation, and Energy Act was also known as the U.S. Farm Bill that was a \$288 billion, five-year, agricultural policy bill that was passed into law by the United States Congress in June 2008. The bill was a continuation of the 2002 Farm Bill. It continues the United States' long history of agricultural subsidy as well as pursuing areas such as energy, conservation, nutrition, and rural development. Some of the programs listed below were to help facilitate this legislation.

CONSERVATION RESERVE ENHANCEMENT PROGRAM

The Conservation Reserve Enhancement Program is a voluntary land retirement program that helps agricultural producers protect environmentally sensitive land, decrease erosion, restore wildlife habitat, and safeguard ground and surface water.

CONSERVATION COMPLIANCE

Conservation compliance applies if a farmer continues planting annually tilled crops on highly erodible fields. To remain eligible for certain US Department of Agriculture (USDA) program benefits, a farmer must have developed, and be actively implementing, a locally approved conservation plan for the highly erodible fields.

SODBUSTER

Sodbuster applies if a farmer plants annually tilled crops on a highly erodible field (as determined by the USDA) that was not used for crop production during the period of 1981 to 1985. If a farmer plows such a highly erodible field, he must do so under a conservation system approved by the local conservation district in order to remain eligible for USDA program benefits.

CHESAPEAKE BAY WATERSHED CONSERVATION PROGRAM

This program is to assist producers in implementing conservation activities on agricultural lands in the Chesapeake Bay Watershed and to improve water quality and quantity through agreements with producers.

SWAMPBUSTER

Swampbuster is a program of Wetland Conservation Provisions of the USDA. The purpose of the provisions is to remove certain incentives to produce agricultural commodities on converted wetlands or highly erodible land, unless the highly erodible land is protected from excessive soil erosion. To remain eligible for certain USDA farm programs (some exceptions may apply), the farmer must discontinue production of annually tilled crops on newly converted wetlands.

IV. MODIFICATIONS MADE TO LOCAL REGULATIONS AND PROGRAMS

To comply with the provisions of the Criteria pertaining to agricultural activities, the County has established an Agricultural Protection Plan with the following components:

- ➤ A protection component that consists of changing the limit on the density of development on agricultural lands from one unit per ten acres, to one unit per twenty acres through their designation as RCA in the Critical Area. Any changes that may be made on the density of a development allowed on agricultural land located in coastal areas outside the Critical Area will result from the review currently being undertaken of the County's regulations relating to agricultural activities county-wide;
- Owners of agricultural land in the Critical Area have been made aware of the opportunity they have for placing their land in an Agricultural Preservation District and for selling a development rights easement on their property;
- A mitigation component whose objective is to ensure that the impacts of agricultural activities on water quality and Habitat Protection Areas are firstly avoided or otherwise minimized. The major mechanisms used to achieve this objective have been the development of Soil and Water Conservation Plans for agricultural lands in the Critical Area – and the implementation of the best management practices recommended in these plans – with state and federal cost-share funding. Such plans are reviewed by the Harford County Department of Planning and Zoning for consistency with the County's Critical Area Program; and
- A fact sheet was developed by the Department of Planning and Zoning specifying the provisions of the Criteria relating to agricultural activities. This fact sheet was attached as part of the Soil and Water Conservation Plan, thus ensuring that owners/operators of agricultural lands are aware of such provisions and will conduct their activities in a manner consistent with the Criteria. Appendix G contains a copy of a draft Memorandum of Agreement between the Harford Soil Conservation District and the Department of Planning and Zoning detailing the role each will play in the development and implementation of Soil and Water Conservation Plans in the Critical Area. All agricultural lands in the Critical Area of Harford County have Soil and Water Conservation Plans established with the Soil Conservation Service.

Criteria language has also been included in the Zoning Code:

- Requiring Soil Conservation and Water Quality Plans for agricultural lands in the Critical Area;
- Ensuring the protection of Habitat Protection Areas within agricultural lands;
- Requiring Forest Management Plans for timber harvesting on agricultural lands;
- Ensuring that new agricultural land is not created by:
 - 1. Diking, draining, dredging, or filling wetlands;
 - 2. Clearing on slopes greater than 15% or on highly erodible soils;

- 3. Clearing land that will adversely affect water quality or will destroy plant and wildlife habitat located in Habitat Protection Areas; and
- 4. Clearing existing vegetation within the Critical Area Buffer.



Chapter 7

SURFACE MINING

I. REQUIREMENTS OF THE CRITICAL AREA CRITERIA

The Criteria define surface mining as activities and uses that require breaking of the land surface to extract minerals; the processing of minerals; the extraction of sand, gravel, rock, etc.from borrow pits for highway construction purposes or other public facilities; the removal of overburden for mining, prospecting, or exploration purposes; and operations affecting one acre or more.

The requirements of surface mining in the Critical Area are to:

- Identify existing and suitable future sites for surface mining and determine appropriate postexcavation uses for such sites; and
- Minimize pollutant runoff from surface mining sites and ensure that surface mining does not occur in unsuitable areas, including the following:
 - 1) Areas where important natural resources such as threatened and endangered species, areas of scientific value, or rare assemblages of species occur such as those defined as Habitat Protection Areas;
 - 2) Areas where highly erodible soils occur;
 - 3) Areas where the use of renewable resource lands would result in the substantial loss of long-term productivity (25 years or more) of wooded areas, agriculture, or would result in the degradation of water quality or loss of vital habitat; and
 - 4) Areas within 100 feet of tidal waters, tidal wetlands, or the edge of streams.

In addition, existing operations are to provide to a minimum 100-foot Critical Area Buffer between excavation activities and tidal waters, tidal wetlands, or the edges of streams, and existing work ponds are to be reclaimed as soon as possible after the cessation of extraction operations. The Criteria also require that future wash plants, including ponds, spoil piles, and equipment not be located in the Buffer.

II. SIGNIFICANT ISSUES AND FACTORS

The major issues associated with surface mining in the Critical Area are:

- Identification of existing and suitable future sites in the Critical Area and suitable reclamation uses for such sites; and
- Minimization of the adverse impacts of surface mining including pollutant loadings off-site and prohibiting the location of surface mining activities in unsuitable areas.

IDENTIFICATION OF EXISTING AND SUITABLE FUTURE SURFACE MINING SITES IN THE CRITICAL AREA

One active surface mining operation exists in the Critical Area. This is the Vulcan Corporation site along the Susquehanna River, located north of Havre de Grace. The site is a 182-acre operation located on a 300-acre parcel of land, 100 acres of which is in the Critical Area. This operation has State Surface Mining Permits that require the minimization of impacts to water quality, plant and wildlife habitat, and to develop reclamation plans. This mining operation is marked shown in Figure 8.



Vulcan Materials Corporation operates a quarry in the Chesapeake Bay Critical Area. The facility is in the county but adjacent to the City of Havre de Grace.

FIGURE 8



SURFACE MINE IN HARFORD COUNTY'S CRITICAL AREA

With regard to potential future mining sites, the Maryland Geological Survey completed a mapping effort to identify lands for potential mineral resource development in Harford County. This effort showed that potentially suitable sites in Harford County's Critical Area have already been used and depleted or have been pre-empted by existing and planned development. Thus, future surface mining operations in Harford County's Critical Area will be confined to expansion of the two existing operations at their present sites.

MINIMIZATION OF THE ADVERSE IMPACTS OF SURFACE MINING OPERATIONS

Table 5 lists the potential pollutants that may be generated by sand and gravel operations and treatments that may be applied to them. As discussed in the next section, the State Surface Mining Permit program provides for the minimization of the adverse environmental impacts of sand and gravel operations and ensures the reclamation of their sites. Since there are no suitable areas in Harford County's Critical Area from a resource base perspective, there is no likelihood that new surface mining operations will be located in areas inappropriate for such uses.

TABLE 5

POTENTIAL POLLUTANTS FROM SAND AND GRAVEL OPERATIONS AND APPROPRIATE REMEDIAL MEASURES

POLLUTANT	SOURCE/CAUSE	IMPACT	REMEDY
Airborne dust	Trucks traveling over	Sedimentation and	Improve roads for hauling;
and particles	unpaved roadways; wind	coverage of plants and,	implement reclamation and
-	erosion; excavation	wildlife; increased levels	revegetation of operation sites; use
	operations involving rock	of respirable dust; changes	dust control measures; apply air
	crushing and the	in local soil and climate.	quality standards.
	pulverization of		
	overburden.		
Noise seasons	Truck traffic; grading and	Interference with animal	Implement noise control measures
	excavations; blasting or	life cycles; disturbance to	in environmentally sensitive areas;
	pulverizing rock.	residential areas; vibration	use pre-blast surveys and buffers;
		of nearby locations.	improve the orientation of site
			operations to residential areas.
Surface Water	Altered infiltration rates;	Reduced water quality;	Implement runoff treatment
	increased runoff; stream	sedimentation; channel	facilities; stabilize potential erosion
	encroachment; product	erosion; reduced stream	areas; control and monitor
	discharges; altered	flow; increased ponding	overburden, remove spoils as soon
	drainage density;	and flooding; iron leachate	as feasible.
	contamination of runoff	and heavy metal	
	with oils, fuels, and wash	contamination; increased	
	products; excessive	nitrogen and phosphorus	
	overburden and spoil	loadings.	
	accumulation.		

TABLE 5 CONTINUED				
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CDAV	TOTENTIAL TO	D A DDDODDIATE DEM	IEDIAL MEASUDES	
GKAV	EL OPERATIONS AND	DAPPROPRIATE REM	IEDIAL MEASURES	
Ground Water	Disrupted or diverted	Decreased water quantity	Maintain site's recharge capacity;	
	waterflow; rock blasting.	in local wells or aquifers;	declare specific site areas as	
		decreased quality of local	unsuitable for mining operations.	
		wetlands; pollution of		
		ground water; rock		
		fissures that redirect		
		ground water.		
Land Clearing	Mining activities.	Loss or alteration of soils,	Plan and phase burden stock piles;	
		drainage patterns,	use best management practices;	
		vegetation, landforms, and	reshape the reclaimed surfaces;	
		habitats.	orient spoils to maximize recharge;	
			analyze overburden for alternative	
			uses such as backfill; protect fills	
			from failure; remove operation	
			roads; declare specific site areas as	
			unsuitable for mining operations.	

Sources: Harford County Chamber of Commerce

III. EXISTING REGULATORY AND MANAGEMENT PROGRAMS

STATE SURFACE MINING PERMIT PROGRAM

In 1975, the State of Maryland established a surface mining permit program. This permit program within the Mineral, Oil, and Gas Division of the Maryland Department of Environment ensures that the adverse impacts of such operations are minimized and that appropriate reclamation measures are taken once the mineral resource has been depleted. Permits for surface mining operations will not be granted if the:

- > Operation will have unduly adverse effects on wildlife, or fisheries;
- Operator fails to provide applicable permits from State and local regulatory agencies responsible for air and water pollution and sediment control;
- Operation will constitute a substantial physical hazard to a neighboring house, school, church, hospital, commercial or industrial building, public road, or other public or private property existing at the time of application for the permit;
- Operation will have a significantly adverse effect on the use of a publicly owned park, wooded area, or recreation area existing at the time of application for the permit;
- Operator does not possess a valid surface mine operator's license or is the subject of legal action brought against him by the State;

- > Effects of the proposed action on the environment have been inadequately considered; or
- Previous experience with similar operations indicates a significant probability that the operation will result in substantial deposits of sediment in stream beds or lakes, landslides, or will cause other water pollution.

A reclamation plan must be submitted as part of a surface mining permit application that specifies the proposed use of the site following reclamation, the manner in which topsoil and subsoil are to be conserved and restored, the specifications for surface gradient restoration suitable for the subsequent use, the proposed manner and type of revegetation or other surface treatment of the affected areas, and a true schedule for the implementation of reclamation measures. Reclamation is to occur as mining on each segment of a site is completed. A bond is required in order to ensure that appropriate reclamation occurs.

IV. MODIFICATIONS MADE TO LOCAL REGULATIONS AND PROGRAMS

The Critical Area Ordinance prohibits the establishment of new surface mining operations within the Critical Area. Since no new surface mining operations are likely in Harford County's Critical Area, all that is necessary is the monitoring of existing operations and a review of proposed expansions of such operations by the Department of Planning and Zoning to ensure that off-site pollutant loadings are minimized, and that significant plant and wildlife habitat are not adversely affected. The State Surface Mining Permit Program is considered to be the main regulatory mechanism, complemented with provisions of the Critical Area Management Program requiring a Special Exception approval for any proposed expansions. Conditions of approval of such Special Exceptions would be measures that ensure the protection of any Habitat Protection Areas (including the Critical Area Buffer) on or adjacent to the site as described in the County Ordinance and this Program, and minimization of off-site pollutant loading through implementation of measures such as those listed in Table 5 and development of adequate reclamation plans.



Chapter 8

NATURAL PARKS

I. REQUIREMENTS OF THE CRITICAL AREA CRITERIA

One of the primary objectives of the Criteria is to encourage the opportunities for interaction between natural environments and people without adversely impacting the natural habitat values of such areas. The Criteria calls for the use of natural parks as a means of meeting this objective. Natural parks are defined in the Program Development Criteria as areas of natural habitat that provide opportunities for recreational activities that are compatible with the maintenance of natural conditions. To meet the Criteria requirements for natural parks, local jurisdictions are to:

- Identify areas where natural parks could be established and consider the use of measures such as land acquisition, easement designations, or protective designations to protect these areas. Park areas should be chosen to preserve examples of coastal ecosystems found within the jurisdiction with boundaries based on biological needs for adequate conservation of these areas; and
- Incorporate resource protection measures and limit park uses, such as the number of visitors, in order to reduce disturbance to the ecosystem.

II. SIGNIFICANT ISSUES

With regard to natural parks, the following significant issues need to be addressed by the County in order to meet the intent of the Criteria:

- Identification of potential sites for the establishment of natural parks within Harford County's Critical Area; and
- Identification of the protective measures and management means to preserve the unique ecosystems that may be found on-site.

IDENTIFICATION OF POTENTIAL SITES FOR NATURAL PARKS

The establishment of natural park areas serve to enhance public opportunities for waterfront access and passive recreation that are compatible with the natural parks concept, as outlined in the Criteria. Harford County's Critical Area contains several sites that have the potential to be natural parks. Some of these sites are already owned by the County, while others are in private or State ownership. The locations of existing parks and State-owned natural resource areas are shown in Figures 9 and 10. Table 6 gives a brief description of these mapped locations.

FIGURE 9



PARKS AND OTHER DEDICATED NATURAL AREAS IN THE SUSQUEHANNA RIVER & SWAN CREEK PORTIONS OF THE CRITICAL AREA

FIGURE 10



PARKS AND OTHER DEDICATED NATURAL AREAS IN THE GUNPOWDER RIVER & BUSH RIVER PORTIONS OF THE CRITICAL AREA

TABLE 6

POTENTIAL SITES FOR ESTABLISHMENT OF NATURAL PARKS

NAME	SIZE	UNIQUE FEATURES	COMMENTS	
COUNTY OWNERSHIP	COUNTY OWNERSHIP			
Mariner Point Park	38 acres	Peninsula surrounded by Foster Branch Creek, Taylors Creek and the Gunpowder River. 5,000 feet of shoreline; mix of mature woodlands and woody shrubs.	Pathways, observation deck, fish pier, boat launch, parking and picnic shelter.	
Leight Park	61 acres	Heavily wooded site containing significant stands of mature hardwoods. Provides excellent waterfront vistas of Otter Pint Creek. Contains several small tidal marshes.	Developed as an educational center and passive open park space. Improvements include a visitor's center, a small boat launch, a nature trail, and 25 parking spaces.	
Perryman Park	87.9 acres	Overlooks Bush Creek marsh. Predominantly open with some woodlands and some wetlands.	Being developed as a park with a nature trail, restrooms, parking, ball fields, and maintenance and storage facilities.	
Robert Copenhaver Park	24 acres	Borders Foster Branch Creek. Predominantly forested, has some non- tidal wetlands. Recreational use in natural park setting.	Northeastern portion used for active recreation. Remaining portion has potential for passive recreation.	
Swan Harbor Farm	522 acres	A Habitat of Local Significance with threatened and endangered species. Includes prime agricultural land with historical and archaeological resources.	Historic home used for events. Fishing pier, gazebo, pedestrian access to the waterfront, and a pond for enhancement of waterfowl and shorebird habitat. The remainder of the site is farmed.	
Oakington-Tydings Park	312 acres	4,300 LF of Bay shoreline and 5,000 LF of Swan Creek shoreline. Includes prime farmland and historic barns.	Currently farmed.	

TABLE 6 CONTINUED			
POTENTIAL SITES FOR ESTABLISHMENT OF NATURAL PARKS			
Belle-Vue Farm	347 acres	A Habitat of Local Significance having prime agricultural land with historical and archaeological resources. Includes 13,200 LF of shoreline.	Recent public acquisition.
Forest Greens Lake	110.57 acres	Shallow lake and marsh area with fish ad wildlife habitat.	Used for passive recreation such as fishing and trails.
Mullins Park	250 acres	Good wildlife habitat	Potential to develop as natural park for passive recreation such as trails.
Willoughby Beach Park	45 acres	A Habitat of Local Significance with threatened and endangered species. Includes woodlands, wetlands, tidal marshes, and access to Otter Point Creek.	Plans are to develop a canoe launch and passive recreation such as trails.
STATE OWNEDSHID			
Bush River Declaration Area	500 acres	Marsh and low-lying, woody, fresh water and estuarine marsh areas. Several heavily wooded areas.	Land was purchased by the State to protect the site's natural features.
Gunpowder Falls Park	257 acres	Includes woodlands, wetlands, tidal marshes, and access to the Little Gunpowder River.	A portion of the site is used for passive recreation such as fishing and trails,

APPROPRIATE MANAGEMENT OF NATURAL PARK AREAS

Sites identified as having potential for natural parks use can be protected and managed in a variety of ways. Historically, the primary means of protecting such areas has involved direct acquisition and management by a public entity. Many of the potential natural park sites in the County have been acquired and will be managed in this manner (e.g., Leight and Mariner Point Parks). The State has also been involved in helping to preserve natural areas through a land acquisition program in the Bush River Declaration Natural Resources Management Area. Funds for the development of limited park facilities in these areas have been available from State and federal grant awards in the past, and the County will continue to pursue the funding opportunities that are available in the future.

In addition to outright purchase, natural park areas can also be obtained through a variety of other means such as cooperative use agreements, the purchase of conservation easements, etc. The Otter Point Creek Marsh Area is one example where such programs have worked successfully in Harford County, particularly with the establishment of the National Estuarine Research Reserve Area through the cooperative use of lands owned by private conservation groups in the area. As other potential natural park sites in Harford County are examined further, the use of these alternatives to direct acquisition should be considered wherever feasible. The use of areas and plans for development in areas designated as natural parks will be reviewed for consistency with the objectives of the County's Critical Area Program.

III. EXISTING REGULATORY AND MANAGEMENT PROGRAMS

NATIONAL ESTUARINE RESEARCH RESERVE

The National Estuarine Research Reserve Program is a cooperative Federal-State program established under the provisions of the Federal Coastal Zone Management Act for the purpose of preserving representative estuarine areas for long-term research and educational activities. The federal government is responsible for overall management of the nationwide reserve systems with the State being responsible for the selection of appropriate sites and the development of management programs for them. Grants are available from the federal government for acquisition of appropriate sites, management of related sites, or the undertaking of appropriate research activities.

The State of Maryland has established a multi-site Chesapeake Bay National Estuarine Research Reserve Program in conjunction with the State of Virginia that can be used for research and education of natural estuarine processes and man-induced stresses on the Bay. The 445-acre Otter Point Creek Marsh Area located near the head of Bush Creek is one of the sites included in the Program. The property is owned by a private conservation organization, the Izaak Walton League, which utilizes the site for environmental education field trips and activities in cooperation with the Reserve Program. The Izaak Walton League has supported inclusion of the area into the Reserve Program as has Harford County. The large size of the marshes, in conjunction with the site's proximity to urban areas and general location along the Bay, makes the property an excellent area for conducting research of importance to Bay managers and educational projects. Inclusion of the area into the Reserve Program is compatible with and supportive of its use as a natural park area.

COUNTY ACQUISITION AND PROGRAMS FOR RECREATION AND OPEN SPACE AREAS

As noted previously, through the combined efforts of the Department of Parks & Recreation and Planning & Zoning, Harford County has been attempting to acquire and develop several areas along the shoreline that are consistent with the natural parks concept. In several instances, as with Anita C. Leight and Mariner Point Parks, funding for limited development of those sites has been provided through Federal Coastal Zone Management Grant Programs administered by the Department of Natural Resources. Development plans for these sites include nature trails, bay observation areas, canoe launch facilities, limited parking, and other associated site improvements. All of the improvements are being made with the primary emphasis being on the fragility of the natural areas involved and their limited ability to handle traditional recreational use impacts.

Along the Oakington Peninsula, the County has acquired 1,250 acres of waterfront property along 2.5 miles of coastline with the assistance of Program Open Space. The three properties that were acquired –

Swan Harbor, Tydings, and Belle Vue – contain significant habitat areas and are consistent with areas to be established as natural parks. Plans for both of the areas are consistent with the goals of the Critical Area program.

IV. MODIFICATIONS MADE TO LOCAL REGULATIONS AND PROGRAMS

To be consistent with the provisions of the Criteria pertinent to Natural Parks, the County – through the Departments of Parks & Recreation, Planning and Zoning and other relevant agencies – examined the potential for the establishment of natural parks in those areas identified in this chapter. For ongoing projects, programs involving acquisition, development, and management need to be coordinated between all agencies involved. Land areas that are currently in private ownership and are adjacent to public land holdings having natural park potential should receive priority consideration. Where appropriate and feasible, the County will continue to work with affected landowners and private conservation organizations to utilize alternatives to direct acquisition of additional natural park areas. Any plans for natural park use/development shall be made with primary concern for fragility of ecosystems and the habitat values of the areas.

As noted previously, plans for the development and use of areas designated as natural parks will be developed by the County Departments of Parks and Recreation and Planning and Zoning with input from appropriate State and local agencies in accordance with the standards listed below in order to ensure their consistency with the County's Critical Area Program. Development and activity plans for such areas will be based on the fragile nature of the natural systems on these sites and their limited ability to handle human impacts. The standards set forth in the Zoning Code and this Program will be utilized in the review of development and management plans for natural park areas as follows:

- > The Critical Area Buffer shall be maintained adjacent to tidal waters and wetlands. If areas within the Buffer are presently unvegetated, trees or other suitable vegetation shall be planted as a part of site development;
- All identified nontidal wetlands and areas of importance for plant and wildlife habitat shall be protected on-site;
- All areas presently wooded on the site shall be maintained to the maximum extent;
- The use of areas for passive recreation activities such as nature study, hunting and trapping, and for environmental education will be allowed if non-water-dependent service facilities for such areas are located outside of the Critical Area Buffer;
- All publicly owned lands leased for agricultural activities shall have current Soil and Water Conservation Plans; and
- Public beaches or other public water-oriented recreation or education areas including, but not limited to, publicly owned boat launching and docking facilities and fishing piers that require a waterfront location, and therefore must be located within the Critical Area Buffer, will be subject to the following requirements:
 - 1) Sanitary facilities shall be provided;
- 2) Service facilities shall be located outside of the Buffer;
- 3) Permeable surfaces shall be used to the extent practicable in the spirit of environmental conservation (these surfaces will still count toward the overall lot coverage); and
- 4) Disturbance to vegetation shall be minimized.



Chapter 9

HABITAT PROTECTION AREAS

This chapter has been divided into five parts that discuss the Critical Area Buffer, habitats of threatened and endangered species, areas of significant plant and wildlife habitat value, anadromous fish propagation waters, and nontidal wetlands.

PART A. CRITICAL AREA BUFFER

I. REQUIREMENTS OF THE CRITICAL AREA CRITERIA

Two of the main objectives of the Criteria are to minimize adverse impacts on water quality, and conserve plant, wildlife, and fish habitat. To assist in achieving these objectives, the Criteria require that local jurisdictions establish a minimum 100-foot Buffer landward from tidal waters, tidal wetlands, and tributary streams. This Buffer area is expanded beyond 100 feet to include contiguous sensitive areas such as steep slopes, hydric soils, or highly erodible soils. In the case of contiguous slopes, the Buffer is to be expanded 4 feet for every 1% of slope over 15% grade or to the top of the slope, whichever is greater in extent.

The purpose of establishing a vegetative Buffer is so that it can serve the following functions:

- Provide for the removal or reduction of sediments, nutrients, and potentially harmful or toxic substances in runoff entering the Bay and its tributaries;
- Minimize the adverse effects of human activities on wetlands, shorelines, stream banks, tidal waters, and aquatic resources;
- Maintain an area of transitional habitat between aquatic and upland communities;
- Maintain the natural environment of streams; and
- Protect riparian wildlife habitat.

Vegetated buffer areas not only mitigate for the adverse impacts on water quality from runoff from activities on adjacent upland areas, but also provide protection for the other types of Habitat Protection Areas discussed in this chapter. Within the Buffer, new development activities, including structures, roads, parking areas and other impervious surfaces, mining and related facilities, or septic systems, are not permitted, except for those necessarily associated with water-dependent facilities

The Buffer is to be maintained in natural vegetation, but may include planted native vegetation where necessary to protect, stabilize, or enhance the shoreline.

As discussed in Chapters 5 and 6 respectively, forestry operations and agricultural activities are allowed in the Buffer under certain conditions, provided that they do not involve permanent removal of vegetation from the Buffer and they do not adversely affect the Buffer's ability to carry out the functions noted above. Any removal of vegetation in the buffer requires a Buffer Management Plan that must be approved by the Department of Planning and Zoning prior to the start of work.

The Buffer Management Plan constitutes the official record of proposed buffer clearing and the mitigation measures that will be provided. Appendix K describes the information required for a Buffer Management Plan. With an approved Buffer Management Plan, the cutting of trees or removal of vegetation is allowed in the Buffer where necessary to provide access to private piers, install or construct a shore erosion protection device or measure, or to build a water-dependent facility, provided that the project has received all necessary State and federal permits.

Buffer Management Plans also permit the removal of individual trees that are in danger of falling and causing damage to dwellings or other structures, or that are in danger of falling and blocking streams or causing accelerated shore erosion.

MODIFIED BUFFER AREAS

Areas where the existing pattern of residential, commercial, industrial, or recreational development in the Critical Area as of December 1, 1985 prevented the Buffer from fulfilling the functions set forth in COMAR 27.01.09.01C for water quality and wildlife habitat were mapped as Modified Buffer Areas (formerly named Buffer Exempt Areas). Development in these areas is addressed by a separate set of landscape requirements and restrictions to the cumulative amounts of new lot coverage as specified in Section 267-63.8 of the Zoning Code.

II. SIGNIFICANT ISSUES AND FACTORS

DETERMINATION OF AREAS TO BE INCLUDED IN THE BUFFER

Due to the necessity of identifying the Buffer expansion features – such as hydric soils – in the field, the location of the Buffer must be identified and mapped on a site-specific basis at the same time when preliminary plans, Forestry Management Plans, or similar plans are developed for activities proposed in the Critical Area. However, the probable area to be included in the Buffer can be roughly determined by reference to the Buffer Elements Map that indicates the location of the tidal shorelines, tributary streams, 100-foot Buffer, Modified Buffer Areas, and the soils map showing the general location of hydric soil areas, soils with steep slopes, and highly erodible soils. The Buffer must be expanded to include contiguous areas with slopes greater than 15%. It must also be expanded for areas of highly erodible soils.

One factor that is important in determining the location of Buffer Areas in the Critical Area is identifying the location of tributary streams. These were mapped on the Natural Features Maps by referring to the location of perennial and intermittent streams as shown on USGS 7" topographic maps and the Harford

County Soils Survey. Whenever a development, forestry operation, or other large scale disturbance is proposed in the Critical Area, a site-specific survey should be conducted to verify the exact location of perennial and intermittent streams in Harford County's Critical Area and the 100-foot Buffer that will need to be maintained adjacent to them.

DEVELOPMENT OF MEASURES TO ENSURE PROTECTION OF THE BUFFER

In order to ensure that the Buffer is maintained in natural vegetation (not lawn), the location and extent of the Buffer is required to be shown on concept plans, preliminary plans, associated sediment control and stormwater management plans, and final plats as areas to be kept in a natural condition. The limit of disturbance shall also be shown on all plans. The limit of disturbance shall not encroach into the Buffer. Similarly, delineation of the location of the Buffer and appropriate measures to ensure its integrity are required as part of the development of Forest Management Plans for forest harvest operations in the Critical Area. In the case of agricultural activities, the provisions of the Criteria pertaining to maintenance of the Buffer are included as part of the Soil and Water Conservation Plan.

In addition, as noted previously, creation of a vegetated Buffer where one does not presently exist is a major objective of resource protection programs in the County. Appendix K describes the requirements for Buffer establishment. In the case of new development where the Buffer is not entirely established in woody vegetation, and open space within 100 feet of tidal waters is available, the Buffer shall be fully planted with native trees and shrubs.

III. EXISTING LOCAL REGULATORY AND MANAGEMENT PROGRAMS

Protection of areas adjacent to streams and tidal waters is indirectly provided by the County's Floodplain Ordinance that prohibits development in the 100-year floodplain.

IV. RECENT MODIFICATIONS MADE TO LOCAL REGULATIONS AND MANAGEMENT PROGRAMS

As noted in previous chapters, the Chesapeake Bay Critical Area Ordinance replaces the provisions of the Natural Resources District for the shoreline area. This is the major mechanism for implementing the requirements of the Criteria. Included in the provisions of the Critical Area Ordinance is language ensuring the protection of the Buffer and the Modified Buffer Areas.

As discussed in Chapter 2, revisions to the Subdivision Regulations were made to ensure that the location of the Buffer is noted on concept plans, preliminary plans, final plats, and that appropriate measures are instituted to ensure Buffer protection.

PART B. THREATENED AND ENDANGERED SPECIES AND SPECIES IN NEED OF CONSERVATION

I. REQUIREMENTS OF THE CRITICAL AREA CRITERIA

The Criteria require that particular attention be given to ensuring the protection of species designated by the

State as Threatened and Endangered Species or Species in Need of Conservation and their habitats. Such species are defined as follows:

- An "Endangered Species" is any species whose continued existence as a viable component of the State's flora or fauna is determined to be in jeopardy including any species determined to be an "Endangered Species" pursuant to the federal Endangered Species Act;
- A "Threatened Species" is any species of flora or fauna that appears likely, within the foreseeable future, to become endangered including any species determined to be a "Threatened Species" pursuant to the federal Endangered Species Act; and
- ➤ A "Species in Need of Conservation" is any species determined by the Secretary of the Department of Natural Resources to be in need of conservation for its continued ability to sustain itself.

Species in each of these categories are formally designated for regulation by the Secretary of the Department of Natural Resources. The Criteria require local governments to develop protection programs for such species with the assistance of the Maryland Department of Natural Resources, and other appropriate public agencies and private organizations. Such programs are to consist of the following elements:

- Designation of a protection area around each of the habitats occurring in the jurisdiction within which development activities and other disturbances shall be prohibited unless it can be shown that these activities or disturbances will not have or cause adverse impacts on these habitats; and
- Development of programs that provide protection for the habitats of Species in Need of Conservation, Endangered, and Threatened species that may include, but are not limited to, acquisition, conservation easements, cooperative agreements with landowners, special provisions in forest management and soil conservation plans, and special provisions in subdivision or zoning regulations.

II. SIGNIFICANT ISSUES AND FACTORS

There are two issues concerning Species in Need of Conservation and Threatened or Endangered Species:

- 1. Identification of the location(s) of the habitats of such species; and
- 2. Development of appropriate protection programs for such habitats.

IDENTIFICATION OF THE LOCATION OF THE HABITATS OF THREATENED AND ENDANGERED SPECIES AND SPECIES IN NEED OF CONSERVATION IN HARFORD COUNTY'S CRITICAL AREA

Species that have been designated as State Threatened or Endangered Species, or Species in Need of Conservation are listed in Appendix I. Habitats of such species have been found in various locations in Harford County's Critical Area. Nontidal wetlands along the Susquehanna River provide habitat for a rare reptile in need of conservation. Deer Creek is habitat for the Maryland Darter, which is both a State and Federally Endangered Species. Recent fish census efforts have not found the species.

A steep slope on the south bank of Deer Creek is a habitat area for a threatened plant species. Habitat areas of Threatened and Endangered plant species have also been identified on the shores of the Gunpowder River, Grays Run, Church Creek, Bush River along the Perryman peninsula, and in Church Creek Pond. All identified habitats of Threatened and Endangered species and Species in Need of Conservation are also designated Habitats of Local Concern. Such habitat areas and Buffer areas that ensure the protection of the species have been mapped in Figures 11 and 12. They are described in more detail in Appendix I.

With the assistance of pertinent State agencies, the County will develop cooperative management programs with the landowners of the properties containing such Habitat Protection Areas. Such programs may involve the establishment of conservation easements for the habitat areas and their required Buffer areas. In addition, any activities that may be proposed in or adjacent to such areas will undergo the development review process as described in Chapter 2 or as part of the development of any required Forest Management Plan or Soil & Water Conservation Plans.



Deer Creek

FIGURE 11



HABITATS OF LOCAL SIGNIFICANCE IN THE SUSQUEHANNA RIVER & SWAN CREEK PORTIONS OF THE CRITICAL AREA

FIGURE 12



HABITATS OF LOCAL SIGNIFICANCE IN THE GUNPOWDER RIVER & BUSH RIVER PORTIONS OF THE CRITICAL AREA

III. EXISTING FEDERAL, STATE, AND LOCAL REGULATORY AND MANAGEMENT PROGRAMS

FEDERAL MARYLAND DARTER RECOVERY PLAN

The U.S. Fish & Wildlife Service is implementing the Endangered Species Recovery Plan for the Maryland Darter in the Deer Creek Watershed. The Plan is administered in conjunction with the State of Maryland, emphasizing the use of conservation agreements along the shoreline of the Darter's known habitat as well as the enforcement of water quality regulations regarding point and nonpoint discharges into Deer Creek to avoid any degradation of water quality.

STATE THREATENED AND ENDANGERED SPECIES REGULATIONS

The State's Threatened and Endangered Species regulations prohibit the taking, exporting, selling, offering for sale, delivery, carrying, transporting, or shipping by any means of Threatened or Endangered Species or of Species in Need of Conservation without a permit from the Department of Natural Resources.



The Bog Turtle (Glyptemys muhlenbergii) is considered state-threatened.

MARYLAND NATURAL HERITAGE PROGRAM

The Maryland Natural Heritage Program was established in 1979 by the Maryland Department of Natural Resources in cooperation with the Nature Conservancy to identify the State's significant natural areas and set practices for their protection. The program mandates a continuously updated inventory on the State's natural areas and plant and wildlife species, particularly rare, threatened and endangered species and unique and exemplary natural communities. Plant and wildlife species are ranked according to their rarity in accordance with the Natural Heritage classification system. This inventory provides the information that can be used by the State and private conservation groups to protect the habitats of rare species and exemplary communities through a variety of methods, including acquisition, conservation easements, and voluntary landowner agreements.

MARYLAND ENVIRONMENTAL TRUST CONSERVATION EASEMENT PROGRAM

The Maryland Environmental Trust (MET) is a semi-autonomous unit, administratively located in the Maryland Department of Natural Resources. The purpose of the trust is to conserve and improve the State's environment, including its land, water, air, wildlife, scenic, and open space resources. Through educational and other media, the MET encourages and motivates the populace of the State, and promotes continuing interest in perpetuating the aesthetic, natural, scenic, and cultural qualities of the State's environment.

The MET also:

- Acquires and maintains properties of aesthetic, scenic, or cultural value, or of value to the public health and welfare, by gift, purchase, or bequest;
- Receives appropriations, gifts, or bequests to carry out its purpose;
- Cooperates with and assists State, Federal, and local government agencies, private or public foundations, and individuals, to further the purposes of the Trust; and
- Promotes the establishment of local committees to work with the Trust to further its objectives at the local level.

The MET presently has an extensive program to acquire conservation easements for areas with significant environmental value. This conservation easement program helps to conserve farmland, woodlands, stream corridors, unique or rare natural areas, or other kinds of open space, by arranging nondevelopment conservation easement agreements with private landowners. Through such agreements, landowners choose to give up their right to develop their land. In return, they receive tax benefits on their Federal and State income taxes and their local property taxes.

ENVIRONMENTAL LAND PRESERVATION COMMISSION BILL

In 1994, Harford County adopted legislation that provides a property tax credit of up to \$500 a year for landowners who preserve environmentally sensitive or environmentally valuable lands through easement or donation to a qualified conservation organization.

IV. MODIFICATIONS MADE TO LOCAL REGULATIONS AND MANAGEMENT PROGRAMS

Harford County has instituted a protection program for areas within its Critical Area that are identified as Habitats for Threatened and Endangered Species and Species in Need of Conservation. First, as discussed above in Chapter 2, provisions have been put into the County's revised Subdivision Regulations and the Critical Area Ordinance to ensure that such areas are not adversely affected by activities proposed in or adjacent to such areas. Measures to ensure the integrity of such habitat shall be included in all Forestry Management Plans as well as Soil and Water Conservation Plans for forestry or agricultural operations proposed to be in or adjacent to such areas.

Whenever possible, cooperative management programs shall be developed with the landowners of such habitats to ensure long-term protection of these areas. Such protection will be ensured through the use of conservation easements, restrictive covenants, voluntary landowner agreements, and similar measures. Close coordination will be maintained with the Natural Heritage Program, the Maryland Environmental Trust, and pertinent private conservation organizations in instituting such management programs.

Consideration will be given to establishing a similar protection program for such areas in the remainder of the County through modification of the provisions of the Natural Resources District.

PART C. SIGNIFICANT PLANT & WILDLIFE HABITATS

I. REQUIREMENTS OF THE CRITICAL AREA CRITERIA

In addition to Threatened and Endangered Species habitat, the Criteria identify several other types of areas of such significant plant and wildlife habitat value that they should be protected. These are:

- Colonial water bird nesting sites;
- Historic aquatic waterfowl staging and concentration areas;
- > Riparian forests and other areas utilized as breeding areas by forest interior dwelling species;
- ➢ Natural Heritage Areas; and
- > Plant and wildlife habitat determined to be of local significance.

The Criteria require different protective measures for each of the above types of area, recognizing their different characteristics. For colonial waterbird nesting areas, a sufficient buffer is to be established so that their nesting sites are protected from the adverse impacts of development activities and from

disturbance during the breeding season. For aquatic waterfowl staging and concentration areas, new water-dependent facilities are to be located in such a way so as to avoid disturbance to such areas. For forested areas utilized as breeding areas by forest interior dwelling species of birds and other wildlife species, development activities or the clearing or cutting of trees that might occur in such areas are to be conducted so as to conserve their value as habitat for forest interior dwelling species and other significant wildlife species. Natural Heritage Areas are to be protected from alteration due to development activities, cutting, or clearing so that the species structure and composition of the areas are maintained. For plant and wildlife habitats of local significance, appropriate measures are to be implemented to ensure that protections are provided.

II. SIGNIFICANT ISSUES AND FACTORS

For each type of plant and wildlife habitats listed above, the issues are the same. The first issue is to identify their location and the second, to develop appropriate protection programs for them. The approaches proposed to be taken with respect to each of these issues for each type of habitat area are discussed below.

COLONIAL WATERBIRD NESTING SITES

Certain types of herons, egrets, and terns, as well as the glossy ibis nest in colonies. Although a number of colonial waterbird nesting sites have been identified in the Chesapeake Bay area, none have been found to date in the area under the jurisdiction of Harford County. A tern colony exists on an island in the Susquehanna Flats that is under the jurisdiction of the U.S. Fish and Wildlife Service. Because the population of this species has declined dramatically throughout the Eastern United States, protection of any sites found in Harford County is important.

Such species are very sensitive to disturbance during the breeding season. Thus, the following management measures should be instituted for any colonial waterbird nesting sites that may be found in Harford County's Critical Area:

- A minimum one mile protection area buffer shall be established around any identified colonial waterbird nesting sites. Development activities or other disturbances shall be prohibited within these buffer areas unless a site-specific study prepared in conjunction with the State of Maryland Department of Natural Resources can prove that the development activity or other disturbance will not have or cause adverse impacts on the identified habitats. Any development activities or other disturbances that are allowed should not occur during the nest building and incubation periods during the months of February through April, and may extend until August.
- During February through April, noise from development activities should be minimized in areas adjacent to the buffer in order to avoid adverse impacts to nesting colonial waterbirds.

AQUATIC HISTORIC WATERFOWL STAGING AND CONCENTRATION AREAS

A historical source of information on the location of areas used by waterfowl in Harford County's Critical Area is the publication, "Environmental Sensitivity Index: An Atlas Illustrating the Sensitivity of the Coastal Environment to Spilled Oil" (1981, College of William and Mary, Virginia Institute of Marine

Science). Within this Atlas are maps that show locations of oil spill-sensitive waterfowl species. The Department of Natural Resources, Resource Conservation Service has mapped the general locations of the historic waterfowl staging and concentration areas for the State of Maryland. This mapped information has been incorporated into the Critical Area Natural Resource Maps for Harford County's Critical Area Management Program, as shown in Figures 13 and 14.

In addition, the above-referenced historical report lists the following areas and waterfowl species for Harford County:

"The following waterfowl species have been found to winter along the Susquehanna River from Conowingo Dam to Havre de Grace: mallards, black ducks, American goldeneyes, and common mergansers. These species are also common in the Susquehanna River and Susquehanna Flats during the fall, as are Canada geese. Canada geese, mallards, and black ducks are also common wintering species in the Swan Creek area, and in adjoining open waters of the Chesapeake Bay. Wood ducks presumably breed near the large tidal marshes to the north of Swan Creek, where they are found from spring to fall. Year-round waterfowl species present in the Bush River from Belcamp south into the waters surrounded by Aberdeen Proving Ground include mallards, black ducks, ringnecked ducks, American goldeneyes, and Canada geese. From spring to fall, wood ducks are found in the Otter Point marsh area, the wetlands north of Highway 40 near McComas and Van Bibber, and along Winter's Run from McComas to Atkisson Reservoir. Waterfowl species that commonly winter in open water areas south of Joppatowne include mallards, black ducks, American widgeons, Canada geese, and tundra (whistling) swans. In addition, wood ducks winter along the Little Gunpowder River from Highway 40 to the Gunpowder River, and south from this area to Days Cove and Rumsey Island."

Adequate protection will generally be given to the waterfowl in such areas by the maintenance of the Critical Area Buffer and the measures implemented to protect nontidal wetlands. The only additional measure needed is to prohibit the location of new water-dependent facilities in or adjacent to areas used by waterfowl as wintering or staging areas unless it is unavoidable. In addition, the use of any water-dependent facilities presently located in such areas or those that must be placed in such areas in the future should be limited during the period of November through March to avoid disturbance of waterfowl wintering there or using them as migratory staging areas.

RIPARIAN FORESTS AND OTHER FORESTED AREAS UTILIZED BY FOREST INTERIOR DWELLING SPECIES

As noted above, two types of forested areas are identified in the Criteria as of particular importance because of their value as wildlife habitat, particularly for forest interior dwelling birds (those species of birds that require relatively large forested tracts to breed successfully). These are existing riparian forests (e.g., relatively mature forests of at least 300 feet in width that occur adjacent to streams, wetlands, or the Bay shoreline, which are documented breeding areas), and large forested areas utilized as breeding areas by forest interior dwelling species (e.g., relatively mature forested areas of 100 acres or more or forest connected to such areas). These forests have been mapped as shown in Figures 13 and 14. Table 7 lists those bird species considered to be forest interior dwelling species.

FIGURE 13



PROTECTED BIRD HABITATS IN THE SUSQUEHANNA RIVER & SWAN CREEK PORTIONS OF THE CRITICAL AREA

FIGURE 14



PROTECTED BIRD HABITATS IN THE GUNPOWDER RIVER & BUSH RIVER PORTIONS OF THE CRITICAL AREA

TABLE 7

LIST OF BIRD SPECIES OBSERVED IN HARFORD COUNTY

* indicates forest interior dwelling species (FIDS) **indicates FIDS especially sensitive to disturbance

Red-throated loon	Turkey vulture	Glaucous gull
Common loon	Osprey	Thayers gull
Horned grebe	Bald eagle	Great black-backed gull
Double-crested cormorant	Northern harrier	Caspian tern
American bittern	Sharp-shinned hawk	Royal tern
Least bittern	Coopers hawk	Common tern
Great blue heron	**Red-shouldered hawk	Forster's tern
Great egret	**Broad-winged hawk	Least tern
Snowy egret	Red-tailed hawk	Rock dove
Little blue heron	Rough-legged hawk	Mourning dove
Cattle egret	American kestrel	Black-billed cuckoo
Green-backed heron	Merlin	Yellow-billed cuckoo
Black-crowned night heron	Peregrine falcon	Barn Owl
Glossy ibis	Ring-necked pheasant	Eastern screech owl
Tundra swan	Wild turkey	Great horned owl
Mute swan	Northern bobwhite	**Barred owl
Greater white-fronted goose	King rail	Long-eared owl
Snow goose	Virginia rail	Short-eared owl
Canada goose	Common moorhen	Snowy owl
Wood duck	American coot	Northern saw-whet owl
Green-winged teal	Black-bellied plover	Common nighthawk
American black duck	Semipalmated plover	*Whip-poor-will
Mallard	Greater yellowlegs	Chimney swift
Northern pintail	Lesser yellowlegs	Ruby-thrd. hummingbird
Blue-winged teal	Solitary sandpiper	Belted kingfisher
Northern shoveler	Spotted sandpiper	Red-headed woodpecker
Gadwall	Upland sandpiper	Red-bellied woodpecker
American Wigeon	Semipalmated sandpiper	Yellow-bellied sapsucker
Canvasback	Least sandpiper	Downy woodpecker
Redhead	Pectoral sandpiper	*Hairy woodpecker
Ring-necked duck	Dunlin	Northern flicker
Greater scaup	Short-billed dowitcher	*Pileated woodpecker
Lesser scaup	Common snipe	Eastern wood pewee
Oldsquaw	American woodcock	Yellow-bellied flycatcher
Common goldeneye	American woodcock	*Acadian flycatcher
Bufflehead	Laughing gull	Willow flycatcher
Hooded merganser	Bonaparte's gull	Least flycatcher
Common merganser	Ring-billed gull	Eastern phoebe
Red-breasted merganser	Herring gull	Great-crested flycatcher
Ruddy duck	Iceland gull	Eastern kingbird
Black vulture	Lesser black-backed gull	Horned lark

TABLE 7 continued

LIST OF BIRD SPECIES OBSERVED IN HARFORD COUNTY

* indicates forest interior dwelling species (FIDS) **indicates FIDS especially sensitive to disturbance

Hooded warbler	Solitary vireo	Canada warbler
Purple martin	*Yellow-throated vireo	Yellow-breasted chat
Tree swallow	Warbling vireo	*Scarlet tananger
Northern rough-winged swallow	Philadelphia vireo	Northern cardinal
Bank swallow	*Red-eyed vireo	Rose-breasted grosbeak
Cliff swallow	Blue-winged warbler	Blue grosbeak
Barn swallow	Golden-winged warbler	Indigo bunting
Blue jay	Tennessee warbler	Rufous-sided towee
American crow	Nashville warbler	American tree sparrow
Fish crow	*Northern parula	Chipping sparrow
Black-capped chickadee	Yellow warbler	Field sparrow
Carolina chickadee	Chestnut-sided warbler	Vesper sparrow
Tufted titmouse	Magnolia warbler	Savannah sparrow
Red-breasted nuthatch	Cap May warbler	Grasshopper sparrow
White-breasted nuthatch	Black-throated blue warbler	Fox sparrow
**Brown creeper	Yellow-rumped warbler	Song sparrow
Carolina wren	**Black-throated green warbler	Swamp sparrow
House wren	Blackburnian warbler	White-throated sparrow
Winter wren	Yellow-throated warbler	White-crowned sparrow
Marsh wren	Pine warbler	Dark-eyed junko
Gold-crowned kinglet	Prairie warbler	Lapland longspur
Ruby-crowned kinglet	Palm warbler	Snow bunting
Blue-gray gnatcatcher	Bay-breasted warbler	Bobolink
Eastern bluebird	Blackpoll warbler	Red-winged blackbird
*Veery	**Cerulean warbler	Eastern meadowlark
Gray-cheeked thrush	*Black-and-white warbler	Rusty blackbird
Swainson's thrush	**American redstart	Common Grackle
Hermit thrush	*Prothonotary warbler	Brown-headed cowbird
*Wood thrush	**Worm-eating warbler	Orchard oriole
American robin	*Ovenbird	Northern oriole
Gray catbird	Northern waterthrush	Purple finch
Northern mockingbird	**Louisiana waterthrush	House finch
Brown thrasher	**Kentucky warbler	Pine siskin
American pipit	Connecticut warbler	Common redpoll
Cedar waxwing	Mourning warbler	American goldfinch
Loggerhead shrike	Common yellowthroat	Evening grosbeak
European starling	**Hooded warbler	House sparrow
White-eyed vireo	Wilson's warbler	**Swainson's Warbler

Confirmation of the presence of these species and the other species on the list can only be made by site surveys undertaken during the breeding season using approved survey methods such as those being used to develop the State Breeding Bird Atlas (see Appendix J for a detailed discussion of approved survey methods). For an area to be considered a significant forest interior dwelling species habitat, the breeding of one sensitive species, or four other species, must be documented.

However, forest areas likely to contain such species can be identified by their size, location, and tree species composition. The locations of such potential areas have been identified on the County's Natural Features Maps. The identification of forested areas as forest interior dwelling species habitat does not mean that no development or cutting or clearing of trees can occur, but that it must be done in a manner that preserves the forest's value as habitat for such species. Thus, the following management practices should be applied to such areas:

- Minimize disturbance during the May-August breeding season (i.e., from off-road vehicles, intensive public use, or logging);
- Locate development or other activities that would cause disturbance to the forested areas on the periphery of the area (i.e., roads, utility line corridors, structures, etc.);
- Retain the continuous cover of branches and foliage that is formed by the crowns of adjacent trees (e.g., the forest canopy) and trees and shrubs underneath the canopy;
- Retain standing dead trees (e.g., snag trees) which serve as bird nesting and feeding habitats;
- Avoid the creation of small clearings and the disproportionate expansion of forest edge habitat;
- Any significant forest area that is temporarily cleared should be replaced with native forest vegetation; and
- Timber harvesting shall not be undertaken in such areas unless it can be demonstrated that harvesting techniques will maintain or improve habitat for forest interior dwelling species.

Alteration to areas identified as potential forest interior dwelling species habitat shall be delayed until breeding bird surveys can be done for the area; the assumption being that such habitat is present and therefore appropriate management practices should be followed.

NATURAL HERITAGE AREAS

In order for an area to be designated as a Natural Heritage Area, it must contain one or more threatened or endangered species, or one or more wildlife species in need of conservation, and be a unique blend of geological, hydrological, climatological, or biological features, and be among the best statewide examples of its kind. No Natural Heritage Areas have been presently designated in Harford County's Critical Area. Should an area be identified, it is expected that the same management approach will be followed as the one proposed for Habitats of Threatened and Endangered Species and Species in Need of Conservation. Whenever possible, this should include development of protection programs in cooperation with the land owner for the retention of the area in a natural state, complemented by review of proposed activities on adjacent properties for their possible impacts on the Natural Heritage Area. The cooperative protection program will be implemented through the use of conservation easements, cooperative management agreements with the land owner, and similar measures.

