CHAPTER III

CHESAPEAKE BAY PRESERVATION AREAS

GUIDELINES FOR DELINEATION

INTRODUCTION

The purpose of this chapter is to assist local officials in the designation of Chesapeake Bay Preservation Areas, outlining appropriate methodologies for conducting environmental inventories, mapping natural features, analyzing resource relationships to local water quality, and delineating Chesapeake Bay Preservation Areas.

Each section provides technical guidance for determining the ecological and geographic extent of these areas. Graphics are provided to facilitate the use of existing mapping products and to illustrate possible spatial relationships of the Preservation Areas.

PREPARATION OF THE ENVIRONMENTAL INVENTORY

INTRODUCTION

The Criteria Regulations require an inventory of certain key features that must or may be components of Chesapeake Bay Preservation Areas. Local governments are provided discretion in the preparation of the inventory; the guidelines provided below are designed to assist local governments in their development of the environmental inventory in order to designate Preservation Areas within their jurisdictions. More and more communities are recognizing the importance of an inventory and analysis of natural and physical resources in order to make informed short and long term land use decisions. The inventory and analysis serves as a foundation for the preparation of a sound plan for the community and any measures for the plan's implementation.

An environmental inventory usually consists of information collected and presented in map form. A set of maps is prepared delineating the location of resources and problem areas. Maps are prepared for such basic natural conditions within a community as:

- Topography
- Soils
- Wildlife and Marine Life Resources
- Geologic Resources
  - Bedrock
  - Surface Material
- Hydrology
  - Drainage/Watersheds
  - Flood-prone Areas
  - Groundwater Characteristics
- Land Cover
  - Vegetative Types
  - Density of Cover

Generally, an analysis of the information collected for the inventory will identify natural and living resources in the community and help local officials and citizens in understanding their uniqueness. It will also indicate how these resources may constrain future development and, in turn, what impact development may have on their long term viability. The analysis will further delineate areas with features of special planning interest. Finally, the environmental inventory provides information critical to the community in its struggle to balance the value of anticipated growth and economic development with the value of natural features and environmental resources.

Environmental inventories are time-consuming and can be expensive, and may involve the expertise of specialists not normally associated with local government staffs. The Regulations, however, require all Tidewater local governments to prepare an environmental inventory **based on existing data and mapping resources.** This will establish, within every community, a baseline of information necessary to make informed land use decisions which protect water quality.

METHODOLOGY

By recording the inventory of the environmental features on base maps, these key environmental features can be assimilated into the overall planning process. There are two different methods of combining the base maps in the preparation of the environmental inventory. The "linear method" entails examining the various environmental features independently of one another in the initial analysis stage. The information is then

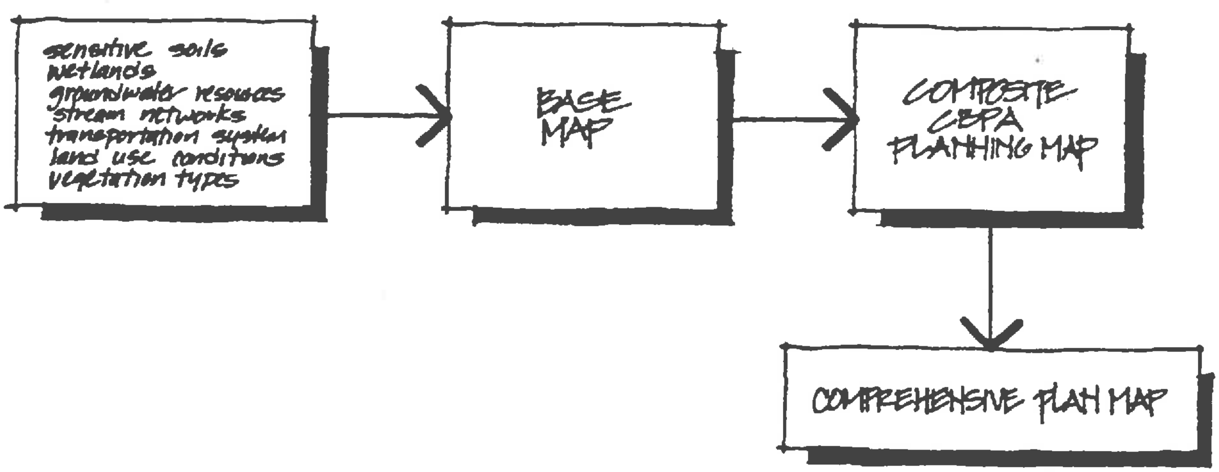
As required by the Criteria Regulations, local governments will assess the nature, location, and condition of the following land forms within the local jurisdiction:

- Tidal shores
- Tidal wetlands
- Tributary streams
- Non-tidal wetlands
- Floodplains
- Highly erodible soils
- Highly permeable soils
- Other lands at local discretion

Although these are features which must be inventoried, it is recommended that local governments take this opportunity to inventory a more comprehensive scope of environmental and cultural resources. Other features could include vegetation types, other soils with constraints to development, underground water resources, existing land use or land cover, mineral resources, and important terrestial and aquatic habitat areas.