HABITATS OF LOCAL SIGNIFICANCE

Habitats of Local Significance are those habitats that may not be of significance statewide, but are significant locally because they contain a unique blend of geological, hydrological, climatological, or biological features, and are among the best county-wide examples of their kind. Harford County, with the assistance of the Maryland Natural Heritage Program, has identified several sites appropriate for such designation in its Critical Area. They contain a rare blend of biological features and contain or have the potential of containing habitats of rare or threatened species. Sites are located along the shores of the Susquehanna River, in the Perryman area near Aberdeen Proving Grounds, the Willoughby Beach peninsula, and along Pulaski Highway near Church Creek. A detailed description of each site can be found in Appendix I. The location of each Habitat of Local Significance has been mapped in the Habitats of Local Significance Maps.

Since these areas contain sensitive natural features, activities proposed in or adjacent to them need to be carefully reviewed to avoid adverse impacts to these areas. Whenever possible, cooperative protection programs will be developed with the land owners of the sites in question and complemented by review of projects proposed in or adjacent to such sites through the development review process, Forest Management Plans, and Soil and Water Conservation Plans where pertinent.

The designation of an area as a Habitat of Local Significance is not intended to restrict noncommercial passive recreation activities such as hiking and nature photography. These activities are likely to have little adverse impact to the sites, and are therefore considered to be allowable uses. On the other hand, active recreational activities, including the use of off-road vehicles, have potential to cause damage to the sensitive areas of the sites, and therefore are prohibited.

Harvesting of timber for both personal and commercial uses shall not be undertaken in the designated Habitats of Local Significance. Harvesting that takes place adjacent to such areas will have to be conducted in such a manner that disturbance to sensitive areas of the sites, including nontidal wetlands, is avoided. Logging roads, for instance, should be located away from these sensitive areas. Harvesting should also not adversely affect the habitat value of the sites for forest interior dwelling bird species, where it presently exists. Protection of the sensitive features of a site will be ensured through the requirement that a Forest Management Plan be developed for any timber harvesting near such areas by a registered, professional forester and approved by the Maryland Forest Service and the Harford County Department of Planning and Zoning.

If any additional Habitats of Local Significance are identified in the future, a similar management approach will be taken. Also, consideration will be given to the protection of any similar areas found in the remainder of the County through revision of the provisions of the Natural Resources District.

III. FEDERAL, STATE, AND LOCAL REGULATIONS AND MANAGEMENT PROGRAMS

As discussed in the previous section on Threatened and Endangered Species and Species in Need of Conservation, the Maryland Environmental Trust administers voluntary conservation easement programs. Through this program, land owners give up their development rights on environmentally sensitive portions of their properties in exchange for tax benefits.

IV. MODIFICATIONS MADE TO STATE AND LOCAL REGULATIONS AND MANAGEMENT PROGRAMS

Harford County has established a plant and wildlife habitat protection program for the various types of plant and wildlife habitats discussed above. Activities proposed in or adjacent to such areas will be reviewed for potential adverse impacts in accordance with the pertinent provisions of the Subdivision Regulations and the Critical Area Ordinance that were discussed previously in Chapter 2. Forestry operations and agricultural activities will be undertaken in accordance with Forest Management Plans and Soil and Water Conservation Plans that contain provisions providing protection for areas identified as significant plant and wildlife habitat.

Where the development of detailed management programs for specific sites is appropriate such as for areas designated as Habitats of Local Significance, the assistance of the Maryland Department of Natural Resources will be sought.

PART D. ANADROMOUS FISH PROPAGATION WATERS

I. REQUIREMENTS OF THE CRITICAL AREA CRITERIA

Anadromous fish propagation waters are defined by the Criteria as "those streams that are tributary to the Chesapeake Bay where spawning of anadromous species of fish (e.g., rockfish, yellow perch, white perch, shad, and river herring) occurs or has occurred." Such streams were designated by the Department of Natural Resources. The Criteria establish the following objectives for local Critical Area Management Programs with respect to anadromous fish:

- > Protect the instream and streambank habitat of anadromous fish propagation waters;
- Enforce land use policies and practices in the watershed of spawning streams within the Critical Area that will minimize the adverse impacts of development on the water quality of the streams; and
- Provide for the unobstructed movement of spawning and larval forms of anadromous fish in streams.

To achieve the objectives, local governments are to ensure that:

The installation or introduction of concrete riprap or other artificial surfaces onto the bottom of natural streams is prohibited, unless it can be demonstrated that water

quality and fisheries habitat will be improved;

- Channelization or other physical alterations that may change the course or circulation of a stream and thereby interfere with the movement of fish is prohibited; and
- Adverse impact on anadromous fish spawning streams from activities occurring in their watersheds are to be firstly avoided or otherwise minimized. Local jurisdictions are encouraged to adopt land use policies and programs in watersheds outside of the Critical Area to minimize the impacts of any activities on anadromous fish spawning streams.

In addition, the Criteria require that local governments abide by the following State laws and regulations:

- The construction or placement of dams or other structures that would interfere with or prevent the movement of spawning fish or larval forms in streams shall be prohibited. If practical, the removal of existing barriers shall be removed (COMAR 08.05.03.05).
- ➤ Local jurisdictions shall assure that the construction, repair, or maintenance activities associated with bridges, or other stream crossings or with utilities and roads, which involve disturbance within the Buffer or which occur instream, as described in COMAR 08.05.03.11B(5), shall be prohibited between March 1 and June 15.

II. SIGNIFICANT ISSUES AND FACTORS

The major issues associated with anadromous fish propagation waters are identification of those streams designated as anadromous fish propagation waters and the establishment of measures to ensure the protection of anadromous fish spawning streams from adverse impacts resulting from activities occurring in those streams or in their watersheds.

IDENTIFICATION OF ANADROMOUS FISH SPAWNING STREAMS IN HARFORD COUNTY

When the Critical Area Management Program was developed, the Maryland Department of Natural Resources stated that all perennial streams in Harford County's Critical Area should be considered anadromous fish spawning streams. As a result, such streams have not been mapped due to their pervasive nature. Their approximate location can be identified by reference to the U.S.G.S. 7" quad maps or the Harford County Soil Survey. Identification of the exact location of any streams located on a proposed site will be required as part of the County's development review process.

IMPLEMENTATION OF APPROPRIATE PROTECTION MEASURES

Implementation of the other requirements of the Critical Area Criteria should provide adequate protection to anadromous fish spawning streams. Among the most pertinent requirements are those relating to establishment of the 100-foot Critical Area Buffer and the protection of nontidal wetlands and

other Habitat Protection Areas. Implementation of the recommendations of the County's Sediment Control and Stormwater Management Evaluation Study discussed in Chapter 2 should address the requirement for minimizing impacts on anadromous fish spawning streams due to activities occurring in their watersheds. With regard to extending protections for anadromous fish spawning streams beyond the Critical Area, it should be noted that the County's Natural Resources District Ordinance is applicable countywide. That ordinance requires a minimum 75 foot natural buffer along streams, restriction of development on steep slopes and soils with development constraints, and requires activities proposed near streams be completed in such a manner that minimizes adverse environmental impacts.

III. FEDERAL, STATE AND LOCAL REGULATORY AND MANAGEMENT PROGRAMS

STATE WATERWAY CONSTRUCTION/OBSTRUCTION PERMIT

Any activity that occurs in a free flowing stream with a watershed of 400 acres or more (or 100 acres or more in the case of trout streams) requires a Waterways Construction/Obstruction Permit from the Maryland Department of the Environment. The required conditions for such a permit require that all bridges and culverts be constructed so as not to adversely affect fish habitat and migration patterns, and that the construction of proposed projects that may adversely affect anadromous fish spawning areas is prohibited from March 1 through June 15.

NATURAL RESOURCES DISTRICT

Outside of the Critical Area, the County's Natural Resource District provides for maintenance of a natural buffer adjacent to streams, protection of significant environmental features such as nontidal wetlands, and the minimization of potentially adverse impacts of activities near streams.

IV. MODIFICATIONS MADE TO LOCAL REGULATIONS AND MANAGEMENT PROGRAMS

The measures instituted to address other parts of the Criteria shall provide adequate protection to anadromous fish propagation waters. In addition, the Zoning Code requires a condition of approval that any proposed development in the Critical Area for construction, repair, or maintenance associated with bridges or other stream crossings, or with utilities and roads that occur instream or involve disturbance within the Buffer, not be undertaken during the period between March 1 and June 15. All proposed instream construction projects shall maintain the natural stream channel bottom and predevelopment conditions.

PART E. NONTIDAL WETLANDS

I. REQUIREMENTS OF THE CRITICAL AREA CRITERIA

In addition to the Habitat Protection Areas specified in COMAR 27.01.09, Harford County implements a nontidal wetlands protection program based upon the provisions in the Natural Resources District transferred in slightly modified form to the Critical Area Ordinance, and appropriate provisions to be

included in Soil and Water Conservation Plans for agricultural areas that may contain nontidal wetlands. Table 8 lists the positive indicators for wetlands of special importance.

TABLE 8

POSITIVE INDICATORS OF NONTIDAL WETLANDS OF SPECIAL IMPORTANCE

A wetland complex – when the area contains two or more contiguous wetland types.

A special soil type – when wetlands (excluding those dominated by loblolly pine) occur on the soil types of Elkton, Muck, or Evesboro-Goldstown. These soils are often well-drained, but when a wetland is present, the area should be examined.

Wetlands in sand/gravel pits that have been abandoned for over five years.

Seep wetlands – springs that pool water at the surface because there is a wetter water regime than in adjacent areas. These wetlands have muck or peat soils present, or there is at least a 70% cover of sphagnum moss. Plant species include:

COMMON NAME	LATIN NAME
Skunk Cabbage	Symplocarpus foetidus
Follciled Sedge	Carex folliculata
Marsh Marigold	Caltha palustris
Canada Mayflower	Maianthemum canadensis
Wood Anemone	Anemone quinquefolia

Wooded wetlands dominated by large trees (greater than 24" DBH) with less than 30% herbaceous cover in exotic species. Exotic species include:

COMMON NAME	LATIN NAME
Japanese Honeysuckle	Lonicera japonica
Japanese Barberry	Berberis thunbergii
Japanese Knotweed	Polygonum cuspidatum
Kudzu Vine	Pueraria lobata
Asiatic Knotweed	Polygonum perfoliatum
Daylily	Hemerocallis fulva
Multiflora Rose	Rosa multiflora
Privet	Ligustrum spp.
Garlic Mustard	Alliaria officinalis
Autumn/Russian Olive	Eleagnus spp.
Purple Loosestrife	Lythrum salicaria
Common Reed	Phragmites australis

Wooded wetland shrubs and herbaceous cover of at least 30%, as an indication of well-defined vegetative layers with high plant species diversity.

Wooded or shrub dominated wetlands over one acre in size.

TABLE 8 continued

POSITIVE INDICATORS OF NONTIDAL WETLANDS OF SPECIAL IMPORTANCE

Wetlands associated with extensive forested tracts, such as may be used by interior dwelling bird species.

Bogs - highly acidic wetlands characterized by peat, or a floating mat of vegetation, and sphagnum moss. They often occur adjacent to old millponds and in old sand/gravel pits.

Wooded wetlands with vernal pools (seasonal ponds).

II. SIGNIFICANT ISSUES AND FACTORS

The location of stormwater management measures in nontidal wetlands will be limited to those for which there is no other viable location, as demonstrated with an approved variance, and whose water quality benefits outweigh the adverse impacts on the water quality and plant and wildlife habitat values of the nontidal wetlands affected. In determining the adverse impacts of the location of such facilities, consideration will be given to the compensatory value of mitigation measures proposed to replace the lost water quality and habitat value of the affected nontidal wetlands. Any stormwater management measures constructed will be required to be undertaken in a manner that minimizes their adverse impact on the nontidal wetlands.

Provisions will also be made to allow the construction of water-dependent facilities that may adversely affect nontidal wetlands if such impacts are necessary and unavoidable and if appropriate mitigation measures are taken. Similarly, the location of roads, utilities and bridges in nontidal wetlands will be allowed only if no feasible alternative exists and impacts are minimized and are appropriately mitigated.

III. FEDERAL AND STATE REGULATORY AND MANAGEMENT PROGRAMS

FEDERAL REGULATORY PROGRAMS

CLEAN WATER ACT

Under Section 404 of the Clean Water Act, the Corps of Engineers regulates the discharge of dredge or fill material into the waters and wetlands of the U.S., subject to oversight by the Environmental Protection Agency. The Environmental Protection Agency maintains final authority in defining the extent of wetlands and if it is determined that a discharge will have unacceptable impacts on municipal water supplies, shellfish and fishery areas, wildlife, and/or recreation, the Environmental Protection Agency can veto issuance of the Corps permit. The U.S. Fish and Wildlife Service provides advisory comments to the Corps of Engineers regarding proposed projects that may affect nontidal wetlands or water bodies. Under Section 401 of the Clean Water Act, the Maryland Department of the Environment is the delegated authority to administer water quality certification programs. All projects involving discharge into wetlands and State waters are reviewed by the Maryland Department of the Environment for potential adverse impacts.

FARM BILL OF 1985 (FOOD SECURITY ACT) TITLE XII SECTION E ("SWAMPBUSTER")

As noted in the chapters on agricultural activities, the Department of Agriculture is to withhold benefits such as farm loans and crop insurance from farmers who convert wetlands for agricultural use subsequent to the passing of this Act.

STATE PROGRAMS

WATERWAY CONSTRUCTION PERMITS

The Waterway Construction Division of the Maryland Department of the Environment issues waterway construction permits for work in a stream or its 100-year nontidal floodplain, including construction, fill, or placement of structures. Agricultural drainage systems, for the purpose of lowering the level of water in the soil, with a drainage area less than 2,500 acres are exempt from needing permits (COMAR 26.17.04.03 D). The Nontidal Wetlands Division of the Maryland Department of the Environment have regulations (COMAR 26.23.02) that require applicants to mitigate, replace, or minimize loss of habitat when there is no reasonable alternative to causing adverse effects on nontidal wetlands.

COASTAL ZONE MANAGEMENT PROGRAM CONSISTENCY DETERMINATIONS

The Coastal Zone Consistency Division of the Maryland Department of the Environment issues recommendations and makes consistency determinations to other State and Federal agencies regarding projects affecting the State's Coastal Zone. The Coastal Zone includes Baltimore City as well as the counties that border the Chesapeake Bay, Potomac River, and Atlantic Ocean.

STATE NONTIDAL WETLANDS PROGRAM

As discussed in Chapter 3, the Maryland Department of the Environment reviews and evaluates permits for impacts to nontidal wetlands through the 404 Joint Application process with the Army Corps of Engineers. The Maryland Department of the Environment has the authority to issue or deny State Wetlands Permits. In addition, the Maryland Department of the Environment provides technical assistance and training to State and local governmental agencies on issues involving nontidal wetlands.

IV. MODIFICATIONS MADE TO LOCAL REGULATIONS AND MANAGEMENT PROGRAMS

In the Chesapeake Bay Critical Area, the Zoning Code requires the retention of a 75-foot buffer around nontidal wetlands, and prohibits alteration of those nontidal wetlands and their Buffers. An estimation of the location of wetlands is provided by the Harford County Soil Survey (Soil Conservation Service, 1972). Hydric soils and soils that have hydric components are listed in Table 1 of this Program. Protection will also be provided to nontidal wetlands regardless of their size that are found to be hydrologically connected through surface or subsurface flow to streams, tidal waters, and/or determined to be of special importance to fish, wildlife, or plant habitat by appropriate federal, State, and local agencies.

List of Appendices to the Harford County Chesapeake Bay Critical Area Management Program Document

Appendix A	Public Review Process
Appendix B	Environmental Site Design Criteria for the Maryland Critical Area
Appendix C	Measures Implementing the Harford County Critical Area Forest Conservation and Protection Program
Appendix D	Description of Grandfathered Projects
Appendix E	Program Requirements for Water-Dependent Facilities
Appendix F	Description of Historical Shore Erosion Processes in Harford County
Appendix G	Measures Implementing Harford County's Critical Area Agricultural Land Protection Program
Appendix H	Notification and Review Procedures for Projects in Harford County Involving Nontidal Wetlands
Appendix I	Habitat Protection Areas for the Harford County Critical Area, State Threatened and Endangered Species and Species in Need of Conservation
Appendix J	Procedures for Identification of Forest-Interior Dwelling Bird Species Habitats
Appendix K	Critical Area Buffer Regulations

Appendix A

Public Review Process – Comprehensive Update 2021

APPENDIX A

Public Review Process

The fifth comprehensive review of the Harford County Critical Area Program will be complete in 2022. The major changes to the Program will be the incorporation of new requirements brought about by the adoption of updated regulations for water-dependent facilities, agriculture, and surface mining. The adopted regulations for renewable energy, specifically solar energy generating systems, will not be incorporated into the County Program due to County-adopted restrictions of minimum acreage requirements and location constraints within the CBCA.

Additional changes to the Program will include updates to the enforcement provisions, variance language, revised growth allocation calculations, new Buffer language, and a revised list of permissible mitigation offsets. The definition of lot coverage will be revised to include a list of various kinds of impervious surfaces, including stone, pavers, pools, and man-made ponds. Many updates to agency names, code references, and other editorial changes will occur.

Critical Area boundary maps and resource inventory maps were updated based on the latest information provided by the Maryland Department of Natural Resources. Property owners were notified by the Critical Area Commission and given the opportunity to meet with State and County staff to discuss the change(s). Mapping changes have been

The Program changes were presented to the Environmental Advisory Board (EAB) and the Planning Advisory Board (PAB) at separate meetings in April 2022. The changes to the code, map, and program were approved by the county council in a process with public hearing. The legislative package was subsequently approved by Critical Area Commission. Copies of decisions on council bills and commission items are available on their respective websites.

Environmental Site Design Criteria for the Maryland Critical Area

Prepared for Maryland Critical Area Commission Annapolis, MD

Prepared by Chesapeake Stormwater Network Baltimore, MD

May 24, 2011

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List of Acronyms

CAC	Critical Area Commission
CDA	Contributing Drainage Areas
CIDA	Contributing Impervious Drainage Area
CSN	Chesapeake Stormwater Network
ESC	Erosion and Sediment Control
ESD	Environmental Site Design
EMC	Event Mean Concentration
GIS	Geographic Information System
HSG	Hydrologic Soil Group
IC	Impervious Cover
IDA	Intensely Developed Area
LDA	Limited Development Area
MDE	Maryland Department of Environment
MEP	Maximum Extent Practicable
NRCS	Natural Resources Conservation Service
Pe	ESD Target Volume
RCA	Resource Conservation Area
RCN	Runoff Curve Number
SA	Surface Area
TP	Total Phosphorus
TMDL	Total Maximum Daily Load
WQv	Water Quality Volume

Part 1 Introduction

The Chesapeake Bay Critical Area Protection Act was originally enacted in 1984 by the Maryland General Assembly to help reverse the deterioration of the Chesapeake Bay and the surrounding environment. In 2002, the Act was amended to add the Atlantic Coastal Bays to the area protected by the Critical Area regulations. The Act was amended again in 2008 to strengthen its provisions to protect water quality and habitat. A summary of the new provisions can be found at www.dnr.state.md.us/criticalarea/guidancepubs/052008overviewofhousebill1253.pdf.

The Critical Area Protection Act is designed to promote environmentally sensitive stewardship of land and water resources in the Critical Area. It addresses three principal concerns: minimizing adverse impacts on water quality that result from pollutants that are discharged from structures or conveyances or that have run off from surrounding lands; to conserve fish, wildlife and plant habitat; and to accommodate future growth in the most environmentally protective means possible. More detailed information about the Critical Area Act and the local Critical Area regulations designed to preserve and protect the Chesapeake Bay and the Atlantic Coastal Bays can be found online at: <u>www.dnr.state.md.us/criticalarea</u>.

1.1 The Maryland Critical Area and Buffer

The Maryland Critical Area is defined as all land and water areas within 1,000 feet of the landward boundary of tidal waters or tidal wetlands. It also includes the waters of and the lands under the Chesapeake and Atlantic Coastal Bays. The Critical Area Law and Regulations apply to 16 counties, Baltimore City, and 47 municipalities surrounding Maryland's tidal waters. Each locality must implement a land use and resource protection program that is designed to minimize the damaging impact of water pollution and loss of natural habitat, while also accommodating the jurisdiction's future growth. The Critical Area was created with the recognition that land use immediately adjacent to the Bay and its tributaries has the greatest potential to influence water quality and natural habitats.

Since 1986, Critical Area regulations have required a minimum Buffer of 100 feet of natural vegetation extending landward from the Mean High Water Line of tidal waters or the edge of tidal wetlands and tributary streams. The Buffer is critical for habitat protection and water quality enhancement, and acts as a transition zone between human disturbance and sensitive land and water resources. The Buffer also acts as a filter for the removal or reduction of sediment, nutrients, and toxic substances that enter adjacent waterways in land runoff.

In 2010, the Critical Area Commission issued new regulations for the Critical Area Buffer; a synopsis can be found at <u>www.dnr.state.md.us/criticalarea/pdfs/LGAG_BR0210.pdf</u>. Most notably, the new regulations now specify how Buffers are to be established in forest vegetation and provide clearer rules on Buffer management, mitigation and enforcement. Further, a minimum 200-foot Buffer is now required for all new subdivisions or site plans within the Resource Conservation Area (RCA).

The Critical Area Buffer may be disturbed only for certain activities, such as waterdependent structures, access to the shoreline, and shore erosion control measures. Also, agricultural activities are permitted within the Buffer under special guidelines. In general, cutting or clearing of trees, except those that are diseased or damaged, is not permitted within the Buffer. A Buffer Management Plan, approved by the local government, can be used to allow for reasonable access to the water, for the removal of invasive species, and for enhancement of the Buffer. Overall, the Buffer should be maintained in natural forest vegetation and must be expanded to include adjacent sensitive resources, such as steep slopes, and hydric or highly erodible soils.

No other types of development or other land disturbances are permitted in the Buffer (e.g., swimming pools, tennis courts, structures, stormwater management structures, and septic fields). If such activities are proposed within the Buffer, the property owner is required to request a variance from their local jurisdiction that both demonstrates unwarranted hardship and proves that the project will not have a negative impact to water quality, plant, fish, or wildlife habitat.

1.2 Evolution of Stormwater Management in the Critical Area

The Critical Area has three primary land use overlay zones: Resource Conservation Areas (RCA), Limited Development Areas (LDA), and Intensely Developed Areas (IDA). *Intensely Developed Areas* are dominated by residential, commercial, industrial, and institutional land uses (at the time of the original Critical Area mapping) and possess relatively little natural habitat. IDAs are also considered the preferred locations for future growth through redevelopment and/or new development.

The original criteria developed under the Critical Area Act required that any development within the IDA be accompanied by practices to reduce water quality impacts associated with stormwater runoff. The Criteria further specified that these practices must be capable of reducing stormwater pollutant loads from a development site to a level at least 10% below the load generated by the same site prior to development. This requirement is commonly referred to as the "10% Rule."

The Critical Area Commission published a guidance document in 1987 to provide a consistent approach to compliance with the 10% Rule (MWCOG, 1987). This document was revised in 1993 and then again in 2003 to reflect changes in stormwater science, treatment technology and state regulations and design manuals (CAC, 2003). The new stormwater criteria presented in this edition apply to all new and redevelopment projects in all three land use overlay zones in the Maryland Critical Area.

The responsibility to review Critical Area stormwater criteria is delegated to each local government for most projects, although there is a subset of projects which must also be submitted to the Critical Area Commission staff.

Over the past decade, stormwater management has evolved dramatically in Maryland, both in terms of the overall strategies to treat stormwater and the most effective types of stormwater Best Management Practices (BMPs). In 2009, the Maryland Department of

the Environment (MDE) revised the 2000 Maryland Stormwater Design Manual, Vol. I & II to reflect the use of environmental site design (ESD) practices. The revised Maryland Stormwater Design Manual can be accessed online at: <u>ht p://www.mde.state.md.us/Programs/WaterPrograms/SedimentandStormwater/stormwater_design/index.asp</u>

1.3 Why the New Edition was Created

This new edition replaces the CAC (2003) stormwater guidance manual and Appendix D.4 of MDE (2000). It is intended to streamline and improve compliance with both the phosphorus removal standard and the new environmental site design regulations. Consequently this new edition seeks to integrate compliance with both stormwater requirements in a single spreadsheet compliance tool. This edition also reflects improvement in our scientific and engineering understanding of stormwater management over the last decade. The goal of this edition is to ensure that runoff from development projects in the Critical Area does not represent an additional nutrient load to the Chesapeake Bay, as defined under Maryland's nutrient allocation under the Baywide nutrient TMDL (MDE, 2010).

1.4 What's New in the 2011 Edition?

- To be consistent with new state-wide ESD requirements, the phosphorus removal performance standards apply to all projects with more than 5000 square feet of disturbance in all three overlay zones in the Critical Area -- Resource Conservation Areas (RCA), Limited Development Areas (LDA), and Intensely Developed Areas (IDA). Any development within these three overlay zones must be accompanied by ESD practices to reduce water quality impacts associated with stormwater runoff.
- The stormwater phosphorus removal performance standard for the Critical Area has been enhanced and refined. *The standard is now expressed in terms of a maximum acceptable annual phosphorus load of 0.3 pounds per acre for new development projects in the Critical Area.* The new performance standard ensures that phosphorus loads from new development in the Critical Area will meet water quality standards in the Maryland portion of the Chesapeake Bay, as derived for the Bay-wide TMDL (MDE, 2010). The new standard also reflects a factor of safety to account for the close proximity of the Critical Area to the waters of the Chesapeake Bay. The technical basis for the new standard is documented in Appendix B. The practical implication for communities is that new development projects that meet the performance standard in the Critical Area will not add to their nutrient reduction liability under their local watershed implementation plans.
- The Critical Area phosphorus removal standard is triggered automatically by the spreadsheet once the proposed impervious cover for a site exceeds 10% (note: sites with less impervious cover are still subject to MDE ESD requirements). Phosphorus removal requirements become progressively more stringent as site

impervious increases, with a maximum TP removal requirement of 85% at the most intensively developed sites (i.e., 100% impervious cover --IC).

- This edition also establishes a two-track plan review process that distinguishes between very small projects (250 to 5000 square feet of site disturbance) and the larger projects (5000 or more square feet of site disturbance that trigger the new MDE ESD stormwater requirements). *This edition applies to all development projects above 5000 square feet in the Critical Area.* Another guidance document is currently being developed to streamline the review of very small development projects.
- This edition adopts a definition for redevelopment that is consistent with the more stringent MDE ESD stormwater regulations. *The key change is that the threshold at which a project is classified as redevelopment increases to 40% pre-existing impervious cove*r (compared to the 15% impervious cover threshold proposed in CAC, 2003).
- This edition also integrates the site analysis of predevelopment hydrologic soil groups to better conform to the state-wide methods and equations prescribed for ESD to the MEP compliance (MDE, 2009). The permeability of predevelopment soil types at a development site determines the magnitude of the target volume that must be treated by ESD practices. Soil properties also govern which ESD practices are feasible at a given site, and can strongly influence the phosphorus removal rate they can achieve.
- For the sake of consistency, *this edition uses the same nomenclature and practice names as outlined in the new state-wide ESD regulations and stormwater manual.* New phosphorus removal rates were developed to conform to the new list of ESD practices (see Appendix A). In some cases, designers need to meet criteria that are more stringent than the new MDE stormwater manual in order to achieve the highest removal rate.
- This edition and the accompanying spreadsheet presents "design level" approach for estimating the phosphorus removal capability of certain stormwater practices, based on a two-tiered design approach in the Critical Area. A practice designed to Level 1 achieves a lower phosphorus removal rate than the more stringent Level 2 designs.
- In general, Level 1 design equates to the minimum design criteria for ESD practices, as outlined in MDE (2009). Level 2 design includes an enhanced list of design features known to maximizes phosphorus removal, and, consequently, earn a higher phosphorus reduction rate. The technical basis for the two design levels are outlined in CWP and CSN (2008). The specific phosphorus removal rate and required design elements differ for each practice: more detailed Level 1 and 2 design criteria can be found in Section 4.
- This edition presents two new non-structural ESD credits that can be used at Critical Area development sites -- *impervious cover conversion and natural area reforestation*. In addition, several new design criteria are presented for existing MDE ESD credits to ensure they perform effectively in the Critical Area.
- The edition also provides expanded design guidance for alternative surfaces, micro-ESD practices, and ESD practices. *It explicitly recognizes that infiltration, dry swales and regular bioretention areas are acceptable ESD practices to use in the Critical Area.* In addition, this edition treats green roofs and permeable pavements as micro-ESD practices rather than alternative surfaces, which provides greater flexibility in applying these innovative practices. The expanded design guidance also promotes more reliable phosphorus removal, and is specifically adapted to withstand the unique conditions and constraints of the Maryland Coastal Plain (CSN, 2008).
- This edition *is linked to an accompanying spreadsheet tool that simultaneously allows designers to track their environmental site design and phosphorus removal requirements.* The spreadsheet should be used for all development projects that disturb more than 5000 square feet in the Critical Area. The spreadsheet enables designers to quickly find the most cost-effective combination of ESD practices that can comply with both laws.
- The compliance spreadsheet replaces the paper worksheets first introduced in CAC (2003). The spreadsheet automatically computes both the ESD target volume and TP removal requirements, and then shows incremental reductions achieved by various combinations of non-structural ESD credits, alternative surfaces, micro ESD practices and conventional structural practices. Part 3 of this document provides further detail on how to use the spreadsheet, in the context of the Critical Area phosphorus removal performance standard.
- This edition also clarifies the conditions under which ESD practices can or cannot be used in the 100 foot Critical Area Buffer.
- The new edition acknowledges that *sea-level rise will affect the location of stormwater infrastructure in the Critical Area,* and proposes several adaptive engineering criteria with respect to the elevation of stormwater outfalls and ESD practices relative to mean high water line.
- Finally, the new edition updates the 2003 CAC guidance for setting offset fees or allowing off-site restoration in the event that full compliance is not possible under the phosphorus removal standard. Part 5 presents *an updated offset fee structure and qualifying criteria for off-site restoration projects.*

Part 2 Standard Critical Area Stormwater Design Review Policies

Over the last 25 years, a series of recurring plan review issues have arisen when local planners evaluate stormwater plan submittals in the Critical Area. This section presents standard design review policies to resolve these issues, which should reduce conflicts between the designer and plan reviewer during the approval process.

2.1 To Whom Do You Submit Your Critical Area Stormwater Plan?

Traditionally, a stormwater plan is either reviewed by the local Critical Area planning authority or the engineering review staff in the Department of Public Works (who is also responsible for ensuring state-wide ESD compliance). Applicants should consult with their local jurisdiction to determine where to submit their Critical Area stormwater plan. It is now possible to consolidate the local stormwater review process within a single review agency that checks for compliance with the "ESD to the MEP" requirement and the Critical Area phosphorus removal standard.

The following table lists those projects which are required to be sent to the Critical Area Commission via the local jurisdiction which will require stormwater calculations. This is not an exhaustive list of required project submittals but rather only those which have a stormwater component. The complete listing of projects required to be submitted to the Commission for review can be found in COMAR 27.01.03.

<u>Ty</u>	pe of Application	<u>IDA</u>	<u>LDA</u>	<u>RCA</u>
1.	Variance from Critical Area provisions	Y	Y	Y
2.	Development of less than 5000 square feet of disturbance-	Ν	Ν	Ν
	(outside of any Habitat Protection Area)			
3.	Development of between 5,000 and 15,000 square feet of	Ν	Ν	Y
	Disturbance (outside of HPA)			
4.	Development resulting in greater than 15,000	Y	Y	Y
	square feet of disturbance			
5.	Subdivision of 3 lots or fewer	Ν	Ν	Y
6.	Subdivision of 4 to 10 lots	Ν	Y	Y
7.	Subdivision of greater than 10 lots	Y	Y	Y
8.	Subdivision affecting growth allocation	N/A	Y	Y
9.	Intra-family transfer	N/A	N/A	Y

Table 1 Projects Requiring Stormwater Submittals to the Critical Area Commission

Under the new ESD regulations, stormwater plans must be submitted for review during three stages of site plan review: the concept plan, the preliminary plan and the final plan. It is strongly recommended that the phosphorus removal spreadsheet

computations and ESD plans should be submitted and reviewed concurrently in each stage of local stormwater plan review.

2.2 What are the Rules for Measuring Impervious Cover?

The degree of phosphorus removal required at a development site is strongly influenced by the amount of post-development impervious cover (IC). Therefore, it is extremely important to accurately measure IC when preparing Critical Area stormwater plans.

Table 2 Defining Impervious Cover in the Maryland Critical Area					
Land Cover	Material	Is it Impervious?	Counts Toward Lot Cover?		
Roads & Parking Lots	Concrete, asphalt, dirt, gravel or oyster shell	Yes	Yes		
Driveways	Concrete, asphalt, dirt, gravel or oyster shell	Yes	Yes		
Sidewalks/Path	Concrete, asphalt, dirt, gravel or oyster shell	Yes	Yes		
Sidewalks/Path	Woodchip	No	No		
Buildings	All Roof Surfaces	Yes	Yes		
Rooftop	Green Roof	No ²	Yes		
Permeable Paver	Concrete, Asphalt or Pavers	No ²	Yes		
ESD practices	MDE (2009)	No	No		
Conventional Structural Practices	MDE (2000)	No	No		
Decks	Pervious Design ¹	No	No		
Decks	Impervious Design	Yes	Yes		
Swimming Pools and L	andscaping Ponds	Yes	Yes		
Bridges or marine facilities over open water Yes Yes					
1. The deck is constructed with gaps between the boards and, instead of a concrete pad, a sloping gravel bed is					

1. The deck is constructed with gaps between the boards and, instead of a concrete pad, a sloping gravel bed is placed under the deck to allow stormwater to infiltrate into the soil. Sheet flow from deck runoff can be insured and erosion reduced by the placement of a gravel bed with vegetative stabilization

2. It is initially entered as impervious cover in Step 2, but the spreadsheet automatically computes the effect of these alternative surfaces in reducing runoff volumes for the site

Impervious cover is broadly defined as those surfaces in the landscape that impede the infiltration of rainfall and result in an increased volume of surface runoff. As a simple rule, all surfaces that are not vegetated will be considered impervious. Impervious surfaces include roofs, buildings, paved streets and parking areas and any concrete, asphalt, compacted dirt or compacted gravel surface. Table 2 provides more detail on what surfaces are classified as impervious or not.

The following policies pertain to the measurement of impervious cover:

- Existing and proposed impervious cover must be measured directly from the most recent and accurate site plan. The use of a planimeter is recommended.
- In addition, the specific contributing impervious drainage area (CIDA) to each ESD credit and/or practice should be delineated on the ESD concept plan.
- Estimates of impervious cover based on general land use type or hydrologic modeling programs are not allowed for submission (e.g., TR-55).
- If land is subdivided prior to construction, it is recommended that the applicant complete the compliance spreadsheet at the time of initial subdivision for lots with an average density of one acre or less, with imperviousness calculated using maximum building envelopes and proposed road layouts.

2.3 How do Permeable Pavement or Green Roofs Affect Your Site IC Footprint?

Prior to 2008, sites within the Critical Area's Limited Development Area (LDA) and Resource Conservation Area (RCA) were limited to a maximum of 15% impervious cover. Impervious surfaces could generally be defined as those man-made surfaces that do not allow stormwater to be infiltrated into the soil. However, certain types of materials were granted a percentage of pervious cover if they provided some degree of infiltration (e.g., pervious pavers). Often, the use of these types of materials created scenarios where individuals could greatly expand the footprint of development on a site. As a result, in 2008 the Commission amended Natural Resources Article §8-1808 to change the term "impervious surface" to "lot coverage" in order to limit the footprint of development on properties designated as LDA and RCA. Lot coverage is now defined as follows:

"Lot Coverage" means the percentage of a total lot or parcel that is:

- 1. Occupied by a structure, accessory structure, parking area, driveway, walkway, or roadway; or
- 2. Covered with gravel, stone, shell, impermeable decking, a paver, permeable pavement, or any manmade material.

Lot coverage does not include:

- 1. A fence or wall that is less than one foot in width that has not been constructed with a footer;
- 2. A walkway in the Buffer or expanded Buffer, including a stairway, that provides direct access to a community or private pier (local governments shall ensure that impacts to the Buffer associated with access are minimized);
- 3. A wood mulch pathway; or

4. A deck with gaps to allow water to pass freely.

The Critical Area commission has also adopted the following definitions to clarify the review process:

Impermeable decks - Lot coverage includes the ground area covered or occupied by an impermeable deck, even when that deck is not directly touching the ground surface.

Stairways - Lot coverage does not include walkways or stairways in the Buffer that provide direct access to a community or private pier. All other stairs or walkways count.

Stormwater management and erosion control measures - Lot coverage does not include these practices when they are approved only for the specific purpose of performing stormwater management or erosion control.

The 2008 Critical Area amendments specify that lot coverage may not exceed 15% within the Limited Development Area (LDA) and Resource Conservation Area (RCA). Designers frequently ask whether this threshold can be exceeded if alternative surfaces such as green roofs or permeable pavers are used. The policy of the Critical Area Commission is that while these practices are encouraged to meet stormwater requirements, they **cannot** be used to increase the site lot coverage footprint.

2.4 How do you define limits of disturbance for new and redevelopment projects?

The project area subject to both Critical Area and ESD stormwater requirements is defined as the area bounded by the limits of disturbance (i.e., any area subject to clearing, grading, excavation or stockpiling activities during all stages or phases of site development). This definition applies to both new and redevelopment projects.

In general, the Critical Area Buffer and other "down-gradient" natural conservation areas are protected by locating them outside the limits of disturbance. Therefore, the site area devoted to the Critical Area Buffer and related natural areas can be excluded from the analysis of the phosphorus removal standard.

2.5 What are rules for working in the Critical Area Buffer?

The Critical Area Buffer is strictly protected from disturbance to maintain its habitat and water quality functions. Therefore, it can only be disturbed for limited activities such as water-dependent structures, access to the shoreline, and for the installation of shore erosion control measures.

• The general rule is that stormwater treatment practices are not permitted within the 100-foot or expanded Buffer

- Stormwater pipes and outfalls are allowed to cross the Buffer, since they are considered to be water-dependent facilities. Outfalls must discharge to open water but be located at least one foot above the mean high water line to account for extreme tides and future sea level rise. The size and capacity of stormwater pipes should be minimized by using ESD practices to the maximum extent possible. Large diameter stormwater outfall pipes are normally a sign of a poor stormwater plan.
- In limited circumstances, it may be permissible to construct regenerative conveyance wetlands (also known as Coastal Plain Outfalls) for restoration purposes within the Buffer if there is an existing erosion problem around a stormwater outfall or within a stream valley. These proposals are considered on a case-by-case basis.
- The Critical Area Buffer cannot be used for disconnection purposes (rooftop, non-rooftop, or sheet flow to conservation areas) unless there is a minimum 75-foot distance between the closest impervious surface to the landward edge of the 100-foot Buffer.
- In portions of the Buffer which have been designated as Buffer Exemption Areas (also known as Modified Buffer Areas, Buffer Management Areas or Special Buffer Areas), there may be certain ESD practices that are permitted within the Buffer. Generally, acceptable practices must be vegetated (i.e., bioretention areas, rain gardens and landscape infiltration) with a mix of native trees, shrubs and ground covers that replicate natural plant communities while still providing effective runoff reduction and pollutant removal.
- If a Buffer currently lacks forest cover, stormwater credits may be obtained if it meets qualifying conditions for soil restoration and reforestation, as outlined in Section 4.1. The use of native species adapted to the coastal plain is required. A guide to recommended species can be found at http://www.nps.gov/plants/pubs/chesapeake/pdf/chesapeakenatives.pdf.

2.6 Where do you get data on hydrologic soil groups present at your site?

The new ESD regulations require that the hydrologic soil groups present at the site must be mapped to determine the ESD target volume. This information is readily available from the Natural Resources Conservation Service, which publish soil surveys in both hard copy and on-line editions. Please consult the following url to determine the soils data available in your community.

http://soils.usda.gov/survey/printed_surveys/state.asp?state=Maryland&abbr=MD

The most convenient format are the web-based soil surveys that make it easy to analyze soil properties using a GIS format. More information on how to use the web soil survey can be found at:

<u>http://websoilsurvey.nrcs.usda.gov/app/Help/WSS_HomePage_HowTo.pdf</u> If soils are classified as urban fill or equivalent (e.g., urban land, cut and fills, or made land), they should generally be assigned to hydrological soil group "D", which has the greatest runoff response (CSN, 2011). Designers also have the option of conducting onsite soil tests to determine the appropriate HSG using the soil testing methods outlined in Appendix E of NJDEP (2009). If testing indicates the soils have acceptable infiltration rates throughout the entire soil profile and there are no signs of suspicious materials, then the site can be considered suitable for infiltration. If the soil tests are negative, then infiltration should be avoided.

Infiltration is prohibited in cases where a site history investigation indicates that the redevelopment site is a brown-field (US EPA, 2008). Contaminated soils should be capped and stormwater practices should treat surface runoff in a "closed" system which does not allow any interaction with groundwater. This typically involves the use of stormwater filtering practices such as sand filters and bioretention that have impermeable bottom liners. Designers should also avoid infiltration at sites that are expected to become severe stormwater hotspots.

2.7 How do you deal with projects that split the Critical Area boundary?

Many development projects cross the boundary of the Critical Area, such that portions of the site are subject to the phosphorus removal performance standard and others are not. In the past, this situation required special paper worksheets to split the site that perplexed designers and reviewers alike.

While it is still a local call, it is now strongly recommended that the phosphorus removal calculations be performed **for the site as a whole.** The rationale is that the entire site must meet the ESD to MEP standard, and in doing so, may be sufficient to also meet the phosphorus removal standard. In the rare cases where this is not possible, the designer may elect to enter site data for the Critical Area portion of the site into the spreadsheet to see if compliance can be achieved in that manner.

2.8 How do you handle off-site runoff to your project from another property?

Some projects receive additional stormwater runoff from off-site properties. In general, applicants are not required to treat this runoff to the meet the phosphorus removal standard, although they should ensure that their drainage system and ESD practices have sufficient capacity to safely convey this upstream runoff during the ten year storm event without erosion.

A designer may elect to treat some or all of the off-site runoff on their property in order to meet their own phosphorus removal requirement. This can be documented by using the spreadsheet to determine their on-site phosphorus removal requirement, and then running the spreadsheet a second time using the inputs for the off-site drainage area (and proposed treatment areas) to calculate the total load reduction. The offsite load reduction can then be compared to the on-site removal requirement to determine if compliance has been achieved.

2.9 What constitutes a direct stormwater discharge to tidal waters, and does it exempt the need for channel protection storage?

The 2000 MDE stormwater manual waives channel protection storage requirements in situations where stormwater directly discharges to tidal waters. The rationale at the time was that the erosive energy of urban stormwater does not come into play in tidal waters. The 2000 manual also specifically exempted Eastern Shore counties from the channel protection requirement (although they are now subject to higher ESD volumes as a result of the new ESD regulations, which provide some form of channel protection).

It is important to note that the Western shore projects are not exempted from the channel protection requirement unless they can demonstrate that the stream channel to which they directly discharge to is tidal in nature.

Direct discharge is defined in the Code of Maryland Regulations 26.17.02.02(12) as "the concentrated release of stormwater to tidal waters or vegetated tidal wetlands from new development or redevelopment projects in the Critical Area." In addition, under COMAR 26.24.01.02 "Filling" (of tidal waters or wetlands) includes "storm drainage projects which flow directly in tidal waters of the State." Thus, a tidal wetland permit must be applied for from MDE's Tidal Wetlands Division for any direct stormwater discharge, unless the peak discharge rate is less than 2.0 cfs for the one year storm event.

Both designers and plan reviewers have struggled with the interpretation of what constitutes a direct discharge and what is the receiving channel. The current policy of the Critical Area Commission is as follows:

- A direct discharge occurs when a storm drain pipe or ESD outflow discharges to a point no more than 50 lateral feet from tidal water, and at an invert elevation no higher than two feet above the mean high tide line.
- All other stormwater discharges on the Western shore must meet the entire calculated P_e volume to satisfy the channel protection requirement
- Projects on the Eastern shore must still treat their entire calculated P_e volume with acceptable ESD practices.

2.10 How close to you need to be to meet the phosphorus removal performance standard?

Full compliance may be hard to achieve at new development sites with high impervious cover or at high intensity redevelopment projects. Plan reviewers often ask how close to the phosphorus load removal requirement a project needs to be in compliance.

Given the inherent uncertainties associated with the spreadsheet, it is not appropriate to rely on them to more than one significant digit. Consequently, if a project is shown to be within 0.1 pounds per acre per year of the removal requirement, the site can be considered to be compliant.

2.11 How does this guide compare to the MDE stormwater manual?

This document expands on the guidance presented in MDE (2009) for the sizing and design of ESD practices. Within the Critical Area, this document supersedes MDE with respect to design criteria for the following practices:

- The design standards for certain ESD credits are more stringent than the MDE manual to assure reliable phosphorus removal.
- Two new ESD credits for reforestation and impervious cover conversion are now available within the Critical Area.
- Design standards have been adopted for ESD micro-practices in the Critical Area that expand on the guidelines proposed in MDE (2009).
- A more flexible design approach has been developed to size green roofs and permeable pavements.
- Due to their proven runoff reduction capability, infiltration, dry swales and bioretention practices are all considered acceptable ESD practices within the Critical Area.
- A new two-tier design standard has been adopted for conventional stormwater practices as outlined by MDE (2000) to assure proper phosphorus removal credit.

Localities may elect to use the Critical Area design criteria throughout their jurisdiction, or wait for the next edition of the MDE stormwater manual.

Part 3 The Critical Area Spreadsheet Tool

The ESD to MEP spreadsheet tool was developed, tested and refined during 2010 to allow designer engineers and local plan reviewers to evaluate compliance with the new ESD regulations and phosphorus removal performance standard. Version 3.0 of the spreadsheet, released in May 2011, enables the user to track phosphorus reductions and ESD volume reductions at new and redevelopment projects within both the State of Maryland and the Critical Area.

These phosphorus calculations have been integrated within the new ESD to MEP framework, which provides, for the first time, a unified basis for addressing both the MDE and Critical Area stormwater regulations in a single tool. This tool should help streamline project review and reduce the need for duplicate submittals. The spreadsheet is only needed for Critical Area projects with a minimum threshold of 5000 square feet or more of disturbed area. The reader should consult the entire user's guide (CSN, 2010, www.chesapeakestormwater.net); the ensuing section describes how to apply it to satisfy the Critical Area phosphorus removal performance standard.

3.1 Getting Started

The first step is to consult with your local Critical Area planning authority to determine whether your development project lies in all or part of the 1,000 foot Critical Area Zone. A map of the Critical Area for each County can also be found online at the Maryland Environmental Resources and Land Information Network (MERLIN) website (<u>http://mdmerlin.net/</u>). Please note that the maps found on MERLIN are for guidance purposes only. You still must consult with your local Critical Area planning department to officially verify whether your site is located within the Critical Area.

If your project is located within the Critical Area, the next step is find out which local agency to submit your Critical Area stormwater plan. This local agency may not always be the same agency that reviews your ESD stormwater plan. Several tasks should be conducted prior to using the spreadsheet including a site reconnaissance visit and an analysis of environmental mapping features. The minimum environmental and site mapping data needed are outlined on page 5.7 of MDE (2009), and localities often have additional mapping requirements. The importance of early stormwater planning and analysis cannot be over-emphasized, as early decisions about site layout and the development footprint can make it much easier to comply with the phosphorus removal standard.

In particular, designers thoroughly understand the pre-development flow paths, hydrology, soils and environmental features present and work with them to layout the ideal development footprint and locate the best sequence of ESD practices.

As a general rule, designers should split the site up into logical drainage areas of 3 to 5 acres or less, and try to maintain natural flow paths. Designers should focus on the most permeable soils at the site that can be exploited for ESD practices. The product of this

effort is a draft site plan that shows the proposed development foot print, impervious cover areas, protected natural areas, pervious areas and basic soils information.

3.2 Users Guide for the ESD to MEP/Critical Area Spreadsheet

The spreadsheet is large and complex and can certainly be intimidating to first time users. In reality, however, there are only a handful of inputs to prepare and enter. With a bit of practice, the spreadsheet is easy to use in the Critical Area, once you understand a few of its key aspects:

- Most of the Critical Area TP reduction calculation outputs are on the extreme right hand side of the spreadsheet, and will not be visible when the spreadsheet is opened. They can be found by scrolling about ten columns to the right.
- Most of the key spreadsheet inputs are located on the left hand side of the spreadsheet, and are clearly shown as blue cells.
- For most projects, designers will need to follow an iterative process and it may take several tries before you successfully comply. The trick is to keep track of your incremental progress in phosphorus reductions at several key cells in the spreadsheet, which are identified later in this section.
- Designers should seek to apply some kind of ESD Or credit or practices to all of the impervious cover present at the site.
- The equations in the spreadsheet are locked so they cannot be changed by the user.

The remainder of this section provides a step by step guide on how to analyze ESD practices in the context of the spreadsheet, and provides general advice for designers and plan reviewers on how to most efficiently comply with the phosphorus removal standard.

Step 1: Complete ESD Planning Checklist

In the first step, designers analyze environmental and soil maps to layout the site and maximize utilization of ESD practices. Designers are asked to answer 12 questions in Table 3 to determine whether they have maximized these early stormwater opportunities. The basic idea is that a compliant concept plan has a "Yes," or "N/A" selected for each question.

It is recommended that designers clearly show these practices on their stormwater concept plan. In the case that a question is answered "No", the designers must provide a narrative justification as to why the practice could not be used on the project.

Table 3. ESD Implementation Checklist					
Check all of the Following ESD Practices That Were	Yes	No	N/A		
Implemented On-Site					
1. Environmental site mapping was conducted prior to site layout					
2. Natural areas were conserved (e.g., forests, wetlands, steep slopes)					
3. Stream, wetland and shoreline buffers were reserved					
4. Disturbance of permeable soils was minimized					
5. Natural flow paths were maintained across the site					
6. Building layout was fingerprinted to reduce site clearing/grading					
7. Site grading promoted sheet flow from impervious areas to pervious ones					
8. Better site design was used to reduce needless impervious cover					
9. Site Design maximized disconnection of impervious cover					
10. Future site operations evaluated to identify potential stormwater hotspot					
11. Installation of ESC and ESD Practices are integrated together					
12. Tree planting was used at the site to convert turf areas into forest					

Step 2: Input Pre and Post Development Site Variables. The basic inputs for this step are simple: Site Area (**B29**), Existing Site Impervious Cover Area (**B30**), and Proposed Site Impervious Cover Area (**B31**). Figure 1 shows where the input cells are located within the spreadsheet. Designers should directly measure impervious cover from the site plan using the Critical Area definitions for impervious cover outlined in Table 2. The spreadsheet calculates the percentage of impervious cover for both existing and proposed conditions. If the existing site is greater than 40% impervious, redevelopment rules will apply. The designer also needs to indicate the rainfall depth (**B32**) in order to calculate the required water quality volume. For the Maryland Critical Area, the appropriate choice is 1.0 inch. The Site Area input is defined as the post-development limits of disturbance.

Figure 1: The Four Key Spreadsheet Inputs in Step 2

A	B	Ç.	2	E
Erosion and Sediment Control Practices and F	Post Construction Stor	mwater		
24 Management Practices Were Integraled into a	Comprehensive Plan			
25 Tree Planbrig/Was Used at the Site to Convert.	Turf Areas into Forest			1
26				
27 Step 2: Calculate Site Imperviousne	ss and Water Qu	ality Volum	e. WQv	
28				
29 Site Area, A (acres)	0.00			
30 Existing impervious Surface Area (acres)	0.125			
31 Proposed Impenvious Surface Area (acres)	CONTRACT.			
32 Raintal Depth, P (in)	10			
33				
34 Existing Impenviousness, Ipe	22.2%			
35 Proposed Imperviousness, land	29,8%			
36				
37 Development Category	New Devel	opment		
38				
33 New Development	I		Redevelopment	
40 Required Treatment Area (acres)	0.71		Required Treatment	Area (actas)
41 Runoff Coethcomt, RV	132		Runoff Coefficient, T	RV
42 Water Quality Volume, WOv (ac-in)	3.64		Water Quality Volum	te, WQv (ats-in)
43				
44 Water Ouslity Volume, WOv (cf)	132		Water Ouality Volu	ima, WOv (cf)
45				
1. 4. + = Site Design / Locialo Tables /		2		
test				14.85

Step 3: Calculate Phosphorous Removal Requirement

The spreadsheet automatically calculates the average annual predevelopment load based upon whether the project is a new development or redevelopment site. For new development, the predevelopment load for the Critical Area is now defined as an annual load of 0.3 pounds of P per acre.

Redevelopment rules apply if the existing site has more than 40 % impervious cover. In these cases, the predevelopment load is calculated based upon the runoff coefficient and an average runoff concentration of 0.3 mg/L for total phosphorus. The phosphorus removal requirement for redevelopment sites is to reduce the pre-development phosphorous load by 50%.

Figure 2 shows where these phosphorus removal calculations occur within the spreadsheet. The spreadsheet first reports the phosphorus removal requirement for the site in **cell 41-L.** Incremental phosphorus reductions achieved by subsequent ESD practices can be tracked in the following spreadsheet cells:

- Effect of ESD Credits and Micro-Practices: Cell 133- R
- Additional Effect of Conventional Structural Practices: **Cell 168-K**

Figure 2: Where the Phosphorus Removal Requirement is Automatically Calculated

G	H.	1	J	ĸ	1	M	N	ç
23					_			
24								
25								
26.		-						
27	Step 3: Calcula	te Phosphor	rous Remov	al Requirem	ent. RR for O	Critical Area	Sites	
28	and the second second		1					
29	New Development		1					
30	Average Annual Pre	edevelopment Lo	pad, Lpre (bs F	PTYTY	0.06			
31			1		-			-
32	2							
33	Redevekonment		1		and the second second	×		
34	Predevelopment Ru	noff Coefficient	RVpre		0.25			
35	Phosphorous Mean	Concentration,	C (mg/L)		0.8			
36	Average Annual Pre	edevelopment Lo	xad, L _{pré} (165 P /	95)	70.0			
37			1					
38	Post-Development F	Runoff Coefficie	nt, Rypost		0.32			
39	Awerage Annual Po	st-Development	Load, L _{post} (lbs.	P/yr]	0.03			
40						1.		
41	Removal Requirem	nent, RR (lbs P	(47)		0.03			
42			-		1			
43								
	Site Design / Lookup Tables	1			14			10
Ready							10	LN-

Step 4: Calculate the Environmental Site Design Rainfall Target

In this step, designers need to enter the percentage of the site in each of the four HydrolOgic Soil Groups (HSGs) on **rows B48-51**. The soil data is used to calculate a pre-development runoff curve number (RCN), which in turn, is used to compute the ESD Rainfall Target. Figure 3 shows where these soil inputs are located in the spreadsheet.

For new development, the ESD rainfall target is defined as the depth of rainfall that must be treated to reduce the site's post-development RCN to the pre-development RCN (i.e., woods in good condition). Required recharge volume is also calculated based upon specific recharge rates for each soil type.

For redevelopment sites, the spreadsheet calculates the required water quality treatment volume, based on the net change in proposed site impervious cover relative to existing site impervious cover.

A	B	C	J D	E
44 Water Quality Volume, WQv (cf)	132		Water Quality Volume, WQv (cf	
65		_		-
46 Step 4: Calculate Environmental Si	te Design (ESD) I	Rainfall T	arget, PE	
47				
48 % Soil Type A	0.6			
49 % Sol Type B	0%			
50 N Sai Type C	UM.			
51 % Soi Type D	04			
52				
53 Pre-Developed Condition, RCN,	0			
54				
55 Soil Type A ESD Rainfall Target, P _E (in)	0.00			
58 Sul Type B ESD Ranfal Target, Pe (in)	000			
57 Soll Type C ESD Rainfall Target, P.; (in).	0.00			
59 Soil Type D ESO Rainfall Target, PE (in)	0.00			
59		-		
88 Site ESD Rain	fall Target, Pr (in)	0.00		
81				
62 ESD.RI	moff Depth, G ₂ (in)	0.00		
63			1	
64 ESD Runoff	Volume. ESDv (cf)	0		
65				
66 Required Recharge	/olume, Re, (ac-tt)	0.00		
57				
88 Required Recharge	Volume, Rey (cf)	0		-
69	in the second			
A & # A Site Design / Loonup Tables /			10	
wady				

Figure 3 Where HSG Soil Data is Entered in the Spreadsheet

If the proposed impervious cover at a redevelopment site exceeds existing impervious cover, the spreadsheet also computes the incremental recharge and channel protection volume for the site. Since most redevelopment sites will be on urban fill soils (CSN,

2010), designers should generally assume that 100% of site area will behave as HSG "D" unless they have an on-site soil test to the contrary.

Designers should always look for the most permeable soils present at the site in order to locate the best ESD practices that possess the highest possible phosphorus reductions.

Step 5: Evaluate Effect of Non-Structural ESD Credits

In this step, designers can apply for credits for non-structural practices that effectively disconnect impervious cover. The five credits include:

- 1. Impervious Cover Conversion
- 2. Reforestation and Soil Restoration
- 3. Rooftop Disconnection
- 4. Non-Rooftop Disconnection
- 5. Sheet flow to Conservation Area

The designer enters the contributing impervious drainage area (**Column D**), as well as site-specific design parameters that are needed to receive each credit (**Column G & H**). Based on this information, the spreadsheet automatically computes an ESD runoff volume credit (P_E) that is used to reduce the site ESD rainfall target volume. The credits are calculated based upon the following MDE relationships:

Disconnection of Rooftop Runoff						
	Disconnection Flow Path Length (ft)					
Western Shore	0	15	30	45	60	75
Eastern Shore	0	12	24	36	48	60
P _E Credit	0	0.2	0.4	0.6	0.8	1

Disconnection of Non-Rooftop Runoff						
Ratio of Disconnection Length to Contributing Length	0	0.2	0.4	0.6	0.8	1
P _E Credit	0	0.2	0.4	0.6	0.8	1

Sheet Flow to Conservation Areas					
Minimum Conservation Area Width	0	50	75	100	
P _E Credit	0	0.6	0.8	1	

The technical basis for the reforestation and impervious cover conversion credits are documented in Part 4.

To obtain the credits, designers must input the predominant predevelopment HSG over the filter path or reforestation areas (i.e., A/B or C/D). The soils data is needed to determine the specific phosphorus removal rates for each hydrological soil group. Designers should always double check the actual distances and slopes of the contributing impervious areas and filter path on the site plan to ensure they conform to the minimum qualifying criteria outlined in Part 4 of this document.

Step 6: Evaluate Effect of ESD Micro-Practices

The spreadsheet presents a somewhat simplified approach to handling ESD micropractices, which include:

- Green Roof
- Permeable Pavements
- Rainwater Harvesting
- Submerged Gravel Wetlands
- Micro-infiltration (or Dry Wells)
- Rain Gardens
- Micro-Bioretention
- Landscape Infiltration
- Grass Swales
- Bioswales
- Wet Swales

Designers can optimize the types of ESD micro-practices that are most suitable for their site by analyzing the predevelopment HSG as shown in Table 4.

Table 4 Acceptable Soils for ESD Micro-Practices							
ESD PRACTICE	HSG A	HSG B	HSG C	HSG D			
Green Roof	X	X	X	X			
Permeable Pavement	X	X	X				
Rainwater Harvesting	X	X	X	X			
Submerged Gravel Wetlands			X	X			
Infiltration	X	X					
Rain Garden		X	X	X			
Bioretention		X	X	X			
Landscape Infiltration	X	X					
Grass Swales	X	X	X				
Bioswales	X	X	X	X			
Wet Swales			X	X			
X= may be suitable depending on depth to water table, bedrock and slope							

In addition, designers should consult Table 5 to identify the most effective micro-ESD practices, based on their contributing drainage area, higher phosphorus removal or capacity to be "upgraded" to a Chapter 3 ESD practice (MDE, 2000).

Enhanced filters can be added as a supplemental design option to the appropriate ESD practices in **Column L.** Infiltration berms are only considered a design element to improve the effectiveness of various disconnection credits in Step 5.

The appropriate hydrologic soil group associated with several ESD micro-practices must be entered into the spreadsheet; this is done to compute differential phosphorus removal rates for the Critical Area computation, as well as to clearly show the most appropriate soil conditions where they can be effectively used.

Table 5 Comparing the ESD Micro-Practices						
ESD PRACTICE	Removal tied to HSG?	Max CIDA ² (sf)	Upgrade? ³			
Green Roof	No	None	No			
Permeable Pavements	Yes	Varies	Yes			
Rainwater Harvesting	No	~20,000	Yes			
Gravel Wetlands	No	< 1 acre	No			
Infiltration	Yes	500	Yes			
Rain Garden	Yes	2,000	No			
Bioretention	Yes	20,000	Yes			
Landscape Infiltration	Yes	20,000	No			
Grass Swales	Yes	< 1 acre	No			
Bioswales	Yes	< 1 acre	Yes			
Wet Swales	No	< 1 acre	NO			
Enhanced Filters	No	n/a	No			

¹Practice has a higher phosphorus removal rate when situated on permeable A or B soils

² The contributing drainage area limits, as prescribed in MDE, Chapter 5

³ The practice be "upgraded" to a Chapter 3 practice that also meets the ESD criterion (e.g., micro-bioretention upgraded to a regular bioretention area)

This step begins with an overlay of the site layout, pervious areas and soil conditions. Designers should work to direct contiguous impervious areas to pervious areas, and draw the approximate drainage areas to each micro-practice. The spreadsheet assumes that 100% of the impervious area is treated by the individual micro-practice. The designer then estimates the surface area of the micro-practice. The designer can then aggregate the total contributing impervious drainage area as a whole.

The designer enters the CIDA into **Column D**, as well as any practice-specific design parameters in **Column G & H** for each set of ESD micro-practices planned for the site. One of the new features in this version of the spreadsheet constrains the practice design parameters so they do not exceed reasonable combinations of surface area to CIDA. The combined phosphorus reductions achieved by ESD micro-practices can be tracked in spreadsheet cell **133-R**.

Dealing with ESD Credits and Practices in Series.

Designers can select a down-gradient ESD practice to which runoff from an up-gradient ESD practice will be directed from the dropdown box in **Column N** (e.g., bioretention to a bioswale). The spreadsheet allows for proper accounting of ESD practices in series, and produces the aggregate ESD rainfall target credit and the increment of phosphorus load reduction for the entire system of ESD micro-practices at the site.

Important Note: When practices are to be used in series, select the down-gradient practice from the pull-down menu in Column N, but <u>DO NOT</u> input the same drainage area into Column D of the down-gradient practice. The spreadsheet automatically directs the proper runoff volume to the down-gradient practice. The only time Column D would be filled in for the down-gradient practice would be if the practice receives runoff from additional impervious cover that was not treated by the up-gradient practice.

Step 7: Check for Site Compliance with Phosphorous Reduction Requirement

The spreadsheet summarizes the total phosphorous load reduced by the ESD practices at **cell 133-R.** This load is then compared to the site reduction requirement to determine whether the site has complied with the phosphorus removal standard. Operationally, this requirement is satisfied when sufficient ESD practices are used to meet the entire ESD rainfall target volume <u>and</u> the entire phosphorus load reduction requirement for the project.

If full compliance with the phosphorus removal performance standard cannot be demonstrated, the designer must re-evaluate the site to achieve greater phosphorus reductions. This involves an iterative process to investigate more ESD options, using the spreadsheet. Some useful strategies include:

Run the Spreadsheet Just For the Critical Area Portion of the Site: If your project contains portions inside and outside the Critical Area boundary, you may want to run the spreadsheet twice, once for the entire site and a second time just using the portion of total site area within the Critical Area. If either run indicates compliance, you are done (see Part 3.6).

Evaluate Whether Off-site Treatment Helps: You may also want to investigate whether it is possible to treat off-site stormwater on your site and credit this towards your on-site phosphorus removal requirement, using the protocols outlined in Part 3.7

Go Back to Step 1 and Adjust Site Layout to Reduce Impervious Cover or Increase Forest Cover. Designers should particularly focus on any of the ESD planning practices that were not used in the ESD implementation checklist.

Go Back to Step 5 and Expand Site Area Subject to Credits. The site plan should be reexamined to determine if more impervious cover could be treated through disconnection and filter strips, either by additional disconnection, or improving the soil and slope conditions within the filter strip, using infiltration berms (p. 5.87 of MDE, 2009), compost amendments, grading, or engineered level spreaders or other measures so that a greater CIDA can be treated.

Go Back to Step 6 and Apply More Effective ESD Practices For Phosphorus Removal. Designers have a number of options to improve the aggregate ESD performance for the site in this step. Consult Table 6 to see whether a different ESD practice or design level could boost the phosphorus removal rates.

- 1. Add more micro-ESD practices to pick-up additional untreated CIDA
- 2. Over-control at individual micro-ESD practices by treating the entire target ESD volume
- 3. Change the mix of micro-ESD practices to increase runoff reduction (shift from grass swale to bio-swale, or from rain garden to micro-bioretention, etc.)
- 4. Add Enhanced Filters to the bottom of select ESD micro-practices (MDE, 2009, see page 5.113)
- 5. Use ESD practices such as infiltration trenches, bioretention and dry swales that serve a larger CIDA and/or have a greater phosphorus removal capability (these can be entered directly into the micro-ESD spreadsheet)

Go forward to Step 9 to see if Conventional Stormwater Practices are capable of removing your remaining phosphorus load (e.g., sand filters, wetlands and ponds).

If you still cannot fully comply, then you should build the maximum system of ESD practices, and apply for an offset with the local Critical Area planning authority to handle the remaining untreated phosphorus load (see Part 5).

Step 8: Compute Reduced RCN for the Channel Protection Volume

If your site is subject to the Channel Protection requirement, you can use this step to determine whether the volume can be reduced due to the ESD volume that you have already provided on the site. The spreadsheet automatically calculates a reduced RCN based upon the ESD rainfall depth treated in prior steps. If the required ESD rainfall depth has not been completely treated through acceptable ESD practices, this revised and reduced RCN is used to calculate the Channel Protection Volume that must be treated through structural practices, such as ponds or wetlands.

The reduced RCN values **should not be used** for the larger design storms used for flood control analysis (e.g., the 10 or 100 year design event).

Step 9: Select Structural Practices to Meet Remaining Phosphorus Load

This step is only performed when the system of ESD practices cannot meet the phosphorus removal standard. Designers can then consider traditional structural stormwater practices such as ponds, wetlands, and filtering systems to obtain the remaining phosphorus reduction.

Designers will need to design the structural practice (or practices) at the most downstream point in the project drainage area, and then independently calculate the treatment volume. These values should then be imported into the respective entry fields for contributing impervious drainage area (**column B**) and the design treatment volume (**column E**). The spreadsheet then recalculates the phosphorous load reduction achieved by the additional structural practices utilized (**cell 168-K**).

The spreadsheet shows two levels of design for structural stormwater practices, which are used to estimate their phosphorus removal capability for the Critical Area requirement. Level 1 is a baseline design using the minimum criteria for the practice as outlined in MDE (2000), whereas Level 2 is an enhanced design that maximizes phosphorus removal. The technical basis for the two design levels are outlined in CWP and CSN (2008). More detailed Level 1 and 2 design criteria can be found in Part 4.

Step 10: Evaluate Feasibility of the Stormwater Plan

Your local review authority may require additional information to evaluate the feasibility of your ESD plan (beyond the spreadsheet result). Several important elements are needed to finalize the concept plan, as follows:

- A detailed stormwater site plan should be drafted to show the spatial distribution of ESD practices in such a manner that plan reviewers can verify spreadsheet areas related to CIDA and ESD practice surface area.
- The designer should also analyze the site to confirm the feasibility of individual ESD practices (e.g., depth to water table, depth to bedrock, contributing slopes, sheet flow distances, minimum practice surface area) as described in Part 4 of this document.
- Designers must also solve the tricky problem of how to sequence installation of ESD practices in the context of plans for grading and erosion and sediment control (ESC).
- Many ESD practices must be protected from disturbance during construction and/or installed after the site has been permanently stabilized. At the same time, the ESC plan must provide effective controls during construction to prevent the discharge of sediments.
- Soil borings and infiltration testing may also be needed to confirm infiltration rates and underlying soil conditions at the site.

- Designers should also carefully review the plan to ensure safe and non-erosive conveyance of large storms through the sequence of ESD practices across the site. This analysis dictates the consequent need for overflows, flow splitters, channel stability and other measures to protect ESD practices from larger storms events, such as peak discharges from the 2 or 10 year storm design event.
- Lastly, the concept plan must meet the minimum submittal requirements established by the State (i.e., pages 5.15-16 of MDE, 2009), in addition to any requirements established by the local stormwater review authority.

Step 11: Final ESD Design Plan and Verification After Installation

The compliance spreadsheet should be run again to verify that the final ESD plan meets the ESD to MEP criterion. At this point, the CIDA, surface areas, design parameters and treatment volume for individual ESD practices can be more accurately measured and defined. The revised values should be entered into the spreadsheet to ensure that the results from the concept plan can be verified or exceeded. The spreadsheet can be submitted as part of the final ESD design package. The package must meet the minimum submittal requirements established by the State (i.e., Page 5.11 of MDE, 2009), in addition to any requirements established by the local stormwater review authority.

Several steps are crucial after the final plan is approved to ensure ESD practices are properly installed. Inspections are needed to ensure ESD areas are protected from disturbance during the construction stage, and when the site has been adequately stabilized to permit the installation of ESD practices. Post-construction inspections are needed to verify that ESD practices have been properly installed, are functioning as intended, and meet any vegetative cover requirements.

Part 4 Enhanced Design Criteria for ESD Practices in the Critical Area

This section documents the phosphorus removal rates for various design levels for stormwater practices installed within the Critical Area (Table 6).

Table 6. Summary of TP Removal Rates For ESD Credits and Practices and						
Conventional Stormwater Practices in the Maryland Critical Area						
	TP Remova	Where is				
ESD Practices	A & B	C & D	on the			
	Soils	Soils	spreadsheet			
Impervious Cover Conversion	Varies	Varies	Row 31 B2			
Simple Rooftop Disconnection	50	25	Rows 80 to 83			
Non-Rooftop Disconnection	50	25 *	Rows 84 to 87			
Sheet-flow to Conservation Area	50	25 *	Rows 88 to 91			
Reforestation/Soil Restoration	Varies	Varies	Rows 76 to 79			
Green Roof	Level 1: 45	Level 2: 60	Rows 96 to 99			
Permeable Pavements	80	60	Rows 100 to 103			
Rainwater Harvesting	45		Rows 104 to 105			
Submerged Gravel Wetlands	6	60	Rows 106 to 107			
Landscape Infiltration	75	NA	Rows 118 to 119			
Micro-infiltration (Dry Well)	65	NA	Rows 108 to 109			
Infiltration	90	60	Rows 165 to166			
Rain Gardens	50	25	Rows 110 to 113			
Micro and Regular Bioretention	75	50	Rows 114 to 117			
Urban Bioretention	50	25	Rows 110 to 113			
Grass Channels	40	20*	Rows 120 to 123			
Bio Swales and Dry Swales	75	50	Rows 124 to 127			
Wet Swales	4	0	Rows 128 to 129			
Sand Filters	Leve	l 1: 60	Rows 163 to 164			
	Leve	l 2: 65				
Wet Ponds and Wet ED Ponds	Leve	l 1: 50	Rows 159 to 160			
	Leve	l 2: 75				
Constructed Wetlands	Leve	Rows 161 to 162				
	Level 2: 75					
See Appendix A for how these remov	al values were	ederived				
NA = not applicable * higher rates possible if soils are restored						

4.1 Non-structural ESD Practices and Credits

Impervious Cover Conversion

Applicability: Impervious cover conversion involves the removal of existing impervious cover at a redevelopment site, followed by soil restoration such that the new pervious area performs hydrologically as if it were un-compacted grass, and filters runoff from adjacent hard surfaces. This practice primarily applies to redevelopment projects which seek to reduce their required water quality volume. The practice may also apply to new development projects that have some pre-existing impervious cover.

MDE Reference: No specific design criteria are provided.

TP Removal Rate: Computed internally by the spreadsheet, based on how much predevelopment impervious cover is being reduced. The reduced TP removal requirement associated with the impervious cover conversion can be found in cell **41-L**.

Additional Design Criteria for Critical Area

The following design standards apply to impervious cover conversion:

- The minimum surface area for the impervious cover conversion credit is 250 square feet.
- Site plans shall show the specific areas where concrete or asphalt will be removed and recycled.
- Underlying compacted soils shall be deep tilled and amended with compost to restore porosity, using the methods outlined in the most current edition of the Bay-wide soil restoration design specification.
- The new pervious area can be graded to accept runoff from adjacent hard surfaces.
- A project is eligible for additional phosphorus removal credit for the pervious area if it is designed to provide further infiltration or bioretention.
- The pervious area must be planted with an acceptable vegetative cover, which reflects landscaping objectives and anticipated future uses at the redevelopment site.
- The conversion shall be permanent, and accompanied by a deed or covenant that specifies that the area cannot be rebuilt in the future (unless it is adequately mitigated).
- The maintenance plan shall specify that the vegetative condition of the pervious area shall be regularly inspected and must be regularly maintained to ensure no soil erosion occurs.

Where it is Entered in the Compliance Spreadsheet: Go to Row 31, Col B and enter the lower proposed existing impervious area.

Simple Rooftop Disconnection

Applicability: Works best at low to moderate density residential dwellings on individual roof leaders, although it can also be used for very small parking lots. The maximum contributing impervious area that can drain to a single disconnection is limited to 500 square feet for residential projects, and 1000 square feet for all other projects. Disconnections are acceptable for soils in HSG A, B and C; soil restoration is usually needed for disconnections on D soils or urban fill soils.

MDE Reference: Page 5.57 in MDE (2009)

Key MDE Design Criteria:

- The disconnection filter path must be at least 15 ft in length, although performance is maximized when the filter path extends to 75 ft, at which point there is no further phosphorus reduction credit.
- There must be a 10 feet lateral setback from the filter path to any adjacent impervious cover (i.e., driveways or sidewalks).
- The filter path cannot have a slope greater than 5%. Infiltration berms can be used to break up slopes.
- Flow velocities in the filter path shall be non-erosive for two year storm.

Critical Area TP Removal Rate

- 50% for qualifying disconnections on HSG A and B Soils
- 25% for qualifying disconnections on HSG C and D Soils (see Table 7).

Table 7 Simple Disconnection		
Level 1 Design TP:25%	Level 2 Design TP: 50%	
C and D Soils	A and B Soils, OR Restored C and D Soils *	
Filter path is 15 to 50 feet long	Filter path exceeds 50 feet *	
Slope of filter path is more than 3%Slope of filter path is less than 3% *		
*All three criteria must be met to qualify for Level 2		

Additional Design Criteria for Critical Area

- The filter path shall have a minimum slope of 1% and a maximum slope of 3%.
- Steeper slopes can be broken up with infiltration berms or site grading to meet these limits.
- The depth between the filter path surface and the seasonally high water table cannot be less than two feet in the coastal plain.
- The lateral distance between any two individual disconnections must exceed 25 feet.

Where it is Entered in the Compliance Spreadsheet. Go to Row 80 to 83 and select the row that corresponds to the predevelopment HSG for your practice, and then enter the acreage of contributing impervious cover, the flow path length (in feet) and its geographic location (Eastern or Western shore).

Non-rooftop Disconnection (Filter Strip)

Applicability: This option works best for commercial sites with sidewalks, driveways and very small parking lots (approximately 6 to 10 spaces). The maximum contributing impervious area that can drain to a single disconnection is limited to 1000 square feet. This disconnection is designed as a filter strip to ensure phosphorus removal.

MDE Reference: page 5.61 in Chapter 5 of MDE (2009)

Key MDE Design Criteria: The basic design criteria are very similar to simple rooftop disconnection:

- The disconnection filter path must be at least 15 ft in length, although performance is maximized when the filter path extends to 75 ft, at which point there is no further phosphorus reduction credit.
- There must be a 10 feet lateral setback from the filter path to any adjacent impervious cover (i.e., driveways or sidewalk).
- The filter path cannot have a slope greater than 5%. Infiltration berms can be used to break up slopes.
- Flow velocities across the filter strip shall be non-erosive for two year storm.

Critical Area TP Removal Rate:

- 50% for qualifying disconnections on HSG A and B Soils
- 25% for qualifying disconnections on HSG C and D Soils (see Table 8)
- Performance can be increased when C and D soils are restored.

Table 8 Non-Rooftop Disconnection (aka filter strip)		
Level 1 Design TP:25% Level 2 Design TP:50%		
C and D Soils	A and B Soils OR Restored C and D Soils *	
Filter path is 15 to 50 feet long	Filter path exceeds 50 feet *	
Slope of filter path is more than 3%Slope of filter path is less than 3% *		
*All three criteria must be met to qualify for Level 2		

Additional Design Criteria for Critical Area

- A gravel diaphragm shall be installed at top of filter strip and an infiltration berm at the toe.
- Heavy equipment must be kept out of the filter strip area during construction, unless the soils are restored.
- The depth between the filter path surface and the seasonally high water table cannot be less than two feet in the coastal plain.
- The lateral distance between any two individual disconnections must exceed 25 feet.

Where it is Entered in the Compliance Spreadsheet: Go to Row 84 to 87 and select the row that corresponds to the predevelopment HSG for your practice, and then enter the acreage of contributing impervious cover, the disconnection length (in feet) and the contributing length of impervious cover (in feet).

Sheet flow to Conservation Area

Applicability: This credit is a good option at the boundary of the Critical Area Buffer, or adjacent to other stream or wetland buffer or other natural areas that must be conserved at the site. The credit cannot be used if stormwater runoff is directed to a buffer that protects a wetland of special state concern.

MDE Reference: page 5.66 in Chapter 5 of MDE (2009)

Key MDE Design Criteria:

- The maximum permissible slope within the Conservation Area is 5%.
- The maximum distance from impervious cover to the conservation area is 75 ft.
- The conservation area must be at least 20,000 square feet in area and have a minimum width of 50 feet.
- The conservation area cannot have managed turf.

Critical Area TP Removal Rate (Table 9)

- 50% for qualifying conservation areas on HSG A and B Soils
- 25% for qualifying conservation areas on HSG C and D Soils

Table 9 Sheet flow to Conservation Area		
Level 1 Design TP:25%	Level 2 Design TP: 50%	
C and D Soils	A and B Soils OR restored C and D Soils *	
Filter path is 15 to 50 feet long	Filter path exceeds 50 feet *	
Slope of filter path is more than 3%Slope of filter path is less than 3% *		
*All three criteria must be met to qualify for Level 2		

Additional Design Criteria for Critical Area

- If runoff is directed to the Critical Area Buffer, a grass filter strip must extend at least 75 feet from the nearest contributing impervious cover.
- A grass filter strip with compost amended soils may be suitable to treat small areas of impervious cover, up to a maximum of 5000 square feet.
- The filter strip needs to be equipped with a gravel diaphragm, infiltration berm or engineered level spreader to spread flows.
- The water table must be at least 18 inches below surface the surface of the strip.
- Designers must perform a site reconnaissance to confirm topography, slope, and soil conditions prior to design.
- The boundary zone shall consist of ten feet of level grass, and have a maximum entrance slope of less than 3% in the first ten feet of filter.
- The conservation area must be located outside the limits of disturbance and be protected by ESC perimeter controls.

Where it is Entered in the Compliance Spreadsheet: Go to Row 88 to 91 and select the row that corresponds to the predevelopment HSG for your practice, and then enter the acreage of contributing impervious cover, the width of the conservation area (feet) and the contributing length of impervious cover (feet).

Soil Restoration/Reforestation Credit

Applicability: This practice is used to improve the hydrologic capacity of open areas by restoring soils and planting trees to achieve forest cover. The proposed reforestation must be for the purpose of reducing runoff. Reforestation required under the Maryland Forest Conservation Act or the CAC Forest and Woodland Protection Criteria are not eligible for the credit. Even small units of soil reforestation and reforestation in urban watersheds can help meet local forest canopy goals and provide effective stormwater treatment at the same time.

MDE Reference: No specific design criteria are provided in MDE (2009).

Critical Area TP Removal Rate: Variable. On projects with HSG A or B soils, for each five square feet of soil restoration and reforestation, one square foot of impervious cover can be deducted from the site. On project with HSG C or D soils, for each ten square feet of soil restoration and reforestation, one square foot of impervious cover can be deducted for the site. The credit is further increased if the restored area is graded to receive runoff from adjacent areas of impervious cover.

Additional Design Criteria for Critical Area

- Additional phosphorus removal credit for treatment of adjacent impervious cover directed to restoration areas using the sheetflow to conservation area credit
- The practice must be subject to a long term reforestation plan that is capable of creating 75% forest canopy in 10 years
- Soil restoration is a required component of the reforestation credit.
- The planting plan must be approved by the appropriate local forestry or conservation authority, including any special site preparation needs. It must contain a long term vegetation management plan to maintain the reforestation area in a healthy forest condition.
- After 10 years, the required density of native trees is 300 stems per acre.
- Planting plans must include at least 5 different native tree species.
- Under urban conditions, planting plans should emphasize balled and burlapped native tree stock from 1 to 4 inches in diameter. The primary reason is to quickly achieve the desired tree canopy and ensure that the individual trees are visible enough so they are not disturbed, mowed or otherwise damaged as they grow.
- In rural or suburban settings, planting plans should include at least a minimum 10% of larger stock (1" caliper or more).
- The reforestation area must be protected by a perpetual stormwater easement or deed restriction which stipulates that no future development or disturbance may occur within the area, unless it is fully mitigated.
- The construction contract should contain a care and replacement warranty extending at least 3 growing seasons, to ensure adequate growth and survival of the plant community. Control of invasive tree species should be a major part of the initial maintenance plan.
- The reforestation area shall be shown on all construction drawings and erosion and sediment control plans during construction.

Where it is Entered in the Compliance Spreadsheet: Go to Row 76 to 79 and select the row that corresponds to the predevelopment HSG for your restoration area, and then enter the acreage of contributing impervious cover and the surface area of the reforestation area (square feet).

Note on Soil Restoration

Applicability: The phosphorus removal capability of disconnections, filter strips and grass channels can be boosted when soils are restored to increase their permeability. The soil restoration process involves deep tilling, grading and soil compost amendments using the methods outlined in the Bay-wide soil restoration specification. There are a few limits on the use of soil restoration, as they are not feasible when:

- Existing soils have high infiltration rates (e.g., HSG "A" soils)
- The water table or bedrock is located within 1.5 feet of the soil surface.
- Slopes exceed 10%.
- Existing soils are saturated or seasonally wet
- They would harm roots of existing trees (stay outside the tree drip line)
- The downhill slope runs toward an existing or proposed building foundation

Soil Amendment: The depth of compost amendment is based on the relationship of the surface area of the soil amendment to the contributing area of impervious cover that it receives. Table 10 presents some guidance on the required depth to which the compost must be incorporated.

Table 10 Short-Cut Method to Determine Compost and Incorporation Depths				
Contributing Impervious Cover to Soil Amendment Area				
	Katio ¹			
	$IC/SA = 0^{2}$	IC/SA = 0.5	IC/SA = 0.75	$IC/SA = 1.0^{3}$
Compost (in) ⁴	2 to 4 ⁵	3 to 6 ⁵	4 to 8 ⁵	6 to 10 ⁵
Incorporation Depth (in)	6 to 10 ⁵	8 to 12 ⁵	15 to 18 ⁵	18 to 24 ⁵
Incorporation Method	Rototiller	Tiller	Subsoiler	Subsoiler
Notos				

Notes:

¹ IC = contrib. impervious cover (sq. ft.) and SA = surface area of compost amendment (sq. ft.)

² For amendment of compacted lawns that do not receive off-site runoff

³ In general, IC/SA ratios greater than 1 should be avoided

⁴ Average depth of compost added

⁵ Lower end for B soils, higher end for C/D soils

More information on the design, construction, and inspection of the soil restoration practice can be accessed at <u>www.chesapeakestormwater.net</u>

4.2 Environmental Site Design Practices

Green Roof

Applicability: Green Roofs (also known as *vegetated roofs, living roofs* or *eco-roofs*) are alternative roof surfaces that typically consist of waterproofing, drainage materials and an engineered growing media that is designed to support plant growth. Green roofs capture and temporarily store stormwater runoff in the growing media before it is conveyed into the storm drain system. A portion of the captured stormwater evaporates or is taken up by plants, which helps reduce runoff volumes, peak runoff rates, and pollutant loads on development sites.

The most common design is the *extensive* green roof system which have a shallow growing media (4 to 8 inches), planted with carefully selected drought tolerant vegetation. Green roofs are preferred because they incorporate stormwater treatment directly into the architecture of the building, which eliminates the need to consume surface land. They provide modest levels of runoff reduction, and can be major compliance element at many high intensity redevelopment sites. Their high installation cost is compensated by long term savings in energy consumption and roof longevity.

MDE Reference and Design Criteria: page 5.42 in Chapter 5 of MDE (2009)

Critical Area TP Removal Rate:

- Design Level 1: 45%
- Design Level 2: 60%
- The requirements for each design level are outlined in Table 12

Table 12 Design Levels for Green Roof		
Level 1 Design TP: 45%	Level 2 Design TP: 60%	
Depth of media up to 4 inches	Media depth 4 to 8 inches	
Drainage mats	2-inch stone drainage layer	
No more than 20% organic matter in media No more than 10% organic matter in media		
*All three criteria must be met to qualify for Level 2		

Additional Design Criteria for Critical Area

- Select species that can tolerate both drought and salt spray
- Further guidance on green roof design and installation can be found in CSN Baywide Design Specification No. 4.

Where it is Entered in the Compliance Spreadsheet: Go to Rows 96 to 99, and select the row that corresponds to the predevelopment HSG for the project site. Next, enter the acreage of contributing impervious cover to the green roof, and the estimated thickness of the media layer (in inches).

Permeable Pavements

Applicability: Permeable pavements are alternative paving surfaces that allow stormwater runoff to filter through voids in the pavement surface into an underlying stone reservoir, where it is temporarily stored and/or infiltrated. Permeable pavement is an attractive option to treat runoff from driveways, plazas, sidewalks, and parking lots, particularly when soils are in HSG A, B and C. Permeable pavement should be avoided if they are located close to sand dunes, due to the risk of blowing sand, at sites where water table is close to the soil surface, and for some HSG D soils.

MDE Reference and Design Criteria: page 5.42 in Chapter 5 of MDE (2009)

Table 11 Permeable Pavement Design Criteria	
Level 1 Design TP: 60%	Level 2 Design TP: 80%
Store and treats the entire WQv	Storage exceeds the one inch WQv *
C or D Soils with infiltration rates less than 0.5 in./hr	A, B or C soils with infiltration rate exceeding 0.5 in./hr *
Under drain required	Under drain not required; OR if an under drain is used, a 12-inch stone sump must be provided below the under drain invert *
The ratio of external contributing area to permeable pavement does not exceed 2:1.	The ratio of external contributing area to permeable pavement does not exceed 1. *
*All four criteria must be met to qualify for Level 2	

Critical Area TP Removal Rate (see Table 11)

Additional Design Criteria for Critical Area

- Permeable pavers with acceptable storage may be constructed on D soils if the facility can achieve a 48 hour drain time. The design volume and contributing drainage area should be entered as a design level 1 filtering system (Row 164).
- A minimum separation distance of two feet from the bottom of the storage reservoir to the seasonally high water table must be maintained for Level 2 designs.
- This separation distance can be reduced to a foot if the reservoir is equipped with a stone sump and under drain.
- A minimum slope of 0.5% shall be maintained in the under drain system.
- CSN released a Bay-wide design specification in 2010 for permeable pavers which can be accessed at <u>www.chesapeakestormwater.net</u>

Where it is Entered in the Compliance Spreadsheet: Go to Rows 100 to 103 and select the row that corresponds to the predevelopment HSG for under the pavers. Next, enter the acreage of contributing impervious cover to the paver and estimated thickness of the paver bed in feet. If an enhanced filter is added to the facility, the cubic feet of additional storage should be entered.

Rainwater Harvesting

Rainwater Harvesting systems intercept, divert, store and release rainfall for future use. Rainwater harvesting is also known as cisterns or rain tank. Rainwater that falls on a rooftop is collected and conveyed into an above or below ground storage tank where it can be used for non-potable water uses and on-site stormwater disposal/infiltration. Non-potable uses may include flushing of toilets and urinals inside buildings, landscape irrigation, exterior washing, fire suppression systems, water cooling towers, water fountains, and laundry, if approved by the local authority.

Applicability: Rain tanks or cisterns are useful for treating rooftop runoff from low density residential homes, and hi-intensity redevelopment projects. High redevelopment intensity often generates higher demand for both indoor non-potable water and outdoor landscape irrigation water, which means that substantial runoff volumes can be reused throughout the year.

MDE Reference: page 5.91 of Chapter 5 of MDE (2009)

Key MDE Design Criteria:

- Rain barrels and cisterns shall be designed to capture at least 0.2 inches of rainfall from the contributing rooftop area.
- A P_E credit based on the fraction of the ESDv captured and re-used shall be applied to the contributing rooftop area.

Critical Area TP Removal Rate: default of 45%, but may be greater depending on how much rainfall is reused.

Additional Design Criteria for Critical Area

- A spreadsheet available to determine the ESD volume actually captured based on indoor and outdoor demand at <u>www.chesapeakestormwater.net</u>
- Designers should consult Bay-wide Design Specification No. 6 for Rainwater Harvesting.

Where it is Entered in the Compliance Spreadsheet: Go to Rows 104 and 105 and enter the acreage of contributing impervious cover and the design volume of the rainwater harvesting practice (cubic feet).

Submerged Gravel Wetlands

Applicability: This practice is recommended for development projects located on the Eastern Shore that have high water tables. The best soils are in HSG C and D, although they can be used on HSG A and B Soils if the water table is within three feet or less from the land surface.

MDE Reference: page 5.77 of Chapter 5 of MDE (2009)

Key MDE Design Criteria:

- The submerged gravel wetland must have a minimum CDA of one acre.
- The wetland gravel bed should be no shallower than 18 inches and no deeper than 48 inches.
- A pretreatment forebay sized at a minimum of 10% of the incoming ESD volume is required to keep sediments from accumulating in the gravel.

Critical Area TP Removal Rate: 60%

Additional Design Criteria for Critical Area

 More detailed guidance on the design, installation and maintenance of submerged gravel wetlands can be found in UNHSC (2009).

Where it is Entered in the Compliance Spreadsheet: Go to Rows 106 and 107 and enter the acreage of contributing impervious cover to the wetland and the depth of the submerged gravel wetland (in feet).

Landscape Infiltration

Applicability. This is a good option for small residential and commercial projects that are located on highly permeable soils. The maximum contributing drainage area to an individual landscape infiltration practice cannot exceed 10,000 square feet, and is not feasible for projects that have HSG C and D soils.

MDE Reference: page 5.82 of Chapter 5 of MDE (2009)

Key MDE Design Criteria:

- The facility should be designed to fully dewater in 48 hours.
- The typical cross-section from top to bottom includes 6 to 9 inches of surface ponding, 12 to 18 inches of soil media, 12 inches of gravel and 12 inches of sand
- Practice restricted to HSG A and B soils.
- The maximum CDA to an individual practice is 10,000 square feet.
- A larger CDA is permissible with on-site soil testing and pretreatment measures.
- Standard setbacks to building foundations and septic systems must be maintained.

Critical Area TP Removal Rate: 75% (for A and B soils only)

Additional Design Criteria for Critical Area

• Designers may upgrade to an infiltration or bioretention practice to serve a larger drainage area, provided that they conduct soil testing to confirm infiltration capability and install pretreatment measures.

Where it is Entered in the Compliance Spreadsheet: Go to Rows 118 and 119 and enter the acreage of contributing impervious cover, surface area (square feet) and the depth of the landscape infiltration practice (feet).

Dry Well and Micro-infiltration

Applicability: This is a good option for small residential and commercial projects that are located on highly permeable HSG A and B soils. The maximum contributing drainage area to an individual dry well cannot exceed 500 square feet. Dry wells are not feasible for projects with HSG C and D soils.

MDE Reference: page 5.91 of Chapter 5 of MDE (2009)

Key MDE Design Criteria:

- Pretreatment is required in gutters or using grass filter strip.
- A 6 to 12 inch bottom sand layer must be provided below stone reservoir.
- Standard setbacks to building foundations and septic systems must be maintained.
- Dry wells are restricted to slopes of 2% or less.
- The facility should be designed to fully dewater in 48 hours.

Critical Area TP Removal Rate: 65%

Additional Design Criteria for Critical Area

- The modified dry well design presented on page 45 of CCBRM (2010) is strongly recommended for use in the Critical Area. The improved design includes a simple but more effective pretreatment system, and standardized "plumbing" components that are readily available from most hardware stores and can be assembled together easily.
- Designers may wish to upgrade to an infiltration practice to serve a larger drainage area, as long as they conduct soil testing to confirm infiltration capability and install pretreatment measures. These larger infiltration systems are classified as ESD practices in the Critical Area, and also possess a higher phosphorus removal rate.
- If soils are extremely permeable (infiltration rates exceed 4 inches per hour), landscape infiltration or rain gardens are preferred since they provide more treatment before reaching groundwater.
- It is recommended that the depth of stone reservoir be kept to two or three feet to maximize surface area.
- A minimum separation distance of two feet from the bottom of the dry well and the seasonally high water table must be maintained.

Where it is Entered in the Compliance Spreadsheet: Go to Rows 108 and 109 and enter the acreage of contributing impervious cover, the surface area of the micro-infiltration practice (in square feet) and its depth (feet).

Infiltration

Applicability. Infiltration is considered a good option on most HSG A and B soils, and some HSG C soils. It is considered a preferred environmental site design practice in the Critical Area due to its higher runoff reduction and phosphorus removal capability. Infiltration practices are restricted or prohibited at development projects that are expected to become stormwater hotspots in the future (i.e., Table 2.6 in MDE 2000).

MDE Reference and Design Criteria: Page3.38 in Chapter 3 of MDE (2000)

Critical Area TP Removal Rate:

- Design Level 1: 60%
- Design Level 2: 90%
- The requirements for each design level are outlined in Table 13.

Table 13 Infiltration Design Levels		
Level 1 Design TP:60%	Level 2 Design TP:90%	
Infiltrates the entire WQv	Infiltrates at least 75% of the ESD Target	
	Volume *	
At least one pre-treatment device	At least two forms of pre-treatment*	
Soil infiltration rate $1/2$ to 1 inch/hr.	Soil infiltration rates of 1.0 to 4.0 inch/hr *	
Treatment volume infiltrates in less than 36	Treatment volume infiltrates within 36 hours	
hours	or more *	
*All four criteria must be met to qualify for Level 2		

Additional Design Criteria for Critical Area

- The New Jersey soil testing protocols are strongly recommended to evaluate soil infiltration rates (NJDEP, 2009, Appendix E).
- A minimum separation distance of two feet from the bottom of the infiltration practice and the seasonally high water table must be maintained for all designs.

Where it is Entered in the Compliance Spreadsheet

Go to Rows 165 and 166 and enter the acreage of contributing impervious cover and the design treatment volume of the infiltration practice (in cubic feet).

Rain Gardens

Applicability: Rain gardens are an option to treat rooftop runoff at individual homes or small commercial projects. They are effective on A and B soils, but are restricted on C soils. The contributing drainage area (CDA) to an individual rain garden should not exceed 2,000 square feet (sf) for residential applications and 10,000 sf for non-residential projects.

MDE Reference: page 5.104 of Chapter 5 of MDE (2009)

Key MDE Design Criteria:

- The maximum depth of temporary ponding in the rain garden is 6 inches.
- The filter bed in the rain garden can range from 12 and 18 inches deep.
- The basic rain garden design uses soil infiltration to dispose of stormwater, so no under drain is used.

Critical Area TP Removal Rate:

- Design Level 1 25% (HSG C Soils)
- Design Level 2: 50% (HSG A and B Soils)
- The requirements for each design level are outlined in Table 14

Table 14 Rain Garden Design Levels		
Level 1 Design TP 25%	Level 2 Design TP 50%	
HSG C Soils	HSG A and B Soils	

Additional Design Criteria for Critical Area

- Rain gardens will generally be located on individual roof leaders for detached single family homes.
- To ensure proper homeowner maintenance, the builder must disclose their location, purpose and function when property is sold. The GPS coordinates of the rain garden must be recorded, and some form of easement, covenant or right of way be provided to ensure they are not filled in.

Where it is Entered in the Compliance Spreadsheet

Go to Rows 110 to 113 and select the row that corresponds to the predevelopment HSG for the rain garden, and then enter the acreage of contributing impervious cover and the surface area of the rain garden (in square feet).
Micro-Bioretention

Applicability: Micro-Bioretention is a versatile ESD practice that can be applied to all soil types and most development conditions.

MDE Reference: page 5.96 of Chapter 5 of MDE (2009)

Key MDE Design Criteria:

- The CDA for micro-bioretention should not exceed 0.5 acres.
- The maximum depth of ponding in the bioretention area is 12 inches.
- The filter bed should range from 2 and 4 feet in depth.

Critical Area TP Removal Rate: See Table 15

Table 15 Micro-Bioretention Design Levels				
Level 1 Design TP:50% Level 2 Design TP: 75%				
HSG C and D Soils and/or under drain	HSG A and B Soils, OR has full ESD to			
	MEP storage, OR has 12 inch stone sump			
	below under drain invert.*			
Filter Media Depth less than 36 inches	Filter Media depth 36 inches or more *			
One cell	Two cells, if CDA is more than 10,000 sf *			
*All three criteria must be met to qualify for Level 2				

Additional Design Criteria for Critical Area

- The minimum depth of the filter bed shall be no less than 18 inches.
- The minimum depth from the bottom of the bioretention area and the seasonally high water table can be one foot, if an under drain is used. Otherwise, a minimum separation distance of two feet is needed to groundwater.
- The recipe for the filter media is to consist of 85%-88% sand, 8%-12% soil fines and 3%-5% organic matter in the form of leaf compost.
- The soil fines be supplied by vendor must be tested to ensure that soils have a phosphorus index (P-Index) between 10 and 30, or a test to show soil media has between 7 and 21 mg/kg of P in the soil media.
- The design shall include a landscaping planting plan that includes herbaceous vegetation, shrubs, and/or trees to achieve surface area coverage of at least 75% within 2 years.
- Plant species selected should reflect coastal plain ecosystems and be salt tolerant. A bioretention plant list can be found in CSN Bayside Design Spec No. 8.
- In residential areas, it is acceptable to use turf as an alternative surface cover in lieu of mulch.
- Maintain at least a 0.5% slope in the under drain to ensure drainage.
- The following building setbacks apply to bioretention: 10 feet if down-gradient from building or level (coastal plain); 50 feet if up-gradient.

Where it is Entered in the Compliance Spreadsheet: Go to Rows 114 to 117 and select the row that corresponds to the predevelopment HSG for the bioretention area, and then enter the acreage of contributing impervious cover and the surface area of the bioretention area (in square feet).

Regular Bioretention

Applicability: Regular bioretention is considered a preferred ESD practice in the Critical Area due to its high runoff reduction and phosphorus removal capability. It can be applied to all soil types and most development conditions.

MDE References: Page 3.38 in Chapter 3 of MDE (2000)

Critical Area TP Removal Rate: (see Table 16)

Table 16 Regular Bioretention Design Levels				
Level 1 Design TP:50%	Level 2 Design TP: 75%			
HSG C and D Soils and/or under drain	HSG A and B Soils <i>OR</i> has full ESD to MEP storage <i>OR</i> has 12 inch stone sump below under drain invert*			
Filter Media Depth less than 36 inches	Filter Media Depth 36 inches or more *			
One cell	Two Cells, if CDA is more than 10,000 sf *			
*All three criteria must be met to qualify for Level 2				

Additional Design Criteria for Critical Area

- Meet all of the design criteria for micro-bioretention, plus:
- Sub-soil infiltration testing: one infiltration test per 1,000 sq. ft. of filter surface; Min infiltration rate > 1/2 inch/hour in order to remove the under drain requirement. Soil infiltration testing is not needed if an under drain is used.
- A pretreatment cell *plus* one of the following: a grass filter strip, gravel/stone diaphragm, gravel/stone flow spreader, or another approved (manufactured) pre-treatment structure. Ideally, bioretention will be provided in a series of cells leading to a ditch system or stream.
- To prevent short-circuiting, the ratio of the length of shortest flow path to the overall average length of the practice must exceed 0.5. If this ratio cannot be attained, shift to a multiple cell design.
- The maximum contributing drainage area to an individual bioretention area shall not exceed 2.5 acres.

Where it is Entered in the Compliance Spreadsheet: Go to Rows 114 to 117 and select the row that corresponds to the predevelopment HSG for the bioretention area, and then enter the acreage of contributing impervious cover and the surface area of the bioretention area (in square feet). If an enhanced filter is added, enter the cubic feet of additional storage provided.

Note on Urban Bioretention: Urban bioretention includes expanded tree pits, street bioretention and foundation planters that are used to treat runoff at high intensity redevelopment projects (CSN, 2011). Due to redevelopment constraints, most urban bioretention practices do not fully meet ESD sizing criteria, and therefore have less phosphorus removal capability. Therefore, they should be entered in the spreadsheet as if they are a rain garden (Row 110 to 113).

Grass Channels

Applicability: Grass channels are a good option along open section roads at low density development projects. They require permeable soils in HSG A, B or C. They **are not** allowed for use on parking lots or rooftops. A bio-swale or dry swale is more effective in TP removal. If the water table is within a foot of the surface, wet swales or linear wetlands are a preferred alternative.

MDE Reference: Page 5.108 in MDE (2009) and described as a credit in MDE (2000).

Key MDE Design Criteria:

- The length of the grass channel must be at least the length of the contributing impervious cover to it.
- The maximum slope of a grass channel cannot exceed 4%, and check dams or infiltration berms should be installed to break up slopes.
- The maximum depth of the flow during the ESD storm shall not exceed 4 inches
- The surface area of the bottom of the grass channel shall be at least 2% of the contributing drainage area.
- The maximum contributing drainage area to an individual grass channel shall not exceed one acre.
- Flow velocities through the channel shall be non-erosive during the two year design storm, and the channel should have sufficient hydraulic capacity to safely convey the 10 year storm.

Critical Area TP Removal Rate (see Table 17)

Table 17 Design Levels for Grass Channels					
Level 1 Design TP:20% Level 2 Design TP:40%					
C and D Soils	A or B Soils OR restored C and D Soils *				
Slopes from 2 and 4%Slopes less than 2% *					
* Both criteria must be met to qualify for Level 2					

Additional Design Criteria for Critical Area

- The minimum width of the grass channel is 4 feet.
- The water table must be at least 12 inches below the channel bottom.
- The grass channel must provide at least 10 minutes of residence time for the water quality storm event prior to any discharge to an inlet, pipe or stream.
- One foot of restored soil along channel bottom is required for C and D soils and mass graded B soils.
- No more than 3% slope is permitted in any 50 foot grass channel segment (e.g., low check dams).
- A minimum slope of 0.5% must be maintained in the grass channel to ensure positive drainage.

Where it is Entered in the Compliance Spreadsheet: Go to Rows 120 to 123 and select the row that corresponds to the predevelopment HSG for the grass channel and then enter the acreage of contributing impervious cover and the surface area of the channel bottom (in square feet).

Bioswales and Dry Swales

Applicability: Bioswales and dry swales are a versatile practice for low to moderate density development projects over the entire range of soil conditions.

MDE Reference:

- Bioswales: page 5.108 in Chapter 5 of MDE (2009)
- Dry Swales: page 3.45 of MDE (2000)

Key MDE Design Criteria: The geometric design criteria for bioswales are identical to the preceding criteria for grass channels.

Critical Area TP Removal Rate

- Design Level 2: 75% (HSG A and B Soils)
- Design Level 1: 50% (HSG C and D Soils)

Table 18 Design Levels for Bio-swales and Dry Swales				
Level 1 Design TP:50% Level 2 Design TP:75%				
Treats the WQv	Filters at least 75% of the ESD Target Volume *			
Bioswale design	Dry Swale OR bioswale with stone sump *			
C and D Soils	A and B Soils, OR C soils with enhanced filter *			
Effective swale slope $\leq 2\%$	Effective swale slope less than 2% *			
Media Depth of 18 inches or lessMedia Depth of 24 inches or more *				
* All five criteria must be met to qualify for Level 2				

Additional Design Criteria for Critical Area

- The minimum depth of the swale filter bed is 18 inches.
- The recipe for the swale filter media are the same as for regular bioretention
- It is acceptable to use turf as an alternative surface cover in lieu of mulch.
- The minimum depth from the bottom of the swale and the seasonally high water table can be one foot, if an under drain is used. Otherwise, a separation distance of two feet is needed to the seasonally high water table. In cases where the water table is close to the surface, consider shifting to a wet swale or linear wetland.
- Maintain at least a 0.5% slope in the under drain to ensure drainage.
- Sub-soil testing: one per 200 linear feet of filter surface; min. infiltration rate must be > 1/2 inch/hour to remove the under drain requirement. Testing is not required if an under drain is used.
- The following residential road setbacks apply to bio swales and dry swales: five feet down-gradient and one foot below road grade.

Where it is Entered in the Compliance Spreadsheet: Go to Rows 124 to 127 and select the row that corresponds to the predevelopment HSG for the bioswale (or dry swale), and then enter the acreage of contributing impervious cover and the surface area of the swale bottom (in square feet).

Wet Swales

Applicability: Wet swales are most feasible on flat terrain with a high water table and HSG C and D soils. They are not recommended for HSG A and B soils, unless the seasonally high water table is within three feet of the land surface. They are primarily applied in non-residential settings.

MDE Reference: Page 3.45 of MDE (2000) and page 5.108 in Chapter 5 of MDE (2009)

Key MDE Design Criteria:

- Check dams or infiltration berms should be installed to break up slopes.
- The maximum depth of the flow during the ESD storm shall not exceed 4 inches.
- The surface area of the bottom of the wet swale shall be at least 2% of the contributing drainage area.
- The maximum contributing drainage area to an individual wet swale shall not exceed one acre.
- Flow velocities through the swale shall be non-erosive during the two year design storm, and the swale should have sufficient hydraulic capacity to safely convey the 10 year storm.

Critical Area TP Removal Rate: 40%

Additional Design Criteria for Critical Area

- The maximum slope of a wet swale shall not exceed 2%
- The average dry weather ponding depth in the wet swale shall not exceed 6 inches.
- The wet-weather ponding depth may not exceed 18 inches. The basic idea is to design for saturated soils and not a permanent pool of standing water.
- Wet swales work best when designed as a series of on-line or off-line cells in the ditch system, with individual cells that are 50 to 75 feet long. Cells may be formed by check dams, infiltration berms or earthen berms.
- A planting plan must be provided on how emergent wetland species will grow in the swale, although it is acceptable to use wetland seed mixes to establish the plant community.

Where it is Entered in the Compliance Spreadsheet: Go to Rows 128 to 129 and enter the acreage of contributing impervious cover to the wet swale, the surface area of the bioswale (in square feet) and the depth of the swale (in feet).

4.3 Conventional Stormwater Practices

Sand Filters

Applicability: Sand filters are an effective treatment option when there is a groundwater contamination risk, such as at *s*tormwater hotspots and brown-fields, or at redevelopment sites located on urban fill soils. Sand filters are suitable for all soil types. There are many different sand filter design variations that can work in difficult site conditions.

MDE Reference and Design Criteria: Page 3.38 in MDE (2000)

Critical Area TP Removal Rate:

- Design Level 1: 60%
- Design Level 2: 65%
- The requirements for each design level are outlined in Table 19

Table 19 Design Levels for Sand Filters					
Level 1 Design TP: 60%	Level 2 Design TP: 65%				
Filters the WQv	Filters at least 75% of the ESD Target Volume*				
One cell design	Two cell design, with one cell for pretreatment*				
Contributing Drainage Area (CDA) contains	CDA is nearly 100% impervious*				
more than 10% pervious area					
* All three criteria must be met to qualify for Level 2					

Additional Design Criteria for Critical Area:

- The perimeter or non-structural design variants are the most feasible sand filter option under most coastal plain conditions.
- The combined depth of the sand filter bed and under drain layer can be reduced to a minimum of 24 inches if site conditions are problematic.
- The minimum depth between the water table and the bottom of the sand filter can be reduced to one foot, if it is equipped with an under drain.

Where it is Entered in the Compliance Spreadsheet: Go to Rows 163 and 164 and select the row that corresponds to the design level achieved by the sand filter. Next, enter the acreage of contributing impervious cover to the filter and the water quality treatment volume (in cubic feet).

Shallow Constructed Wetlands

Applicability: While constructed wetlands are technically not classified as an ESD practice, they are an effective biological treatment practice for the Critical Area (particularly when the water table is close to the surface). New wetland designs that emphasize shallow, linear, multi-cell configurations, and seek to replicate forested wetland conditions are recommended for the Critical Area (Flores et al, 2009 and Cappiella et al, 2008).

MDE Reference and Design Criteria: page 3.8 in MDE (2000)

Table 20 Design Levels for Constructed Wetlands					
Level 1 Design TP:50%	Level 2 Design TP:75%				
Pool volume treats the one- inch WQv	Pool volume treats 1.25WQv or more *				
Single cell (with a forebay)	Multiple cells **				
Uniform wetland depth	Diverse microtopography with varying depths **				
Mean wetland depth is <i>more</i> than 1 foot	Mean wetland depth is <i>less</i> than 1 foot **				
The surface area of the wetland is <i>less</i> than 3% of the contributing drainage area (CDA).	The surface area of the wetland is <i>more</i> than 3% of the CDA. **				
Length/Width ratio <i>OR</i> Flow path = 1:1 or more	Length/Width ratio <i>OR</i> Flow path = 2:1 or more **				
Length of shortest flow path/overall length = 0.5 or more	Length of shortest flow path/overall length = 0.8 or more**				
Emergent wetland plant community	Mixed of forested wetland community **				
* Mandatory to qualify for Level 2 ** Must meet at least 4 of 7 of these criteria to qualify for Level 2					

Critical Area TP Removal Rate (see Table 20)

Additional Design Criteria for Critical Area

- It is acceptable to excavate up to 6 inches below the water table to create a wetland, and to dig pools up to 3 feet to control mosquitoes. The wetland volume is equal to the water quality volume, if the basic geometric criteria in Table 20 are met.
- Flashboard risers are recommended for constructed wetlands in flat terrain.
- The creation of forested stormwater wetland plant communities is strongly encouraged, (e.g., cypress, tupelo, Atlantic white cedar and other wet-footed tree species).
- The Regenerative Conveyance System is recommended in the Critical Area, particularly when there is significant gradient across the site (Flores et al, 2009).

Where it is Entered in the Compliance Spreadsheet: Go to Rows 161 and 162 and select the row that corresponds to the design level achieved by the constructed wetland. Next, enter the acreage of contributing impervious cover to the wetland and the water quality treatment volume provided (in cubic feet).

Wet Ponds

Applicability: The use of wet ponds in the Critical Areas is not encouraged, since they are not considered an ESD practice, and recent research indicates their nutrient removal performance is limited under coastal plain conditions (Appendix A, CSN, 2009). In general, shallow constructed wetlands are a preferred alternative to wet ponds.

MDE Reference and Design Criteria: page 3.8 in MDE (2000)

Critical Area TP Removal Rate:

- Design Level 1: 50%
- Design Level 2: 75%
- The requirements for each design level are outlined in Table 21.

Table 21 Design Levels for Wet Ponds					
Level 1 Design TP: 50%	Level 2 Design TP: 75%				
Pool volume treats the one- inch WQv	Pool volume treats 1.25 WQv or more *				
Single Pond Cell (with forebay)	Multiple Cell Design **				
Length/Width ratio OR Flow path = 1:1 or	Length/Width ratio OR Flow path = 2:1 or				
more	more**				
Length of shortest flow path / overall	Length of shortest flow path/overall length = 0.8				
length = 0.5 or more	or more**				
Standard aquatic benches	Wetlands more than 10% of pond surface area **				
* Mandatory to qualify for Level 2					
** Must meet at least 3 of 4 of these criteria to qualify for Level 2					

Additional Design Criteria for Critical Area

- A pond landscaping plan is required to achieve a natural ground cover of native perennials, shrubs, and trees in the buffer zone.
- Ponds that are dugout below the water table are poor performers, and no WQv credit is given for any storage below the seasonally water table.
- Fountains may prevent stagnation and sediment release in summer.

Where it is Entered in the Compliance Spreadsheet: Go to Rows 159 and 160 and select the row that corresponds to the design level achieved by the wet pond. Next, enter the acreage of contributing impervious cover to the pond and its water quality treatment volume (in cubic feet).

Part 5 Stormwater Offset Fees and Offsite Compliance

5.1 Updated Stormwater Offset Fee Schedule

Offsets are defined as "structures or actions that compensate for undesirable impacts." Offsets address the impacts associated with uncontrolled stormwater runoff generated from a development site by providing alternative ways to reduce pollutants when on-site ESD practices are insufficient or impractical. Offsets must remove a phosphorus load equal to or greater than the phosphorus removal requirement. Offset fees must be equivalent to the cost of planning, designing, constructing, and maintaining stormwater retrofits or other restoration practices capable of reducing an equivalent load of phosphorus.

Recent cost data suggests that stormwater offset fees need to be increased to fully recover the public sector cost to build retrofits that can remove an equivalent amount of phosphorus (CSN, 2011). The new recommended offset fee is \$32,500 per pound of phosphorus that must be mitigated. The fee assumes that the phosphorus removal will occur in storage retrofits and/or stream restoration practices located on larger public or parcels within the same watershed. This option works best in larger counties with moderate development intensity, abundant retrofit opportunities and past experience in delivering watershed retrofits.

A higher offset fee may be warranted in larger cities that are already intensively developed, since they often lack the abundant and less expensive storage retrofit opportunities of their suburban counterparts. Setting the price for offsets should always be a local decision, given that each is unique with respect to its existing development intensity, expected redevelopment activity, retrofit opportunities, staff capability, business climate and future nutrient reduction liability.

5.2 Basic Principles for Critical Area Stormwater Offset Programs

The following principles are offered to develop effective and accountable programs to handle stormwater offsets for Critical Area projects.

Offsets Should be Simple to Administer and Verify. The offset fee should be expressed in simple unit terms that can be directly computed from redevelopment site data and/or stormwater spreadsheet computations. In the Maryland Critical Area, this common unit will be pounds of phosphorus load remaining at the site above the phosphorus removal standard.

Offsets Must Occur Within the Same Sub-Watershed, which is operationally defined as the scale associated with the USGS 12 digit hydrologic unit code mapping systems. These subwatersheds normally range from about 15 to 65 square miles in area in the Bay watershed. For smaller cities, this scale means the offset project can occur pretty much anywhere in their jurisdiction. In a larger

county, this scale ensures that there is a linkage between where the impact occurs and where it is mitigated.

Offsets Should Require Some On-Site ESD Treatment. Offsets are only allowed if a designer can demonstrate that a reasonable effort has been made to install ESD practices at the site. The basic idea is that you can't just write a check to avoid the entire cost of ESD implementation. Some ESD practices can always be implemented to some degree at nearly every development site, except for certain brown-field sites.

The Off-site Compliance Option: Another way to get to compliance is for the developer to find an off-site retrofit or restoration project that can achieve an equivalent degree of phosphorus removal. This situation may occur when the developer has a large property that extends across the Critical Area boundary. Off-site compliance is only allowed for retrofits of existing impervious cover, and not new impervious cover. The local Critical Area review authority makes the final decision as to whether the off-site compliance option is acceptable.

Local Stormwater Offset Programs Should Be Accountable. It is critically important to craft a stormwater offset program that is transparent and can quantitatively demonstrate that it is providing the desired load reduction under the phosphorus removal performance standard. Therefore, a good local phosphorus offset program has the following accountability elements:

Dedicated Account. All funds collected from offset fees should be parked in a dedicated fund for the sole purpose of constructing qualifying offset projects. The fund should be restricted so that it cannot be tapped to meet other municipal needs.

Fiscal Accountability. A locality should track offset fees collected and funds disbursed for offset projects over time, and provide the annual balance and financial status on an annual basis.

Reversion Clause. If the locality accumulates offset fees but does not expend them within a five year time period, the funds should automatically revert to a pre-defined state agency, foundation or watershed group with capacity to expend them on restoration projects.

Watershed Restoration Inventory. The program should have a current watershed restoration inventory that identifies priority retrofit and restoration projects for offset implementation. Most localities in the Critical Area have conducted watershed restoration plans in the past.

Retrofit Registry. The locality should develop and maintain a retrofit registry that tracks the status of offset project implementation and the estimated phosphorus load reduced. The registry should also track the cumulative acres of impervious cover for which offsets have been granted.

The registry can be configured to show whether there is a surplus or deficit in offset treatment, and should be prominently displayed on their local websites. Localities are also advised to link their retrofit registry with their overall nutrient accounting system to meet their phosphorus load reduction requirements under their Bay-wide nutrient TMDL allocation for Maryland.

Offset Fees Should be Indexed for Inflation. One of the most common mistakes is to include a fixed offset fee schedule in a local stormwater ordinance that cannot be increased unless the statute is re-enacted. Within a few short years, revenues collected from offset fees can no longer recover the full cost to the public sector to build the projects. Therefore, the offset fee schedule should be indexed for construction inflation so that it can keep up with the true cost of retrofit implementation over the years. The accepted industry index to cite is the annual construction inflation index published by the *Engineering News Record*.

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Appendix A Standardized TP Removal Rates for the Critical Area

Tables A-1 and A-2 provide updated total phosphorus removal rates for new ESD practices and traditional stormwater practices in order to integrate the ESD approach with the Critical Area phosphorus removal performance standard. These values are used in the ESD to the MEP compliance spreadsheet in order to track the progressive phosphorus reduction by ESD practices at a development site. The values reflect the mass removal rate for each practice, using the VA DCR technical memo. The mass removal rate reflects the relative contribution from runoff reduction and the change in phosphorus concentration as it flows through the practice. In most cases, the mass removal rate differs based on the hydrologic soils group of the underlying soils. In some cases, an enhanced level of design is possible to increase the TP mass removal rate.

Table A-1						
ESD Practices	Old CAP Rate/	Removal I New Data Source	Rates for Critical AreaRecommendedNew RatesA & BC & DSoilsSoilsLess than 6 : 45More Than 6 : 60		Stormwater Practices Rationale and Documentation Depth of vegetated roof. High runoff reduction but no change in TP EMC	
Green Roof	Credit ¹	VA DCR				
Permeable Paver	Credit ²	VADCR	80 60		Research has shown high rates of both runoff reduction and TP removal, depending on degree of soil infiltration.	
Rooftop Disconnect	Credit ⁴	VADCR	50 25		The 25% removal rate for C/D soils can be increased to 50% if it conforms to more stringent design criteria	
Non- Rooftop Disconnect (Filter Strip)	None ⁵	VADCR	50	25	The 25% removal rate for C/D soils can be increased to 50% if soils are restored	
Sheet flow tO Conservatn Area	None ⁶	VADCR	5025Subject to Critical Area buffer restriction.		Subject to Critical Area buffer restriction.	
Impervious Cover Conversion and Reforestation Credit are taken by reducing post development IC						
Notes						

¹Credit is for surface area of the rooftop is not considered impervious

² Credit is for surface area of pavers which are considered 50 to 90% imperviousness, depending on product

⁴ Credit is for all contributing impervious area which is excluded from total site impervious cover ⁵ Non-rooftop disconnection to a filter strip is allowed as MDE credit but is not directly called out in the 10% guidance

⁶ This MDE credit is specifically disallowed within the Critical Area's 100 foot buffer

Table A-2						
Adjusted Removal Rates for Critical Area Stormwater Practices						
ESD	Old CA	New	Recommended		Rationale	
Practices	P Rate/	Data Source	New Rat	es	and	
	Credit	Source	A & B C & D Soils Soils		Documentation	
Rainwater	None ⁷	VA	4	5%	TP rates are based on default	
Harvesting		DCR			volume of runoff reused	
Landscape	None 7	VADCR	75%	Not	This a hybrid of both infiltration and	
Infiltration				Allowed	bioretention	
Sub Gravel	None 7	UNH	Not	60%	Based on recent research from New	
Wetlands			Allowed		Hampshire	
Infiltration	None 7	None	0%	0%	This is not a stand-alone practice,	
Berm					but can help enhance NRD filter	
					strip and grass channel performance	
Dry Well	65% ⁸	63%	65%	Not	Retain same rate as for infiltration	
		NPRD		Allowed	practices	
Infiltration	65%	VADCR	90% 60%		See Table A-3	
Rain	None 7	VADCR	50%	25%	Several key design elements that	
Gardens					contribute to P removal of this form	
			of		of bioretention are absent	
Micro-	50% ⁹	VADCR	75% 50%		Performance related to degree of soil	
bioretention					infiltration achieved	
Grass	Credit ¹⁰	VADCR	40%	20%	The 25% removal rate for C/D soils	
Channels					can be increased to 50% if soils are	
					restored	
Wet Swales	40%	VADCR	Not	40		
			Allowed			
Bio	65	VADCR	75%	50%	Performance related to degree of soil	
swales "					infiltration achieved	

Notes

 7 There was no removal rate provided for this practice in the 2003 10% guidance manual

⁸ Assumed to be comparable to rates for infiltration practices

⁹ Assumed to be comparable to rates for bioretention practices

¹⁰ Credit is for all contributing impervious area which is excluded from total site impervious cover, although parking lots are excluded ¹¹ Bio-swales are comparable to dry swales

Table A 9							
I able A-3							
	Adjusted	kemovali	kates for C	ritical Are	ea Stormwater Practices		
ESD	Old CA	New	Recommended		Rationale		
Practices	P Rate/	Data	New Rates		and		
	Credit	Source	A&B C&D		Documentation		
			Soils	Soils			
Infiltration	65%	VADCR	Level	1:60%	Level 1 is the base removal rates for		
Systems 12			Level	2:90%	the practice using standard design		
Filtering	50%	VADCR	Level 1: 60%		criteria in MDE (2000). Level 2		
Systems 12			Level 2: 65%		includes additional design		
Ponds 12	50-65	VADCR	Level	1:50%	elements that enhance TP removal		
			Level	2:75%	rate, following the VADCR		
Wetlands ¹²	40-55	VADCR	Level	Level 1: 50% approach			
			Level 2: 75%				
Notes ¹² TP removal rates for multiple design variants are provided in Table 4.8 of the 10% Guide.							

Appendix B

Documentation of the Revised Phosphorus Removal Performance Standard of 0.30 lb/ac/yr

Background

A single urban pollutant was selected as a surrogate for all stormwater pollutants. This "keystone" pollutant was used as the basis for computing pre-development and postdevelopment pollutant loads at a site and ultimately, the necessary pollutant removal requirement. As part of the original guidance, each major stormwater pollutant was evaluated for suitability as a potential keystone pollutant. Based on this review, total phosphorus was recommended as the keystone pollutant to meet the Critical Area 10% Rule (MWCOG, 1987). Total phosphorus was selected as the keystone pollutant because it has the following characteristics:

- The adverse impacts of total phosphorus on the water quality of the Chesapeake Bay are well documented.
- Total phosphorus exists in both soluble and particulate forms, which means that a variety of removal mechanisms such as settling and biological uptake is needed for effective treatment.
- Abundant data exists to characterize total phosphorus concentrations and pollutant removal performance. This enables reviewers to more accurately compute post development stormwater loads and choose an effective stormwater BMP

The original performance standard was to treat post development runoff to achieve a predevelopment background load of no greater than 0.45 lbs of TP per acre per year. This was established in 1987 using the limited runoff monitoring data then available to characterize nutrient loads from Maryland watersheds. The baseline load was 0.5 lbs/ac/year, which represented a composite of the annual phosphorus load from a mixed watershed of forest, crop and pasture land uses.

Over the last two decades, better data has become available to characterize the acceptable post-development phosphorus load from new development projects. The primary data source is the Maryland nutrient loadings from the Chesapeake Bay Basin Model developed by the EPA to support the Bay-wide TMDL, as reported in MDE (2010), and reprised in Table B-1.

Table B-1 Total Phosphorus Loads, By Sector in Maryland Portion of Bay Watershed							
Loading Sector	2009 Load	Target Load	% Reduction				
	Million po	Target					
Forest Runoff	0.35	0.35	0				
Atmospheric Deposition	0.04	0.04	0				
Wastewater ¹	0.87	0.69	34%				
Urban and Suburban Runoff	0.67	0.44	36%				
Agricultural Runoff ²	1.44	1.25	12%				
RUNOFF SOURCES	2.46	1.99 ³					
TOTAL 3.3 2.72 12%							
Source: MDE (2010) ¹ includes combined sewer overflows ² includes confined animal feedlots ³ excludes CAFO portion of agricultu	ral runoff	P					

The acceptable P TP target load from Bay-wide TMDL from all land-based sources of phosphorus pollution is 1.99 million/lbs/yr. Land sources of phosphorus pollution included runoff from forest, agricultural (excluding CAFOs) and urban and suburban land uses. Wastewater and CSO loads were excluded from the calculation, since they are not runoff-related, as was atmospheric deposition over open waters of the Bay.

The land-based TP target load was then divided by the total land area in Maryland's portion of the Chesapeake Bay watershed (5.866 million acres) to arrive at an average per acre phosphorus load of 0.34 pounds per acre per year.

Given the direct proximity of the Critical Area to the Bay, and to be consistent with the original Critical Area criteria (i.e., 10% reduction from the predevelopment load), the 0.34 lb target TP load was reduced by another 10%, to yield a final value of 0.30 lbs/ac/year.

The Critical Area Phosphorus removal standard is consistent with the proposed phosphorus baseline load for new development projects in Virginia discharging to the Chesapeake Bay, which has ranged between 0.28 to 0.45 lbs/acre/year.

For redevelopment projects, a lower phosphorus removal standard was developed to be consistent with MD ESD requirements. The target load reduction for redevelopment projects is the removal of one pound of phosphorus per impervious acre, or fraction thereof, by an acceptable treatment facility, or a 50% total P removal rate for the site.

Appendix C

Measures Implementing the Harford County Critical Area Forest Conservation and Protection

APPENDIX C FOREST MANAGEMENT GUIDE FOR TIMBER HARVEST AND FOREST CONSERVATION WITHIN THE CRITICAL AREA OF HARFORD COUNTY

INTRODUCTION

Retaining and, where possible, increasing the amount of forest cover is one of the major objectives of the State Chesapeake Bay Critical Area Act and Harford County's Critical Area Management Program. This goal includes avoiding disturbance to the Critical Area Buffer wherever possible. This goal is pursued with the understanding that forest can be selectively removed according to certain laws. Maryland Code allows timber harvest, even in the Critical Area. Land development in Harford County can occur with tree removal according to a forest conservation plan. The following program guidance shall be applied to any timber harvest or forest conservation plan in the Critical Area.

FOREST MANAGEMENT PLANS (TIMBER HARVEST)

A. Required Plan

All timber harvesting operations (private or commercial) in the Critical Area of Harford County must conform to a Forest Management Plan (Plan) prepared by a forester registered in the State of Maryland and submitted to the local office the Maryland Forest Service for review. A Forest Resource Conservation Plan may be accepted. The Maryland Forest Service typically reviews plans for one or more contiguous acres of forest land. However, a Plan is required for timber harvest operations, regardless of size, in the Critical Area by Harford County to ensure the objectives of the State Chesapeake Bay Critical Area Act and Harford County's Critical Area Management Program are met and disturbance to the Critical Area Buffer is avoided.

Plans must be prepared in accordance with the minimum requirements listed below Plans must show how the area will be reforested whether by natural regeneration or by planting with no development taking place. Provisions in subsections C through E below concern the unusual occasions where a harvest disturbs the Critical Area Buffer or any other identified Habitat Protection Areas per certain circumstances allowed by code or a variance. Copies of the Forest Management Plan, signed by the forester with a valid state registration number, shall be sent to the District Forestry Board and the Department of Planning and Zoning for their review and comments. The Department of Planning and Zoning must give final approval to Forest Management Plans.

B. <u>Minimum Requirements of Forest Management Plans in the Critical Area of Harford</u> <u>County</u>

1. Name, address, and telephone number of landowner;

- 2. Description and location of property, including tax map reference, nearest road(s), and total acreage of site;
- 3. Name, address, telephone number, and registration number of professional forester preparing plan
- 4. Date of preparation;
- 5. Owner's goals (in addition to protection of water quality values and plant and wildlife habitat values) including forest incentive programs that the owner is interested in (FCMA, cost sharing programs, etc.);
- 6. A detailed map of the site (including scale and north arrow) which shows:
 - a. Cultural features such as property boundaries, roads and building on or immediately adjacent to site;
 - b. Tidal waters, tidal wetlands, perennial, and intermittent streams on or adjacent to site;
 - c. Boundary of the Critical Area and the Critical Area Buffer, including any associated expanded Buffer;
 - d. Forest stands on or immediately adjacent to site identified by SAF forest cover type or as delineated by the FSD, described below;
 - e. Identified Habitat Protection Areas and Wetlands of Special State Concern (nontidal wetlands, threatened and endangered species habitat, etc.) on or adjacent to site;
 - f. Proposed location of any logging roads, log decks, stockpile areas, staging areas, skid trails, haul roads to the nearest public road, stream crossings, culverts, and the limits of disturbance; and
 - g. Slopes in excess of 15% as determined from topographic maps;
- 7. Soils map of site which shows location of soil types associated with steep slopes, highly erodible soils, and soils with hydric inclusions as shown on the Critical Area Maps;
- 8. Description of measures to be instituted to ensure protection of identified Habitat Protection Areas on or adjacent to site or reference to the Buffer Management Plan, as appropriate;
- 9. Identification of wildlife corridors and measures to be used to ensure their maintenance;
- 10. Description of each forest stand including species composition, stocking level, acreage, dominant timber size, class, even or uneven aged characterization, site index or growth potential, and understory species composition;
- 11. Schedule and description of forestry practices to be implemented for each stand, including size of area affected, current and residual basal area (sq.ft./acre), type and intensity of proposed cuts, times of cuts, etc. Proposed forest management practices for the next fifteen years should be generally described;

- 12. Reforestation provisions including location, method (by replanting or by natural regeneration), species, size of area, stock, type, spacing, water quality and wildlife habitat values to be obtained, and provisions for maintenance for a three-year period to ensure adequate survival of stock planted or naturally regenerating; and
- 13. Sediment Control Plan must be included with the Forest Management Plan if required by Harford County or state code and conform to current Maryland Soil Erosion and Sediment Control Standards and Specifications for Forest Harvest Operations. The most recent manual was published in 2015.

C. <u>Timber Harvest in Critical Area Buffer or other Habitat Protection Areas</u>

Harford County zoning prohibits disturbance to Habitat Protection Areas including the Critical Area Buffer except in special conditions. If timber harvest is to occur in these areas per certain circumstances allowed by code or a variance, the following are required:

- 1. A Critical Area Buffer management plan approved by the Department of Planning and Zoning.
- 2. A Forest Management Plan prepared with the following special provisions:
 - a. No cutting of areas within 50 feet of tidal waters, tidal wetlands, and perennial streams;
 - b. Logging roads and skid trails or other vehicular traffic are not permitted within the Critical Area Buffer. Trees harvested from the Critical Area Buffer must be removed to the nearest skid trail outside of the Critical Area Buffer by cable;
 - c. Harvests may not occur within the Critical Area Buffer or expanded Critical Area Buffer areas from March 1 to June 15 during the anadromous fish breeding season;
 - d. Reforestation measures must specify replanting and not natural regeneration to ensure maintenance of the Critical Area Buffer's water quality and plant and wildlife habitat values, including its function as a wildlife corridor;
 - e. Commercial harvesting of trees is allowed to the edge of intermittent streams provided that the required Critical Area Buffer Management Plan includes provisions to ensures that:
 - i. Nontidal wetlands and other Habitat Protection Areas are not disturbed,
 - ii. There is no disturbance to the stream banks,
 - iii. Appropriate reforestation measures are used to ensure that the water quality and plant and wildlife habitat values for the Critical Area Buffer are maintained.
 - f. Approval from the District Forestry Board after review by the Department of Planning and Zoning for adequacy of the measures proposed to ensure maintenance of the integrity of the Buffer and/or other Habitat Protection Area(s).

D. <u>Habitats of Local Significance</u>

Harvests proposed within 500 feet of Habitats of Local Significance, habitats of threatened or endangered species or habitats of species in need of conservation or their buffers. Best Management Practices (BMPs) recommended by DNR for the protection of these habitats must be included in the Forest Management. The habitat protection plan must be reviewed and approved by the Maryland Department of Natural Resources (DNR). DNR may restrict the timing of a harvest to avoid a breeding season or anadromous fish stream closure

E. Wetlands of Special State Concern

Any plans involving harvests within Wetlands of Special State Concern or their 100-foot buffers must be reviewed and approved by DNR.

FOREST CONSERVATION PLAN (Land Development)

In the case of development activities, the forest conservation objective of Harford County's Critical Area Program is to be achieved through the preparation of a Forest Conservation Plan. This plan provides information required in addition to the more general Forest Management Plan describing the existing forest cover and how its wildlife habitat and water quality protection values are to be maintained.

The Forest Conservation Plan describes measures for the protection of existing wildlife corridors, and in the case of developments in areas designated as a Limited Development Area or Resource Conservation Area, describe how the afforestation requirements will be met. The Forest Conservation Plan shall be submitted as a component of the Forest Management Plan to the Harford County Department of Planning and Zoning and reviewed as part of the preliminary plan approval process. The information that must be included in a Forest Conservation Plan is described in more detail below:

A. Forest Stand Delineation (FSD)

Unless no forest will be disturbed by the development, an FSD is required for any development within the Critical Area in which forest covers an area greater than 40,000 square feet. The FSD shall be prepared according to the standards presented in Chapter 4 of the Harford County Forest Cover Conservation and Replacement Manual and show the location of the Critical Area, and any all-appropriate habitat protection areas. The FSD shall be developed by a forester registered in Maryland or other approved professionals as detailed in Chapter 3 of the Harford County Forest Cover Conservation and Replacement Manual;

B. Forest Cover Retention Requirements

Forested areas to be retained according to the objectives of the Critical Area Program regarding minimization of forest cover removal and the limitations on forest cover removal must be shown on the Forest Conservation Plan. Retained forest cover shall be protected from development. Criteria for priority of retention areas are listed in decreasing order:

- 1. Forest in or adjacent to the Critical Area Buffer, Habitat Protection Areas, or their Buffers;
- 2. Forests on hydric soils, highly erodible soils, or slopes in excess of 15%;
- 3. 100-year floodplain;
- 4. Forests with trees of more than 24 inches diameter at breast height, especially champion trees;

- 5. Forested areas associated with contiguous forests of 100 acres or more; and
- 6. Stands or portions of stands with good species and/or structural diversity as defined in Chapter 4 of the *Harford County Forest Cover Conservation and Replacement Manual*.

C. Afforestation and Reforestation Requirements

Plans for the replacement of forest cover removed, or for afforestation of unforested sites shall follow the criteria detailed below or shall pay an in-lieu fee of \$4.00/square foot:

- 1. Afforestation/Reforestation Plans shall detail the size of area and location of area to be cleared and planted, including species, stock type, spacing and planting method to be used. Afforestation/Reforestation Plans shall be developed according to the standards described in Chapter 5.13 of the *Harford County Forest Cover Conservation and Replacement Manual*;
- 2. Afforestation/Reforestation plans shall be developed by a forester registered in Maryland or landscape architect and reviewed by the Maryland Forest Service;
- 3. Such plans shall include a description of how such efforts will promote water quality protection and the creation of plant and wildlife habitat;
- 4. Spacing of plantings shall be at a minimum on a 10'x10' basis, or closer in the case of small trees and shrubs, using ¹/₄" caliper seedlings or larger stock. All planting materials greater than one inch caliper shall meet or exceed requirements of *American Standards for Nursery Stock Specifications*;
- 5. Afforestation/Reforestation Plans should include provisions for protection of trees, i.e., stakes, guards. Plans should also show relative locations of stockpile areas, limits of disturbance, and measures to protect the root zone, as well as surface portions or retained trees and forest;
- 6. Soil amendments shall be added, and ground cover planted as needed to ensure stabilization of a site until the tree seedlings become fully established. The ground cover should allow surface water infiltration, be beneficial to wildlife, and not inhibit seedling growth;
- 7. To maximize wildlife habitat benefits, a tiered canopy shall be created whenever feasible by planting a small shrub or tree in place of every 4 to 8 seedlings or by intermingling rows of trees and rows of shrubs and small trees. To create more diversity, 2 or 3 different species with similar growth rates may be planted interchangeably;
- 8. The percentage of forested area cleared, and the square feet of area to be cleared and replanted shall be included in the plan; and

- 9. Afforestation/reforestation areas are considered in the following priority order:
 - a. Unforested Critical Area Buffer or nontidal wetland buffer;
 - b. Areas of unforested hydric soils, highly erodible soils, or slopes in excess of 15%, or other areas needing reclamation;
 - c. Unforested 100-year floodplain; and
 - d. Unforested areas contiguous to forest areas of greater than 100 acres or areas where wildlife corridors could be created; and
- 10. Native species shall be used for afforestation and reforestation plantings unless otherwise approved by the Department of Planning and Zoning. For more information on plant species, please visit <u>www.harfordcountymd.gov/2030/Environmental-Planning</u> or call the Department of Planning and Zoning.

Appendix D

Description of Grandfathered Projects

APPENDIX D

GRANDFATHERED PROJECTS (part of original Program submittal in 1988)

I. Introduction

In recognition of the fact that a local jurisdiction may have approved certain projects prior to the approval of its Chesapeake Bay Critical Area Management Program, but these projects were not constructed prior to June 1, 1984 (the date of passage of the Chesapeake Bay Critical Areas Act), the Chesapeake Bay Critical Area Program Development Criteria established certain provisions on whether construction of such developments should count against a County's growth allocation. Projects meeting the following conditions can be grandfathered and not counted against a County's growth allocation provided that they meet the applicable provisions of the County's Critical Area Management program for the protection of identified Habitat Protection Areas, for the development of water-dependent facilities, and for the provision of adequate stormwater management measures:

- 1) Construction of a single family dwelling on an undeveloped, legal parcel of land which existed as of December 1, 1985;
- Construction of subdivisions that received final approval prior to June 1, 1984, provided that lots not individually owned are consolidated or reconfigured to comply with the provisions of the County's Critical Area Management program to the maximum extent possible;
- 3) Construction of subdivisions which received final approval between June 1, 1984 and December 1, 1985;
- 4) Construction of subdivisions which received final approval after December 1, 1985, and prior to the date of approval of the Management Program. Such subdivisions shall be consistent with the provisions of the County's Critical Area Management Program, or the development of these areas must utilize a portion of the County's growth allocation; and
- 5) The expansion of commercial uses on parcels designated LDA because they did not meet the minimum 20-acre size required for IDA designation.

II. Summary of Grandfathered Development in the Critical Area

According to a review of the County's development approval records, no development has occurred since June 1, 1984 which should be counted against the County's growth allocation.

The construction activity that has occurred has consisted almost entirely of residential structures (needing only building permit approval) on lots that were part of subdivisions approved prior to June 1, 1984, located in areas that were designated LDA or IDA. Such construction has primarily occurred in the Riverside and Harbor Oaks developments (IDA areas on Tax Maps 62 and 51, respectively) with approximately 80 building permits issued for the former and approximately 50 in the latter – out of a total of approximately 200 permits issued in the Critical Area. The remainder was for building structures in other existing subdivisions, except for four on individual lots.

There has also been a resubdivision of land as part of the West Shore development (Tax Map 66), which is a large, mixed commercial/high density residential development adjacent to Otter Point Marsh which was originally approved in the mid-1970's. In mapping the area in which this development is located, the portion of the area that was built upon as of December 1, 1985 was designated as IDA, and the remainder, LDA. Nevertheless, since approval was given for high density development in the remainder of the site prior to June 1, 1984, construction of such development will be considered grandfathered if it satisfies the IDA requirements. Approval of a third phase of high density residential development (an approximately 28-acre townhouse development) was granted in early 1987 as a modification to the subdivision plan approved in the mid-1970s. Since this phase will have a water quality stormwater management pond associated with it and will not involve the alteration of any areas of significant plant and wildlife habitat value, it has been considered as in compliance with the provisions of the Critical Area Criteria.

The remainder of the site will be utilized for commercial development, and building permits for two commercial structures to be constructed on the edge of the site were issued early in 1985. Two adjacent, commercial-zoned lots have not yet been built upon, but the remainder of the property was originally planned and approved as a shopping center. However, it is now proposed to be developed as a lower density commercial development with no development to occur within a 300-foot area adjacent to Otter Point Marsh. The first 200 feet of this area is to be left undisturbed and the 100-foot area nearest the development will be utilized for a water quality oriented stormwater management pong.

There is one other large undeveloped area for which development approval has been long granted – that of the church Point property in the Forest Greens area (Tax Map 63). This is a forested area adjacent to water and sewer service, and the property is designated LDA. It was approved for small lot, high density development in the mid-1930s, but a revised plan is now being developed which would be a modification to the original

approved plan and thus needs County approval. The new plan would retain a 100=foot Buffer, a large wooded area and provide for the creation of wooded lots at LDA density. If submitted as planned, it will be considered a reconfiguration of a previously-approved subdivision that would be more in compliance with the provisions of the County's Critical Area Management Program and thus, grandfathered. Due to its previously approved status, the County does not propose to apply the forest replacement requirements of the LDA to this development.

One other proposed subdivision in the Critical Area, Philadelphia Estates, received preliminary plan approval in November, 1986. Approximately 100 units were planned on a 26-acre parcel in the Long Bar Harbor Area (Tax Map 62), which is partially in and partially out of the Critical Area. A natural forested Buffer area 500-700 feet from tidal waters and tidal wetlands is proposed, along with protection of nontidal wetlands and the provision of water quality oriented stormwater management measures. Due to financial considerations, it is expected that the developer will let his preliminary plan approval lapse in November 1987, and not proceed with construction of the development.

There has been one rezoning and subsequent PRD approval on a 6-acre parcel designated IDA in the Joppatowne area. The purpose of the rezoning, which occurred in 1987, was to allow construction of an 85 unit apartment complex. Adequate stormwater management measures will be provided to comply with the Critical Area requirements.

Several other proposed projects in the Critical Area have been discussed with the Department of Planning and Zoning staff, but none have ever received preliminary plan approval as of this date.

III. Tracking of Development in the Critical Area

The Department of Planning and Zoning has computerized its development approval records and henceforth will be better able to ensure compliance of developments with the provisions of Harford County's Critical Area Management Program. Before computerization had taken place, approval records were not geographically referenced, making analysis of project approvals for compliance with the provisions of the Critical Area Program a time-consuming and difficult process.

Appendix E

Program Requirements for Water-Dependent Facilities

Appendix E

PART I

Information requirements for applicants regarding submittal of proposals for construction or expansion of water-dependent facilities

GENERAL INFORMATION REQUIRED:

- Name of proposed project site;
- Names and addresses of owner, subdivider or developer, land planner, surveyor and/or engineer;
- Location of facility site by election district, county and state; names of adjacent property owners or adjacent subdivisions;
- Type of approval required (subdivision approval, zoning modification, building permit, etc.);
- Vicinity map(s); and
- General description of proposed project including justification for any alteration to the Critical Area Buffer and mitigation measures proposed to minimize impact of such alterations (if any).

DESCRIPTION OF WATERBODY INVOLVED AND ASSOCIATED AQUATIC RESOURCES REQUIRED:

- Name of waterbody involved;
- Width of waterbody at site;
- Existing navigational channels, piers or decking areas adjacent to site;
- Significant aquatic habitats on or within ¹/₄ mile of site (SAV beds, tidal wetlands, fish spawning or nursery areas, habitat used by State Designated Threatened or Endangered Species or Species in Need of Conservation, waterfowl staging or concentration areas);
- Bathymetric characteristics and nearshore profile at or near site;
- Shoreline characteristics including soil composition, bank height, historic shore erosion rates, description of any shore erosion protection measures at or adjacent to site;
- Water quality conditions as designated by State; and
- Flushing rates of waterbody as determined by EPA flushing model documented in the <u>Coastal</u> <u>Marina Assessment Handbook</u> (if determined necessary by Department of Planning and Zoning).

INFORMATION REQUIRED RELATING TO IN-WATER CONSTRUCTION:

- Size, type and location of proposed structure(s);
- If boating facility, number of slips to be provided;
- Description of construction methods, type of equipment and type of materials (including any preservatives) to be used in building structure including measures proposed to minimize adverse impacts of construction;
- Description of any dredging and dredged material disposal involved with project (location, amount of material to be dredged, depth, type of method used, time of year to be undertaken, description of dimension of any basins or channels to be created, location and design of proposed disposal site;
- Measures proposed to minimize potential adverse impacts on water quality, circulation patter, littoral transport of sand or flushing characteristic; and
- Location of, design of, and justification of need for any bulkheads or other structural shore erosion measures proposed.

INFORMATION REQUIRED RELATING TO ANY ON-SHORE CONSTRUCTION:

- A. Description of Existing Physical Conditions, including:
- Boundary lines of the proposed project site, indicate in heavy outline, and tract acreage:
- Field run or photogrammetric topographic contours, references to U.S.G.S. datum, where practicable, at five (5) foot intervals;
- Soil types according to the Harford County Soil survey (the location of soils with development constraints highly erodible solids, soils with severe septic constraints, soils with high water tables, soils with hydric inclusions shall be identified);
- Slopes greater than or equal 15%;
- 100-year floodplains identified in FEMA flood insurance study or in more detailed studies undertaken or approved by the County;
- Perennial, tributary and intermittent streams located on or adjacent to site;
- Nontidal wetlands on or adjacent to site as identified by existence of hydric soils or hydrophytic vegetation and required buffers;
- Chesapeake Bay Critical Area boundary and Critical Area Buffer
- Types of vegetative cover on the site, particularly the location of forested areas on the site and location of significant individual trees;
- Plant and wildlife habitat that has been identified as of State or county importance, on or adjacent to the site, including:
 - a. Habitats of Threatened or Endangered Species,
 - b. Species in Need of Conservation,
 - c. Natural Heritage areas,
 - d. Anadromous fish propagation waters, and
 - e. Habitats of Local Significance; and

• Location and widths of pavement and rights-of-way of all existing streets or alleys adjoining the project site, or intersecting any street that bounds it (those recorded but unimproved shown with dashed lines); railroads and utility rights-of-way, parks and other public spaces adjoining the site.

B. Description of Proposed Development, including:

- Location and shape of any proposed structures;
- Layout widths and names of any proposed streets associated with project;
- Any proposed water and sewer lines and facilities;
- Location and number of parking spaces, both existing and proposed;
- Location and extent of any other proposed impervious surfaces;
- Conceptual grading plan including approximate limits of disturbance and areas of significant cut and fill;
- Proposed method(s) of stormwater management and location of facilities/measures for each drainage area in development, including the provision of sufficient information on soil and hydrologic conditions, so that the viability of the proposed measures can be accurately determined;
- Any proposed drainage and utility easements; and
- Areas of significant natural resource value to be left undisturbed, e.g., tidal and non-tidal wetlands, forested areas to be retained, plant and wildlife habitat identified as of State and County importance.

OPERATIONAL INFORMATION REQUIRED:

- If the construction or expansion of boating facilities is proposed, any services to be provided on-shore, e.g., toilet and shower facilities, pump-out facilities, gas pumps, food services, other goods and services provided, boat maintenance, repair or storage services provided, etc.;
- If gas pumps or boat maintenance, repair or storage services presently provided or proposed to be provided or expanded, description of the measures proposed to minimize impacts of such activities on water quality and aquatic habitats shall also be provided; e.g., description of maintenance and disposal procedures to be followed, etc. (see Part I.2, "Best Management Practices", for further detail); and
- Trash collection facilities to be provided.

PART II

BEST MANAGEMENT PRACTICES

ACTIVITY 1: BASIN DESIGN

Impact

Basin and entrance channel design affect flushing and sedimentation patterns. Adequate flushing of a marina is necessary for maintaining the water quality of the marina basin and adjacent waterway. Natural circulation near the site should be maintained whenever possible. Poorly flushed marinas can become stagnant and permit the concentration of pollutants from the marine facility and boats. The settling and accumulation of organic material and fine sediments can result in decreased dissolved oxygen levels and shoaling within the marina basin. Inadequate flushing and subsequent stagnation may lead to water quality degradation, affecting dissolved oxygen, water temperature, and pollutant concentrations.

B M Ps

- Design features that promote flushing are:
- Basin depths that are not deeper than the open water or channels to which the basin is connected and never deeper than the marina access channel;
- Basin and channel depths that gradually increase toward open water;
- Two openings at opposite ends of the marina to establish flow-through currents.
- Single entrances that are centered in rectangular basins rather than at one corner.
- Basins with few vertical walls and gently rounded corners or oval shaped.
- Even bottom contours, gently sloping toward the entrance with no pockets or depressions.
- Areas where tidal exchange may not adequately flush the marina, tide gates or one-way valves may be used to enhance the flushing rate.
- For harbor-locked marinas dredged from uplands, flushing may be induced by creating a tidal prism with the basin. The basin is flooded on incoming tide and the water flows out smaller diameter pipes on the ebb tide.
- Entrance channels designed with openings as wide as possible and with increasing depth away from the marina basin prompt flushing.
- Flushing may also be enhanced when entrance channels are located in the direction of prevailing winds as wind-generated currents can facilitate circulation between the basin and the adjacent waterway.
- Placement of breakwaters may impede shoaling in channels and basin, and help to maintain good flushing.

INFORMATION REQUIRED FOR REVIEW PROCESS

- Maps of area proposed for development must indicate pre-and post-development features, including:
 - a) Depth of basin, entrance channel(s) and adjacent waters with ¹/₂ mile radius;
 - b) Bottom contours of basin.;
 - c) Sedimentation patterns; and
 - d) Location and design of mechanical flushing enhancement structures and breakwater.
- Description of pre-and post-development conditions, which must include:
 - a) Flushing potentials in basin and channel(s), and
 - b) Estimates of sedimentation rates;

ACTIVITY 2: BOAT FUELING AND OPERATION, CONTROL OF PETROLEUM PRODUCT POLLUTION

Impact

Pollutants discharged to waters in association with the fueling and operation of boats include carbon monoxide, carbon dioxide, oil, gasoline, and other hydrocarbons resulting from combustion of fuels and lubricants, and lead. Data on the impact of chronic low level discharges of the remaining pollutants on coastal organisms and ecosystems are lacking. Most studies concerning the effects of hydrocarbons on marine fauna have been after major oil spills, where the amount of hydrocarbon pollutants is considerably greater than would occur from outboard exhausts. These studies showed that the areas of concern regarding oil pollution were direct lethal toxicity, sublethal disruption of physiological or behavioral responses (of which extremely little is known), persistence and accumulation of oil in invertebrates that is passed up the food web chain, destruction of habitat, and damage to fishery resources through tainted shellfish or finfish meat. Outboard motor exhaust and bilge water discharges lead into marine waters. Lead also enters the aquatic environment in surface runoff, and almost all of the lead that is discharged eventually reaches bottom sediments. Lead is very toxic to most plants and is moderately toxic to mammals where it acts as a cumulative poison. Fish are most sensitive to lead among aquatic organisms.

B M Ps

Measures which prevent discharge of petroleum products to the aquatic environment include:

- Location and construction of fuel storage tanks which minimize potential of accidental puncture;
- Tanks should be EPA-approved and filled using approved safety equipment and procedures;
- Fuel pumps should be fitted with automatic shut-off of the feeder line if the pump is knocked off vertical alignment;
- Fueling nozzles should be fitted with back-pressure shut-off valves. Locking fuel fills should not be utilized, requiring the operator to manually hold the on-position during the fueling procedure;
- Filling of fuel tanks from containers should be prohibited while boats are in marina;
- Fueling should be supervised by marina personnel who should be trained to prevent and cleanup any fuel spills;
- Only low-lead gas and diesel fuel should be sold onsite;
- Facilities for fueling of ramp-launched boats before launching would help prevent spills directly into the water;
- Discharge of oil and gas with bilge water should be controlled by use of oil filtration devices on bilge pumps or soil absorbent pads (sponges placed in the bilge and recovered prior to bilge water discharge);
- Maintenance services provided by the marina may help improve combustion efficiency of resident boats; and
- Removal of engines to an upland shop for major maintenance and repair may also help reduce petroleum product losses to the water.
- Location and construction of fuel storage tanks;
- Location and design of fuel pumps;
- Types of fuel distributed at marina;
- Details of maintenance/shop facilities at marina;
- Design of bilge disposal system with emphasis on control of petroleum products; and
- Details of marina personnel training which covers prevention and cleanup of oil or fuel spills.

ACTIVITY 3: BOAT MAINTENANCE

Impact

Discharge of toxic chemicals such as copper of tin based antifoulant paints or battery acids may impact aquatic fauna. The bottom paint used on boats is designed to reduce fouling and, thus contain toxic compounds. Because of its extreme toxicity, paints containing tributyltin should not be used. Antifoulant compounds enter marina waters while boats are docked and as a result of washing the hull. In addition, marine organisms are also affected by detergents from boat washing. Detergents, including oil dispersants, may be divided into two categories; water-based compounds, which are highly toxic to fish and shellfish but not to crustaceans, and solvent-based compounds for which the inverse is true. Other potential impacts due to boat maintenance involve discharge of chemicals due to improper storage or use, such as painting while the boat is in the water.

B M Ps

Measures which can reduce the potential for discharge of toxic chemicals into marina waters include:

- Use of antifouling paints restricted to boat hulls only; piers and other in-water structures should not be painted with anti-fouling paints;
- Elimination of use of paint containing tributyltin in accordance with recently passed State legislation;
- Restriction of the number of boats in-water with copper based painted hulls;
- Encouragement to use dry dock facilities which may minimize exposure times of marina waters to antifoulants;
- Systems designed to retain and properly dispose of paint flakes and fine particles from hull cleaning and repainting should be used at boat maintenance facilities;
- All previously opened containers of miscellaneous chemicals, boat paints, and paint vehicles should be stored in designated facilities;
- Waste chemicals must be disposed offsite by contract with a private waste handling firm.
- No explosive chemicals may be stored onsite;
- Waste motor parts and old batteries must be placed in closed containers before removal offsite; and
- Painting of boats while in the water is prohibited.

- Description of inwater structures, materials and preservatives used on these structures;
- Describe dry dock facility in terms of availability, i.e., capacity and cost of use;
- Show structures or design features of boat washing facility which prevent discharge of antifoulants, oil/grease and detergents to marina waters. These include drainage and filtration systems which may be incorporated in the overall stormwater management plans for the facility and
- Describe boat maintenance facilities indicating storage locations of paints, solvents and other potential toxicants and the use of methods to insure their proper storage and disposal, including the proposed penalties for disregarding marina rules on these matters.

ACTIVITY 4: CONSTRUCTION IN WATER

Impact

A direct water quality impact during construction of bulkheads, revetments, pilings, piers, docks, and breakwaters is a temporary increase in turbidity. All structures may impede water and sediment movements. In addition, in-water structures associated with water-dependent facilities can impact water quality within the marina basin through leaching of wood preservatives from the structures.

B M Ps

Measures which can reduce the potential for discharge of pollutants into marina waters include:

- The use of pile-driving rather than jetting;
- Design and placement of all structures for minimal restriction of water circulation or mixing within the marina basin, and for reduction of shoaling;
- Avoidance of solid structures;
- Elevation of docks and piers as high as possible, orient in north-south rather than east-west direction, and minimize structure width to allow for maximum sunlight penetration;
- Encouragement of the use of:
 - a) Alternative materials such as concrete-filled, steel-reinforced PVC, plastics, or other nonconventional materials, and
 - b) Highly refined (grade one) creosote that contains less tar or alternative preservatives such as chromated copper arsenate (CCA salt) to minimize chemical leaching; and
- See also Dredging Section for turbidity control measures.

- Description of construction methods and type of equipment to be used for building in water structures;
- Illustration of structures on conceptual plans with depths before and after indicated;
- Description of types of structure and materials and preservatives to be used;
- Mean life expectancy of structures; and
- Type of material and preservatives to be used.

ACTIVITY 5: DREDGING (Initial Construction and Periodic Maintenance)

Impact

Dredging temporarily degrades water quality onsite and in the direction of water flow by increasing turbidity through the resuspension of the bottom sediments. These resuspended sediments can affect filter feeding organisms such as shellfish by reducing feeding rates, suffocate organisms by clogging gills, reduce primary productivity by reducing light penetration, and bury benthic organisms through siltation. Resuspended bottom sediments can contain trace metals, toxic substances, nutrients, and organic debris that can be released into the water column. Resulting water quality problems can include lowered dissolved oxygen concentrations and promotion of algal blooms.

B M Ps

Minimization of adverse water quality impacts through use of measures such as the following:

- Dredging of channels that follows the course of natural channels;
- Building slips for boats with deep drafts in naturally deep water;
- Extending priers and docks as far as possible into naturally deep water;
- Providing upland storage for smaller boats and using boat lifts to transport them to the water; and
- Utilizing dredging methods which avoid use of discharge of dredged materials into open waters.

- Maps of areas proposed for dredging must indicate:
 - a) Depths and contours of basin, channel(s) and adjacent waters within a ¹/₂ mile radius before and after development,
 - b) Location of dredge area and depth of material removed, and
 - c) Location and design of turbidity control structures; and
- Conceptual plans must include description of:
 - a) Dredging schedule indicating no interference with fish spawning season (15 March 1 June),
 - b) Method and equipment used for dredging,
 - c) Design features of turbidity control structures, and
 - d) Best use of naturally deep waters.

ACTIVITY 6: DREDGED MATERIAL PLACEMENT

Impact

Dredge material might be potentially disposed of in open water, wetlands, or upland sites. Open water disposal is seldom a viable option for marine projects and disposal on wetlands is unacceptable because of environmental reasons. Current Maryland regulations so severely restrict any open waters disposal that generally only upland disposal is allowed.

B M Ps

Mitigation measures for dredged material disposal include:

- Utilizing suitable dredged material for beach replenishment, construction, sanitary landfill, and agricultural soil improvements;
- Confining discharges to the smallest practicable deposition zone to protect adjacent substrates;
- Dedicating permanent upland disposal sites as part of specifications for new marina construction would help eliminate future problems related to disposal of maintenance dredging material. These permanent sites can be sites that have been previously used or represent an environmentally satisfactory alternative;
- Raising the height of containment embankments to increase the carrying capacity at existing disposal areas;
- Disposing of toxic and organic materials in impervious containment basins (settling of contaminated suspended particles may be enhanced by the addition of a cationic polyelectrolyte with further treatment using sand filters and activated charcoal before discharge). Currently, only Hart and Miller Islands Disposal site will accept significantly contaminated dredged materials;
- Upland retention or treatment of runoff from the discharge material to remove dissolved pollutants before they reach the aquatic environment (a simple treatment such as ozonation or serration can be adequate for reduction of BOD and COD before the discharge of supernatant liquid from spoil areas enters into receiving waters);
- Controlling erosion at diked areas by shaping the dike and using stabilization measures, such as revegetation;
- Positioning outfalls to empty back into the dredged area; and
- Characterizing the sediments to be dredged and considering the potential odor problems during the selection of the disposal site and site preparation.
- When upland disposal is not possible and open water disposal is considered environmentally acceptable, measures that can minimize problems or impacts include:
 - a) Using several sites to provide a more even distribution of dredged material overburden,
 - b) Maintaining the same elevation as marches and other contiguous area to promote natural tidal flooding and flushing,
 - c) Situating spoil islands on the windward side of the dredged channel, and
 - d) Using materials for approved tidal wetland development.

- Location and design of disposal site;
- Treatment for removal of pollutants before discharge of supernatant liquid; and
- Use of long-term dredged material after dewatering;

ACTIVITY 7: SHORELINE PROTECTION

Impact

Modification of shoreline by removal of wetland vegetation, construction, and increased wave action due to boat wake may encourage erosion at a marina site. Loss of shoreline area and degraded water quality may result.

B M Ps

Shorelines may be protected against erosion by employing:

- Creation and protection and maintenance of existing marshes;
- Nonstructural vegetation measures;
- Rip-rap stabilization of eroding banks, using armor stone placed near high tide line;
- 5 mph speed limit enforcing a "No Wake" zone in marina basin and entrance channel;
- Basin depth designs which minimize turbidity due to prop wash and scour;
- Designated slips for boats of different drafts; and
- Breakwaters near entrance channel or marina mouth.

- Maps of area proposed for development must indicate pre- and post-development shoreline features such as:
 - a) location, extent and quality of wetlands,
 - b) slopes of shoreline,
 - c) mean high and mean low water lines,
 - d) bulkheads, revetments, rip-rap, and breakwaters,
 - e) depths of basin, channel and all adjacent waters,
 - f) sedimentation patterns, aeration and depletion,
 - g) "No Wake" zone in marina basin and entrance channel, and
 - h) areas of erodible soils; and
- Outline measures of boater awareness and compliance with "No Wake" rules including description of penalties for non-compliance.

ACTIVITY 8: SEWERAGE DISCHARGE TREATMENT

Impact

Raw sewage from boats and filtered discharges from ineffective upland septic systems may impact water quality and aesthetics. Boat sewage can be visually repulsive. Increased nutrient loadings from sewage may contribute to increased biological demand (BOD) in receiving waters. The most serious effect of discharging fresh fecal material is the potential for introducing disease-causing viruses and bacteria (pathogens). Problems may occur if boat sewage is released in the vicinity of shellfish (clam or oyster) beds or into enclosed waterways with limited flushing. Shellfish require clean water to be microbiologically safe for human consumption, regardless of whether they are eaten raw or partially cooked. Fecal coliform bacteria, other bacterial pathogens, and viruses found in water and sediments are concentrated by shellfish, depending upon temperature, density of pathogens, salinity, currents, depth, water chemistry, and shellfish feeding activity. Once concentration of pathogens has occurred, microorganisms will not necessarily be flushed at the same rate. Known enteric pathogens associated with feces-contaminated shellfish include typhoid fever, dysentery, gastroenteritis, and infectious hepatitis.

B M Ps

Marina features which reduce the potential of sewage discharge include:

- Newly constructed and renovated marina facilities should, if possible, be connected to the municipal sewage system for disposal of sewage from boats and shore-based facilities;
- Ample and conveniently located toilet facilities and showers should be provided onshore;
- Pump-out facilities for holding tanks and portable heads should be provided by the marina at the fueling dock;
- Cost of pump-out service should be included in slip rental fees and provided on an unlimited basis;
- Marina stores should supply Coast Guard-approved marine heads, marine sanitation devices, and related supplies;
- Boaters should be notified of the prohibition against sewage dumping in marina waters, the pollution levels which result from discharges, and the penalties imposed for violations, by posting prominent signs at points of access to piers and other frequented areas, and in conjunction with slip rental agreements; and
- Individuals leasing slip space should be held responsible for sewage disposal violations by written contract agreements which specify: "Head discharge overboard will result in voiding this contract immediately and expulsion from the marina with forfeiture of rental fees. Heads are to be pumped out without a per-service fee at marina as often as requested".

- Sewage holding and disposal systems for onshore and boat-pump facilities which are connected to municipal systems;
- Location and design of pump-out facilities;
- Location and design of onshore toilet and shower facilities; and
- Information concerning the training of marina personnel concerning the importance of prevention of sewage pollution in marina waters and enforcement of marina rules regarding unlawful discharges.

ACTIVITY 9: SITE LOCATION *(TO MITIGATE IN-WATER CONSTRUCTION & OPERATION IMPACTS)

Impact

Dredging, construction and increased boat traffic may disturb aquatic resources such as shellfish beds, submerged aquatic vegetation, and fish nurseries. These activities may interfere with navigation. They may also interfere with circulation or salinity regimes.

B M Ps

- Plans and construction design must list and locate aquatic resources potentially impacted and identify measures to be used to ensure minimal impact;
- Avoidance of location in areas with poor water quality or in areas with low tidal range/activity and low flushing rates such as dead end channels or canals or the upper reaches of tidal creeks;
- Avoidance of navigable waterways as identified by the U.S. Army Corps of Engineers;

INFORMATION REQUIRED FOR REVIEW PROCESS

- Maps of the area proposed for development must show aquatic resources located within one mile by surface water connection including, but not limited to spawning areas, SAV beds, tidal wetlands, and nontidal wetlands;
- Maps and construction plans which indicate locations of navigated waterways and potential interference and expected length of time involved for construction of marina.

Information required for U.S. Army Corps of Engineers Section 10/404 permits includes:

- a) Evaluation of economic, social environmental costs vs. benefits,
- b) Extent of private and public need,
- c) Desirability of alternate locations,
- d) Effects on wetlands,
- e) Impacts on navigation,
- f) Effects on flood control,
- g) Compliance with applicable effluent and water quality standards and management practices,
- h) Interference with adjacent properties or water resource projects,
- i) Consistency with state, regional or local land use classification,
- j) Compliance with Coastal Zone management programs,
- k) Enhancement, preservation or rehabilitation, and
- l) Cumulative impacts,

NOTE: Onshore construction impacts should be mitigated by application of basic Chesapeake Bay Critical Area Program requirements.

ACTIVITY 10: POST-CONSTRUCTION STORMWATER MANAGEMENT

Impact

Water quality in the marina basin and adjacent waters can be impacted by pollutants in stormwater runoff. These pollutants include sediments, nutrients, salts, petroleum hydrocarbons, metals, and bacteria. Of primary concern is the potential for increased turbidities due directly to suspended sediments and indirectly to increased algal growth. Sediment derived turbidity as well as decreased light penetration due to algal blooms can affect the growth of SAV. Other suspended or dissolved pollutants may be accumulated in fish and shellfish affecting the health of those organisms and the organisms which consume them.

B M Ps

Features which minimize stormwater discharge of pollutants act to control runoff velocity and volume, and retain pollutants before these waters enter the Bay system. These features include:

- Use of infiltration measures, retention ponds and extended detention ponds to handle the first 1" of rainfall, and effect the removal of a minimum of 10% of pollutant loadings, especially sediments, total nitrogen, biochemical oxygen demand total phosphorous, lead, and zinc;
- Use of rip-rap and bulkheads as runoff filtering devices by directing runoff through porous surface to such structures lined with filter cloth;
- Use of porous surfaces (crushed stone, shell) wherever possible, particularly in parking lots;
- Direction of runoff from impervious surfaces to porous surfaces to improve infiltration capacity;
- Minimal clearing of onsite vegetation;
- Retention and creation of onsite vegetative buffers between potential sources of pollutants and tidal wetlands or tidal waters;
- Conservative use of onsite fertilizers; and
- Use of non-phosphorous detergents for washing boats.

INFORMATION REQUIRED FOR REVIEW PROCESS

- Maps of the area proposed for development must indicate:
 - a) Post-construction drainage patterns, especially of runoff coming off of nonvegetated area (urban runoff),
 - b) Type and pervious nature of all surfaces on marina property,
 - c) Design and location of detention/retention systems, and
 - d) Post-construction vegetation patterns,
- Description of stormwater management plan must include:

a) Estimates of pre- and post-construction loadings of major pollutants (sediment, nitrogen, phosphorus, lead and zinc, and biological oxygen demand in marina waters) with all assumptions of controlling conditions detailed,

- b) Mixing and flushing rates in marina waters,
- c) Total acreage of major land cover types and infiltration potentials, and
- d) Maintenance schedule for stormwater management structures.

ACTIVITY 11: TRASH CONTROL

Impact

Litter is a form of pollution associated with increased boating activity that has an aesthetic as well as an ecological impact. During the peak boating season, approximately one-half to one cubic yard of uncompacted garbage per day can be expected for every 100 boats in a marina. Plastics are the chief concern. To date, 15 percent of the world's 280 species of sea birds are known to have ingested plastic. Plastic has been found in the stomachs of four of the seven species of marine turtles, in at least eight species of fish, in marine mammals including whales, dolphins, and manatees, and in invertebrates. Lost or discarded fish netting, monofilament line, and plastic beverage yokes are materials that may lead to strangulation, drowning, or starvation.

B M Ps

Measures which prevent loss of trash include:

- Provision of equipment carts on all piers for conveyance of refuse to conveniently placed dumpsters; and
- Strict enforcement by marina personnel of property disposal of trash by boaters, with potential fines for improper disposal.

- Plans should indicate location and type of trash collecting facilities; and
- Plans for proper training of marina personnel and the enforcement of property trash disposal should be outlined.

Appendix F

Description of Historical Shore Erosion Processes

In Harford County

APPENDIX F

DESCRIPTION OF HISTORICAL SHORE EROSION PROCESSES IN HARFORD COUNTY

I. General Description of Shore Erosion Processes

Harford County's tidal shorelines are the scene of a dramatic interaction between water, wind, and land. To safeguard their property, shoreline property owners need to know how to work with these natural forces and not against them, and therefore, understanding the dynamics of shore erosion is important.

In summary, there are three basic steps to the erosion process:

- (1) physical attack by waves and groundwater;
- (2) erosion of banks and deposition at the base of banks; and
- (3) removal, transportation, and deposition of bank materials along the shoreline.

Shore erosion may be defined as the net loss of land over a given reach and/or segment of a shoreline. However, the rate and amount of erosion along a specific shoreline may vary from year to year. Consequently, while many of the variables which affect these estuarine shorelines are complex and not entirely understood, the most significant variables and processes have been of energy in contact with the shoreline. These sources of energy are usually associated with either wind-generated wave action or groundwater activity. Furthermore, it is not uncommon for both erosive forces to occur together.

In addition, there are several other variables that interact and affect the shoreline. These variables include:

- (1) form or type of shoreline;
- (2) storm frequency;
- (3) tides and currents;
- (4) near-shore bottom characteristics; and
- (5) waves generated from boat activity.

II. Harford County Shoreline Characteristics

Harford County is situated along the western shore of the upper Chesapeake Bay. The County has 106 miles of shoreline, of which only 26 miles (25%) is directly accessible to the public and within Harford County's Critical Area. The United States Army's testing installation at the Aberdeen Proving Ground (APG) controls the remainder of shoreline.

The Susquehanna River serves as the County's northeast boundary, shared by the western boundary of Cecil County. To the southeast, the County is bordered by the

Little Gunpowder River, which is a shared boundary with Baltimore County.

Harford County reveals a wide diversity of shore typologies, which contain different characteristics and combinations of shore and fastland zones. The point where Deer Creek flows into the Susquehanna River roughly marks the fall line, which separates the Coastal Plain from the Piedmont uplands region. From this portion farther downstream to Havre de Grace, high bluffs and steep banks slope to the water's edge. Throughout much of this area, there are interruptions of rock outcroppings which reveal the region's geologic history.

The segment of shoreline between Havre de Grace and Swan Creek Point is the only area within Harford County's Critical Area that borders the Chesapeake Bay. The shoreline is predominantly natural, with a few short sandy and gravelly beaches. These areas are interconnected with low to moderate bluffs from Oakington, having 15 feet tall bluffs, to near Swan Creek Point having an elevation of 5 feet.

The shoreline along Swan Creek and the Bush River seems to exist in a relatively natural state. Low to moderate bluffs, as well as many sheltered coves with protruding marshlands, are found throughout both areas. In contrast to the basin-like appearance of the Bush River, Harford County's portion of the shoreline on the Gunpowder River is narrow and marshy. These shorelines are stabilized with structural erosion protection measures in the Rumsey Island and Gunpowder Cove areas of Joppa, with low to moderate bluffs occurring farther south in the Foster Branch area.

III. Assessment of Shoreline Conditions in Harford County

Historic shorelines and rates of erosion within Harford County have been mapped by the Maryland Geological Survey. These maps are based on erosion rates which occurred in the 1840s and 1940s Maps were updated and revised in the 1970s and in 2000. The most recent effort digitized historic shorelines and determined shoreline rates of change. Results were published online on the Maryland Coastal Atlas map service under the "Shorelines Historical Archive" and "Shoreline Rates of Change" layers here: https://gisapps.dnr.state.md.us/coastalatlas/WAB2/. Results were also tabulated a report, State of Maryland Shore Erosion Task Force. (January 2000) *Final Report*. Shoreline rates of change and the presence of structures like bulkheads and revetments helps guide planned measures.

Based upon these studies, approximately 11 percent or sixteen miles of the 140-mile shoreline within Harford County's jurisdiction is experiencing significant erosion rates of 2 feet or more per year. Most of this shoreline is on military base lands and beyond the regulation of the county. For shoreline under county jurisdiction, unless structural measures are already present along a reach of tidal shoreline or a water-dependent facility requiring structural measures is planned, consideration should be given first to non-structural shore erosion control measures.

Appendix G

Measures Implementing Harford County's Critical Area Agricultural Land Protection Program

APPENDIX G

PART I

AGRICULTURAL WATER QUALITY ENFORCEMENT PROCEDURES

As of 1992, each of the farms operating in Harford County's Critical Area are currently implementing soil and water conservation plans in cooperation with the Soil Conservation District as discussed in Chapter 6 of the Critical Area Program Management Document. The Soil and Water Conservation Plans are the keystone of the County's effort to address the provisions of the Critical Area Program development criteria relating to agricultural activities.

In addition to the Soil and Water Conservation Plans, the Maryland Department of the Environment in cooperation with the Soil Conservation Districts administrates an enforcement program to address agricultural pollution wherever it occurs within the State.

APPENDIX G PART II

MEMORANDUM OF AGREEMENT

BETWEEN

HARFORD SOIL CONSERVATION DISTRICT

AND

HARFORD COUNTY, MARYLAND, A BODY CORPORATE AND POLITIC OF THE STATE OF MARYLAND, THROUGH THE DEPARTMENT OF PLANNING AND ZONING

WHEREAS the Harford Soil Conservation District, hereinafter called the District, is a political subdivision of the State of Maryland with a responsibility for the conservation of soil and soil resources and for the prevention and control of soil erosion within Harford County (Annotated Code, Agriculture Article, Sec. 8-307); and

WHEREAS, Harford County, hereinafter called the County, is required by the Chesapeake Bay Critical Area Law to have a Local Chesapeake Bay Critical Area Management Program (Annotated Code, Natural Resources Article, Section 8-1808); and

WHEREAS, the Critical Area Commission's Program Development Criteria require that the County's Local Management Program include an Agricultural Protection Plan (COMAR 27.01.06.03A) and specify that the required elements of the program be enforceable (COMAR 27.01.10.01H); and

WHEREAS, Harford County's Department of Planning and Zoning, hereinafter called the Department, has the responsibility for the preparation and implementation of the Local Chesapeake Bay Critical Area Management Program; and

WHEREAS, the Critical Area Criteria specify that the Local Critical Area Management Program is to be developed and implemented in cooperation with the District (COMAR 27.01.05).

NOW THEREFORE, the District and the Department agree to cooperate in the discharge of their mutual responsibilities and enter into this Memorandum of Agreement as a foundation for an enduring, cooperative working agreement, whereby:

THE DISTRICT AGREES TO:

- 1. Assist each farm within the Critical Area to have in place and implement a mandatory, approved Soil Conservation and Water Quality Plan emphasizing Best Management Practices (COMAR 27.01.06.03C(1), subject to be updated every ten (10) years;
- 2. Provide the Department with location map(s) of farm areas for which a landowner-farmer

has obtained through the District's Soil Conservation and Water Quality Plan;

- 3. Incorporate measures in Soil Conservation and Water Quality Plans to protect water quality and areas identified as Habitat Protection Areas in the County's Critical Area Management Program (COMAR 27.01.06.03B);
- 4. Provide for the establishment of buffer areas along shorelines within which agriculture will be permitted only if best management practices are used in accordance with an approved Soil Conservation and Water Quality Plan (Annotated Code. Natural Resources Article, Section 8-1808c(6); COMAR 27.01.06.03D; COMAR 27.01.09.01C);
- 5. Inform landowners who propose to harvest timber about the requirements for Forest Management Plans in the Chesapeake Bay Critical Area which ensure protection of water quality and areas identified as Habitat Protection Areas (COMAR 27.01.06.03B);
- 6. Ensure, in the development and approval of Soil Conservation and Water Quality Plans, that any disturbed expansion of agricultural activities does not involve:
 - (a) The destruction, diking, draining, dredging, or filling of wetlands;
 - (b) The clearing of forests or woodlands on soils with a slope greater than 15%, or on highly erodible soils with a "Kw" factor greater than .35 and a slope greater than 5%;
 - (c) Clearing which would adversely affect water quality or plant and wildlife habitat identified as Habitat Protection Areas in the County's ChesapeakeBay Critical Areas Program (COMAR 27.01.06.02C); or
 - (d) Clearing of existing natural vegetation within the 100-foot Critical Area Buffer (COMAR 27.01.09.01).
- 7. Provide, to District Cooperators who have not yet obtained a Soil Conservation and Water Quality Plan, technical advice on Best Management Practices applicable to the Cooperator's farming operation which will protect water quality and plant and wildlife habitat (COMAR 27.01.06.02E; COMAR 27.01.06.03); and
- 8. Provide the Department with annual reports of the District's conservation activities within the Critical Area.

THE DEPARTMENT AGREES TO:

- 1. Notify landowners about the regulations and provisions pertaining to agriculture as delineated in the Local Critical Area Management Program and direct pertinent landowners with agricultural lands (e.g., cropland, pastureland, etc.) to the District to obtain approved Soil Conservation and Water Quality Plans;
- 2. Review the location maps and, within fifteen (15) working days, provide comments on protective measures which may be needed because of Habitat Protection Areas on or near the site for which the District is preparing or reviewing a Soil Conservation and Water Quality Plan (COMAR 27.01.06.03);
- 3. Prohibit the creation of new agricultural lands that would disturb the resources specified in Paragraph 6, above (COMAR 27.01.06.02C);
- 4. Review and maintain files of annual conservation activities performed by the District within the County's Critical Area;
- 5. Inform landowners who have not voluntarily cooperated with the District to meet the

requirements of the Local Protection Program that they are in violation of state law (COMAR 27.01.06) and require the compliance with applicable regulations and provisions; and

6. Inform the Maryland Department of Agriculture regarding agricultural landowners who will not voluntarily comply with the Local Critical Area Management Program.

BOTH PARTIES AGREE AND UNDERSTAND:

- 1. The Department and the District will cooperate in implementing the Critical Area Law and the County's Local Protection Program;
- 2. Either party, as mutually agreed upon, and within their respective capacities, will provide or arrange for such additional services, facilities, equipment, materials, and arrangements as may be required to achieve common objectives;
- 3. Neither the Department nor the District will be bound by an obligation in this Agreement, which will involve the expenditure of funds in excess of the amounts available;
- 4. This Agreement shall be effective on the date of the last signature hereto; and
- 5. This Agreement shall be reviewed at least every five (5) years on a mutually acceptable date.

APPROVED BY: Signature

Barry Glassman, County Executive

Lee D. ME Daniel

Signature Lee D. McDaniel, Harford Soil Conservation District Chairman

14/2021

September 8,2021

Date

Appendix H

Notification and Review Procedures for Projects in Harford County Involving Nontidal Wetlands

APPENDIX H

NOTIFICATION AND REVIEW PROCEDURES FOR PROJECTS IN HARFORD COUNTY INVOLVING NONTIDAL WETLANDS

Introduction

Nontidal wetlands are transitional environments existing as isolated entities or between open waters and dry land. They are associated with saturated soils and high groundwater levels and typically exhibit vegetation adapted to wet conditions and periodic flooding. Nontidal wetlands are now widely recognized as important natural resources, vital to maintaining and improving water quality and reducing flood damage, while providing habitat for many types of plants and animals.

State regulations have protected tidal wetlands since 1972, whereas nontidal wetlands legislation was not adopted until 1989. In response to the situation, Harford County Department of Planning and Zoning initiated, and the County adopted, a "Natural Resource District" (NRD) in 1982. The intent of the NRD is to preserve special environmental features through a watershed management approach. In the spring of 1985, formal amendments were presented to the County Council in Bill 85-12. On May 10, 1985, the bill was signed into law. Through this process, Harford County expanded the scope of its natural resources protection by adopting regulations which protect nontidal wetlands and stream valley corridors.

For the purpose of the definition in Bill 09-13, the County adopted the classification system developed by the United States Fish and Wildlife Service. Thus, nontidal wetlands are defined as all palustrine aquatic bed, palustrine emergent, palustrine forested, and palustrine scrub-shrub wetlands. These nontidal wetlands are lands that are inundated or saturated by surface or groundwater 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, marshes, bogs, and similar areas. The technical guidelines for determining the three parameters of nontidal wetlands (vegetation, soils, and hydrology) shall be followed in accordance with the U.S. Army Corps of Engineers 1987 Wetland Delineation Manual and the associated Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region.

Policy Regarding Development in Nontidal Wetlands

Harford County Department of Planning and Zoning has placed a substantial amount of its resources into developing a nontidal wetlands protection program. The Department has initiated a systematic approach to nontidal wetlands management providing for effective wetland protection and interagency coordination pertaining to project reviews. Through this process, Harford County has established, as described below, a policy regarding development in nontidal wetlands. Development in nontidal wetlands is subject to the provisions of the Harford County Zoning Code and several State and federal permit processes. By informing the development community of these requirements, the Department hopes to:

- educate the need to apply for appropriate State and federal permits;
- minimize costly and time-consuming revisions of development proposals; and
- avoid enforcement actions as a result of failure to apply for permits.

Nontidal Wetland Regulations

Development in nontidal wetlands is subject to County, State, and federal regulations. The following sections outline these regulations:

HARFORD COUNTY - Pursuant to the Natural Resource District (NRD) Section of the Zoning Code, Section 267-62, special environmental features outside of the Critical Area such as nontidal wetlands are to be preserved. NRD is defined in three ways:

- (1) Steep slopes: any land area exceeding 40,000 square feet with a slope in excess of 25%.
- (2) Nontidal wetlands: nontidal wetlands shall not be disturbed by development. A buffer of at least 75 feet shall be maintained in areas adjacent to wetlands.
- (3) Streams: the Natural Resource District for all perennial and intermittent streams shall be a minimum of 75 feet on both sides, measured from the top of the streambank or 50 feet beyond the 100 year floodplain, whichever is greater. For all streams that have a drainage area of more than 400 acres, as depicted on the Harford County Hydrology/Drainage Area Map, which is incorporated herein byreference, the Natural Resource District shall be expanded to a minimum distance of 150 feet on both sides, measured from the top of the streambank or 50 feet beyond the 100 year floodplain, whichever is greater. The Natural Resource District boundaries under this provision shall include the buffer requirements of Subsection B(2).

Inside the Critical Area, nontidal wetlands are protected by the Critical Area Regulations as per Section 267-63.7. According to these regulations, development is not permitted in nontidal wetlands within the Critical Area except for permitted development associated with water-dependent facilities. A naturally vegetated buffer of 75 feet is to be established adjacent to nontidal wetlands. The location of roads, utilities and stormwater management measures may be permitted in nontidal wetlands if it is determined that there is no technically feasible alternative according to the procedures outlined in Section 267-63.7. For the purpose of the Harford County Zoning Code, nontidal wetlands are all palustrine aquatic bed, palustrine emergent, palustrine forested, and palustrine scrub- shrub wetlands as defined by the United States Fish and Wildlife Service. These nontidal wetlands are lands that are inundated or saturated by surface or groundwater 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, marshes, bogs, and similar areas. The technical guidelines for determining the three parameters of nontidal wetlands (vegetation, soils, and hydrology) shall be followed in accordance with the U.S. Army Corps of Engineers 1987 Wetland Delineation Manual and the associated Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region.

Hydric soils have a water table that is at or within one foot of the surface for extended periods during the growing season. These soils have a characteristic grey color which reflects anaerobic conditions. The Soil Conservation Service has evaluated the soil series in Harford County and has listed hydric soils, and soils with hydric inclusions in Chapter 2 of the Critical Area Program Manual. The effect of the Conservation Requirements under Section 267-63 of the Zoning Code is that nontidal wetlands shall not be disturbed by development. Essential access roads and other public facilities, however, may be placed in the NRD. In addition, an undisturbed buffer of at least 75 feet from the wetland perimeter must be maintained. Lot lines should not extend into the NRD area if the lots have an urban residential zoning.

STATE OF MARYLAND - The Wetlands and Waterways Program of the Maryland Department of the Environment (MDE) administers a permit process for waterway construction which is often applicable to development in wetlands. For the purpose of the MDE process, wetlands are defined according to any of the three attributes (vegetation, soils, hydrology) of the wetland definition used by the federal government. Section 8-803 of the Natural Resources Article of the Annotated Code of Maryland requires that a person shall obtain a nontidal waterway construction permit from MDE for any construction in the 100-year floodplain, or any development which involves stream crossings or modification of the stream channel.

If a project requires a Corps of Engineers (COE) permit, as described below, three State of Maryland approvals must be obtained. First, Applicants for federal permits are required to certify that their project is consistent with the Coastal Zone Management Program. The State of Maryland is required to concur or disagree with this certification. The boundaries of Maryland's Coastal Zone Program include the entire land and water area of Harford County. The statement of certification of consistency with the Coastal Zone Management Program is a part of the Joint Permit Application form described below.

Second, a State Water Quality Certificate will be required from MDE. Under Section 401 of the Federal Clean Water Act, the State of Maryland is required to issue a Water Quality Certification for any federally permitted activity which may result in a discharge of dredged or fill material to State waters or wetlands. This certifies that the activity will not cause a violation of the State water quality standards or limitations. Application for Water Quality Certification is made through the Joint Wetland Permit application described below.

Third, Sections 8-1201 through 8-1211 of the Natural Resources Article of the Annotated Code of Maryland require that a person obtain a Nontidal Wetland Permit from MDE for grading, filling, excavating, destroying or removing vegetation, altering the water level, or placing structures in a nontidal wetland or its 25-foot buffer. Application for this Permit is made jointly with the COE 404 Wetland Permit described below. The Applicant submits a completed Joint MDE/COE Application form to the Wetlands and Waterways Program. This Application Form contains all the information required for the State of Maryland and Federal nontidal wetlands regulatory programs.

FEDERAL GOVERNMENT - Federal regulations pertaining to development in nontidal waterways and wetlands are considerable. The following description of the major applicable federal regulations is excerpted from information published by the COE.

"Section 404 of the Clean Water Act requires prior authorization from the Secretary of the Army acting through the COE for the discharge of dredged or fill material into all waters of the United States, including streams and wetlands. Discharge of fill material generally includes, without limitation, the following activities: placement of fill that is necessary to the construction of any structure or impoundment; site-development fills for recreations, industrial, commercial, residential, and other uses; causeways or road fills; dams and dikes....; property protection and/or reclamation devices such as riprap; fill associated with the creation of ponds and any other work involving the discharge of fill material."

The COE suggests that the following procedure be used to prepare a preliminary plan showing all waterways and wetlands for COE review.

"It is suggested that you review the State Maps and the U.S. Fish and Wildlife Service National Wetlands Inventory Maps (contact the Planning and Zoning office). Wetlands were mapped by aerial photography but are not all inclusive. You should review all areas of your site with respect to the COE definitions of wetlands. Any area that has hydric soils should be included. Two year and 100 year flood plain boundaries should also be shown."

"Clearly show if any work is proposed in any waterway (i.e. piers, bulkheads, riprap, dredging, road crossings) or in any wetlands (i.e. fill for houses and roads). A general site development plan showing only where the lots are located is not clear enough."

"Upon receipt of the above information, this office will review the plans and determine if the work requires Department of the Army authorization."

Application for a 404 Wetlands Permit is made through the Joint Permit Process described above. Additional information concerning the COE permit process can be obtained from the Baltimore District Office of the COE.

Maryland State Programmatic General Permit

The Maryland State Programmatic General Permit was granted by the COE to Maryland Department of The Environment to simplify permitting procedures for activities determined to have minimal impacts to aquatic resources, including wetlands. Activities meeting the determined activity thresholds be reviewed and authorized by the Maryland Department of the Environment for the COE.

Wetland Delineation and Permit Application Procedures

The Department of Planning and Zoning suggests that the following procedures be used to assure compliance with applicable County, State, and federal regulations and to prevent delays in

project review and approval. The engineers are familiar with the various base maps which may be useful. The Department has the following data available to download from the County website:

- Photogrammetric Maps;
- Digital
- Orthophotography; Floodplain Maps;
- USDA SSURGO Soils Maps;
- National Wetland Inventory Maps;
- Harford County LIDAR. and
- Harford County Hydrology /Drainage Area Maps

Additional data may also be available on the Watershed Resources Registry website and

Maryland DNR Merlin website.

STEPS:

- (1) Prepare a standard project plan map of the development parcels using the County photogrammetric maps. Delineate any slopes in excess of 25%.
- (2) Transfer the general soil series to the project plan map. Identify hydric soils and those with hydric inclusions or other soils with severe development constraints due to slope, erodibility, or drainage/ permeability characteristics.
- (3) Consult the Critical Area, Floodplain, and NRD maps; the State Wetland Maps; and the Fish and Wildlife Service Wetland Map. Transfer any delineated wetland or floodplain to the project plan map.
- (4) Transfer all perennial and intermittent streams shown on the soil survey maps, the USGS topographic quadrangles, and the photogrammetric maps.
- (5) A detailed field report should be submitted which must be consistent with the NRD and Critical Area regulations, as described in sections 267-62 and 267-63 of the Harford County Zoning Code. It is recommended that the following procedures be used to assure compatibility and compliance needed prior to project approvals. A trained, experienced biologist or soil scientist should be consulted to perform a field check and delineation of nontidal wetlands. The characteristics referenced below should be evaluated pursuant to the following guidelines:

Hydrology

• Identify existing surface and groundwater regimes. Delineate areas with perennial and intermittent streams as candidates for nontidal wetlands.

- Identify any significant hydrological indicators. (i.e., site topography, watermarks, sediment deposition, etc.)
- Identify any additional field-located water features. (i.e., springs, seeps, ponds.)

Soils

- Soil indicators used to determine whether soils exhibit a wetland within a given area to be identified. (i.e., organic, hydric, gleying, etc.)
- It is suggested that soil borings be taken to a depth of 18 inches documenting characteristics of the soil profile. This description should include hue, chroma, value of the matrix and redoximorphic features and hydric soils field indicators. mottling and chroma characteristics. Any seasonal high water table elevation that is encountered should also be described in the report.

Vegetation

• A survey of dominant plant species within the subject area, with specific attention to Plant indicator Status (upl, facu, fac, facw, obl) wetland vs. upland vegetation should be performed.

Delineation Procedures

The field delineation should be mapped at the same scale as the project plan map and with direct reference to wetland (hydrophytic) vegetation hydric soils and hydrology as defined in the Harford County Zoning Code. The following procedures are suggested:

- Appropriate recordation and perimeter flagging of nontidal wetlands.
- As necessary, flags and/or stakes should be numbered and referenced as part of the records keeping process. (i.e., soil borings, vegetative communities)
- Soil and plant lists containing the types and species should accompany the field report.
- (6) The Department considers large tracts of land containing interconnected wetland systems to be very essential in watershed protection. In such cases, the Department may request that the 75 foot buffer be flagged during the field delineation phase.
- (7) Areas delineated as nontidal wetlands and 75 foot buffers should be shown on Sediment and Erosion Control Plans and Stormwater Management Plans submitted to Harford Soil Conservation District. Plans will be subject to a cursory in-house review among various County departments such as the Departments of Planning and Zoning (DPZ) and Public Works (DPW).
- (8) Transfer all woodland and other vegetation shown on the photogrammetric maps and the most recent aerial photographs. Refinements to the woodland boundary as shown on the field report must also be consistent with the project plan map.
- (9) Design the roads, building envelopes, stormwater management facilities and any other structures so as to avoid the 100-year floodplain/NRD, streams, nontidal wetlands, and Critical Area Habitat Protection Areas. Development that impacts streams and wetlands is subject to the conservation requirements of the NRD and Critical Area Management Program of the Zoning Code and will likely require State and federal permits. Essential road and utility crossings of floodplains, streams, or nontidal wetlands may be granted a permit if the applicant can demonstrate that alternatives are not feasible and that the minimum amount of intrusion is proposed. Contact the DPW for information about alternative designs for stormwater management.
- (10) Submit the concept or preliminary plan and field report to the Department for review. Plans will be subjected to a cursory in-house review before they will be scheduled for review by the Development Advisory Committee (DAC). This initial check will serve to identify major features and the adequacy of the submission. Detailed review will be performed in conjunction with DAC.

- (11) Label areas delineated as nontidal wetlands, Critical Area Habitat Protection Areas, or NRD on the plans submitted for review. These areas may be counted toward the open space requirement if the development employs the COS option. Active recreation areas may not be located in wetlands. The Homeowners' Association documents for maintenance of open space and other facilities should indicate that the nontidal wetlands will be left undisturbed.
- (12) Upon receipt of a plan and field report delineating a floodplain/NRD or nontidal wetland, staff of the Department of Planning and Zoning will verify the delineation by field visit (see verification procedures section).
- (13) File an application for a Joint State and COE permit even if the development has been designed initially to avoid sensitive environmental features. The COE and MDE will determine whether a permit is required. If a permit is required, the COE may conduct a field visit to determine the extent and significance of the wetlands. Failure to apply for a permit may result in an enforcement action if the development is found later to have filled a water area or wetland. All applicable State and federal permits or certifications should also be submitted as part of the application package to the Department of Planning and Zoning.

Habitat Protection Areas for the Harford County Critical Area

Threatened and Endangered Species, Species In Need of Conservation

Locally Significant Habitats

Colonial Waterbirds

Locally Significant Habitats:

Belcamp Beach	23
Grays Run	25
Leight Park Site	27
Otter Point Creek	29
Perryman Woods	31
Swan Creek Point	33
Willoughby Woods	34
Colonial Waterbirds	

Great Blue Heron Colonies

Maryland Natural Heritage Program Wildlife and Heritage Service Department of Natural Resources Tawes State Office Building, E1 Annapolis, MD 21401

December 2018

BioNet Tier: 2 Size: 76 ac

Key Wildlife Habitats

- Coastal Beach
- Intertidal Mudflat and Sandflat
- Tidal Freshwater Marsh and Shrubland

Important Features

- Small waterwort (*Elatine minima*, state-listed as Endangered)
- Mudwort (*Limosella australis*, state-listed as Endangered)
- Parker's pipewort (*Eriocaulon parkeri*, statelisted as Threatened)
- Maryland bur-marigold (*Bidens bidentoides*, watchlist)

Ecological Significance

The shallow, sandy-bottomed, intertidal zone at Boyer Road Shoreline supports two species listed as Endangered in Maryland, mudwort (*Limosella australis*) and small waterwort (*Elatine minima*). The mudwort is a small plant of mudflats which is found in several locations in Cecil County, but Boyer Road Shoreline is the only known location in Harford County. The small waterwort, also a minute plant of muddy and sandy shores, is very rare in Maryland. Parker's pipewort (*Eriocaulon parkeri*), a small plant listed as Threatened in Maryland, also grows in the intertidal area, as well as Maryland burmarigold (*Bidens bidentoides*, watchlist).

The Maryland bur-marigold is a globally rare regional endemic, found only from Maryland northward to New York. It has narrow habitat requirements – tidal mud flats along river edges. In Maryland, this species is limited to tidal marshes of the upper Chesapeake Bay and its tributaries, which makes conservation of Harford County's populations essential to the survival of the species in Maryland.

The habitat of all these rare and uncommon plants is a relatively flat intertidal shoreline with a sandy or muddy substrate. Due to shoreline development and stabilization, this natural shoreline is now very rare in Harford County. Because of the exceptional quality of the habitat, the presence of several rare and uncommon species, and the lack of human disturbance, Boyer Road Shoreline is among the most significant sites in Harford County.

Site Management Considerations

The effects of climate change, such as sea-level rise, increased intensity of coastal flooding, and changes in sediment deposition, will be one of the greatest threats to this coastal wetland /aquatic system. The adjacent uplands and nearby shoreline habitats may



affect the stability and composition of intertidal flats, as well as their ability to shift by migrating inland or along the shoreline as the sea level rises. Additional threats include the construction of structures in the intertidal zone, the clearing of vegetation in the upland buffer, excessive boat wakes, and the landing of boats on the shoreline during the growing season.

This site is designated as a habitat protection area for state-listed species under the Chesapeake Bay Critical Area Regulations (COMAR 27.01.09.03).

The Maryland Department of Natural Resources' Natural Heritage Program and cooperative partners completed a State Wildlife Action Plan in 2015 as a requirement of State Wildlife Grant funding. The plan details key wildlife habitats, natural communities, and Species of Greatest Conservation Need (SGCN) statewide, and provides information on threats and conservation needs of Maryland's wildlife resources and supporting habitats. For more information, the full Plan can be accessed at http://dnr.maryland.gov/wildlife/Pages/plants wildlife/SWAP Submission.aspx.

Gunpowder Shore County: Harford

Key Wildlife Habitats

- Coastal Beach
- Intertidal Mudflat and Sandflat
- Tidal Freshwater Marsh and Shrubland

Important Features

- Parker's pipewort (*Eriocaulon parkeri*, statelisted as Threatened in Maryland)
- Spongy lophotocarpus (*Sagittaria spathulata*, state-listed as Threatened)

Ecological Significance



Gundpowder Shore contains an ecologically fragile intertidal zone consisting of a mixture of cobble, sand, and mud. The sandy intertidal zone supports a very large population of Parker's pipewort (*Eriocaulon parkeri*), a globally rare plant species which is listed as Threatened in Maryland. This species occurs in several locations on the eastern shore, but only in three locations on the western shore, all in Harford County. This population is by far the largest on the western shore. The sandy-bottomed intertidal habitat also supports spongy lophotocarpus (*Sagittaria spathulata*, state-listed as Threatened). Due to shoreline development and stabilization, this type of natural shoreline is now very rare in Harford County.

Site Management Considerations

The effects of climate change, such as sea-level rise, increased intensity of coastal flooding, and changes in sediment deposition, will be one of the greatest threats to this coastal wetland /aquatic system. The adjacent uplands and nearby shoreline habitats may affect the stability and composition of intertidal flats, as well as their ability to shift by migrating inland or along the shoreline as the sea level rises. Additional threats include the construction of structures in the intertidal zone, the clearing of vegetation in the upland buffer, excessive boat wakes, and the landing of boats on the shoreline during the growing season.

This site is designated as a habitat protection area for state-listed species under the Chesapeake Bay Critical Area Regulations (COMAR 27.01.09.03).

The Maryland Department of Natural Resources' Natural Heritage Program and cooperative partners completed a State Wildlife Action Plan in 2015 as a requirement of State Wildlife Grant funding. The plan details key wildlife habitats, natural communities, and Species of Greatest Conservation Need (SGCN) statewide, and provides information on threats and conservation needs of Maryland's wildlife resources and supporting
habitats. For more information, the full Plan can be accessed at <u>http://dnr.maryland.gov/wildlife/Pages/plants_wildlife/SWAP_Submission.aspx</u>.

I-95 Crossing County: Harford

Key Wildlife Habitats

- Cliffs and Rock Outcrops
- Montane-Piedmont Floodplain

Important Features

- Northern map turtle (*Graptemys geographica*, statelisted as Endangered)
- Forest interior dwelling species (FIDS) habitat

Ecological Significance

I-95 Crossing includes an old, unused railroad bed (about ten feet high) which runs along the Susquehanna River, and the long, narrow wetland complex to the west of this railroad. A portion of this wetland complex consists of the old Susquehanna Canal, which flows through a flat, floodplain woodland. To the south of this woodland, a very diverse emergent marsh with standing dead trees can be found. Steep, wooded slopes border the wetland complex to the west. These slopes contain many rocky outcrops. Scattered eastern hemlocks (*Tsuga canadensis*), which are indicative of a cool microclimate, can be found growing in the rock crevices on some of these outcrops.

The wetlands, tributaries, old canal, and Susquehanna River shoreline of I-95 Crossing provide suitable habitat for the northern map turtle (*Graptemys geographica*). This mostly aquatic turtle is currently listed as an Endangered species in Maryland. It can be seen basking on logs or along the river banks. In Maryland, this endangered turtle is restricted to the Susquehanna River watershed.

One of the notable features of the I-95 Crossing area is the steep, northeast-facing slopes which occur to the west of the wetlands. The eastern hemlocks which grow in the rocky crevices along the slopes indicate that the slopes have a cool microclimate and thus are likely to provide habitat for species that have adapted to these unusual conditions. Extensive northeast-facing slopes such as the ones found within this area are very unique in the Piedmont province of Maryland and occur only on the Harford County side of the Susquehanna River. These slopes have a high likelihood of harboring rare species and should, therefore, be protected.

An additional value of I-95 Crossing is that it provides habitat for forest interior dwelling birds. Forest interior dwelling birds that have been observed on the site include red-eyed vireo, Acadian flycatcher, ovenbird, and northern parula.

Site Management Considerations

Principal threats to the site include sediment and stormwater runoff from adjacent uplands, which could degrade the quality of the wetlands and tributaries on which the rare species depends. Also, the expansion of the adjacent quarry could lower the water table, which could, in turn, alter the hydrology of the wetlands. Other threats to I-95 Crossing are activities which could alter the character of the steep slopes, or reduce the habitat value of the site for forest interior dwelling birds. Timber harvesting on the site should not occur on slopes of 15% or greater, to prevent a change in the microclimate or species composition of the steep slopes. Substantial removal of forest cover immediately above the steep slopes, which could also alter this microclimate, should be avoided.

This site is designated as a habitat protection area for state-listed species under the Chesapeake Bay Critical Area Regulations (COMAR 27.01.09.03). Certain wetlands and their adjacent 100 foot upland buffer at this site are regulated as Wetlands of Special State Concern by the Maryland Department of the Environment (COMAR 26.23.06.02).

The Maryland Department of Natural Resources' Natural Heritage Program and cooperative partners completed a State Wildlife Action Plan in 2015 as a requirement of State Wildlife Grant funding. The plan details key wildlife habitats, natural communities, and Species of Greatest Conservation Need (SGCN) statewide, and provides information on threats and conservation needs of Maryland's wildlife resources and supporting habitats. For more information, the full Plan can be accessed at http://dnr.maryland.gov/wildlife/Pages/plants wildlife/SWAP Submission.aspx.

Lower Deer Creek County: Harford

Key Wildlife Habitats

- Piedmont Stream
- Montane-Piedmont Floodplain
- Cliff and Rock Outcrop
- Mesic Mixed Hardwood Forest
- Montane-Piedmont Acidic Seepage Swamp

Important Features

• Chesapeake logperch (*Percina bimaculata*, state-listed as Threatened)



- Habitat for Maryland darter (*Etheostoma sellare*, federally listed as Endangered, state-listed as Endangered)
- Single-headed pussytoes (Antennaria solitaria, state-listed as Threatened)
- Rapids clubtail (*Gomphus quadricolor*, state-listed as In Need of Conservation) and other rare dragonflies

Ecological Significance

Lower Deer Creek flows into the Susquehanna River from its origin in Pennsylvania. The Deer Creek watershed is rural, consisting primarily of agricultural fields and forestland, with some scattered development. The lower portion is a healthy body of water with good forest buffer along the riverbanks. This section is low in gradient with rocky riffles, sandy runs, and some scattered sandy pools. The aquatic habitat is very diverse, including silt, sand, gravel, and boulder areas, and much of the creek bottom is vegetated, especially in shallower areas. Pools and runs in the creek are attractive resting areas for spring migratory hickory shad and river herring, causing Deer Creek to be a popular springtime fishing destination. The creek is stocked with hatchery trout but becomes too warm for trout survival in the summer, at which point the trout swim into the Susquehanna River.

Historically, Deer Creek supported spawning runs of anadromous fish such as hickory shad, white perch, yellow perch, alewife, and blueback herring, but a private dam built on Deer Creek blocked approximately 25 miles of spawning habitat from these anadromous fishes. Installation of a fish ladder re-opened historic anadromous fish spawning habitat in Deer Creek in 2000. Since the opening of the fish ladder, all of the historical species of anadromous fishes that ascended Deer Creek to spawn have been documented passing through the fish ladder.

Deer Creek is the last known habitat of the Maryland darter (*Etheostoma sellare*, federally listed as Endangered, state-listed as Endangered), the only vertebrate endemic to Maryland. This species was last sighted in 1988, but recurring survey efforts hope to rediscover the fish in this good quality habitat. Three other rare fish species, the shortnose sturgeon (*Acipenser brevirostrum*, state-listed as Endangered), the Atlantic sturgeon (*Acipenser oxyrhynchus*, state-listed as Endangered), and the Chesapeake logperch (*Percina*)

bimaculata, state-listed as Threatened), use Deer Creek for spawning. The Chesapeake logperch maintains a healthy population the lower section of Deer Creek.

Parts of the creek are surrounded by ecologically valuable terrestrial habitat, including mature hardwood forests. Forest interior dwelling bird species such as red-eyed vireos, ovenbird, scarlet tanagers, and Acadian flycatchers have been observed in these woods. The rare plant single-headed pussytoes (*Antennaria solitaria*, state-listed as Threatened) can be found in this forest habitat. This occurrence of pussytoes is the largest population of this plant in Maryland and one of the most northern known populations for this species throughout its range. Seasonally flooded seepage swamps and floodplains along the creek provide habitat for dragonflies and damselflies, as well as some rare wetland plants like ostrich fern (*Matteuccia struthiopteris*, state rare) and the butternut tree (*Juglans cinerea*, state rare).

Site Management Considerations

This site is designated as a habitat protection area for state-listed species under the Chesapeake Bay Critical Area Regulations (COMAR 27.01.09.03). Certain wetlands and their adjacent 100 foot upland buffer at this site are regulated as Wetlands of Special State Concern by the Maryland Department of the Environment (COMAR 26.23.06.02).

The Maryland Department of Natural Resources' Natural Heritage Program and cooperative partners completed a State Wildlife Action Plan in 2015 as a requirement of State Wildlife Grant funding. The plan details key wildlife habitats, natural communities, and Species of Greatest Conservation Need (SGCN) statewide, and provides information on threats and conservation needs of Maryland's wildlife resources and supporting habitats. For more information, the full Plan can be accessed at http://dnr.maryland.gov/wildlife/Pages/plants wildlife/SWAP Submission.aspx.

Key Wildlife Habitats

- Piedmont River
- Montane-Piedmont Floodplain

Important Features

- Shortnose sturgeon (*Acipenser brevirostrum*, statelisted as Endangered, federally listed as Endangered)
- Atlantic sturgeon (*Acipenser oxyrinchus*, state-listed as Endangered, federally listed as Threatened)
- Chesapeake logperch (*Percina bimaculata*, statelisted as Threatened)
- Northern map turtle (*Graptemys geographica*, state-listed as Endangered)

Ecological Significance

The Lower Susquehanna is an aquatic site encompassing the Susquehanna River from the Conowingo Dam downstream to the I-95 bridge crossing. This portion of the river is diverse in both flow and substrate – from high velocity riffles snaking through boulder and bedrock below the dam to slow water, almost lentic habitats over sand and submerged vegetation near the I-95 bridge. This variety in both flow and substrate creates diverse habitat for a variety of important fisheries and aquatic resources. Several rare fishes are found here, including shortnose sturgeon (*Acipenser brevirostrum*, state and federally listed as Endangered), Atlantic sturgeon (*Acipenser oxyrinchus*, state-listed as Endangered, federally listed as Threatened), and the globally rare Chesapeake logperch (*Percina bimaculata*, state-listed as Threatened). The northern map turtle (*Graptemys geographica*, state-listed as Endangered) can be seen basking on logs or along the riverbanks. It uses numerous islands in the river, as well as the river shore areas for breeding as well. In Maryland, this aquatic turtle is restricted to the Susquehanna River watershed. However, it also occurs northward along the floodplain well into Pennsylvania.

In addition to providing important habitats to these imperiled species, the lower Susquehanna River, including the lower portions of Deer Creek, provide important spawning habitat for important fisheries including migratory alewife, blueback herring, American and hickory shad. The submerged aquatic grass beds of the lower Susquehanna, as well as the Susquehanna Flats, located off of the city of Havre de Grace, are a critical nursery ground for Maryland's state fish, the striped bass.

Site Management Considerations

The effects of climate change, such as increased intensity of storms, rainfall, and flooding events is one of the greatest threats to this aquatic system. The water quality and hydrology in this section of the Susquehanna River is the cumulative result of numerous



effects upstream in the vast drainage basin of the river in Maryland, Pennsylvania, and New York. Many aspects of water quality and hydrology are also greatly influenced and partly controlled by the presence and management of multiple dams along the Susquehanna, including Conowingo Dam.

The Maryland Department of Natural Resources' Natural Heritage Program and cooperative partners completed a State Wildlife Action Plan in 2015 as a requirement of State Wildlife Grant funding. The plan details key wildlife habitats, natural communities, and Species of Greatest Conservation Need (SGCN) statewide, and provides information on threats and conservation needs of Maryland's wildlife resources and supporting habitats. For more information, the full Plan can be accessed at http://dnr.maryland.gov/wildlife/Pages/plants wildlife/SWAP Submission.aspx.

Northern Susquehanna Canal County: Harford

BioNet Tier: 2 Size: 323 ac

Key Wildlife Habitats

- Cliffs and Rock Outcrop
- Mesic Mixed Hardwood Forest
- Montane-Piedmont Floodplain

Important Features

- Short's rockcress (*Boechera dentata*, watchlist)
- Starflower Solomon's-plume (*Maianthemum stellatum*, state-listed as Endangered)
- Sweet-scented Indian-plantain (*Senecia suaveolens*, state-listed as Endangered)
- Valerian (Valeriana pauciflora, state-listed as Endangered)
- Forest interior dwelling species (FIDS) habitat

Ecological Significance

Northern Susquehanna Canal is a long narrow site following the western shore of the Susquehanna River for almost three miles. The historic old Susquehanna Canal and the abandoned railroad tracks run the entire length of the site. This site contains a mature floodplain forest dominated by large trees such as sycamore, silver maple, and green ash. In spring, the ground is covered with colorful wildflowers such as Virginia bluebells, golden ragwort, and erect trillium. Northern Susquehanna Canal contains populations of many rare plant species, such as Short's rockcress (*Boechera dentata*, watchlist), starflower Solomon's-plume (*Maianthemum stellatum*, state-listed as Endangered), sweet-scented Indian-plantain (*Senecia suaveolens*, state-listed as Endangered), and valerian (*Valeriana pauciflora*, state-listed as Endangered). In addition, the site contains glade fern (*Diplazium pycnocarpon*), a species which is listed as Threatened in Maryland. This site harbors the only known occurrences in Harford County and the largest extant populations along Maryland's Susquehanna River of all four species. Northern Susquehanna Canal also harbors one of the largest populations in the state of ostrich fern (*Matteuccia struthiopteris*, state rare).

The mature forest covering the bottomland along the Northern Susquehanna Canal provides exemplary breeding habitat for forest interior dwelling birds. Fourteen species of these birds have been observed on the site, five of which are listed as indicators of high-quality habitat which are the hooded warbler, Kentucky warbler, worm-eating warbler, American redstart, and Louisiana waterthrush. This site also provides excellent habitat for other birds, including bald eagle, wood duck, great blue heron, and greenbacked heron. Most of this site occurs within Susquehanna State Park.



Site Management Considerations

This site is designated as a habitat protection area for state-listed species under the Chesapeake Bay Critical Area Regulations (COMAR 27.01.09.03). Certain wetlands and their adjacent 100 foot upland buffer at this site are regulated as Wetlands of Special State Concern by the Maryland Department of the Environment (COMAR 26.23.06.02).

The Maryland Department of Natural Resources' Natural Heritage Program and cooperative partners completed a State Wildlife Action Plan in 2015 as a requirement of State Wildlife Grant funding. The plan details key wildlife habitats, natural communities, and Species of Greatest Conservation Need (SGCN) statewide, and provides information on threats and conservation needs of Maryland's wildlife resources and supporting habitats. For more information, the full Plan can be accessed at http://dnr.maryland.gov/wildlife/Pages/plants wildlife/SWAP Submission.aspx.

Oakington Shore County: Harford

Key Wildlife Habitats

- Coastal Beach
- Intertidal Mudflat and Sand Flat
- Mesic Mixed Hardwood Forest
- Tidal Freshwater Marsh and Shrubland

Important Features

- Parker's pipewort (*Eriocaulon parkeri*, state-listed as Threatened)
- Maryland bur-marigold (*Bidens bidentoides*, watchlist)
- Forest interior dwelling species (FIDS) habitat

Ecological Significance

The most notable features of the Oakington Shore area are two tidal coves which open directly into Chesapeake Bay. The intertidal zone of these coves is largely undisturbed and consists of a mixture of sand, pebbles, and mud. Some stretches of the sandy-bottomed coves are vegetated with threesquare bulrush, switchgrass, dotted smartweed, and water willow. These sandy coves along the tidal shoreline support two globally rare plant species. One of the rare plants, Parker's pipewort (*Eriocaulon parkeri*) is listed as Threatened in Maryland. The other species, Maryland bur-marigold (*Bidens bidentoides*, watchlist) is a globally rare regional endemic, found from Maryland northward to New York. It has narrow habitat requirements – tidal mud flats along river edges. In Maryland, this species is limited to tidal marshes of the upper Chesapeake Bay and its tributaries, which makes conservation of Harford County's populations essential to the survival of the species in Maryland.

Oakington Shore includes tidal wetlands on both sides of the shallow coves. Scattered patches of submerged aquatic vegetation, such as hydrilla, Eurasian watermilfoil, and wild celery, occur in the coves. The southernmost of these wetlands consists of a young forest dominated by red maple and sweetgum transitioning to a more open wetland dominated by arrow arum, halberd-leaved tearthumb, and swamp rosemallow. A drier beech-oak forest with an understory of flowering dogwood occurs in the ravines above the wetlands. The forest is high quality habitat for forest interior dwelling species (FIDS).

Site Management Considerations

The effects of climate change, such as sea-level rise, increased intensity of coastal flooding, and changes in sediment deposition, will be one of the greatest threats to this coastal wetland /aquatic system. The adjacent uplands and nearby shoreline habitats may affect the stability and composition of intertidal flats, as well as their ability to shift by migrating inland or along the shoreline as the sea level rises. Additional threats include



the construction of structures in the intertidal zone, the clearing of vegetation in the upland buffer, excessive boat wakes, and the landing of boats on the shoreline during the growing season.

Most of the Oakington Shore area is located in Swan Harbor Farm and is owned by Harford County. This site is designated as a habitat protection area for state-listed species under the Chesapeake Bay Critical Area Regulations (COMAR 27.01.09.03). Certain wetlands and their adjacent 100 foot upland buffer at this site are regulated as Wetlands of Special State Concern by the Maryland Department of the Environment (COMAR 26.23.06.02).

The Maryland Department of Natural Resources' Natural Heritage Program and cooperative partners completed a State Wildlife Action Plan in 2015 as a requirement of State Wildlife Grant funding. The plan details key wildlife habitats, natural communities, and Species of Greatest Conservation Need (SGCN) statewide, and provides information on threats and conservation needs of Maryland's wildlife resources and supporting habitats. For more information, the full Plan can be accessed at http://dnr.maryland.gov/wildlife/Pages/plants wildlife/SWAP Submission.aspx.

Key Wildlife Habitats

- Cliffs and Rock Outcrops
- Montane-Piedmont Floodplain

Important Features

- Northern map turtle (*Graptemys geographica*, statelisted as Endangered)
- Forest interior dwelling species (FIDS) habitat

Ecological Significance



South Lapidum includes an old, unused railroad bed (about ten feet high) which runs along the Susquehanna River, and the long, narrow wetland complex to the west of this railroad. A portion of this wetland complex consists of the old Susquehanna Canal, which flows through a flat, floodplain woodland. To the south of this woodland, a very diverse emergent marsh with standing dead trees can be found. This marsh, in turn, drains into an open water wetland complex, just before it meets with an inlet that forms the mouth of the old canal.

Steep, wooded slopes and forested ravines border the wetland complex to the west. These slopes contain many rocky outcrops. Scattered eastern hemlocks (*Tsuga canadensis*), which are indicative of a cool microclimate, can be found growing in the rock crevices on some of these outcrops.

The wetlands, tributaries, old canal, and Susquehanna River shoreline of South Lapidum provide suitable habitat for the northern map turtle (*Graptemys geographica*). This mostly aquatic turtle is currently listed as an Endangered species in Maryland. It can be seen basking on logs or along the river banks. In Maryland, this endangered turtle is restricted to the Susquehanna River watershed.

One other notable feature of South Lapidum is the steep, northeast-facing slopes which occur to the west of the wetlands. The eastern hemlocks which grow in the rocky crevices along the slopes indicate that the slopes have a cool microclimate and thus are likely to provide habitat for species that have adapted to these unusual conditions. Extensive northeast-facing slopes such as the ones found within this area are very unique in the Piedmont province of Maryland and occur only on the Harford County side of the Susquehanna River. These slopes have a high likelihood of harboring rare plant species, and should, therefore, be protected.

An additional value of South Lapidum is that it provides habitat for forest interior dwelling birds. Forest interior dwelling birds that have been observed on the site include red-eyed vireo, Acadian flycatcher, prothonotary warbler, Kentucky warbler, ovenbird, and northern parula.

Site Management Considerations

Principal threats to the site include sediment and stormwater runoff from adjacent uplands, which could degrade the quality of the wetlands and tributaries on which the rare species depends. Other threats to South Lapidum are activities which could alter the character of the steep slopes, or reduce the habitat value of the site for forest interior dwelling birds. Timber harvesting on the site should not occur on slopes of 15% or greater, to prevent a change in the microclimate or species composition of the steep slopes. Substantial removal of forest cover immediately above the steep slopes, which could also alter this microclimate, should be avoided.

This site is designated as a habitat protection area for state-listed species under the Chesapeake Bay Critical Area Regulations (COMAR 27.01.09.03). Certain wetlands and their adjacent 100 foot upland buffer at this site are regulated as Wetlands of Special State Concern by the Maryland Department of the Environment (COMAR 26.23.06.02).

The Maryland Department of Natural Resources' Natural Heritage Program and cooperative partners completed a State Wildlife Action Plan in 2015 as a requirement of State Wildlife Grant funding. The plan details key wildlife habitats, natural communities, and Species of Greatest Conservation Need (SGCN) statewide, and provides information on threats and conservation needs of Maryland's wildlife resources and supporting habitats. For more information, the full Plan can be accessed at http://dnr.maryland.gov/wildlife/Pages/plants wildlife/SWAP Submission.aspx.

Key Wildlife Habitats

- Springs
- Montane-Piedmont Floodplain
- Mesic Mixed Hardwood Forest

Important Features

- Northern map turtle (*Graptemys geographica*, statelisted as Endangered)
- Potomac amphipod (*Stygobromus tenuis potomacus*, watchlist)

Ecological Significance



Stafford Road Slopes consists of a two mile stretch of land along the Susquehanna River, which is comprised of extensive northeast-facing slopes. These slopes are generally very steep, and contain several seeps.

The Susquehanna River shoreline and associated wetlands and upland habitats of Stafford Road Slopes provide suitable habitat for the northern map turtle (*Graptemys geographica*). This mostly aquatic turtle is currently listed as an Endangered species in Maryland. It can be seen basking on logs or along the river banks. In Maryland, this endangered turtle is restricted to the Susquehanna River watershed.

A rich, deciduous forest can be found growing on the slopes. This forest is dominated by tulip poplar and various oaks, with an understory of red maple and a shrub layer of pawpaw (*Asimina triloba*). The herbaceous layer of the forest is very diverse, and contains mayapple (*Podophyllum peltatum*), pale jewelweed (*Impatiens pallida*), blue cohosh (*Caulophyllum thalictroides*), dutchman's breeches (*Dicentra cucullaria*), Christmas fern (*Polystichum acrostichoides*), bloodroot (*Sanguinaria canadensis*), wild ginger (*Asarum canadense*), jack-in-the-pulpit (*Arisaema triphyllum*), and many other species. The ground itself is very stony, and the stones are interspersed with rich, organic soil.

Stafford Road Slopes in comprised of a long stretch of steep, rocky slopes with a northeastern exposure. Extensive northeast-facing slopes such as the ones found within this area are very unique in the Piedmont province of Maryland, and occur only on the Harford County side of the Susquehanna River.

The microclimate of the slopes is very cool and moist. These slopes harbor both the Potomac amphipod (*Stygobromus tenuis potomacus*), a groundwater invertebrate species on the state's watchlist, as well as a tremendously large population of a rare white form of red trillium (*Trillium erectum var. album*). The uniqueness of the slopes, combined with the presence of rare species on the site, make Stafford Road Slopes very worthy of protection.

The slopes along Stafford Road are well-known for their exceptional springtime beauty. This beauty is due primarily to the abundance of wildflowers on the slopes, most notably the rare trilliums and dutchman's breeches. The white color of these flowers carpets the slopes of the area for their entire length.

Site Management Considerations

Most of Stafford Road Slopes falls within Susquehanna State Park. This site is designated as a habitat protection area for state-listed species under the Chesapeake Bay Critical Area Regulations (COMAR 27.01.09.03). Certain wetlands and their adjacent 100 foot upland buffer at this site are regulated as Wetlands of Special State Concern by the Maryland Department of the Environment (COMAR 26.23.06.02).

One activity which has the potential to destroy the integrity of the site is timber harvesting. This activity could alter the microclimate of the slopes, and subsequently change the species composition of the vegetation on these slopes. Timber harvesting could also cause direct damage to the rare species on the site. For reasons mentioned above, timber harvesting should be prohibited within the protection area, except to remove individual diseased trees, or trees which are in danger of falling where they may threaten human safety (i.e., along Stafford Road at the base of the slopes).

The Maryland Department of Natural Resources' Natural Heritage Program and cooperative partners completed a State Wildlife Action Plan in 2015 as a requirement of State Wildlife Grant funding. The plan details key wildlife habitats, natural communities, and Species of Greatest Conservation Need (SGCN) statewide, and provides information on threats and conservation needs of Maryland's wildlife resources and supporting habitats. For more information, the full Plan can be accessed at http://dnr.maryland.gov/wildlife/Pages/plants_wildlife/SWAP_Submission.aspx.

Key Wildlife Habitats

- Piedmont Stream
- Montane-Piedmont Floodplain
- Mesic Mixed Hardwood Forest
- Tidal Freshwater Marsh and Shrubland

Important Features

- Chesapeake logperch (*Percina bimaculata*, statelisted as Threatened)
- Forest interior dwelling species (FIDS) habitat

Ecological Significance



Swan Creek is a roughly 10-mile long stream that flows into the Chesapeake Bay at the northern end of the U.S. military base, Aberdeen Proving Ground. Much of the Swan Creek watershed is rural, consisting primarily of agricultural fields and forestland, with some development mostly at the southern edge at the town of Aberdeen. The headwaters of this tributary are important for maintaining water quality in downstream reaches. The lower portion of Swan Creek is comprised of good quality forested buffers and tidal marshes along the riverbanks. This section is low in gradient with gravel and sandy runs and sandy pools with large woody debris - providing important habitat for the critically imperiled Chesapeake logperch (*Percina bimaculata*, state-listed as Threatened). This small, globally-rare darter is found primarily in the Lower Susquehanna River in southeastern Pennsylvania and northeastern Maryland. In the past 80 years, its global range has diminished by more than 50 percent as the species has disappeared from the Potomac River basin and parts of the Susquehanna River basin in Pennsylvania. To survive, the logperch needs streams with silt-free gravel, as it feeds on aquatic invertebrates by flipping stones with its nose.

Other rare fishes found historically in the Swan Creek watershed include bridle shiner (*Notropis bifrenatus*) and the federally-endangered Maryland darter (*Etheostoma sellare*). A tributary of Swan Creek was one of the last known habitats of the Maryland darter (*Etheostoma sellare*, both federally listed and state-listed as Endangered), the only vertebrate endemic to Maryland. This species was last sighted in Maryland in 1988, but recurring survey efforts hope to rediscover the fish in this good quality habitat.

Much of the creek is buffered by ecologically valuable terrestrial habitat, including mature mixed hardwood forests. Forest interior dwelling bird species such as red-eyed vireo, ovenbird, scarlet tanager, and Acadian flycatcher have been observed in these woods.

Site Management Considerations

Much of the Swan Creek area within the Critical Area boundary is found on properties owned and managed by Harford County as Swan Harbor Farm and Mullins Park.

Swan Creek is designated as a habitat protection area for state-listed species under the Chesapeake Bay Critical Area Regulations (COMAR 27.01.09.03).

The Maryland Department of Natural Resources' Natural Heritage Program and cooperative partners completed a State Wildlife Action Plan in 2015 as a requirement of State Wildlife Grant funding. The plan details key wildlife habitats, natural communities, and Species of Greatest Conservation Need (SGCN) statewide, and provides information on threats and conservation needs of Maryland's wildlife resources and supporting habitats. For more information, the full Plan can be accessed at http://dnr.maryland.gov/wildlife/Pages/plants_wildlife/SWAP_Submission.aspx.

Locally Significant Habitats

Belcamp Beach

County: Harford

Key Wildlife Habitats

- Coastal Beach
- Intertidal Mudflat and Sandflat
- Tidal Freshwater Marsh and Shrubland

Important Features

- Salt-marsh bulrush (*Schoenoplectus novae-angliae*, state rare)
- Tickseed sunflower (*Bidens trichosperma*, state rare)
- Spongy lophotocarpus (*Sagittaria spathulata*, state rare)
- Maryland bur-marigold (*Bidens bidentoides*, watchlist)

Ecological Significance

Belcamp Beach has a sandy, gravelly, intertidal zone of beach with a firm bottom and predominantly fresh water. This habitat supports a group of rare wetland plants, including salt-marsh bulrush (*Schoenoplectus novae-angliae*, state rare), spongy lophotocarpus (*Sagittaria spathulata*, state rare), tickseed sunflower (*Bidens trichosperma*, state rare), and Maryland bur-marigold (*Bidens bidentoides*, watchlist).

The Maryland bur-marigold is a globally rare regional endemic, found from Maryland northward to New York. It has narrow habitat requirements – tidal mud flats along river edges. In Maryland, this species is limited to tidal marshes of the upper Chesapeake Bay and its tributaries, which makes conservation of Harford County's populations essential to the survival of the species in Maryland. Common plants found here include common threesquare, switchgrass, rattlesnake-master, seaside goldenrod, and big cordgrass.

Site Management Considerations

The effects of climate change, such as sea-level rise, increased intensity of coastal flooding, and changes in sediment deposition, will be one of the greatest threats to this coastal wetland /aquatic system. The adjacent uplands and nearby shoreline habitats may affect the stability and composition of intertidal flats, as well as their ability to shift by migrating inland or along the shoreline as the sea level rises. Additional threats include the construction of structures in the intertidal zone, the clearing of vegetation in the upland buffer, excessive boat wakes, and the landing of boats on the shoreline during the growing season.

This site has been designated as a locally significant habitat under the Chesapeake Bay Critical Area Regulations (COMAR 27.01.09.03).



The Maryland Department of Natural Resources' Natural Heritage Program and cooperative partners completed a State Wildlife Action Plan in 2015 as a requirement of State Wildlife Grant funding. The plan details key wildlife habitats, natural communities, and Species of Greatest Conservation Need (SGCN) statewide, and provides information on threats and conservation needs of Maryland's wildlife resources and supporting habitats. For more information, the full Plan can be accessed at http://dnr.maryland.gov/wildlife/Pages/plants wildlife/SWAP_Submission.aspx.

Grays Run County: Harford

Key Wildlife Habitats

• Tidal Freshwater Marsh and Shrubland

Important Features

• Salt-marsh bulrush (*Schoenoplectus novae-angliae*, state rare)

Ecological Significance



The Grays Run area consists of a five acre fresh to brackish tidal marsh and a complex of tidal and nontidal wetlands and streams which drain into this marsh from the north. The tidal marsh is dominated by broad-leaved cattail (*Typha latifolia*), narrow-leaved cattail (*Typha angustifolia*), swamp rosemallow (*Hibiscus moscheutos*), wild rice (*Zizania aquatica*), and several bulrushes (*Scirpus sp.*) and other sedges. Grays Run flows in a northeast to southwest direction through the marsh. Pulaski Highway cuts across the marsh near its lower end.

A freshwater pond occurs to the southwest of the tidal marsh. Baltimore and Ohio railroad tracks run in an east to west direction along the northern border of both the pond and the marsh. Temporarily to seasonally-flooded forested nontidal wetlands with associated tributary streams occur to the north of these tracks. These wetlands are dominated by green ash (*Fraxinus pennsylvanica*), red maple (*Acer rubrum*) and boxelder (*Acer negundo*).

Grays Run contains a large population of salt-marsh bulrush (*Schoenoplectus novae-angliae*, formerly named *Scirpus cylindricus*), a state rare sedge. This species is found in only a few locations in the state and is of limited distribution in Harford County, currently known only from two sites in the Grays Run-Church Creek watershed. Salt-marsh bulrush has a broad range along the Atlantic Coastal Plain but has a restricted habitat - the transition zone between saline and fresh water in tidal river systems.

Site Management Considerations

Grays Run is located almost entirely within the Chesapeake Bay Critical Area and was designated a Habitat of Local Significance by Harford County in 1995. This designation prohibits development activities and other disturbances within the defined protection area unless it can be shown that such activities would not adversely affect the designated species or their habitat.

Activities which alter the hydrology of the tidal marsh or adjoining wetlands or increase pollutant runoff into the marsh should be avoided. Draining, filling, or development immediately adjacent to the wetlands could adversely impact the rare species habitat.

Although a portion of the marsh was drained in 1994 to construct a gas pipeline through the site, the project was carefully planned and monitored and the salt-marsh bulrush population was not damaged.

The maintenance of Grays Run in its present condition would provide the rare species population on the site with the best chance for survival over the long term. Monitoring of the rare species and the condition of the habitat should be done annually.

Certain wetlands and their adjacent 100 foot upland buffer at this site are regulated as Wetlands of Special State Concern by the Maryland Department of the Environment (COMAR 26.23.06.02).

The Maryland Department of Natural Resources' Natural Heritage Program and cooperative partners completed a State Wildlife Action Plan in 2015 as a requirement of State Wildlife Grant funding. The plan details key wildlife habitats, natural communities, and Species of Greatest Conservation Need (SGCN) statewide, and provides information on threats and conservation needs of Maryland's wildlife resources and supporting habitats. For more information, the full Plan can be accessed at http://dnr.maryland.gov/wildlife/Pages/plants_wildlife/SWAP_Submission.aspx.

Leight Park Site County: Harford

Key Wildlife Habitats

- Coastal Beach
- Intertidal Mudflat and Sand Flat
- Mesic Mixed Hardwood Forest
- Tidal Freshwater Marsh and Shrubland

Important Features

- Spongy lophotocarpus (*Sagittaria spathulata*, state rare)
- Maryland bur-marigold (*Bidens bidentoides*, watchlist)
- Forest interior dwelling species (FIDS) habitat

Ecological Significance

Leight Park Site contains a sizable population of Maryland bur-marigold (*Bidens bidentoides*), a freshwater tidal marsh species that is globally rare and a regional endemic, found from Maryland northward to New York. This species occurs in a number of locations along the upper Chesapeake Bay in Cecil and Harford counties. Because the total range of this species is limited to fresh tidal marshes from New York south to the upper Chesapeake and its tributaries, conservation of Maryland's populations is important for the survival of the species.

The shoreline at Leight Park is a good example of a freshwater-slightly brackish tidal wetland. The intertidal zone is a combination of abruptly dropping mucky shoreline and small coves with gradually sloping sandy shorelines. One sandy cove harbors a small colony of spongy lophotocarpus (*Sagittaria spathulata*, state rare), an intertidal species.

Like other estuaries, this site supports a variety and abundance of wildlife, especially birds, fish, and invertebrates. The wide expanse of water provides good fishing for belted kingfisher, great blue heron, and osprey. Several small streams and seepage areas provide habitat for salamanders and frogs. The forest also is part of a larger block of forest that provides habitat for forest interior dwelling species (FIDS), such as Acadian flycatcher and scarlet tanager.

Site Management Considerations

The effects of climate change, such as sea-level rise, increased intensity of coastal flooding, and changes in sediment deposition, will be one of the greatest threats to this coastal wetland /aquatic system. The adjacent uplands and nearby shoreline habitats may affect the stability and composition of intertidal flats, as well as their ability to shift by migrating inland or along the shoreline as the sea level rises. Additional threats include the construction of structures in the intertidal zone, the clearing of vegetation in the upland



buffer, excessive boat wakes, and the landing of boats on the shoreline during the growing season.

Leight Park is owned and managed by Harford County and is part of the Otter Point Creek component of the Chesapeake Bay National Estuarine Research Reserve. This site has been designated as a locally significant habitat under the Chesapeake Bay Critical Area Regulations (COMAR 27.01.09.03).

The Maryland Department of Natural Resources' Natural Heritage Program and cooperative partners completed a State Wildlife Action Plan in 2015 as a requirement of State Wildlife Grant funding. The plan details key wildlife habitats, natural communities, and Species of Greatest Conservation Need (SGCN) statewide, and provides information on threats and conservation needs of Maryland's wildlife resources and supporting habitats. For more information, the full Plan can be accessed at http://dnr.maryland.gov/wildlife/Pages/plants wildlife/SWAP Submission.aspx.

Otter Point Creek County: Harford

Key Wildlife Habitats

- Mesic Mixed Hardwood Forest
- Coastal Plain Floodplain
- Tidal Freshwater Marsh and Shrubland

Important Features

- Primrose-willow (*Ludwigia decurrens*, state rare)
- Forest interior dwelling species (FIDS) habitat

Ecological Significance



The Otter Point Creek area contains an extensive forested wetland dominated by sycamore (*Platanus occidentalis*), silver maple (*Acer saccharinum*), and river birch (*Betula nigra*). In canopy openings, the saturated soil supports emergent species such as mud plantain (*Heteranthera reniformis*), cardinal flower (*Lobelia cardinalis*), and Turk's-cap lily (*Lilium superbum*). Along the open shoreline are swamp buttercup (*Ranunculus septentrionalis*), sweetflag (*Acorus calamus*), and sneezeweed (*Helenium autumnale*).

An emergent nontidal wetland in the Otter Point Creek area harbors an exceptionally vigorous population of primrose-willow (*Ludwigia decurrens*), a state rare herbaceous plant. This southern species is near the northern edge of its range in Maryland. It occurs in several counties in southern Maryland, but is known from only one other site in Harford County.

The varied wetland habitats of this site include forested wetlands, old ponds bordered by aquatic and emergent vegetation, nontidal marshes, and freshwater tidal marshes. The large, unbroken tract of deciduous forest wetland provides excellent habitat for forest interior dwelling birds and mammals. Breeding birds known from Otter Point Creek include prothonotary warbler and scarlet tanager. Despite being located in a highly-developed part of the county, many uncommon mammals have been noted, including beaver, muskrat, mink, and river otter.

Site Management Considerations

This area is within the 350-acre Bosely Conservancy, owned and managed by the Harford County chapter of the Izaak Walton League, a private conservation organization. This site is also a component of the Chesapeake Bay National Estuarine Research Reserve. Otter Point Creek has been designated as a locally significant habitat under the Chesapeake Bay Critical Area Regulations (COMAR 27.01.09.03).

Sedimentation from local road and housing construction and runoff from the nearby Pulaski Highway (US-40) threaten the water quality of Otter Point Creek. Invasive

weedy species such as multiflora rose (*Rosa multiflora*) are well established on the trails along the creek. The area is popular with fishermen and local residents.

Recommendations for management of this site include regular monitoring of the water quality, controlling the multiflora rose and other invasive species along the trails, and monitoring local trails for potential impacts to the rare species population.

The Maryland Department of Natural Resources' Natural Heritage Program and cooperative partners completed a State Wildlife Action Plan in 2015 as a requirement of State Wildlife Grant funding. The plan details key wildlife habitats, natural communities, and Species of Greatest Conservation Need (SGCN) statewide, and provides information on threats and conservation needs of Maryland's wildlife resources and supporting habitats. For more information, the full Plan can be accessed at http://dnr.maryland.gov/wildlife/Pages/plants_wildlife/SWAP_Submission.aspx.

Perryman Woods County: Harford

Key Wildlife Habitats

- Vernal Pools
- Coastal Plain Flatwood and Depression Swamp

Important Features

• Forest interior dwelling species (FIDS) habitat

Ecological Significance



According to the Upland Natural Areas Study conducted by the Maryland Department of Natural Resources, Perryman Woods is a flat, wooded site predominated by white oak, tulip poplar, American beech, and sweetgum with diameters generally ranging from 12 to 18 inches. Several larger trees with diameters of 24 inches also occur on the site. Subdominant tree species include northern red oak, black oak, hickory (*Carya* sp.), and red maple. Arrowwood (*Viburnum* sp.), blueberries (*Vaccinium* sp.), and greenbrier (*Smilax* sp.) occur in the understory, as do saplings of overstory trees. Perryman Woods is bisected by a powerline corridor which runs in an east-west direction through the middle of the site. A red maple / green ash tidal marsh with a fringe of cattails (*Typha* sp.) and arrow arum (*Peltandra virginica*) can be found in the southern portion of this site.

Notable features of Perryman Woods are the many temporarily to seasonally flooded nontidal wetlands (vernal pools) which occur throughout the site. Some of these pools support wetland vegetation, including willow oak, smooth arrowwood (*Viburnum recognitum*), spicebush (*Lindera benzoin*), buttonbush, and willow (*Salix* sp.), while others are virtually unvegetated.

The deciduous woodland and associated vernal pools of the Perryman Woods area represent a natural community type called "flatwood" or a depressional forested wetland. This community type is found only in the Coastal Plain portion of the County, and is thus of limited occurrence. Flatwood communities have been substantially fragmented and reduced in Maryland and are considered a rare habitat. In Harford County, most flatwood communities have been destroyed by agricultural and development activities. The Perryman Woods site represents one of the best remaining examples of this community type in the County. The large trees on the site make this community particularly unique.

The vernal pools within Perryman Woods provide breeding and feeding habitat for a large number and variety of amphibians, a few reptile species, and a large number of aquatic invertebrates. Many of these species are vernal pool specialists, and require natural pools to complete their life cycles.

An additional value of Perryman Woods is that it provides habitat for forest interior dwelling birds. Interior dwelling species which have been observed on the site include pileated woodpecker, hairy woodpecker, whip-poor-will, Acadian flycatcher, yellow-throated vireo, red-eyed vireo, northern parula, ovenbird, American redstart, and scarlet tanager.

Site Management Considerations

Potential threats to this site are related to negative impacts to the water quality of the vernal pools. Runoff from the adjoining agricultural field has the potential to adversely impact the vernal pools on the site, and also to impact the water of the tributary streams flowing through the site. Precautionary measures should be taken during any future construction in the vicinity of Perryman Woods to prevent any sedimentation of these streams and pools.

All proposed timber harvesting activities should be conducted so it will not alter the existing vegetation structure or change the existing species composition of the site. Disturbances to vernal pools and the tidal wetland during harvesting operations should be avoided, and the habitat value for forest interior dwelling birds should be retained.

This site has been designated as a locally significant habitat under the Chesapeake Bay Critical Area Regulations (COMAR 27.01.09.03). Certain wetlands and their adjacent 100 foot upland buffer at this site are regulated as Wetlands of Special State Concern by the Maryland Department of the Environment (COMAR 26.23.06.02).

The Maryland Department of Natural Resources' Natural Heritage Program and cooperative partners completed a State Wildlife Action Plan in 2015 as a requirement of State Wildlife Grant funding. The plan details key wildlife habitats, natural communities, and Species of Greatest Conservation Need (SGCN) statewide, and provides information on threats and conservation needs of Maryland's wildlife resources and supporting habitats. For more information, the full Plan can be accessed at http://dnr.maryland.gov/wildlife/Pages/plants wildlife/SWAP Submission.aspx.

Swan Creek Point County: Harford

Key Wildlife Habitats

- Coastal Beach
- Intertidal Mudflat and Sandflat
- Tidal Freshwater Marsh and Shrubland

Important Features

Maryland bur-marigold (*Bidens bidentoides*, watchlist)

Ecological Significance



The primary feature of Swan Creek Point is the intertidal habitat that supports a population of Maryland bur-marigold (*Bidens bidentoides*, watchlist) which is globally rare and a regional endemic, found only from Maryland northward to New York. The total Maryland range of this species is limited to tidal waters of the upper Chesapeake Bay and its tributaries. Therefore, conservation of Harford County's populations is important to the survival of the species in Maryland and range-wide. This species is often found in association with a few other rare intertidal plants. Therefore, this area is likely to offer potential habitat for these associated rare species.

Site Management Considerations

The effects of climate change, such as sea-level rise, increased intensity of coastal flooding, and changes in sediment deposition, will be one of the greatest threats to this coastal wetland /aquatic system. The adjacent uplands and nearby shoreline habitats may affect the stability and composition of intertidal flats, as well as their ability to shift by migrating inland or along the shoreline as the sea level rises. Additional threats include the construction of structures in the intertidal zone, the clearing of vegetation in the upland buffer, excessive boat wakes, and the landing of boats on the shoreline during the growing season.

The Swan Creek Point area is located within the Eleanor and Millard Tydings Park, owned and managed by Harford County. This site has been designated as a locally significant habitat under the Chesapeake Bay Critical Area Regulations (COMAR 27.01.09.03).

The Maryland Department of Natural Resources' Natural Heritage Program and cooperative partners completed a State Wildlife Action Plan in 2015 as a requirement of State Wildlife Grant funding. The plan details key wildlife habitats, natural communities, and Species of Greatest Conservation Need (SGCN) statewide, and provides information on threats and conservation needs of Maryland's wildlife resources and supporting habitats. For more information, the full Plan can be accessed at http://dnr.maryland.gov/wildlife/Pages/plants_wildlife/SWAP_Submission.aspx.

Key Wildlife Habitats

- Vernal Pools
- Coastal Plain Flatwood and Depression Swamp

Important Features

• Forest interior dwelling species (FIDS) habitat

Ecological Significance



Willoughby Woods consists primarily of a flat, well-stratified ¹⁴ *e* deciduous woodland, dominated by white oak, tulip poplar, and sweetgum, with an understory of red maple and sweetgum, and a shrub layer of blueberries (*Vaccinium* spp.), and saplings of overstory trees. A large alluvial red maple/tulip poplar floodplain occurs in the northwestern portion of the site, which is bisected by Willoughby Beach Road. Notable features of Willoughby Woods are the many temporarily to seasonally flooded nontidal wetlands, known as vernal pools, which occur throughout the site. Most of the vernal pools support wetland vegetation, including willow oak, smooth arrowwood (*Viburnum recognitum*), and spicebush (*Lindera benzoin*), while some of the smaller pools are virtually unvegetated.

Several open nontidal wetlands and one tidal wetland add to the overall diversity of the site. Three nontidal wetlands, along the railroad tracks in the southwestern portion of the site, were once part of the large tidal marsh complex to the south, in Aberdeen Proving Ground. These wetlands are now somewhat impounded by the railroad tracks and, as a result, are semi-permanently to permanently flooded. These wetlands presently support a high diversity of plant species, including sedges (*Carex* spp.), rushes (*Juncus* spp.), bulrushes (*Scirpus* spp.), burreed (*Sparganium* sp.), beggar-ticks (*Bidens* spp.), buttonbush (*Cephalanthus occidentalis*), and bladderworts (*Utricularia* sp.), and also contain some standing dead trees. One wetland, along the north edge of Willoughby Beach Road in the eastern part of the site, contains roses (*Rosa* sp.), narrow-leaved cattails (*Typha angustifolia*), buttonbush, and bladderworts. This wetland is unique in that *Sphagnum* spp. is present over large portions of the wetland, creating somewhat of a bog-like habitat.

The deciduous woodland and associated vernal pools of the Willoughby Woods area represent a natural community type called "flatwood" or a depressional forested wetland. This community type is found only in the Coastal Plain portion of the County, and is thus of limited occurrence. Flatwood communities have been substantially reduced in Maryland and are considered a rare habitat. In Harford County, most flatwood communities have been destroyed by agricultural and development activities. The Willoughby Woods site represents one of the best remaining examples of this community type in Harford County, and is also one of the larger intact woodlands in the Coastal Plain portion of the County. The vernal pools within Willoughby Woods provide breeding and feeding habitat for a large number and a variety of amphibians, a few reptile species, and a large number of aquatic invertebrates. Many of these species are vernal pool specialists, and require natural pools to complete their life cycles. A high concentration of vernal pools occurs on the Willoughby Woods site, which makes this natural community particularly valuable to species that depend on such pools.

An additional value of Willoughby Woods is that it provides habitat for forest interior dwelling birds. Interior dwelling species which have been observed on the site include ovenbird, red-eyed vireo, scarlet tanager, Acadian flycatcher, hairy woodpecker, and Kentucky warbler.

Site Management Considerations

Potential threats to this site are related to negative impacts to the water quality of the vernal pools. Runoff from the existing housing developments, adjoining agricultural field, and Willoughby Beach Road have the potential to adversely impact the vernal pools on the site, and also to impact the water of the tributary streams flowing through the site. Precautionary measures should be taken during any future construction in the vicinity of Perryman Woods to prevent any sedimentation of these streams and vernal pools.

All proposed timber harvesting activities should be conducted so it will not alter the existing vegetation structure or change the existing species composition of the site. Disturbances to vernal pools and tidal wetlands during harvesting operations should be avoided, and the habitat value for forest interior dwelling birds should be retained.

Small stands of the invasive common reed (*Phragmites australis*) in two of the wetlands along the railroad tracks threaten the integrity of these wetlands and should be eradicated. Sweetgum (*Liquidambar styraciflua*) is beginning to move into an otherwise open wetland along the north edge of Willoughby Beach Road in the eastern part of the site and should be controlled to keep this unique wetland open.

This site has been designated as a locally significant habitat under the Chesapeake Bay Critical Area Regulations (COMAR 27.01.09.03). Certain wetlands and their adjacent 100 foot upland buffer at this site are regulated as Wetlands of Special State Concern by the Maryland Department of the Environment (COMAR 26.23.06.02).

The Maryland Department of Natural Resources' Natural Heritage Program and cooperative partners completed a State Wildlife Action Plan in 2015 as a requirement of State Wildlife Grant funding. The plan details key wildlife habitats, natural communities, and Species of Greatest Conservation Need (SGCN) statewide, and provides information on threats and conservation needs of Maryland's wildlife resources and supporting habitats. For more information, the full Plan can be accessed at http://dnr.maryland.gov/wildlife/Pages/plants wildlife/SWAP Submission.aspx.

Colonial Waterbird Colonies

The Maryland Department of Natural Resources monitors the location and population sizes of nesting colonial waterbirds throughout Maryland. Colonial waterbirds include such species as egrets, herons, ibis, gulls, terns, and pelicans. For some species, these monitoring activities occur annually. For other species that are more common, such as great blue herons, monitoring may only occur every five years or longer.

Two locations for great blue heron rookeries were located in Harford County in 2013: Park Island off of Havre de Grace and Robert Island in the Susquehanna River. The Park Island colony was rather small, with only four nests detected, while the Robert Island colony was larger with 43 nests.

General Guidelines for Conservation of Great Blue Heron Colonies

With their seven foot wing span and distinctive s-shaped neck, great blue herons are a frequent, magnificent sight around the Chesapeake Bay. They nest in colonies, sometimes called rookeries, in forested areas that are relatively free of predators and disturbance. Colony sites are often adjacent to water, in forested non-tidal wetlands and/or floodplains. Wading in shallow water, great blue herons hunt for fish, frogs, crayfish, and snakes. Their long pointed bill also helps them catch insects, mice, and other small animals. As Maryland continues to grow and develop, secure nest sites for great blue herons may become scarcer. Whenever possible, great blue heron colony sites should be conserved as part of responsible land stewardship. Conservation of great blue heron colonies that are located in the Chesapeake Bay Critical Area is required by state law (§ 8-1801/1806). Significant mortality of chicks or eggs resulting from disturbance of the colony during the breeding season is a violation of the U.S. Migratory Bird Treaty Act. Disturbance includes actions such as cutting nest trees, cutting nearby trees, or nearby construction that causes abandonment of chicks by the adults.

The following guidelines are recommended as measures to protect great blue heron nesting colonies.

- 1. Establish a protection area of ¹/₄ mile radius from the colony's outer boundary. Within this area establish three zones of protection: Zone 1 extends from the outer boundary of the colony to a radius of 330 feet, Zone 2 extends from 330 feet to 660 feet in radius, and Zone 3 extends from 660 feet to ¹/₄ mile (1,320 feet).
- 2. During the breeding season, 15 February through 31 July, all human entry into Zone 1 should be restricted to only that essential for protection of the great blue heron colony. Human disturbance of colony sites that results in significant mortality of eggs and/or chicks is considered a prohibited taking under various state and federal regulations.
- 3. No land use changes, including development or timber harvesting, should occur in Zone 1.

- 4. Construction activities, including clearing, grading, building, etc., should not occur within Zones 1 and 2.
- 5. Selective timber harvesting may occur in Zone 2, but clearcutting should be avoided.
- 6. No construction or timber harvesting activities should occur within Zone 3 during the great blue heron breeding season.

The Department of Natural Resources' Wildlife and Heritage Service provides assistance to those interested in protecting this resource. The above guidelines are usually suitable for protection of most great blue heron colonies. Specific protection measures depend upon site conditions, planned activities, colony site type and history, and other factors. For more specific technical advice regarding planned projects and great blue heron protection, contact the Wildlife and Heritage Service (410/260-8540).

Appendix J

Procedures for Identification of Forest-Interior Dwelling Bird Species Habitats

A Guide to the Conservation of Forest Interior Dwelling Birds in the Chesapeake Bay Critical Area



June 2000



Martin O'Malley - Governor Anthony G. Brown - Lt. Governor State of Maryland

> Critical Area Commission for the Chesapeake and Atlantic Coastal Bays 1804 West Street, Suite 100 Annapolis, Maryland 21401 410-260-3460 Web Site: www.dnr.state.md.us/criticalarea

> *Inside Artwork by Mary Owens Critical Area Commission *Exception includes artist's name

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This document is available in alternative format upon request from a qualified individual with a disability.
A GUIDE TO THE CONSERVATION OF FOREST INTERIOR DWELLING BIRDS IN THE CHESAPEAKE BAY CRITICAL AREA

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EXECUTIVE SUMMARY

The Chesapeake Bay Critical Area Criteria direct local jurisdictions to develop a management program for the conservation of forest areas used as breeding habitat by forest interior dwelling birds and other wildlife species. This document replaces the first Guidance Paper, approved in 1986, by the Chesapeake Bay Critical Area Commission for the conservation of forest interior dwelling bird (FIDS) habitat. Included in this paper is a description of the legal basis for the protection of FIDS habitat, a clarification of the methods used to identify FIDS habitat, and a list of FIDS species occurring in the Critical Area. Six species have been added to the list in the original document bringing it to a total of twenty-five.

The paper explains the concept of forest edge and forest interior and emphasizes the use of the <u>Site Design Guidelines</u> from the original paper to conserve forest interior. The paper also contains a method for determining the amount of mitigation that should be required when unavoidable impacts occur in FIDS habitat. The mitigation amount is based in large part on the extent to which the <u>Site Design Guidelines</u> are followed and includes direct and indirect impacts to the habitat. Mitigation will usually be creation of FIDS habitat, but may include, in some cases, protection of existing habitat.

Local and regional planning for FIDS conservation is addressed in addition to the site-specific methods that are stressed.

INTRODUCTION

What are FIDS?

Forest interior dwelling birds (FIDS) require large forest areas to breed successfully and maintain viable populations. This diverse group includes colorful songbirds---tanagers, warblers, vireos---that breed in North America and winter in the Caribbean, Central and South America, as well as residents and short-distance migrants---woodpeckers, hawks, and owls. FIDS are an integral part of Maryland's landscape and natural heritage. They have depended on large forested tracts, including streamside and Bayside forests, for thousands of years.

Recent declines

Although most of these birds are still fairly common, populations of some forest bird species have been declining during the last 30-40 years. According to the Breeding Bird Survey (BBS), a volunteer bird count conducted each June since 1966, there was a 63% decline in occurrence of individual birds of neotropical migrant species (many of which are FIDS) in Maryland between 1980 - 1989. A census of neotropical migrants in Rock Creek Park near Washington, DC from 1948 - 1988 revealed a drastic decline including the total loss of some species within the park. While the forest and park did not change significantly over that 31-year period, the surrounding landscape became much more urbanized and fragmented (Briggs and Criswell, 1978).

Some species, such as the wood thrush and the cerulean warbler, are rapidly declining. According to the BBS, the wood thrush declined almost 2%, while the population decline of cerulean warbler was close to 4% during the period of 1966 - 1998 (US Geological Survey, 1998).

Factors of decline

While many factors have contributed to the decline of FIDS populations, including the loss of habitat on wintering grounds and loss of migratory stopover areas for neotropical migrants, the loss and fragmentation of forests on the breeding grounds here in North America appear to play a critical role. Though some regions appear to be heavily forested today, our forests are increasingly fragmented and altered compared with the forests of the late 1800's and early 1900's. Unlike forest clearing a hundred or so years ago, landscape changes today are more likely to be permanent. This forest fragmentation results in both direct and indirect impacts for FIDS by reducing both the quantity and quality of forest habitat available to FIDS.

Forest Fragmentation and FIDS

Forest fragmentation is the whittling away of forest tracts into increasingly smaller and more isolated patches due to housing and commercial development, roads, logging and agriculture. This effect can be seen in Figure 1, a schematic of actual land use changes that occurred near



Figure 1. Drawing of actual landscape change between 1952 (top) and the early 1980's (bottom) near Columbia, Maryland. (Based on photograph, Robbins et al. 1989.) Adapted with permission from the Wildlife Society.

Columbia, Maryland between the early 50's and the early 80's. While some birds such as northern cardinals and American robins thrive in and around fragmented forests, most FIDS, such as warblers and vireos, require relatively large unbroken forests to live and successfully reproduce.

Forest fragmentation reduces the size of forest patches, reducing the total area of contiguous habitat available to birds and increases the isolation of habitat, reducing the quality of that which remains. Numerous studies have looked at the relationship between forest patch size and isolation and the abundance of bird species present. A study by Robbins et al. (1989) found that the probability of detecting a particular species of forest interior dwelling bird generally increased as the size of the forest increased, whereas the probability of detecting common nonforest bird species associated with more altered and fragmented forest habitat increased as the



Figure 2. Graph comparing the probability of occurrence by area of forest habitat. Graph shows probability of finding a scarlet tanager (a forest interior dwelling bird species) is higher as the size of forest habitat increases, whereas the probability of finding a European starling (an introduced edge species) decreases as forest size increases. (From Robbins et al., 1989, adapted with permission from the Wildlife Society.)

Direct Habitat Loss

The direct loss of forest habitat results in smaller forest tracts that may no longer be adequate to accommodate a bird's territory, to provide an ample supply of food, or to provide the necessary forest structure for breeding. Many forest tracts are too small to support species with large breeding territories such as the red-shouldered hawk, barred owl and pileated woodpecker. For example, a breeding pair of red-shouldered hawks require from 250-625 acres to sustain them. Most FIDS, even those species that have small breeding territories, will only select larger forest tracts for breeding.

In addition to area requirements, many FIDS have additional habitat requirements for nesting. Reduction of forest size often results in the loss of specialized habitats/microhabitats. Small forests cannot sustain the same environmental conditions that larger forests can, such as higher humidity and complex vegetative structure. The vegetative structure (amount of canopy and lower and midstory vegetation) may be missing or inadequate in smaller forests. Younger, less structurally diverse and highly fragmented forests cannot support the same variety of plant and animal species that older, more pristine forests can support.

FIDS are generally more successful at survival and reproduction in large, older, hardwooddominated forests; however, there has been a loss of quality habitat through the conversion of hardwood and mixed-hardwood forests to pine and the reduction of "old growth" forest to small isolated patches. Prior to European settlement, it is estimated that old-growth forest covered approximately 95% of the Chesapeake watershed (Kraft & Brush, 1981). Forest coverage in Maryland today is about 44% (USDA Forest Service, 1996) and about 40% of the remaining deciduous forest in the East today consists of small, isolated woodlots of relatively immature trees in agricultural and suburban landscapes. When European settlers arrived in eastern North America in the 1600's, the average height of a hardwood tree was 100 feet or more. The average height of trees in the Chesapeake Bay region today is only 60-80 feet (USDA Forest Service, 1996).

Indirect habitat loss or "edge" effects

Edge effects occur when different habitat types are located next to each other. When considering FIDS, we are concerned about the edge effects on forest when it is adjacent to lawn, agricultural fields, or pasture. A variety of edge effects can adversely impact FIDS depending on the size of the forest, adjacent land use, the amount of forest in the landscape, increase in the penetration of light and wind into the forest, encroachment of invasive plants and the presence of other competing or predatory edge species.

Forest "interior" refers to the area in the center of a forest. It is surrounded by "edge". In the Critical Area, the forest area within 300 feet of a forest edge is considered "edge" habitat. "Interior habitat" is commonly defined as the forest area found greater than 300 feet from the forest edge. Interior habitat functions as the highest quality breeding habitat for FIDS. When a forest becomes fragmented, areas that once functioned as interior breeding habitat are converted

to edge habitat and are often associated with a significant reduction in the number of young birds that are fledged in a year.

Higher rates of nest predation occur in forest edges. In addition, forest edges provide access to the interior for avian predators such as blue jays, crows, grackles and mammalian predators that include foxes, raccoons, squirrels, dogs and cats. These predators eat eggs and young birds still in the nest. They tend to be abundant near areas of human habitation and can be detrimental to nesting success. For example, domestic house cats are estimated to kill 3-4 million birds each day in the United States.

Neotropical migrants are particularly susceptible to brood parasitism by brown-headed cowbirds. Before the 1900's, the cowbird was largely absent from Eastern forests, occurring primarily in the grasslands west of the Mississippi. Pasture land, agricultural fields and suburban lawns are prime feeding habitat for cowbirds. When these grassy areas are interspersed with fragmented forests, cowbirds can be abundant and have dramatic impacts on the breeding success of FIDS. Cowbirds lay eggs in the nests of a variety of birds and the eggs usually hatch ahead of the host's eggs. The young cowbirds develop rapidly and are usually larger and more aggressive than the host's young, taking more than their share of food and often kicking unhatched eggs and nestlings of the host species out of the nest.

Long-distance migrants are more vulnerable to predation and parasitism than resident birds because of their limited breeding season. The migrant species often only have time to produce one brood once they arrive on the breeding grounds and before the fall migration to the south.

The forest edge is exposed to more light and wind than the interior of the forest resulting in a change in moisture and vegetative composition. Small and fragmented forests tend to be drier and to have less leaf litter. Leaf litter is an important component for maintaining arthropod (i.e., insects, spiders) populations for hungry birds. Neotropical migrants, in general, feed almost exclusively on insects while on their Maryland breeding grounds. In addition, increased densities of deer in many of our forests result in loss of plant diversity and structural diversity from overgrazing on the forest floor and in the midstory. Invasive plants such as Japanese honeysuckle and English ivy encroach into smaller forest fragments, limiting the growth of native plants, stifling natural succession, thereby limiting vegetative and structural diversity.

Loss of winter habitat and migratory stopovers

The decline in neotropical migrant species may be due in part to the loss of forest in their winter habitat in the tropics and along migratory routes. These small birds may travel a distance of one thousand miles or more over several days to a week. Providing for the needs of these birds, in addition to keeping adequate areas for breeding, also means conserving the native vegetation that provides both the food needed for refueling and cover from predators during migratory stopovers. Removing understory vegetation in our yards and parks eliminates plants that provide crucial food and cover for migrant songbirds. Another concern about neotropical migrants is the

large-scale loss of wintering habitat in the tropics, as forest is converted to agricultural fields and pasture.

FIDS as Umbrella Species

Forest birds are valued for their diverse beauty, distinct songs and behavioral characteristics and, for the migrants, the wonder of their seasonal journeys. Over 63 million Americans consider themselves to be birdwatchers. FIDS also act as an "umbrella species" for a wide range of forest benefits. The eastern deciduous forest is more than a group of trees. It is an ecosystem of plants and animals that has evolved over thousands of years. In addition to providing habitat for numerous species of wildlife, forests help to protect our watersheds from pollution and have a major effect on the stability of world climates by absorbing carbon dioxide and releasing oxygen. Diversity in bird species is a good indication of the quality, diversity and benefits found from forest habitat overall.

FIDS are an important component of a natural forest system. They spread seeds through their droppings, help control insect numbers and provide food to those higher on the food chain. The habitat needs of FIDS overlap those of many other plant and animal species including large mammals, many wildflower species, wood frogs and wild turkey. When sufficient habitat is protected to sustain a diversity of forest birds, other important components and microhabitats of the forest will be encompassed and be protected. These include the small, forested streams and headwaters critical for fish populations and the vernal pools necessary for the survival of amphibians.

Forest birds are also an important link in a complex food web. Warblers and other insectivores eat untold numbers of insects such as spruce budworms and caterpillars, helping to keep these defoliators in check (Yahner, 1995). Migratory birds journey north from points far south to breed due in part to the abundance of insects in North America in the spring. Without healthy populations of birds, these insects would consume significantly greater quantities of greenery.

The guidance that follows provides a way for landowners, developers and local governments to conserve this suite of birds and the forests on which they depend.

CRITICAL AREA PROVISIONS FOR FIDS HABITAT PROTECTION

The Chesapeake Bay Critical Area Program was established in 1984 with the passage of the Critical Area Act. The law mandated the development of regulations (Critical Area Criteria) by the Governor-appointed Critical Area Commission. Based on goals set forth by the Act, minimum requirements were developed to protect water quality, conserve plant and wildlife habitat and direct growth and development. These requirements are implemented through 61 county and municipal Critical Area Programs.

One of the requirements of the Criteria is the protection and conservation of breeding habitat for forest interior dwelling birds (FIDS). Specifically, the Criteria instruct local jurisdictions to develop Critical Area Programs to:

Protect and conserve those forested areas required to support wildlife species identified above in 'C(2)(a)(iii) and (iv) [these regulations refer to riparian forests and large forest tracts, respectively; see below "What is FIDS habitat"], by developing management programs which have as their objective, conserving the wildlife that inhabit or use the areas. The programs should assure that development activities, or the clearing or cutting of trees which might occur in the areas, is conducted so as to conserve riparian habitat, forest interior wildlife species and their habitat. Management measures may include incorporating appropriate wildlife protection elements into forest management plans and cluster zoning or other site design criteria which provide for the conservation of wildlife habitat. Measures may also include soil conservation plans that have wildlife protection provisions appropriate to the area defined above and incentive programs which use the acquisition of easements and other similar techniques [COMAR 27.01.09.04C(2) (b)(iv)].

The Criteria identify two FIDS habitat types for which conservation is mandated:

- (1) Existing riparian forests (for example, those relatively mature forests of at least 300 feet in width which occur adjacent to streams, wetlands, or the Bay shoreline, which are documented breeding areas) [COMAR 27.01.09.04C(2)(a)(iii)];
- (2) Forest areas utilized as breeding areas by forest interior dwelling birds and other wildlife species (for example, relatively mature forested areas within the Critical Area of 100 acres or more, or forest connected with these areas) [COMAR 27.01.09.04C(2)(a)(iv)].

Both definitions give <u>examples</u> of habitat sizes: riparian forests 300 feet or wider, forest tracts 100 acres or larger. Smaller forested areas may support FIDS depending on the characteristics of the forest tract and surrounding landscape and FIDS habitat may be absent in forests larger than 100 acres. Therefore, in addition to considering the acreage of a forest when identifying potential FIDS habitat, forest characteristics like forest age, shape, forest edge-to-area ratio, vegetative structure and composition, topography and degree of human disturbance should be taken into consideration as well as the character of the surrounding landscape, including

proximity to large forested areas, percent of contiguous forest in surrounding area, habitat quality of nearby forest tracts and adjacent land uses.

The following steps are recommended for local jurisdictions to develop, adopt and implement a FIDS protection element into their Critical Area Program:

- 1. Identify forest areas that are potentially viable breeding habitat for FIDS.
- 2. Incorporate FIDS habitat and forest protection into long-term planning efforts.
 - identify growth areas outside of large contiguous forested areas
 - evaluate zoning of forested areas during comprehensive planning
 - identify opportunities for conservation and protection of forest (i.e., Rural Legacy, public lands)
- 3. Incorporate FIDS habitat and forest protection into subdivision and zoning ordinances and site plan review.
 - adopt conservation site design standards into zoning and subdivision ordinances including provisions for mitigation when impacts are unavoidable.

FIDS OCCURRING IN THE CRITICAL AREA

Twenty-five species of Forest Interior Dwelling Birds potentially breed in the Critical Area (Table 1; Stewart and Robbins,1958, Iliff et al., 1996, Robbins and Blom, 1996). The majority are small songbirds such as warblers, vireos and flycatchers. Others include the Barred Owl, Whip-poor-will and several hawk and woodpecker species. Twenty of the 25 species are neotropical migrants that nest in temperate North America in the spring and summer and winter in Central and South America.

Although each species is associated with a particular set of forest conditions, all require relatively large, unfragmented forest blocks located within heavily forested landscapes or regions to successfully breed and maintain viable populations. Thirteen of the 25 species are *highly area-sensitive*, seldomly occurring in small, heavily disturbed or fragmented forests. Highly area-sensitive species are most vulnerable to forest loss, fragmentation and habitat degradation. They are generally rare or uncommon on the Maryland Coastal Plain and have highly specialized breeding habitat requirements. The presence of one highly area-sensitive bird species nesting in a forest during the breeding season is an indicator of high-quality FIDS habitat. A forest that supports populations of six or more of these species is considered exceptional habitat. Few such forests remain in eastern Maryland. The remaining 12 species exhibit less area-sensitivity, but require relatively large contiguous forests to maintain stable populations. A forest containing less than 4 of these 12 species is an indication of severe forest fragmentation and thus, marginal or low quality habitat. These forests may present opportunities for habitat restoration or enhancement. Where there is permanent fragmentation and there is no potential FIDS habitat, FIDS conservation is not required.

This edition of the guidance paper includes six additional revisions to the species list. Additions include broad-winged hawk, brown creeper, veery, black-throated green warbler, cerulean warbler. These species are widely recognized as FIDS and are included on the list because of recent documentation that these species breed on the Maryland Coastal Plain (Robbins and Blom, 1996). All five species are rare breeders on the Maryland Coastal Plain and, with the exception of veery, are highly area-sensitive. The presence of these species holding territory during the breeding season is an indication of high quality FIDS habitat.

A sixth addition to the species list is the wood thrush. Although it breeds Statewide, the wood thrush is experiencing significant population declines in Maryland and throughout much of its breeding range in eastern North America. It is negatively impacted by forest fragmentation and maintenance of viable populations requires large contiguous blocks of mature deciduous or mixed deciduous-conifer forest. One additional revision involves a change in the area-sensitivity designation for black-and-white warblers to "*highly area-sensitive*".

Common Name	Scientific Name	Safe Date ^b	Migratory Class ^c
Red-shouldered Hawk ^d	Buteo lineatus	Mav 1 - Aug 31	Temperate
Broad-winged Hawk ^d	Buteo nlatvnterus	June 5 - Aug 10	Neotropical
Barred Owl ^d	Strix varia	Jan 15 - Aug 31	Nonmigratory
Whip-poor-will	Caprimuleus vociferus	Mav 10 - Julv 15	Neotropical
Hairv Woodpecker	Picoides villosus	Mar 15 - Aug 31	Nonmigratorv
Pileated Woodpecker	Drvocopus pileatus	Mar 15 - Aug 31	Nonmigratorv
Acadian Flvcatcher	Empidonax virescens	Mav 25 - Aug 5	Neotropical
Brown Creeper ^d	Certhia americana	Mav 15 - Aug 31	Temperate
Veerv	Catharus fuscescens	June 10 - Aug 31	Neotropical
Wood Thrush	Hvlocichla mustelina	Mav 25 - Aug 20	Neotropical
Yellow-throated Vireo	Vireo flavifrons	Mav 25 - Aug 15	Neotropical
Red-eved Vireo	Vireo olivaceus	June 1 - Julv 31	Neotropical
Northern Parula	Parula americana	June 1 - Aug 15	Neotropical
Rlack_throated Green Warhler ^d	Dondroica virons wavnoi	Inne $10 - \Delta \log 5$	Neotronical
Cerulean Warbler ^d	Dendroica cerulea	Mav 25 - Aug 5	Neotropical
Black-and-white Warbler ^d	Mniotilta varia	Mav 15 - Julv 25	Neotropical
American Redstart ^d	Setophaga ruticilla	June 10 - Julv 20	Neotropical
Prothonotarv Warbler	Protonotaria citrea	Mav 10 - Julv 20	Neotropical
Worm-eating Warbler ^d	Helmitheros vermivorus	Mav 20 - Julv 20	Neotropical
Swainson's Warbler ^{d, e}	Limnothlvnis swainsonii	April 20 - Aug 31	Neotropical
Ovenbird	Seiurus aurocapillus	Mav 20 - Aug 5	Neotropical
Louisiana Waterthrush ^d	Seiurus motacilla	Mav 1 - Julv 10	Neotropical
Kentuckv Warbler ^d	Oporornis formosus	Mav 25 - Julv 15	Neotropical
Hooded Warbler ^d	Wilsonia citrina	Mav 25 - Julv 25	Neotropical
Scarlet Tanager	Piranga olivacea	May 25 - Aug 10	Neotropical

Table 1. List of Forest Interior Dwelling Bird species (FIDS) that potentially breed^a in the Critical Area.

^a Documentation of breeding evidence based on Stewart and Robbins (1958), Iliff et al. (1996), and Robbins and Blom (1996).

^b Safe dates, as listed in Robbins and Blom (1996), indicate the time of year when a species can be assumed to occupy a breeding territory.

^c Migratory classes: "neotropical" migrant - breeds in temperate North America and winters primarily in Central and South America; "temperate" migrant - breeds and winters primarily in temperate North America; "nonmigratory" - year-round resident with no migratory movements.

^d These species are <u>highly area-sensitive</u> and most vulnerable to forest loss, fragmentation and overall habitat degradation.

^e State-listed as Endangered.

HOW TO DETERMINE IF FIDS HABITAT IS PRESENT

The Critical Area Commission has determined that the presence of FIDS habitat, as used in the Criteria, should be based on the overall quality of FIDS habitat in a forested area. Accordingly, two methods may be used to determine if FIDS habitat is present. The first requires the evaluation of certain forest characteristics such as forest tract size, approximate forest age and forest edge:area ratio. The second method requires that a bird survey be conducted to determine which species are breeding in a particular forest, using appropriate bird survey methods and a qualified observer. Either method, as described below, may be used.

Habitat Determinations Based on Forest Characteristics

The presence and relative abundance or density of many forest nesting bird species is closely related to such features as forest area, age, shape and the proportion of edge habitat present (e.g., Whitcomb et al., 1981, Ambuel and Temple, 1983, Lynch and Whigham, 1984, Robbins et al., 1986, Askins et al., 1987, Keller et al., 1993). The Criteria provide two examples of forest areas that are considered potential FIDS habitat and are to be conserved in the Critical Area: 1) forest with 100 or more contiguous acres, and 2) riparian forest areas with a width of at least 300 feet [COMAR 27.01.09.04C(2)(a)]. In reality, forests that support FIDS have a wider range of characteristics. The following descriptions provide a more accurate guide for identifying FIDS habitat. When these conditions exist, habitat is assumed to be present and protection measures should be employed unless it is determined that the forest does not function as FIDS habitat.

- A. Forests at least 50 acres in size with 10 or more acres of "forest interior" habitat (i.e., forest greater than 300 feet from the nearest forest edge). The majority of the forest tract should be dominated by pole-sized or larger trees (5 inches or more in diameter at breast height), or have a closed canopy; <u>or</u>
- B. Riparian forests at least 50 acres in size with an average total width of at least 300 feet. The stream within the riparian forest should be perennial, based on field surveys or as indicated on the most recent 7.5 minute USGS topographic maps. The majority of the forest tract should be dominated by pole-sized or larger trees, or have a closed canopy.

In both cases, the size of the forest tract is based on the entire forest area, regardless of Critical Area boundaries or property lines. Two forests tracts may be considered unconnected or disjunct if they are separated by nonforested habitat which results in a permanent 30 - 50-foot break in the forest canopy (e.g., road, cleared right-of-way). The above forest characteristics are intended to be a guide. On occasion, FIDS may be present in smaller forests or absent in larger ones.

Habitat Determinations Based on Bird Surveys

A bird survey can be used in lieu of forest characteristics to determine if FIDS habitat is present; however, a survey is necessary only if an applicant (e.g., for a proposed development or timber harvest) refutes a habitat determination based on forest characteristics and seeks a confirmation of the bird species present. A confirmation is the responsibility of the applicant and must be based on current data obtained by a qualified observer using the bird survey methods described below.

Bird Survey Methods

The primary purpose of the bird survey (herein referred to as a "FIDS survey") is to determine the breeding status and approximate location of all bird species present, especially FIDS, in a given forest. This information is used to determine if FIDS habitat is present, as defined in the preceding section, and help develop appropriate conservation measures.

The Critical Area Commission requires the use of standard biological methods to conduct FIDS surveys. Accordingly, the following combination of methods are recommended: 1) point counts, 2) general searching or canvassing during early to mid-morning hours, and 3) canvassing during evening hours for nocturnal FIDS (e.g., Whip-poor-will, Barred Owl). The point count is a widely used quantitative bird survey method (Ralph et al., 1995). Detailed descriptions and evaluations of point count methodology are provided in such publications as Ralph and Scott (1981), Verner (1985), and Ralph et al. (1995). Generally, this method consists of an observer standing at a point or station for a standardized length of time (e.g., 10 minutes) and recording by species the number of all individual birds seen or heard. The count is then repeated at other stations (usually spaced at least 450-600 feet apart) located throughout a site or habitat. Canvassing, used in conjunction with point counts, helps to ensure that species which may be present are not missed and that sufficient observations have been made to accurately determine each species' breeding status. The minimum amount of field effort required to conduct a survey is three mornings (point counts and canvassing during daylight hours) and two evenings (canvassing for nocturnal species). Minimum standards for conducting FIDS surveys are as follows:

- Conduct point counts during May 25-June 30, between one-half hour before sunrise, four hours after sunrise. The likelihood of detecting most FIDS during the breeding season, especially songbirds, is greatest during early morning hours within this five-week period. Canvassing should be done during the same five-week period within "safe dates" as listed in Table 1.
- 2. The minimum number of point count stations that should be located in a forest area is as follows:

Forest Area	No. Point Count Stations
< 200 acres	\geq 1 station per 15 acres
\geq 200-500 acres	\geq 1 station per 25 acres

- 3. Locate point count stations at least 450 feet apart and, where possible, place them 150 feet or more from the nearest forest edge.
- 4. Point count stations should be distributed throughout potential FIDS habitat and located in a manner that attempts to maximize the number of forest interior dwelling bird species detected. Habitat associations of each species should be taken into consideration so that relatively species-rich habitats (e.g., mature or old forest, structurally diverse stands, riparian forest, coves and ravines), species with specialized habitat requirements (e.g., Louisiana Waterthrush) and highly area-sensitive species are not overlooked or under surveyed. If possible, stratify the number of stations by major forest type and age class (e.g., mature upland deciduous forest, mature deciduous floodplain forest, pole-stage mixed pine-hardwood forest).
- 5. Conduct at least three point counts per station, with each count occurring on a different morning and separated by at least five days.
- 6. During each point count, record the species (including nonFIDS), breeding code (e.g., 'X' for a species seen or heard in breeding habitat within safe dates; see Appendix A), sex and age, if possible, of each individual bird or breeding pair of birds seen or heard. Also, on each day, record the date, start and finish time, general weather conditions and observer name. Record similar information during canvassing efforts.
- 7. Conduct point counts only during appropriate weather conditions. Avoid days with precipitation, heavy fog and strong winds. Calm, seasonably warm conditions are best.
- 8. Canvassing for diurnal species should be conducted during early to mid-morning (about one-half hour before sunrise to four hours after sunrise). These surveys can be done on the same mornings as point counts. Canvassing can be used to upgrade the breeding status (e.g., from "possible" to "probable" or "confirmed") of select species or to search areas where no point count stations are located. Canvassing can be particularly useful to upgrade the breeding status of relatively inconspicuous species with large breeding territories (Hairy Woodpecker, Pileated Woodpecker and Red-shouldered Hawk). Point counts alone may fail to detect these species frequently enough to accurately determine their breeding status.
- 9. Canvassing for nocturnal species should be conducted on at least two evenings, separated by at least five days. Broadcasting taped recordings of Barred Owl and Whip-poor-will calls may increase the probability of detecting these species; <u>however, tape recordings</u>

must be used judiciously since birds may abandon breeding territories if the tapes are played too often. Once a target species is detected, stop using the recording that evening.

- 10. All surveys on a given forest tract, especially point counts, should be conducted by the same observer.
- 11. The person conducting the survey must be a <u>qualified observer</u>; i.e., capable of identifying all potentially occurring birds by sight and sound. A current list of qualified observers can be obtained by contacting the Maryland Department of Natural Resources (DNR) or the Critical Area Commission. A person is deemed qualified by DNR if he or she successfully completes a DNR administered field test on bird identification, or is recommended to DNR as qualified by at least two references experienced in forest bird identification. The references should be familiar with the candidate's skills and experience in bird identification and survey methods, particularly in forested habitats. For additional information, please contact the Critical Area Commission or DNR.
- 12. The minimum data reporting requirements to DNR and the Critical Area Commission are as follows:
 - a. For each point count station, the number, sex and age (if possible) of birds observed, by species, during each count.
 - b. A table listing the proposed breeding status (observed, possible, probable or confirmed) of each species observed in the survey area and, if appropriate, nearby or adjacent areas. A species shall be considered breeding at a given site if survey data support a "probable" or "confirmed" breeding status determination. (See Appendix A for definitions of these criteria.)
 - c. A map showing the location of each point count station and extent of canvassing.

Interpretation of Bird Survey Data

The Critical Area Commission and DNR provide final interpretation of survey data using the breeding status criteria listed in Appendix A as a guide. The entire forest tract is considered when determining the number and breeding status of forest interior dwelling bird species present.

If the survey yields either of the following results, FIDS habitat is present:

- A. At least four of the species listed in Table 1 are present with a "probable" or "confirmed" breeding status, as defined by Robbins and Blom (1996); or
- B. At least one highly area-sensitive species, as listed in Table 1, is present with a "probable" or "confirmed" breeding status.

CONSERVATION GUIDELINES

This section discusses planning tools that can be used to achieve long-term, wide-scale FIDS habitat conservation as well as FIDS conservation at the site-specific level.

A. Regional and Local Land Use Planning

The land use planning process, whether at the regional or local level, provides an opportunity to pro-actively address protection and conservation of FIDS habitat within and outside of the Critical Area. Land use planning efforts should be used to identify and protect the largest contiguous tracts of forest in a region. When possible, the quality of, and threats to, these habitat areas should be assessed in order to prioritize habitat areas for protection and conservation.

Land use planning tools, like mapping habitat areas or regional growth management, enable local jurisdictions to use local authority to minimize impacts to FIDS habitat at the site level and to protect the highest quality and most valuable forest and FIDS habitat in the region and over time. In addition, FIDS habitat conservation can encompass many other conservation goals that have been identified within a region. For example, by virtue of the size and composition of forest that is needed to protect FIDS, thousands more species will benefit from the protection of large high quality forest areas.

Land use planning tools, such as smart growth, flexibility in zoning and subdivision ordinances, can provide conservation of important forest habitat before it gets to the site planning stage. Growth Management and Smart Growth strategies enable local governments to direct growth away from forested and other sensitive resource areas and encourage development in areas with existing infrastructure.

Certain ordinances, regulations and development standards actually cause unintended forest fragmentation. In some cases, the goals of these ordinances may not allow for a great deal of flexibility, (e.g., public safety); however, wherever possible, these standards should be written to better achieve habitat and natural resources protection goals. Local governments should evaluate the effect of existing standards so that these standards do not result in unnecessary forest clearing, (i.e., requirements for large lots, extensive setbacks that increase the distance between lots, and wide roads).

In order to protect forest habitat, local ordinances should:

- provide flexibility in required road widths and frontage widths to eliminate/reduce gaps in the forest canopy
- reduce minimum lot size requirements to reduce the amount of land that is consumed by single family development
- encourage transfer of development rights from large forested regions to areas with existing infrastructure and fewer natural resources

- provide flexibility in area requirements for septic reserve areas where practicable
- require clustering to reduce forest fragmentation
- encourage shared driveways and shared septic systems to reduce openings in the forest.

See Appendix B for additional information on flexible ordinance language and development standards.

B. Site Design Guidelines for FIDS

In addition to land use planning, site design is an important approach to FIDS habitat conservation. In general, the greatest loss of FIDS habitat occurs when development fragments or intrudes into the forest interior or increases the area of forest edge. The following <u>Site Design</u> <u>Guidelines</u> (also in Appendix C) provide guidance to landowners and plan reviewers on how to achieve the greatest possible protection and conservation of FIDS habitat when development is proposed. A key to using the <u>Site Design Guidelines</u> is to determine and assess the amount of interior habitat that would be impacted under a proposed development scenario. When these guidelines are followed, the impacts to interior forest habitat are minimized.

Local governments should evaluate their existing subdivision and zoning ordinances to determine if they will allow the implementation of the following *Site Design Guidelines*.

Site Design Guidelines

- 1. Restrict development to nonforested areas.
- 2. If forest loss or disturbance is unavoidable, concentrate or restrict development to the following areas:
 - a. the perimeter of the forest (i.e., within 300 feet of the existing forest edge)
 - b. thin strips of upland forest less than 300 feet wide
 - c. small, isolated forests less than 50 acres in size
 - d. portions of the forest with low quality FIDS habitat, (i.e., areas that are already heavily fragmented, relatively young, exhibit low structural diversity, etc.).
- 3. Maximize the amount of forest "interior" (forest area > 300 feet from the forest edge) within each forest tract (i.e., minimize the forest edge:area ratio). Circular forest tracts are ideal and square tracts are better than rectangular or long, linear forests.
- 4. Minimize forest isolation. Generally, forests that are adjacent, close to, or connected to other forests provide higher quality FIDS habitat than more isolated forests.

- 5. Limit forest removal to the "footprint" of houses and to that which is necessary for the placement of roads and driveways.
- 6. Minimize the number and length of driveways and roads.
- 7. Roads and driveways should be as narrow as possible; preferably less than 25 feet in width and 15 feet in width, respectively.
- 8. Maintain forest canopy closure over roads and driveways.
- 9. Maintain forest habitat up to the edges of roads and driveways; do not create or maintain mowed grassy berms.
- 10. Maintain or create wildlife corridors.
- 11. Do not remove or disturb forest habitat during April-August, the breeding season for most FIDS. This seasonal restriction may be expanded to February-August if certain early nesting FIDS (e.g., Barred Owl) are present.
- 12. Landscape homes with native trees, shrubs and other plants and/or encourage homeowners to do so.
- 13. Encourage homeowners to keep pet cats indoors or, if taken outside, kept on a leash or inside a fenced area.
- 14. In forested areas reserved from development, promote the development of a diverse forest understory by removing livestock from forested areas and controlling white-tailed deer populations. Do not mow the forest understory or remove woody debris and snags.
- 15. Afforestation efforts should target a) riparian or streamside areas that lack woody vegetative buffers, b) forested riparian areas less than 300 feet wide, and c) gaps or peninsulas of nonforested habitat within or adjacent to existing FIDS habitat

See Figures 3A, 3B, and 3C for illustrations of several of the Site Design Guidelines.

GUIDELINES NOT FOLLOWED

GUDELINES FOLLOWED

GUIDELINES NOT FOLLOWED

GUDELINES FOLLOWED





Figure 3A. Restrict development to non-forested areas when possible or limit development to forest edge in order to maximize retention of forest interior.

GUIDELINES NOT FOLLOWED



GUIDELINES FOLLOWED



Figure 3B. Limit the amount of forest clearing, reduce the length of driveways and other roads, and cluster development to minimize impacts to forest.

GUIDELINES NOT FOLLOWED



Figure 3C. Maintain forest habitat to edge of roads and driveways and maintain canopy closure over roads, where possible.

DETERMINATION OF INTERIOR HABITAT LOSS

It will often be necessary to calculate the amount of forest interior on a site before development and after development. The following paragraph explains how to do this.

Direct habitat loss refers to the actual acreage of forest area that is cut or cleared. Interior habitat loss on a parcel refers to acres of forest interior that are cut or converted to edge. To determine the interior habitat of a parcel, the forested edge of 300 feet is subtracted from the total contiguous forest. The area left is forest interior provided it is at least ten acres in size. When the FIDS *Guidelines* (outlined above) are followed the amount of interior habitat loss will be minimized. When evaluating site design options for a particular property, potential impacts to interior habitat after development are compared to predevelopment interior habitat. The site plan that results in the least amount of interior habitat impacts is generally the better one. Figure 4 shows a schematic of a contiguous forest tract with edge habitat and interior habitat identified.

Figure 4. Edge vs. Interior



MITIGATION

The Criteria direct local jurisdictions to protect and conserve those forested areas necessary to support FIDS by developing a *management program* which has as its objective conserving the wildlife that inhabit or use the forested areas (COMAR 27.01.09.04). This provision requires the conservation and protection of all FIDS habitat, even that located on grandfathered lots. The primary objective of FIDS habitat conservation and protection is to preserve or retain the maximum amount of contiguous, undisturbed forest habitat, particularly the portion of forest that is interior habitat. This protection strategy requires that most existing FIDS habitat be preserved on-site. This can best be achieved by following the <u>Site Design Guidelines</u>; however, there are situations where FIDS habitat impacts occur even when the <u>Guidelines</u> are followed. Therefore, in order to meet the conservation and protection requirement, local jurisdictions should include in their management programs mitigation requirements that must be met whenever FIDS habitat is impacted.

Mitigation that results in the conservation and protection of FIDS habitat can be achieved in a number of ways. FIDS mitigation can, in many cases, be achieved on-site concurrently with general forest replacement requirements (reforestation) if the reforestation area expands or creates new FIDS habitat. Off-site mitigation should only be considered when no effective, long-term on-site habitat protection is possible. This determination should be made by the local jurisdiction with the input of DNR and the Critical Area Commission staff. The use of off-site mitigation, if well directed, may provide for the creation/protection of large, potentially high quality forests. This method of FIDS protection is similar to the concept of a "no net loss" made popular by wetland protection programs where impacts must first be avoided and only when avoidance is not possible, new habitat is created to replace wetlands lost.

For example, a large subdivision may be proposed on a site that contains forest that has been identified as FIDS habitat. Even if development is proposed predominantly in the nonforested areas of the site, some impacts to the forest edge may occur. While the <u>Site Design Guidelines</u> have been followed by avoiding direct impacts to the forest interior, there are still FIDS habitat impacts. These impacts should be mitigated by creating FIDS habitat on- or off-site.

In another example, there may be no options for avoiding impacts when developing a small forested grandfathered lot with a single-family dwelling. If it is determined that there are no alternative development scenarios where FIDS habitat impacts could be avoided, off-site mitigation may provide a better long-term FIDS habitat protection strategy.

As an alternative to requiring small property owners to find their own sites for FIDS mitigation, local jurisdictions may adopt a fee-in-lieu program under which the local jurisdiction would take responsibility for implementing the mitigation. A local government may be better equipped to ensure successful restoration and protection of a mitigation area as well as to help landowners of smaller properties meet requirements. The opportunity for creating and maintaining large forested habitat areas may be greater when a number of smaller projects are combined; however, it is recommended that in the case of impacts due to larger projects (e.g., new subdivision,

commercial development) the landowner or developer should be held responsible for locating the mitigation site.

How much mitigation should be required?

When FIDS habitat is impacted, the amount of FIDS mitigation required is based on the following:

- 1. A determination of whether or not the *Guidelines* are followed; * **
- 2. The number of acres of FIDS habitat that is directly cut; and
- 3. The number of acres of interior habitat loss (cut or converted to edge).

If it is determined that the <u>Guidelines</u> were followed, the amount of FIDS mitigation should equal **the number of acres of** *direct forest habitat loss*.

If it is determined that the <u>Guidelines</u> were not followed, the amount of FIDS mitigation should equal the number of acres of *direct forest habitat loss*, plus, two times the number of acres of *interior habitat loss* (FIDS habitat cut or converted to edge).

* Factors that may be taken into account when determining if the <u>Guidelines</u> can be followed include the size of the parcel, whether or not the parcel is grandfathered and site constraints that may limit development designs.

** One means to help evaluate whether an adequate attempt has been made to apply the <u>Guidelines</u> is to determine if a minimum of 80% of predevelopment forest interior will remain as viable habitat after development. This method should not be the only criteria that is considered. An attempt should always be made to apply all the <u>Guidelines</u> to every project.

The following steps are proposed as a method to determine the amount of interior habitat lost or impacted under a proposed development scenario.

- 1. Identify and calculate the acreage of all FIDS habitat on the parcel, taking into account all contiguous forest areas on and off the property. (See section on how to determine if FIDS habitat is present.)
- 2. Identify and calculate the pre-development acres of forest interior by delineating the 300foot wide forested edge and measuring the acreage of remaining interior habitat. (See Figure 6.)
- 3 Calculate the area of forest cut in the interior and edge of FIDS habitat. This area is considered the *direct forest habitat loss*.
- 4. Determine the post-development forest cover and remaining interior habitat by

delineating the proposed new edge habitat after development (300-foot wide forested edge) and measuring the acres of interior habitat that remain. Edge habitat is created whenever there is a minimum 30-foot wide break in the forest canopy (e.g., a road or lawn).

5. Subtract the post-development interior from the pre-development interior. This area is considered the *interior forest habitat loss*.

Appendix D is a FIDS Conservation Worksheet to use in helping to evaluate how well the <u>Guidelines</u> have been followed and to help with the calculation of any mitigation.

The following example demonstrates how two site designs with the same number of acres cleared can result in widely different levels of interior impacts.

Example:

Consider a 96-acre site purchased for development. The site is 70% forested with agricultural fields on the southwestern and the eastern edges of the parcel. The forest on the property is connected to a larger forest to the north. The entire forest both on and off the parcel is functioning as FIDS habitat. The owner proposes to build nine houses. He directs his consultant to design two different layouts for the nine lots. The consultant prepares two site plans and calculates the amount of direct and interior loss of FIDS habitat after development using the method described above. (See Figures 5A and 5B.)



FIDS Mitigation (Guidelines not followed) Direct FIDS forest loss = 21 acres Interior forest loss = 37 acres Mitigation = Direct FIDS forest loss + 2(interior forest loss) = 21 acres + 2(37) = 95 acre Figure 5B.

DEVELOPMENT SCENARIO 2 (Guidelines followed)



Mitigation = Direct FIDS habitat loss = 10 acres

The goal of mitigation is to provide long-term FIDS habitat; therefore, FIDS mitigation sites should contain or result in, through reforestation, a contiguous area of at least 100 acres with a minimum of 20 acres of interior. In those situations where it is not possible to find an appropriate area of 100 acres it may be possible to reduce the minimum size to 50 acres if the reforestation guidelines on the following page are followed. The minimum contiguous forested area does not have to be contained in one parcel. There should be a reasonable expectation that a mitigation area will remain undeveloped and forested in perpetuity. (For assistance in finding appropriate mitigation sites see Appendix E, Resources for Locating Mitigation Sites.)

Once the areas of *direct forest habitat loss* and *interior forest habitat loss* have been calculated and the required acreage of mitigation is determined, mitigation for the FIDS forest habitat losses may be either in the form of:

Creation of FIDS habitat through reforestation, or *Protection* of existing FIDS habitat once mitigation for direct losses have been met

For *direct forest habitat* impacts, all mitigation must result in the creation of new FIDS habitat.** Again, simple forest replacement proposed to meet the basic Critical Area reforestation requirements can satisfy the FIDS mitigation <u>only</u> if the reforestation area creates a new area of FIDS habitat or expands an existing habitat area.

**There may be some flexibility in dealing with grandfathered lots of 1 acre or less when a jurisdiction can demonstrate that other programs within the jurisdiction provide protection and creation of forests that will function as FIDS habitat. Examples of such programs include:

- using money from other mitigation fee-in-lieu funds to create FIDS habitat
- protecting forest lands through conservation programs such as Rural Legacy
- protecting forests outside of the Critical Area

Once mitigation for the direct forest habitat impact has been satisfied, mitigation for the *interior forest habitat* impact may be achieved either by creation of FIDS habitat (reforestation) or protection of existing FIDS habitat. However, when the protection option is chosen, the protected acres are given only half credit toward the required mitigation acres. Reforestation is given full credit toward meeting the interior forest habitat mitigation requirements while protection is only given one-half credit due to the fact that all forests in the Critical Area are afforded some protection under the Critical Area Criteria. While the long-term viability of existing FIDS habitat is improved with permanent protection, new habitat areas must be created to maintain and increase the area of viable FIDS habitat in the Critical Area.

Creation of FIDS habitat through reforestation

Reforestation to create FIDS habitat refers to the reestablishment of locally native forest on a currently nonforested site that will create a forest large enough to function as FIDS habitat. Reforestation through natural succession or planting is given full credit toward FIDS mitigation requirements. For example, if the total mitigation required for impacts to FIDS habitat is ten acres, then reforestation of ten acres of FIDS habitat would fulfill the FIDS mitigation requirement.

If mitigation creates new FIDS habitat through planting or natural regeneration, this mitigation may count toward the basic Critical Area forest replacement requirements; however, forest replacement may not count toward FIDS mitigation unless it creates FIDS habitat.

FIDS Reforestation Guidelines

- 1. Reforestation should be designed to maximize the area of interior habitat (see Figure 6).
- 2. Fill in gaps or openings in existing forested areas. Reforest nonforested peninsulas (see Figure 6).
- 3. Establish or extend a riparian forest buffer to provide a minimum buffer width of at least 300 feet. This reforestation should be part of a forest tract at least 50 acres in size (see Figure 6).
- 4. All mitigation, with the possible exception of that along a riparian area, should result in the establishment of a minimum forest tract size of 100 acres of which 20 acres is forest interior.*
- 5. Use natural succession and/or plantings of locally native tree and shrub species to create new habitat. Appropriate action, including the control of invasive species, should be taken to help ensure that the original forest type is replaced.
- 6. When enlarging forest patches, create shapes such as circles or squares which minimize edge and provide interior habitat.
- 7. Connect forest fragments to other forest or forest fragments with a corridor at least 300 feet in width.
- 8. The reforestation area should be comprised predominantly of hardwood. If planting, plans should be designed so that at the time of canopy closure at least 75% of the canopy tree species are locally native hardwoods.
- 9. All mitigation sites must be permanently protected through a conservation easement or

other legal mechanism (See Appendix F). No development may occur in these areas. Some timber harvesting may occur provided Critical Area timber harvest guidelines are followed.

* It may be possible to have a mitigation area less than 100 acres when a 50-100 acre mitigation site: -is adjacent to a major river corridor (e.g., Potomac, Choptank, Chester) or along the Bay especially along the tips of peninsulas----these landscape features provide FIDS breeding habitat and tend to be important migratory stopover areas for FIDS and other landbirds; - is located in a heavily forested landscape (>75% forest within 10km) and large forest tracts (>500 acres) are nearby (within 500 m); - contains old growth forest, unique natural communities and/or rare, threatened or endangered species;





Forest tract before reforestation: 117 acres Interior before reforestation: 40 acres



Reforestation acreage: 9 acres Forest tract after reforestation: 66 acres Interior after reforestation: 126 acres (This is a 61% increase in interior, with only an 8% increase in total forest tract size.)

Figure 6. Target mitigation to fill openings in existing forest and to extend or fill in gaps along riparian areas.

Protection of existing FIDS habitat as a form of mitigation refers to the permanent protection of existing forest habitat from development impacts. Protection may be achieved through the acquisition of the land, purchase of development rights and protection by conservation easements. Half credit toward the FIDS mitigation requirement is given. For example, if the mitigation required for FIDS habitat is 10 acres, then the protection of 20 acres of FIDS habitat would fulfill the mitigation requirement.

FIDS Protection Guidelines

- 1. All mitigation should result in the establishment of a minimum forest tract size of 100 acres of which 20 acres is forest interior. Generally, the larger the size of a forest tract, the greater the value for FIDS.
- 2. In most cases, the older a forest stand, the more valuable it is for the greatest number of FIDS.
- 3. Protect forest land adjacent to lands that are currently protected or are managed with a conservation objective (e.g., public lands, lands protected through land trusts, wetlands, habitat of threatened and endangered species.)
- 4. All mitigation sites must be permanently protected. No development may occur in these areas. Some timber harvesting may occur provided Critical Area timber harvest guidelines are followed. Refer to Appendix E for information on conservation easements.

For a list of information to submit to local government when proposing a mitigation site for either creation or protection of FIDS habitat see Appendix G.

Conclusion

Mitigation is just one part of an overall conservation strategy for FIDS in the Critical Area. The most effective FIDS conservation begins with avoiding development impacts to FIDS habitat through long-term land use planning and implementation of <u>Site Design Guidelines</u>. In a hierarchy of protection strategies for FIDS, mitigation is a last resort, to be used only after land planning and site design options have been exhausted.

Conservation of FIDS habitat should be considered in other existing voluntary and regulatory programs. Many land trusts, local and state government, and incentive programs are currently protecting forests that can serve as core tracts to add on to within a county or a region. FIDS conservation can, in many cases, be dovetailed with wetland protection and mitigation, threatened and endangered species protection and Forest Conservation Act requirements.

Cooperation across jurisdictional boundaries and between public and private interests will also greatly increase the effectiveness of FIDS conservation throughout the region.

The design principles represented in Figure 7 summarize landscape level conservation principles that apply to FIDS at both the large and small scale. It is important to keep these principles in mind when considering either the protection of existing habitat and/or mitigation for habitat impacts.

Figure 7. A schematic of preserve design principles as they apply to forest interior dwelling bird (FID) conservation; from Diamond (1975).















WORSE







A. Maximize forest tract size - a large forest is better than a smaller one.

B. Avoid fragmentation of existing contiguous forests - a single large forest is better than several smaller ones of the same total area.

C. Minimize forest isolation - forests in close proximity to each other are better than forests located far apart.

00

D. Maximize the juxtaposition of individual forest tracts.

E. Minimize the forest edge:area ratio - forests that approach a circle or square will provide a greater proportion of "interior" habitat than thin, narrow forests of the same total area.

F. Maximize connectivity between forests and the width of the connective corridors - forests that are effectively linked are better than disjunct forests.

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DEFINITIONS OF BREEDING STATUS CATEGORIES AND CODES.

There are 3 breeding categories: POSSIBLE, PROBABLE and CONFIRMED. Different codes exist within categories. The correct use of the categories and codes is essential for documenting breeding evidence.

POSSIBLE (always a 1-letter code)

- O Species <u>observed</u> at a site, but not in breeding habitat. This code is primarily for birds that are not believed to breed at the site. Flyovers and any species outside of "Safe Dates" (Table 1, page 10) with no further breeding evidence should be recorded as 'O'.
- X Species heard or seen in breeding habitat within Safe Dates. Be very cautious during migration periods.

PROBABLE (always a 1-letter code)

- A Agitated behavior or anxiety calls from adult. Parent birds respond to threats with distress calls or by attacking intruders. This does not include responses to "pishing" or tape playing of recorded calls.
- P <u>Pair</u> observed in suitable breeding habitat within safe dates. Use this code with caution.
- T <u>Territorial</u> behavior or singing male present at same location on at least <u>2</u> different days. Territoriality can be presumed from defensive encounters between individuals of the same species, or by observing a male singing from a variety of perches within a small area.
- C <u>Courtship</u> or <u>copulation</u> observed. This includes displays, courtship feeding, and birds mating.
- N Visiting probable <u>nest</u> site. This code applies when a bird is observed visiting a probable nest site repeatedly, but no further evidence is seen.
- B Nest <u>building</u> by wrens or excavation by woodpeckers. Both groups build dummy or roosting nests at the same time they are building a real one, but an unmated male will exhibit the same behavior.

<u>CONFIRMED</u> (always a 2-letter code)

NB Nest building (except wrens and woodpeckers) or adult carrying nesting material. _ Be cautious with this code since carrying sticks is part of the courtship ritual (Code 'C') for some species. Distraction display; including injury feigning. Agitated behavior (Code 'A') can D _ be mistaken for a distraction display. UN <u>Used nest found</u>. Use extreme caution. Nests are difficult to identify. If unsure, forget it - removing or collecting a nest is illegal without a permit. FL Recently fledged young or downy young. This includes dependent young. Be _ cautious of species that range widely soon after fledging. Don't forget to look for dead fledglings or nestlings along roads. FS Adult bird seen carrying fecal sac. Excreted feces of nestlings are contained in a _ membranous sac and often carried away from the nest by the parents. FY Adult carrying food for young. Be cautious since some species feed young long after wandering from a nest site or carry food for a long distance. Many also engage in courtship feeding (Code 'C'). Occupied nest. Presumed by activity of parents; entering nest hole and staying, ON _ parents exchanging incubation responsibilities, etc. Primarily intended for hole nesters and nests too inaccessible to see the contents. NE <u>Nest with eggs</u> or eggshells or ground. Identify these very carefully. _ NY _ Nest with young seen or heard.

Examples to use as guidelines; from the "Maryland and DC Breeding Bird Atlas Project Handbook"

- 1. Woodpecker drumming: POSSIBLE X within Safe Dates; PROBABLE T if same place 2 different days. This refers to territorial drumming not feeding.
- 2. Duck summers on pond without suitable adjacent marshes: POSSIBLE O.
- 3. Woodcock nuptial flights for 3 weeks: PROBABLE T (POSSIBLE X if observed only once); PROBABLE C if courtship and display to female observed.

- 4. Gulls frequenting dumps, plowed fields, parking lots throughout summer in unsuitable nesting habitat: POSSIBLE O.
- 5. Song Sparrow seen carrying nesting material: CONFIRMED NB.
- 6. Wood Thrush seen on nest for extended period of time, but too high to see contents: CONFIRMED ON.
- Great Blue Heron feeding along a river away from any known nesting area: POSSIBLE O. Watch such a bird closely. It could lead to a colony.
- 8. Second year American Redstart singing abnormal song in a hedgerow in early June: POSSIBLE O.
- 9. Male House Wren sings all summer and stuffs nest boxes with sticks; no evidence of a mate: PROBABLE B.
- 10. Male and female Scarlet Tanagers observed together several times in the same area, but no nest or young ever seen: PROBABLE P.

FLEXIBLE ORDINANCE LANGUAGE AND DEVELOPMENT STANDARDS

Adapted from the *Model Development Principles*, 1998. (Center for Watershed Protection, Website: www.cwp.org)

The following model development principles provide site design guidance for economically viable, yet environmentally sensitive development. The goal of using the principles is to provide planners, developers and local officials with benchmarks to investigate where existing ordinances may be modified to reduce impervious cover, conserve natural areas (e.g., forest and FIDS habitat) and prevent stormwater pollution. These development principles identify areas where existing codes and standards can be changed to better protect forest, streams and wetlands at the local level.

Residential Streets and Parking Lots (Habitat for Cars)

- 1. Design residential streets for the minimum required pavement width needed to support travel lanes; on-street parking; and emergency, maintenance and service vehicle access. These widths should be based on traffic volume.
- 2. Reduce the total length of residential streets by examining alternative street layouts to determine the best option for increasing number of homes per unit length.
- 3. Wherever possible, residential street right-of-way widths should reflect the minimum required to accommodate the travel-way, the sidewalk and vegetated open channels. Utilities and storm drains should be located within the pavement section of the right-of-way, wherever feasible.
- 4. Minimize the number of residential street cul-de-sacs and incorporate landscaped areas to reduce their impervious cover. The radius of cul-de-sacs should be the minimum required to accommodate emergency and maintenance vehicles. Alternative turnarounds should be considered.
- 5. Where density, topography, soils and slope permit, vegetated channels should be used in the street right-of-way to convey and treat stormwater runoff.
- 6. The required parking ratio governing a particular land use or activity should be enforced as both a maximum and a minimum in order to curb excess parking space.
- 7. Parking codes should be revised to lower parking requirements where mass transit is available or enforceable shared parking arrangements are made.

- 8. Reduce the overall imperviousness associated with parking lots by providing compact car spaces, minimizing stall dimensions, incorporating efficient parking lanes and using pervious materials in the spillover parking areas.
- 9. Provide meaningful incentives to encourage structured and shared parking to make it more economically viable.
- 10. Wherever possible, provide stormwater treatment for parking lot runoff using bioretention areas, filter strips and/or other practices that can be integrated into required landscaping areas and traffic islands.
- 11. Advocate open space development that incorporates smaller lot sizes to minimize total impervious area, reduce total construction costs, conserve natural areas, provide community recreational space and promote watershed protection.
- 12. Relax side yard setbacks and allow narrower frontages to reduce total road length in the community and overall site imperviousness. Relax front setback requirements to minimize driveway lengths and reduce overall lot imperviousness.
- 13. Promote more flexible design standards for residential subdivision sidewalks.
- 14. Reduce overall lot imperviousness by promoting alternative driveway surfaces and shared driveways that connect two or more homes together.
- 15. Clearly specify how community open space will be managed and designate a sustainable legal entity responsible for managing both natural and recreational open space.
- 16. Direct rooftop runoff to pervious areas such as yards, open channels, or vegetated areas and avoid routing rooftop runoff to the roadway and the stormwater conveyance system.
- 17. Create a variable width, naturally vegetated buffer system along all perennial streams that also encompasses critical environmental features such as the 100-year floodplain, steep slopes and freshwater wetlands.
- 18. The riparian stream buffer should be preserved or restored with native vegetation that can be maintained throughout the plan review, delineation, construction and occupancy stages of development.
- 19. Clearing and grading of forests and native vegetation at a site should be limited to the minimum amount needed to build lots, allow access and provide fire protection. A fixed portion of any community open space should be managed as protected green space in a consolidated manner.

- 20. Conserve trees and other vegetation at each site by planting additional vegetation, clustering tree areas and promoting the use of native plants. Wherever practical, manage community open space, street rights-of-way, parking lot islands and other landscaped areas to promote natural vegetation.
- 21. Incentives and flexibility in the form of density compensation, buffer averaging, property tax reduction, stormwater credits and by-right open space development should be encouraged to promote conservation of stream buffers, forests, meadows and other areas of environmental value. In addition, off-site mitigation consistent with locally adopted watershed plans should be encouraged.
- 22. New stormwater outfall should not discharge unmanaged stormwater into jurisdictional wetlands, sole-source aquifers, or other waterbodies.

APPENDIX C

SITE DESIGN GUIDELINES

The <u>Site Design Guidelines</u> provide guidance on how to achieve the greatest possible protection and conservation of FIDS habitat when development is proposed. The guidelines are recommended to be followed in order to minimize the impacts to interior forest habitat.

- 1. Restrict development to nonforested areas.
- 2. If forest loss or disturbance is unavoidable, concentrate or restrict development to the following areas:
 - a. the perimeter of the forest (i.e., within 300 feet of the existing forest edge)
 - b. thin strips of upland forest less than 300 feet wide
 - c. small, isolated forests less than 50 acres in size
 - d. portions of the forest with low quality FIDS habitat, (e.g., areas that are already heavily fragmented, relatively young, exhibit low structural diversity, etc.).
- 3. Maximize the amount of forest "interior" (forest area > 300 feet from the forest edge) within each forest tract (i.e., minimize the forest edge:area ratio). Circular forest tracts are ideal and square tracts are better than rectangular or long, linear forests.
- 4. Minimize forest isolation. Generally, forests that are adjacent, close to, or connected to other forests provide higher quality FIDS habitat than more isolated forests.
- 5. Limit forest removal to the "footprint" of houses and to that which is necessary for the placement of roads and driveways.
- 6. Minimize the number and length of driveways and roads.
- 7. Roads and driveways should be as narrow as possible; preferably less than 25 feet in width and 15 feet in width, respectively.
- 8. Maintain forest canopy closure over roads and driveways.
- 9. Maintain forest habitat up to the edges of roads and driveways; do not create or maintain mowed grassy berms.
- 10. Maintain or create wildlife corridors.
- 11. Do not remove or disturb forest habitat during April-August, the breeding season for most FIDS. This seasonal restriction may be expanded to February-August if certain early nesting FIDS (e.g., Barred Owl) are present.

- 12. Landscape homes with native trees, shrubs and other plants and/or encourage homeowners to do so.
- 13. Encourage homeowners to keep pet cats indoors or, if taken outside, kept on a leash or inside a fenced area.
- 14. In forested areas reserved from development, promote the development of a diverse forest understory by removing livestock from forested areas and controlling white-tailed deer populations. Do not mow the forest understory or remove woody debris and snags.
- 15. Afforestation efforts should target a) riparian or streamside areas that lack woody vegetative buffers, b) forested riparian areas less than 300 feet wide, and c) gaps or peninsulas of nonforested habitat within or adjacent to existing FIDS habitat.

APPENDIX D

FIDS CONSERVATION WORKSHEET

Parcel size

_____ total acreage

			Cifical Area acreage
	Existing Forest cover Forest cover FIDS habitat* FIDS interior		total contiguous acreage total acres CA total acres CA acres CA
	Calculate interior by subtractin	ng out a 300 ft. edg	ge.**
in	If available:		acreage of contiguous forest area both
			and out of the CA within a 3-mile radius.
	Post development		
	Forest cover		total acres CA
	FIDS habitat		total acres CA
	Interior habitat remaining Interior acreage		acres CA

Critical Area acreage

*How to Identify FIDS Habitat

Assume FIDS habitat is present if a forest meets either of the following minimum conditions:

Forests at least 50 acres in size with 10 or more acres of forest interior (see below to calculate interior) habitat. The majority of the forest tracts should be dominated by pole-sized or larger trees (5 inches or more in diameter at breast height), or have a closed canopy; or

Riparian forests at least 50 acres in size with an average total width of at least 300 feet. The stream within the riparian forest should be perennial, based on field surveys or as indicated on the most recent 7.5 minute USGS topographic maps. The majority of the forest tracts should be dominated by pole-sized or larger trees, or have a closed canopy.

In lieu of using the above criteria for determining if FIDS habitat is present, a FIDS survey may be done by a qualified FIDS observer. See page 12 of the Guidance Document for the procedures to be followed. You may contact the Maryland Department of Natural Resources, Forest Wildlife Divisions or the Critical Area Commission for a list of qualified observers.

**How to Measure the amount of forest interior and forest edge

To determine the amount of interior in a forest, the edge of 300 feet is subtracted from the total contiguous forest. The area left is forest interior provided it is at least ten acres in size.

When measuring forest edge, do not include natural forest edges such as those adjacent to open water, nonforested wetlands and streams. Riparian forests of 300 feet or greater are considered interior habitat when calculating FIDS habitat in the Critical Area provided that they have a minimum of 50 contiguous acres or are connected to a forest that has been determined to be FIDS habitat.

<u>Please answer the following questions regarding the FIDS Site Design Guidelines</u> and how they were applied to the project.

1.	Has development (e.g., house, septic reserve areas, driveway) been		
	restricted to nonforested areas?	Yes	_No

If no, explain

2.	If development has not been restricted to nonforested areas, has
	development been restricted to:

a. perimeter of the forest within 300 feet of the forest edge?	YesNo
b. thin strips of upland forest less than 300 feet wide?	YesNo
c. isolated forests less than 50 acres in size?	YesNo
d. portions of the forest with low quality FIDS habitat, (e.g., areas that are heavily fragmented, relatively young,	
exhibit low structural diversity, etc.)?	YesNo

Yes___No____

3. Have new lots been restricted to existing nonforested areas and/or forests as described in #2 above?

If no, please explain how property owners will be prevented

from clearing in the FIDS habitat on their property (i.e., protective covenants/easements)?

4. Will forest removal be limited to the footprint of the house and

that which will be necessary for the placement of roads and driveways	? Yes_	No_
Have the number and lengths of roads been minimized?	Yes	No_
Have the width of roads and driveways been reduced to 25 feet and 15 feet respectively?	Yes	No_
If no, explain		
Will the forest canopy be maintained over roads and driveways?	Yes	No_
Will the forest canopy be maintained up to the edge of roads and driveways?	Yes	No_
Will at least 80% of the forest interior be maintained after development?	Yes	No_
If no, indicate percentage of forest interior that will be maintained?		%
Are there special conditions on the site that limit where houses and other development activities may be located such as wetlands, steep slopes, etc.? If so, please identify and explain.		
Do you believe that the <i>Site Design Guidelines</i> have been followed		
and that FIDS habitat has been conserved on this site?	Yes	No

MITIGATION REQUIREMENTS

If the *Site Design Guidelines* <u>have</u> been followed the required mitigation will be the creation of FIDS habitat equal to the acreage being directly cut or disturbed. (See pages 27 - 28 for specific mitigation options and criteria.)

Enter acreage of FIDS habitat that is being directly impacted ______acres.

THIS IS YOUR MITIGATION REQUIREMENT WHEN THE SITE DESIGN GUIDELINES ARE FOLLOWED.

If the Site Design Guidelines have not been followed complete the following.

A.	Pre-development FIDS habitat	 acres.
B.	Post development FIDS habitat	 acres.
C.	Pre-development FIDS habitat interior	 acres.
D.	Post development FIDS habitat interior	 acres.
E.	FIDS habitat being directly impacted	 acres.
	(Subtract B from A)	
F.	Interior lost due to development	 acres.
	(Subtract D from C)	
G.	Multiply F. times two (2)acres and add to E. =	 acres.

THIS IS YOUR MITIGATION REQUIREMENT WHEN THE DEVELOPMENT GUIDELINES HAVE NOT BEEN MET.

APPENDIX E

RESOURCES FOR LOCATING MITIGATION SITES

In order to assist local jurisdictions in the implementation of the FIDS guidance and the recommendation that forest habitat mitigation be required whenever impacts to FIDS habitat take place onsite, the following State and local programs are outlined. Each of the following programs may be used by local governments, planning staff, landowners and developers to identify appropriate mitigation sites for FIDS habitat planting and protection of existing FIDS habitat. The State Critical Area staff are available to assist in the identification of the most appropriate program for meeting mitigation requirements.

The Green Infrastructure Network (MD Department of Natural Resources):

Using Geographic Information Systems principles and landscape ecology, DNR has mapped an interconnected network of natural lands across the State described as "hubs" and "corridors" that are prioritized for conservation and restoration activities based on their ecological significance (e.g., large contiguous areas of forest, sensitive species, important wetlands or stream, etc.) and the level of threat (e.g., protection status, development pressures, etc.). The goal of the Green Infrastructure Assessment is to help identify an ecologically sound open space network and ultimately, to incorporate this valuable network into State and local land conservation planning efforts.

Green Infrastructure areas have been identified on public and private lands throughout the State through a series of maps and a database developed by DNR. Because only limited Statewide data is available to define this network, the help of local governments, land trusts, citizens and scientific experts is needed in this cooperative endeavor to further refine and identify the Green Infrastructure land network and effectively incorporate this information into State and local planning efforts.

The purpose of the Green Infrastructure land network is to create a coordinated Statewide approach to land conservation and restoration that will identify and protect lands with important ecological and biodiversity characteristics; address problems of forest fragmentation, habitat degradation and water quality; maximize the influence and effectiveness of public and private land conservation investment; promote shared responsibility for land conservation between public and private sectors and guide and encourage compatible uses and land management practices.

In addition, the Green Infrastructure land network could be used by local governments or developers to identify areas where FIDS mitigation, either habitat creation or protection, will achieve the goal of creating or enhancing viable FIDS habitat and be the most valuable. When refined on the local level, the Green Infrastructure Assessment may be useful in assessing the potential natural resource related impacts of a proposed development and in identifying opportunities for natural resources and habitat enhancement activities.

APPENDIX F

CONSERVATION EASEMENTS

For the purpose of protecting and maintaining FIDS habitat, conservation easements should meet the following minimum conditions:

- * The agreement should be between the property owner (grantor) and the local government and/or a land conservancy group (grantees).
- * Restrictions on the property include the loss of development rights for the construction of houses and other structures.
- * New agricultural activities are prohibited, (i.e., clearing, draining, construction).
- * Any harvesting of timber must be done under an approved Timber Harvest Management Plan that would include a review for impacts to FIDS habitat.
- * Recreational activities may be allowed provided they do not alter the character of the forest and do not cause undue disturbance during the breeding season.
- * The easement shall be created in perpetuity.

Conservation easements should be held by either a local government agency and/or a local land trust that is willing and able to monitor compliance with agreements. An ideal situation is for both a local government agency and local land trust to jointly hold an easement on a property and be responsible for its enforcement. Often local land trusts are better set up than government agencies to monitor the easements for which they are responsible. There are approximately 40 local land trusts in Maryland.

The hub and corridor information and maps that have been developed at the State and regional level will be available to local governments and can be used to identify target areas that may be best suitable for targeting FIDS mitigation.

Contact:

Ms. Teresa Moore, Executive Director Maryland Greenways Commission Chesapeake Coastal and Watershed Service Tawes State Office Building, E-2 Annapolis, MD 21401 (410) 260-8780 FAX (410) 260-8709

Rural Legacy

The mission of the Rural Legacy Program is to protect regions rich in a multiple of agricultural, forestry, natural and cultural resources that, if conserved, will promote resource-based economies, protect green belts and greenways and maintain the fabric of rural life. The Rural Legacy Program provides the focus and funding necessary to protect large contiguous tracts of land and other strategic areas from sprawl development and enhance natural resources, agricultural, forestry and environmental protection through cooperative efforts among State and local governments and land trusts. Protection is provided through the acquisition of easements and fee estates from willing landowners and the supporting activities of Rural Legacy Sponsors and governments.

Application for Rural Legacy Program grants may be made by a Sponsor (defined as one or more local governments, or land trusts endorsed by local governments) to the Rural Legacy Board. The applications include a description of the area, an identification of existing, protected lands and the anticipated level of initial landowner participation in the program, a Rural Legacy Plan complying with the Rural Legacy criteria and a proposed grant amount.

Contact:

Rural Legacy Program Department of Natural Resources Program Open Space Tawes State Office Building, E-4 Annapolis, MD 21401 (410) 260-8403

Critical Area Forest/FIDS Mitigation and the Conservation Reserve Enhancement Program (CREP):

In some counties, fee-in-lieu monies could be used to plant trees and purchase easements in conjunction with the U.S. Department of Agriculture Conservation Reserve Enhancement Program (CREP). CREP is a nationwide program that promotes the planting of streamside buffers and the restoration of wetlands on agricultural land by offering financial incentives to landowners who voluntarily remove land from agricultural production for a period of 10-15 years. A recent component of this program is also the purchase of perpetual easements on qualifying lands. This is where the greatest potential exists for CREP and the Critical Area Program to combine forces to create and protect FIDS habitat. CREP will only pay for the first 150 feet adjacent to a waterbody. An area planted with Critical Area monies would be located landward of the 150-foot CREP forested buffer.

Planting Forested Buffers

The benefits offered to property owners would match the CREP bonus payments and cost-share. An area planted with Critical Area monies would be located landward of the 150-foot CREP forested buffer. Both the CREP and the Critical Area portions would be put in a perpetual easement to be held and enforced by the local Soil Conservation District (SCD), local land trust, or DNR. The benefits to the local Critical Area Programs include:

- The identification of forest/FIDS mitigation sites in the Critical Area to fulfill mitigation requirements and ensure no net loss of forest.
- Monitoring and enforcement of the mitigation sites would be in the hands of the Soil Conservation District, land trusts, or DNR, taking some burden off of the counties and helping to ensure that the trees are planted and survive.

Purchase of Easements on Existing Forest

Fees-in-lieu above the 1:1 mitigation ratio can be used for creative projects that help to restore/protect habitat and water quality. The monies could be used to purchase easements on forested areas in the Critical Area that are contiguous or near a CREP easement site.

Process

Some county planners are looking for ways to spend fee-in-lieu money. Local landowners may be interested in planting more acreage than is provided under CREP. In order to merge these two interests, local planners need to maintain communication with the Soil Conservation District and local land trusts so that interested landowners can take advantage of this additional funding source.

In some jurisdictions, county planners are looking for ways to spend fee-in-lieu and forest mitigation money. Local landowners may be interested in planting more acreage than is provided under CREP. In order to merge these two interests, local planners can be contacted to see whether there is any money available for interested landowners.

- 1. Landowner contacts local NRCS/SCD office or works with a local land trust regarding CREP contract and easement.
- 2. Landowners interested in obtaining this additional funding should contact their county Critical Area planner to find out if there are any funds available.
- 3. If money is available and the landowner decides to utilize Critical Area money for tree planting and an easement, then the landowner would go through the normal easement process (negotiate easement lines with DNR staff, submit easement applicant via local partner, receive bonus payment from the Board of Public Works in conjunction with a check from the local government for tree planting and easement, easement is executed and recorded).
- 4. Long-term monitoring and stewardship would be handled by DNR and a local partner (land trust, SCD).

Payments

For a county to combine FIDS mitigation with CREP, the fee-in-lieu amount charged to those property owners that cannot mitigate on-site would have to be comparable to the rates paid out by the CREP program. CREP pays up to 100% of the cost of tree buffers in addition to a bonus payment for every acre of trees restored and placed under a permanent easement. The bonus payment ranges, based on the county, from \$693 to \$2,716 per acre.

To learn more about the CREP program, landowners should contact their local NRCS office. To learn more about the easement, contact Jeff Horan, Deputy Director of Forest, Wildlife and Heritage at DNR.

State Highway Administration

A local government or a project applicant can contact the Maryland State Highway Administration (SHA) to see if they have information on sites within a particular watershed or county. They often will have property owner information for potential mitigation sites and knowledge on whether an owner is interested in selling or not. They will also sell any extra acreage from their own mitigation (usually wetland) sites, resulting from SHA project impacts. These sites will not always be forested, but in many cases they are.

Contact:

Todd Nichols Phone: 410-545-8628 FAX: 410-209-5003 E-mail: <u>tnichols@SHA.state.md.us</u>

Maryland Land Trusts:

There are a number of active land trusts throughout the State of Maryland whose goals and objectives include permanent protection of natural resources areas through the use of land conservation tools such as conservation easements and land purchase. The following list of Maryland Local Land Trusts in the State is updated regularly by the Maryland Environmental Trust.

Contact:

Nick Williams Maryland Environmental Trust 100 Community Place, First Floor Crownsville, MD 20132 (410) 514-7907 FAX: (410) 514-7919

What is a land trust?

A land trust is nonprofit organization devoted to land preservation. It can be private, nonprofit or public, like MET. Nationwide, land trusts assist conservation-minded property owners to preserve natural areas, farms, forests and scenic openspace without giving up ownership. Property owners that work with land trusts to protect their land have made a voluntary decision to preserve the beauty of their land, forever.

Your Local Land Trusts

In 1988, the Maryland Environmental Trust (MET) developed the Local Land Trust Assistance Program to assist citizen groups in formation and operation of land trusts by offering training, technical assistance, administrative and project grants and membership in the Maryland Land Trust Alliance. Today, the program works with over 40 private nonprofit land trusts. These land trusts can hold <u>conservation easements</u> independently or jointly with MET (currently 40,000 acres are co-held between a local land trust and MET). In addition, some of these land trusts acquire and manage land.

Many people want to have their conservation easements co-held by a local land trust. See below for list. MET can advise you as to which organizations work in your area.

Organization	Address	Daytime Phone
Accokeek Foundation	3400 Bryant Point Road Accokeek, MD 20627	(301) 283-2113
American Chestnut Land Trust	Box 204 Port Republic, MD 20676	(410) 586-1570
Annapolis Conservancy Board	160 Duke of Gloucester St. Annapolis, MD 21401 20627	(410) 263-7949
Bay Ridge Trust	9 Lawrence Avenue Annapolis MD 21403	(410) 626-0342
Broad Creek Conservancy	1201 Swan Harbor Circle Broad Creek, MD 20744	(301) 292-6318
Calvert Farmland Trust	P.O. Box 3448 Prince Frederick, MD 20678	(410) 414-5070
Carroll County Land Trust	P.O. Box 2137 Westminster, MD 21157	(410) 848-9172
Caves Valley Land Trust	2522 Caves Road Owings Mills, MD 21117	(410) 244-7656

MARYLAND LOCAL LAND TRUSTS

Cecil Land Trust	2522 135 East Main St. Elkton, MD 21921	(410) 392-9667
Central Maryland Heritage League	P.O. Box 721, Middletown, MD 21769	(301) 371-7090
Chesapeake Habitat Restoration Trust	13630 Georgia Avenue Silver Spring, MD 20906	(410) 991-7011
Conservancy for Charles County	1170 Overlook Accokeek, MD 20607	(301) 283-2410
Cove Point Natural Heritage Trust	18-T Ridge Road, Greenbelt, MD 20770	(301) 345-6390
Eastern Shore Land Conservancy	P.O. Box 169 Queenstown, MD 21658	(410) 827-9756
Franklintown Land Trust	5100 Maple Park Avenue Baltimore, MD 21207	(410) 448-0779
Greater Sandy Spring Green Space	20120 New Hampshire Ave Brinklow, MD 20862	(301) 774-6135
Gunpowder Valley Conservancy	16940 York Road, Suite 201, Monkton, MD 21111	(410) 329-8074
Harford Land Trust	P.O. Box 385 Churchville, MD 21028	(410) 836-2103
Harpers Ferry Conservancy	P.O. Box 1350 Harpers Ferry, WV 25425	(304) 535-9961
Howard County Conservancy	P.O. Box 175 Woodstock, MD 21163-0175	(410) 465-8877
Kensington Land Trust	P.O. Box 602 Kensington, MD 20895	(301) 933-8756
Land Preservation Trust	Exec. Plaza 1 11350 McCormick Rd Hunt Valley, MD 21031	(410) 771-9900x106
Long Green Valley Conservancy	12815 Kanes Road Glen Arm, MD 21057	(410) 592-2381
Lower Shore Land Trust	213 Downtown Plaza, City Center, Suite 305 Salisbury, MD 21801	(410) 341-6575

Magothy River Land Trust	P.O. Box 126 Severna Park, MD 21146	(410) 233-1660
Manor Conservancy	P.O. Box 448 Monkton, MD 21111	(410) 659-1315
Maryland Mountain Trust	P.O. Box 604 Grantsville, MD 21536	(301) 334-3963
Monocacy Watershed Conservancy	P.O. Box 4253 Frederick, MD 21705	(301) 663-9303
Mt. Washington Preservation Trust	1807 South Road Baltimore, MD 21209	(410) 466-4270
North County Land Trust	7605 Bay St. Pasadena, MD 21122	(202) 261-1614
Patuxent Watershed Land Trust	8508 Timber Pine Court Ellicott City, MD 21043	(410) 418-5222
Patuxent Tidewater Land Trust	P.O. Box 1955 Leonardtown, MD 20650	(301) 475-1795
Potomac Conservancy	1730 North Lynn St, Ste 403 Arlington, Virginia 22209	(703) 276-2777
Prettyboy Watershed Preservation Society	4318 Beckeysville Road Hampstead, MD 21074	(410) 239-3524
Rockburn Land Trust	6560 Belmont Woods Road Elkridge, MD 21227	(410) 467-7774
Save Historic Antietam Foundation	P.O. Box 550 Sharpsburg, MD 21782	(301) 790-2800x298
Severn River Land Trust	P.O. Box 2008 Annapolis, MD 21404	(410) 424-4000
South County Conservation Trust	P.O. Box 82 Churchton, MD 20733	(410) 867-1756
South Mountain Heritage Society	P.O. Box 509 Burkittsville, MD 21718	(301) 834-7851
Stronghold Corporation	Dickerson, MD 20842	(301) 874-2024

Tree-Land Foundation	P.O. Box 535 Myersville, MD 21773	(301) 663-1122
Western Shore Conservancy FPNA	2808 Church Road Bowie, MD 20721	(301) 390-0797
Wildlife Land Trust/CWS	17308 Queen Anne's Bridge Rd. Bowie, MD 20716	(301) 390-7010
Woodland Committee Land Trust	2403 W Rogers Avenue Baltimore, MD 21209	(410) 367-8855

APPENDIX F

CONSERVATION EASEMENTS

For the purpose of protecting and maintaining FIDS habitat, conservation easements should meet the following minimum conditions:

- * The agreement should be between the property owner (grantor) and the local government and/or a land conservancy group (grantees).
- * Restrictions on the property include the loss of development rights for the construction of houses and other structures.
- * New agricultural activities are prohibited, (i.e., clearing, draining, construction).
- * Any harvesting of timber must be done under an approved Timber Harvest Management Plan that would include a review for impacts to FIDS habitat.
- * Recreational activities may be allowed provided they do not alter the character of the forest and do not cause undue disturbance during the breeding season.
- * The easement shall be created in perpetuity.

Conservation easements should be held by either a local government agency and/or a local land trust that is willing and able to monitor compliance with agreements. An ideal situation is for both a local government agency and local land trust to jointly hold an easement on a property and be responsible for its enforcement. Often local land trusts are better set up than government agencies to monitor the easements for which they are responsible. There are approximately 40 local land trusts in Maryland.

INFORMATION REQUIRED FOR MITIGATION SITE DEVELOPMENT PLAN

- 1. A brief description of mitigation requirements based on the associated development project and how the mitigation plan will meet these requirements.
- 2. A brief description of the FIDS habitat that is being impacted including acreage, amount of interior lost, dominant tree and shrub species and aquatic and/or other features that help define habitat characteristics.
- 3. Include a site location map depicting the geographic relationship between the impact site and proposed mitigation site and a vicinity map with enough detail to locate the site for monitoring purposes.
- 4. Describe the existing land use and ownership, adjacent land use and position in the landscape in relation to other forest tracts.
- 5. Describe the proposed plant communities that will be created/protected. If creating FIDS habitat, indicate if natural regeneration or plantings will be used.
- 6. If natural regeneration is proposed, describe the likely seed source, any site or soil preparation that will be undertaken, control measures for invasive species, measures to protect from wildlife grazers, etc.
- 7. If planting, provide a list of trees and shrubs to be planted, planting densities, control measures for invasive species, measures to protect from wildlife grazers and soil and/or site preparations, watering regime, etc.
- 8. Provide assurance of the legal right to use the proposed property for mitigation (e.g., letter of intent, option to purchase, etc.).
- 9. Indicate who will be responsible for monitoring and a description of information that will be provided in the monitoring reports.

Appendix K

Critical Area Buffer Regulations

Title 27 CRITICAL AREA COMMISSION FOR THE CHESAPEAKE AND ATLANTIC COASTAL BAYS

Subtitle 01 CRITERIA FOR LOCAL CRITICAL AREA PROGRAM DEVELOPMENT

Authority: Natural Resources Article, §8-1806, Annotated Code of Maryland

1. Buffer.

- A. In this Appendix, the following terms have the meanings indicated.
- B. Terms Defined.
 - (1) "Accessory structure" means a structure that is detached from the principal structure, located on the same lot and customarily incidental and subordinate to a principal structure.
 - (2) "Addition" means construction that increases the size of a structure.
 - (3) "Buffer Management Plan" means a narrative, graphic description, or plan of the Buffer that is necessary when an applicant proposes a development activity that will affect a portion of the Buffer, affect Buffer vegetation, or require the establishment of a portion of the Buffer in vegetation. Buffer Management Plan includes a major Buffer Management Plan, a minor Buffer Management Plan, or a Simplified Buffer Management Plan.
 - (4) "Caliper" means the diameter of a tree measured at 2 inches above the root collar.
 - (5) "Canopy tree" means a tree that, when mature, reaches a height of at least 35 feet.
 - (6) "Financial assurance" means a performance bond, letter of credit, cash deposit, insurance policy, or other instrument of security acceptable to a local jurisdiction.
 - (7) "In-kind replacement" means the removal of a structure and the construction of another structure that is smaller than or identical to the original structure in use, footprint area, width, and length.
 - (8) "Invasive species" means a type of plant that is non-native to the ecosystem under consideration and whose introduction causes, or is likely to cause, economic or environmental harm or harm to human health.
 - (9) "Landward edge" means the limit of a site feature that is farthest away from a tidal water, tidal wetland, or tributary stream.
 - (10) "Large shrub" means a shrub that, when mature, reaches a height of at least six feet.
 - (11) "Major buffer management plan" means a plan and supporting documentation required under Section 4.J of this Appendix.
 - (12) "Minor buffer management plan" means a plan and supporting documentation required under Section 4.1 of this Appendix.
 - (13) "Native plant" means a species that is indigenous to the physiographic area in

Maryland where the planting is proposed.

- (14) "Natural regeneration" means the natural establishment of trees and other vegetation with at least 400 free-to-grow seedlings per acre, which are capable of reaching a height of at least 20 feet at maturity.
- (15) "Simplified buffer management plan" means a plan required for an application under Section 4.H of this Appendix.
- (16) "Structure" means building or construction materials, or a combination of those materials, that are purposely assembled or joined together on or over land or water, including a temporary or permanent fixed or floating pier, piling, deck, walkway, dwelling, building, boathouse, platform, gazebo, and a shelter for the purpose of marine access, navigation, working, eating, sleeping, or recreating.
- (17) "Substantial alteration" means any repair, reconstruction, replacement, or improvement of a principal structure, where the proposed total footprint is at least 50 percent greater than that of the existing principal structure.
- (18) "Understory tree" means a tree that, when mature, reaches a height between 12 and 35 feet.
- (19) "Upland boundary" means the landward edge of a tidal wetland or a nontidal wetland.
- C. Policies. In developing their Critical Area programs, local jurisdictions shall use the following policies with regard to the buffer:
 - (1) Provide for the removal or reduction of sediments, nutrients, and potentially harmful or toxic substances in runoff entering the Bay and its tributaries;
 - (2) Minimize the adverse effects of human activities on wetlands, shorelines, stream banks, tidal waters, and aquatic resources;
 - (3) Maintain an area of transitional habitat between aquatic and upland communities;
 - (4) Maintain the natural environment of streams; and
 - (5) Protect riparian wildlife habitat.

D. Authority of Secretary; Scope; Alternative Procedures and Requirements.

(1) The provisions stated herein may not be construed to limit the authority of the Secretary of Agriculture under Agriculture Article, Title 9, Subtitle 4, Annotated Code of Maryland.

- (2) The provisions of Sections 2-7 of this Appendix do not apply to an area of the buffer that is designated as a modified buffer area under Section 8 of this Appendix.
- (3) A local jurisdiction may adopt alternative procedures and requirements for the provisions stated herein, if:
 - (a) The alternative procedures and requirements are at least as effective as the Critical Area program under Natural Resources Article, Title 8, Subtitle 18, Annotated Code of Maryland, regulations adopted under the authority of that subtitle, and any additional requirements of the local program; and
 - (b) The Commission has approved those alternative procedures and requirements.
- E. Buffer Standards.
 - (1) A local jurisdiction may authorize disturbance in the buffer for:
 - (a) A new development activity or a redevelopment activity:
 - (i) Associated with a water-dependent facility under COMAR 27.01.03
 - (ii) Located in an approved modified buffer area under Section 8 of this Appendix; or
 - (iii) In accordance with E.(8) of this Section; or
 - (b) In accordance with COMAR 26.24.02, a shore erosion control measure under COMAR 27.01.04.
 - (2) Except as authorized under E.(1) of this Section, a local jurisdiction may not authorize disturbance in the buffer.
 - (3) Except for the minimum buffer widths under E.(5) through (8) of this Section, a local jurisdiction shall establish a buffer of at least 100 feet landward from:
 - (a) The mean high water line of tidal waters;
 - (b) The edge of each bank of a tributary stream; and
 - (c) The upland boundary of a tidal wetland.
 - (4) For purposes related to the calculation of the minimum buffer widths under E.(5) through (8) of this Section, a local jurisdiction shall measure landward from the points specified under E.(3) and (4) of this Section.

- (5) In accordance with E.(4) of this Section, except as provided under E.(6) of this Section, if a local jurisdiction grants final local approval for a subdivision or a site plan in the Resource Conservation Area on or after July 1, 2008, the local jurisdiction shall establish:
 - (a) An expanded buffer in accordance with E.(7) and (8) of this Section; and
 - (b) A buffer of at least 200 feet from tidal waters or a tidal wetland.
- (6) The provisions of E.(5)(b) of this Section do not apply if:
 - (a) The application for subdivision or site plan approval was submitted before July 1, 2008, and legally recorded by July 1, 2010;
 - (b) The application involves the use of growth allocation; or
 - (c) A local program procedure approved by the Commission provides for the reduction of the strict application of the minimum 200-foot buffer under E.(5)(b) of this Section if that minimum would preclude a subdivision of the property at a density of one dwelling unit per 20 acres or an intra-family transfer authorized under Natural Resources Article, §8-1808.2, Annotated Code of Maryland.
- (7) If a buffer is contiguous to a steep slope, a nontidal wetland, a nontidal wetland of special State concern under COMAR 26.23.06.01, a hydric soil, or a highly erodible soil, a local jurisdiction shall expand the minimum buffer required under E.(3) or (5) of this Section and shall calculate the extent of that expansion in accordance with the following requirements:
 - (a) A steep slope at a rate of 4 feet for every 1 percent of slope or to the top of the slope, whichever is greater;
 - (b) A nontidal wetland to the upland boundary of its 75-foot Buffer;
 - (c) A nontidal wetland of special State concern to include the wetland and its regulated 100-foot buffer; and
 - (d) Hydric soils or highly erodible soils to the lesser of:
 - (i) The landward edge of the hydric or highly erodible soils; or
 - (ii) 200 feet beyond the 100-foot Buffer, for a total of 300 feet.
- (8) If a buffer is contiguous to a highly erodible soil on a slope less than 15% or a hydric soil and is located on a lot or parcel that was created before January 1, 2010, a local jurisdiction may authorize a development activity in the expanded buffer, if:

- (a) The location of the development activity is in the expanded portion of the buffer for a highly erodible soil on a slope less than 15 percent or a hydric soil, but not the 100-foot buffer;
- (b) The buffer for a highly erodible soil on a slope less than 15 percent or a hydric soil occupies at least 75 percent of the lot or parcel; and
- (c) Mitigation occurs at a 2:1 ratio based on the lot coverage of the proposed development activity that is in the expanded buffer.

2. Buffer Establishment.

- A. Applicability.
 - (1) The requirements of this Section are applicable to:
 - (a) A development or redevelopment activity that occurs on a lot or parcel that includes a buffer to tidal waters, a tidal wetland, or a tributary stream if that development or redevelopment activity is located outside the buffer; or
 - (b) The approval of a new subdivision that includes a buffer to tidal waters, a tidal wetland, or a tributary stream.
 - (2) The requirements of this Section are not applicable to:
 - (a) An in-kind replacement of a principal structure; or
 - (b) Land that remains in agricultural use after subdivision in accordance with a buffer management plan under Section 4 of this Appendix.
- B. A local jurisdiction shall require an applicant to establish the buffer in vegetation in accordance with C of this Section as well as the Standards set forth in the Mitigation and Planting Section. A buffer management plan shall also be provided as described in Section 4 of this Appendix when an applicant applies for:
 - (1) Approval of a new subdivision or a new lot;
 - (2) Conversion from one land use to another land use on a lot or a parcel; or
 - (3) Development on a lot or a parcel created before January 1, 2010.
- C. At the time of application, if the buffer is not fully forested or is not fully established in woody or wetland vegetation, an applicant shall establish the buffer to the extent required in the following table:

Development Category	Lot Created Before Local Program Adoption	Lot Created After Local Program Adoption
New development on a vacant lot	Establish the buffer based on total lot coverage	Fully establish the buffer
New subdivision or new lot	Fully establish the buffer	
New lot with an existing dwelling unit	t Establish the buffer based on total lot coverage	
Conversion of a land use on a parcel or lot to another land use	Fully establish the buffer	
Addition or accessory structure	Establish the buffer based on net increase in lot coverage	
Substantial alteration	Establish the buffer based on total lot coverage	

D. Natural regeneration is not permitted as a means to establish the buffer, nor is it permitted as a means to mitigate for any disturbance to the buffer.

3. Mitigation and Planting Standards.

- A. Applicability. The requirements of this Section are applicable to a development or redevelopment activity that occurs on a lot or parcel that includes a buffer to tidal waters, a tidal wetland, or a tributary stream when that development or redevelopment activity is located inside the buffer.
- B. As applicable to a site, a local jurisdiction shall require that a buffer management plan in accordance with Section 4 of this Appendix to satisfy the planting and mitigation standards of this Section and satisfy the buffer establishment standards required under Section 2 of this Appendix so as to:
 - (1) Prohibit the installation or cultivation of new lawn or turf on-site in the buffer;
 - (2) Ensure the planting of native species in compliance with the amounts specified under C, G, and H of this Section;
 - (3) Ensure coverage of the buffer with mulch or ground cover or both until buffer plantings are established;
 - (4) Ensure planting is evenly distributed throughout the entire buffer; and
 - (5) Provide optimum habitat and water quality benefits.
- C. As applicable to a site, a local jurisdiction shall calculate the cumulative amount of buffer mitigation required in accordance with the following standards:

- (1) For a development activity within the buffer, mitigation shall be based on the limits of disturbance and calculated in accordance with the ratios under G of this Section;
- (2) The removal of a healthy tree having a caliper of at least 1 inch as measured at 4.5 feet above the ground surface shall be replaced at a ratio of 100 square feet for every 1 inch of caliper;
- (3) The removal of any shrub shall be replaced 1:1 with a native shrub species purchased in a 3-gallon container or larger; and
- (4) The removal of a dead, diseased, or dying tree shall be replaced 1:1 with a native tree species having a height of at least 5 feet tall and a 1-inch caliper or greater.
- D. Priority mitigation areas and offsets must be considered by the applicant prior to requesting fee-in-lieu. Prior to accepting fee-in-lieu, the Department of Planning and Zoning shall receive an explanation from the applicant demonstrating how the priority mitigation options, listed below, were considered for implementation, and why those options are not feasible. The following mitigation options are available for Buffer disturbance and are listed in order of priority:
 - (1) On site Plant the required amount of mitigation as native forest vegetation in the 100-foot Buffer;
 - (2) Off site Plant the required amount of mitigation at another Buffer site in the Critical Area, as approved by the Department; or
 - (3) Applicants who cannot fully comply with the planting requirements in D.(1) and (2) above may use offsets to meet the mitigation requirement. Offsets include:
 - (a) The removal of an equivalent area of existing impervious surface in the Buffer;
 - (b) Wetland creation or restoration;
 - (c) Shoreline restoration or enhancement;
 - (d) The installation of Best Management Practices for stormwater management; or
 - (e) Other measures that improve the water quality or HPA habitat on site or elsewhere in the Critical Area or NRD, as approved by the Department.
- F. If it is not possible to comply with the above mitigation options within the Critical Area, plantings and/or other habitat and water quality improvements should occur within the affected watershed, especially near streams, wetlands, forests, forest retention areas, and the NRD.

G. In accordance with the applicable activity, a local jurisdiction shall require the following ratios of mitigation:

Activity	Mitigation Ratio
Shore erosion control	1:1
Riparian water access	2:1
Development or redevelopment of water-dependent facilities	2:1
Variance	3:1
Violation	4:1

H. A local jurisdiction may authorize the combination of the planting and mitigation standards found in I and K of this Section in accordance with the following table:

Requirement	Amount	Options
Establishment	Less than 1/4 acre	Landscaping stock according to I of this Section for the entire area
	1/4 acre to 1 acre	At least 50 percent of area in landscaping stock according to I of this Section, the remainder according to K of this Section
	1 acre to 5 acres	At least 25 percent of area in landscaping stock according to I of this Section, the remainder according to K of this Section
	Greater than 5 acres	At least 10 percent of area in landscaping stock according to I of this Section, the remainder according to K of this Section
Mitigation	Less than 1 acre	Landscaping stock according to I of this Section for the entire area
	1 acre or greater	At least 50 percent of area in landscaping stock according to I of this Section, the remainder according to K of this Section

I. A local jurisdiction shall apply the following planting credits for the type and size of the vegetation proposed:

Vegetation Type	Minimum Size Eligible for Credit	Maximum Credit Allowed (Square Feet)
Canopy tree	2-inch caliper and 8 feet high	200
Canopy tree	1-inch caliper and 5 feet high	100
Understory tree	1-inch caliper and 5 feet high	75
Large shrub	3 gallon container	50
Herbaceous perennial*	1 quart	2
Planting Cluster 1*	1 canopy tree and 3 large shrubs	300
Planting Cluster 2*	2 understory trees and 3 large shrubs	350

- * These options are only available for buffer establishment and buffer mitigation of less than $\frac{1}{2}$ acre.
- J. All landscaping stock planted in accordance with I shall be 100 percent guaranteed for at least 2 years after planting is completed.
- K. A local jurisdiction may use the following table to allow flexible stocking size when authorized under H of this Section:

Stock Size of Trees Only	Required Number of Stems Per Acre	Survivability Requirement	Minimum Financial Assurance Period After Planting
Bare-root seedling or whip	700	50 percent	5 years
1/2-inch to 1-inch container grown trees	450	75 percent	2 years
More than 1-inch container grown trees	350	90 percent	2 years

- L. A local jurisdiction may not:
 - (1) Authorize a variance to the planting and mitigation standards under this Section; or
 - (2) Issue a final use and occupancy permit for an application under Section 2.B.(2) of this Appendix unless the applicant:
 - (a) Completes the planting required under an approved buffer management plan; or
 - (b) Pending completion of the planting required under an approved buffer management plan during the next planting season, provides financial assurance to cover the costs for:
 - (i) Materials and installation; and
 - (ii) In the case of a mitigation or establishment requirement that is at least 5,000 square feet, long-term survivability in accordance with the requirements of Section 4.J.(2)(d) of this Appendix.
- M. Before recordation of a final subdivision, an applicant shall:
 - (1) Post permanent signs delineating the upland boundary of the buffer at a ratio of at least one sign per lot or per 200 linear feet of shoreline, whichever is applicable; and
 - (2) Design each sign required under M.(1) of this Section so that it:
- (a) Is at least 11 inches in width and 15 inches in height;
- (b) Is placed at a height of 4.5 feet, but not attached to a tree; and
- (c) Clearly states "Critical Area Buffer—No clearing or disturbance permitted".
- N. Concurrent with the recordation of a final plat, an applicant shall record a protective measure in a buffer management plan in accordance with Section 4 of this Appendix.
- O. A local jurisdiction may not approve a final subdivision application until the jurisdiction has reviewed and approved the buffer management plan.

4. Buffer Management Plans.

- A. The provisions of this Section do not apply to maintenance of an existing grass lawn in the buffer.
- B. A local jurisdiction shall require an applicant proposing a development activity to submit a buffer management plan if:
 - (1) The establishment of the buffer is required in accordance with Section 2 of this Appendix; or
 - (2) Disturbance to the buffer will result from the issuance of a:
 - (a) Variance;
 - (b) Subdivision approval;
 - (c) Site plan approval;
 - (d) Shore erosion control permit as required under COMAR 26.24.02;
 - (e) Building permit or zoning certificate;
 - (f) Grading permit; or
 - (g) Special exception.
- C. In accordance with the requirements under Sections 2 and 3 of this Appendix, a local jurisdiction shall require an applicant to submit a:
 - (1) Simplified buffer management plan;
 - (2) Minor buffer management plan; or

- (3) Major buffer management plan.
- D. A local jurisdiction may not approve a buffer management plan unless:
 - (1) The plan clearly indicates that all planting standards under Section 3 of this Appendix will be met; and
 - (2) Appropriate measures are in place for the long-term protection and maintenance of all buffer areas established under this Section.
- E. A local jurisdiction may not issue a permit for a development activity under Section 2 or 3 of this Appendix unless the local jurisdiction has approved the buffer management plan submitted under C of this Section.
- F. If an applicant fails to implement a buffer management plan, that failure shall constitute a violation of the local Critical Area program.
- G. A local jurisdiction may not issue a permit on a property that is the subject of a violation under F of this Section.
- H. Simplified Buffer Management Plan.
 - (1) Before the performance of an activity in the buffer, a local jurisdiction shall require the applicant to submit a simplified buffer management plan (blank form supplied at the end of this Appendix) as part of the application associated with any of the following activities:
 - (a) Providing access to a private pier or shoreline that is up to 3 feet wide;
 - (b) Manually removing invasive or noxious vegetation;
 - (c) Filling to maintain an existing grass lawn; or
 - (d) Cutting a tree that is in danger of falling and causing damage to a dwelling or other structure, causing blockage to a stream, or accelerating shore erosion.
 - (2) A simplified buffer management plan shall include the following information:
 - (a) A brief narrative describing the proposed activity, including the anticipated start date and method to be used;
 - (b) The proposed mitigation;
 - (c) In the case of the removal of invasive or noxious species, the revegetation of the area in accordance with Section 3.B.(1) and (3) of this Appendix;

- (d) The proposed planting date; and
- (e) The signature of the party responsible for the proposed activity and for ensuring the survival of the planting.
- I. Minor Buffer Management Plan.
 - (1) A local jurisdiction shall require an applicant to submit a minor buffer management plan for:
 - (a) Establishment of less than 5,000 square feet of the buffer for an application listed under Section 2 of this Appendix; or
 - (b) A requested disturbance that requires less than 5,000 square feet of mitigation for an application listed under Section 3 of this Appendix.
 - (2) A minor buffer management plan shall include:
 - (a) A plan that shows the proposed limit of disturbance, the total number and size of trees to be removed, if applicable, and the arrangement of the planting to be done;
 - (b) A landscape schedule that shows the proposed species type, the quantity of plants, the size of plants to be installed, and the planting date;
 - (c) A maintenance plan for the control of invasive species, pests, and predation that shows invasive species and pest control practices, the provision of at least 2 years of monitoring, and a reinforcement planting provision if survival rates fall below the standards described in Section 3.J and K of this Appendix;
 - (d) An inspection agreement that grants permission to the local jurisdiction to inspect the plantings at appropriate times;
 - (e) If buffer establishment is required under Section 2 of this Appendix, the information on which calculation of the amount of buffer to be planted was based;
 - (f) If buffer mitigation is required under Section 3 of this Appendix, the information on which calculation of the amount of the buffer to be planted was based; and
 - (g) The signature of the party responsible for the proposed activity and for ensuring the survival of the planting.
- J. Major Buffer Management Plan.
 - (1) A local jurisdiction shall require an applicant to submit a major buffer management plan for:

- (a) Establishment of at least 5,000 square feet of the buffer for an application listed under Section 2 of this Appendix; or
- (b) A requested disturbance that requires at least 5,000 square feet of mitigation for an application listed under Section 3 of this Appendix.
- (2) A major buffer management plan shall include:
 - (a) A plan that shows the proposed limit of disturbance, the total number and size of trees to be removed, if applicable, and the arrangement of the planting to be done;
 - (b) A landscape schedule that shows the proposed species type, the quantity of plants, the size of plants to be installed, and the planting date;
 - (c) A maintenance plan for the control of invasive species, pests, and predation that shows invasive species and pest control practices, the provisions of at least 2 years of monitoring, and a reinforcement planting provision if survival rates fall below the standards in Section 3.J and K of this Appendix;
 - (d) A long-term protection plan that includes evidence of financial assurance that adequately covers the planting and survivability requirement, a provision for at least 2 years of monitoring as required in Section 3.J and K of this Appendix, and if planting, an anticipated planting date before construction or the sale of the lot;
 - (e) An inspection agreement that grants permission to the local jurisdiction to inspect the plantings at appropriate times;
 - (f) If buffer establishment is required under Section 2 of this Appendix, the information on which calculation of the amount of buffer to be planted was based;
 - (g) If buffer mitigation is required under Section 3 of this Appendix, the information on which calculation of the amount of the buffer to be planted was based; and
 - (h) The signature of the party responsible for the proposed activity and for the survival of the planting.
- (3) For a major buffer management plan:
 - (a) A single species may not exceed 20 percent of the total planting requirement; and
 - (b) Shrubs may not exceed 50 percent of the total planting requirement.

5. Fee In Lieu of Buffer Mitigation.

A. If an applicant can demonstrate to the Director of Planning and Zoning that the priority mitigation options as listed in Section D of the Mitigation and Planting Standards are not

feasible, a payment of \$4.00 per square foot of mitigation will be accepted in lieu of the plantings to be replaced. Fee-in-lieu shall otherwise not be accepted by the County.

- B. A local jurisdiction shall:
 - (1) Calculate the square footage of mitigation due in accordance with Section 3 of this Appendix;
 - (2) Establish a special fund, which may not revert to the jurisdiction's general fund, for the collection of the fee in lieu of buffer mitigation; and
 - (3) Use the funds in the following ways, as listed by order of priority:
 - (a) In the CBCA by means of:
 - (i) Planting in the Buffer to fully establish native habitat along waterbodies;
 - (ii) Creating or enhancing native habitat including forest, meadow, or wetland, giving preference to sensitive environmental areas where R/T/E species are known or suspected and to the County's mapped Green Infrastructure Network;
 - (iii) Removing existing lot coverage; or
 - (iv) Installing Best Management Practices for stormwater management.
 - (b) Other measures that improve water quality or habitat in the Critical Area; or
 - (c) If the previous options listed in (a) and (b) are not feasible to implement within the CBCA, then those same options in the same order of priority may be implemented outside of the CBCA within the same watershed.
- C. A local jurisdiction may utilize a lesser fee in lieu of buffer mitigation that is based on an alternative to the amount required under B of this Section if:
 - (1) The jurisdiction demonstrates that its proposed alternative will ensure the receipt of funds sufficient to administer a financially sound fee in lieu of buffer mitigation program, based on the following costs in that jurisdiction:
 - (a) Planting materials;
 - (b) Labor;
 - (c) Land acquisition, either by fee simple or by easement;

- (d) Planting maintenance; and
- (e) Monitoring and administration of the special account; and
- (2) The Commission approves the lesser alternative proposed.
- D. Each year, the local jurisdiction shall report to the Commission regarding their implementation of the fee-in-lieu program over the course of the previous calendar year

6. Agricultural Activities.

- A. The buffer is not required for agricultural drainage ditches if the adjacent agricultural land has in place best management practices as required in COMAR 27.01.06.
- B. Agricultural activities are permitted in the buffer, if, as a minimum best management practice, a 25-foot vegetated filter strip measured landward from the mean high water line of tidal waters or tributary streams (excluding drainage ditches), or from the edge of tidal wetlands, whichever is further inland, is established, and further provided that:
 - (1) The filter strip shall be composed of either trees with a dense ground cover, or a thick sod of grass, and shall be so managed as to provide water quality benefits and habitat protection consistent with the policies stated in Section 1 of this Appendix; noxious weeds, including Johnson grass, Canada thistle, and multiflora rose, which occur in the filter strip, may be controlled by authorized means;
 - (2) The filter strip shall be expanded by a distance of 4 feet for every 1 percent of slope, for slopes greater than 6 percent;
 - (3) The 25-foot vegetated filter strip shall be maintained until such time as the landowner is implementing, under an approved soil conservation and water quality plan, a program of best management practices for the specific purposes of improving water quality and protecting plant and wildlife habitat; and provided that the portion of the soil conservation and water quality plan being implemented achieves the water quality and habitat protection objectives of the 25-foot vegetated filter strip;
 - (4) The best management practices shall include a requirement for the implementation of a grassland and manure management program, where appropriate, and that the feeding or watering of livestock may not be permitted within 50 feet of the mean high water line of tidal water and tributary streams, or from the edge of tidal wetlands, whichever is further inland;
 - (5) Clearing of existing natural vegetation in the buffer is not allowed; and
 - (6) Farming activities, including the grazing of livestock, do not disturb stream banks, tidal shorelines, or other habitat protection areas as described in this Appendix.

7. Tree Clearing and Timber Harvesting.

Cutting shall not occur in the Buffer or other habitat protection areas described in COMAR 27.01.09.02, .03, .04, and .05.

8. Modified Buffer Areas.

Some sections of the Critical Area Buffer have been mapped exempt from certain buffer requirements where it was demonstrated by the local jurisdiction that the existing pattern of residential, industrial, commercial, or recreational development in the Critical Area prevented the buffer from fulfilling the functions stated in Section 1 of this Appendix. The regulations for these sections of Buffer have been modified to achieve water quality and habitat protection objectives, as outlined in the Harford County Zoning Code.

Note: The mitigation options listed in this Appendix may also be referenced as priority mitigation options when mitigation is required for disturbance outside of the Buffer, but within the CBCA. In such a case, planting installation on or off site should be prioritized in the Buffer or in other sensitive environmental areas, but may also be installed elsewhere on site within the CBCA as described in this Appendix.

CRITICAL AREA BUFFER MANAGEMENT PLAN

The following form should be completed by the property owner, or responsible party, for any disturbance of natural vegetation or construction within the Critical Area Buffer. Once completed, and approved, this form will constitute your Buffer Management Plan and will provide our office with an official record of your proposed Buffer impacts and the way in which you plan to meet any required offsets (mitigation). This Buffer Management Plan will be subject to annual renewal, and is considered expired after one year from the date signed on this form.

Property Background Information:

Property Owner (or Contact):				
Property Owner's	Address:				
Property Owner's	(or Contact's Ph	one):			
Project Address (i	f different):				
Tax Map #	Block #	Parcel #	Section #	Lot #	

Proposed Buffer Disturbance

- _____ New development/redevelopment (ie: new building, home addition, replacement
 - structures)
- _____ Shore erosion control
- _____ Shore access
- _____ Dead or dying tree removal
- ____ Other (please explain)_____

Is the property in a designated Modified Buffer Area (MBA)?	Yes	No
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Are there any special plat notes or restriction	ns concerni	ng your Buffer	· (wetlands,	habitat
protection areas, conservation easements)?	Yes	No		

If yes, please explain:

Three examples follow:	
and/or number of trees cleared as well as the type of equipment that will be used.	
Please provide a brief explanation of your proposed project in the space below. Include	area

- 1) 600 square feet partially cleared for shore access with hand tools; canopy will be maintained, disturbance will be limited to three saplings and several shrubs; and path will consist of wood chips
- 2) Removal of poison ivy from 2,000 sq. feet area along shore access path; method of removal includes hand pulling and chemical spraying of individual plants with an approved herbicide; any resulting bare areas will be mulched to prevent soil erosion and to prevent reestablishment of invasives. There will be no removal of trees or shrubs.
- 3) A variance was granted to build a new house on a grandfathered lot in the Buffer. The area permanently impacted in the Buffer will be 4000 square feet, including the area of the house and a fifteen-foot clearing around the house. The lot is entirely forested. A bulldozer will be used for site preparation.

Proposed Project:
Justification:
Long-term management plans for this area:

Calculation of Mitigation

The following three-step process is used to compute the amount of mitigation needed for impacts to the Buffer. For the purposes of this Buffer Management Plan, mitigation is defined as planting or similar offsets which will help to negate the effect of the Buffer disturbance. To determine the amount of mitigation for your Buffer disturbance you need to determine the following:

- 1. Amount of buffer disturbed for clearing, grading, and placement of new structures, etc.
- 2. Mitigation ratio for the type of Buffer impact
- 3. Mitigation amount calculated by multiplying the area disturbed by the mitigation ratio.

Step 1 - Amount of buffer disturbance

Buffer disturbance is based on either the area disturbed or the number of individual trees that will be cut. It is recommended that when an area to be disturbed more closely resembles a natural forest (i.e. canopy cover with multi-layer understory) <u>or</u> when structures or other impervious surfaces are placed within the Buffer of a MBA, even if no trees are cleared, you should quantify

the disturbance amount in *area cleared*. On the other hand, if your site more closely resembles a park setting (i.e., scattered trees with little or no understory), it is recommended that you count the number of trees removed.

AREA OF BUFFER CLEARED OR DISTURBED: _____ SQUARE FEET - OR -NUMBER OF TREES CLEARED: _____ # OF TREES

Step 2 - Mitigation Ratios

Different types of Buffer management activities require different mitigation ratios. Higher ratios are used for activities that have a greater impact upon the buffer. The purpose of the mitigation is to improve the Buffer functions where possible. The table below provides the mitigation ration for different types of Buffer management activities.

Type of Buffer Disturbance	Mitigation Ratio
New development/redevelopment (non-MBA)	3:1
New development/redevelopment (MBA)	2:1
Shore erosion control	1:1
Shore access	2:1
Other	*

*Please consult with your local government Critical Area Planner if the purpose of your Buffer disturbance is in the *Other* Category.

Mitigation Ratio = _____ (From the above table)

Step 3 - Mitigation Amount

Mitigation Amount = (sq. ft. or # of trees) x (mitigation ratio) = _____ sq. ft. or # trees

Buffer Planting Plan

This section is to help you provide more specific details on your mitigation location and plantings.

Planting Location

All mitigation should be located within the Critical Area in the following order of preference:

- 1. On-site within the Buffer
- 2. On-site adjacent to existing Buffer
- 3. On-site within the Critical Area

- 4. Off-site (follow order of preference 1-3 above)
- 5. Fee-in-lieu payment

Plant Spacings and Mitigation Credits for Various Size Trees and Shrubs of Native Vegetation

Credit	Plant Size	Plant Spacing
Square Feet		
100 sq. ft.	1 canopy tree (3/4 inch diameter @ 4.5	10 foot on center
	foot height)	
50 sq. ft.	1 large shrub (3-5 gallon container)	3 foot on center
300 sq. ft.	Cluster together: 1 canopy tree (3/4 inch	Tree – 10 foot on
	diameter @ 4.5 foot height) and 3 large	center; Shrub – 3
	shrubs (3-5 gallon containers)	foot on center

Schematic Drawing

Please attach a schematic drawing to scale identifying areas of impact to the Buffer, indicate on plan existing trees and shrubs if possible, and the proposed location for replanting within the Buffer. Show the location of the Critical Area buffer. Indicate on the drawing the specific types of vegetation which will be removed and the specific types and amount of vegetation which will be used for mitigation.

I certify these statements to be true and accurate and that any trees to be removed are on my property. I hereby grant County/Local Jurisdiction officials permission to enter my property for inspections of this Buffer Management Plan.

Applicant Signature	Date
Approval information: FOR OFFICE USE ONLY	
This Buffer Management Plan is approved as of by	7