After the features are identified and values are assigned to them, the actual physical inventory will be conducted for each feature. For example, the wetlands feature will be mapped after an analysis of the various types of wetlands. The resulting map will delineate the boundaries of (1) tidal wetlands, (2) nontidal wetlands that are connected by surface flow and contiguous to tidal wetlands or tributary streams, and (3) isolated nontidal wetlands. Since tidal wetlands and contiguous nontidal wetlands are components of Resource Protection Areas and the most important wetlands in protecting water quality, they should be depicted as being distinct from isolated nontidal wetlands. This distinction can be achieved by color or by different shades.

Once the categories of features have been individually mapped, the combined maps, one upon another, form the final environmental inventory. The inventory of features will be further analyzed using guide-



lines introduced later in this chapter to determine the boundaries for, first, Resource Protection Areas and, second, Resource Management Areas.

With the preparation of the inventory and the introduction of improved information as it becomes available, local governments will have a comprehensive environmental information base to use in all of their land use planning efforts. As time and staff resources permit, additional analyses can be undertaken which, in turn, enhance this important information resource.

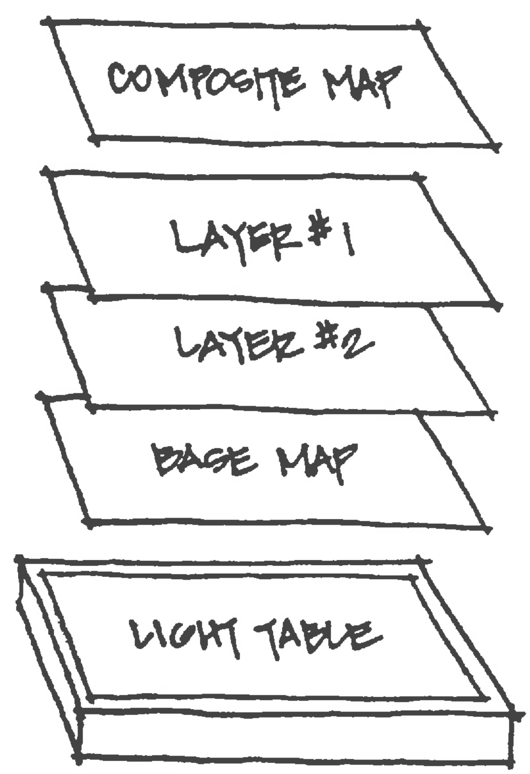
Existing Mapping Resources

As noted earlier, the designation of Chesapeake Bay Preservation Areas is based on **existing** data and mapping resources readily available to Tidewater local governments. There are certain limitations in the accuracy of these resources due to scale and methodology. Nevertheless, these resources provide an important tool for local land use planning and, as such, are appropriate for the designation of Preservation Areas.

The majority of these mapping resources are available at a scale of 1:24,000 (1"=2000'), which facilitates the preparation of overlays of environmental features. Some of the available mapping products, like the USGS topographic maps, are widely used by most, if not all, local governments. Other available mapping resources may be less familiar, or they may present a new resource to localities. Local governments should use these available resources (identified in Table 3-1) in conjunction with other locally-derived data sets and maps, many of which address the problems associated with scale and accuracy.

Although the Criteria Regulations do not dictate a map scale for the designation of Chesapeake Bay Preservation Areas, local governments should prepare their designation maps at a scale that will provide the best fit with their comprehensive plan, zoning map, tax maps, or local topographic mapping. For many rural local governments, the 1: 24,000-scale will generally be adequate. For urban and rapidly developing suburban localities, more detailed mapping of Preservation Areas may be desirable.

The scale of the final map or maps designating Chesapeake Bay Preservation Areas will in large part depend upon the mechanism local governments choose to implement the performance criteria at the



MAPPING NATURAL RESOURCES

The following section provides specific guidelines on the mapping of individual features that must or may be components of Chesapeake Bay Preservation Areas. The guidelines address the use of existing mapping resources available for this effort. The USGS topographic maps are the most fundamental and practical maps to be used, and they are available for every part of Tidewater Virginia. USGS topographic maps generally use contour lines at 2-foot, 5-foot, or 10-foot intervals to show the shape and elevation of the terrain.

The standard series of USGS maps are the 7-1/2 minute format quadrangles ("quads"), which use a map scale of 1:24,000, that is, 1 inch on the map equals 2000 feet on the land. In Virginia, each map represents an area approximately 7 miles from east to west and 8 miles north to south. This scale combines an appropriate amount of detail with a relatively large amount of land portrayed on each map, thus minimizing the number of maps necessary to cover an area. (See Figure 3-2.)

Recent mapping techniques, such as aerial reconnaissance for map revisions, have enabled the accuracy of these maps to be standardized so that not more than 10% of the points shown on a map will be in error by more than 1/30th of an inch. It is important for localities to note that different quad maps have different base years, pertaining to when they were published or last updated. The base year number appears in the lower right portion of the map, below the quad name. Localities should be aware that updated quad maps generally show more detail than older quad maps. Areas shown in purple on quad maps represent features that have been added from aerial photographs during the map revision process, and indicate that the quad map has been revised. All efforts should be made to obtain the most recent quad maps to facilitate the analysis of accurate information in the planning process.

The brochure entitled "Topographic Map Symbols", published by USGS, provides additional information on the USGS mapping process, as well as a list of symbols and accompanying explanations that aid in the understanding of USGS maps. Additional information on USGS maps can be obtained from the U.S. Geological Survey at the location listed in the Appendix, "Government Resources".

Tributary Streams

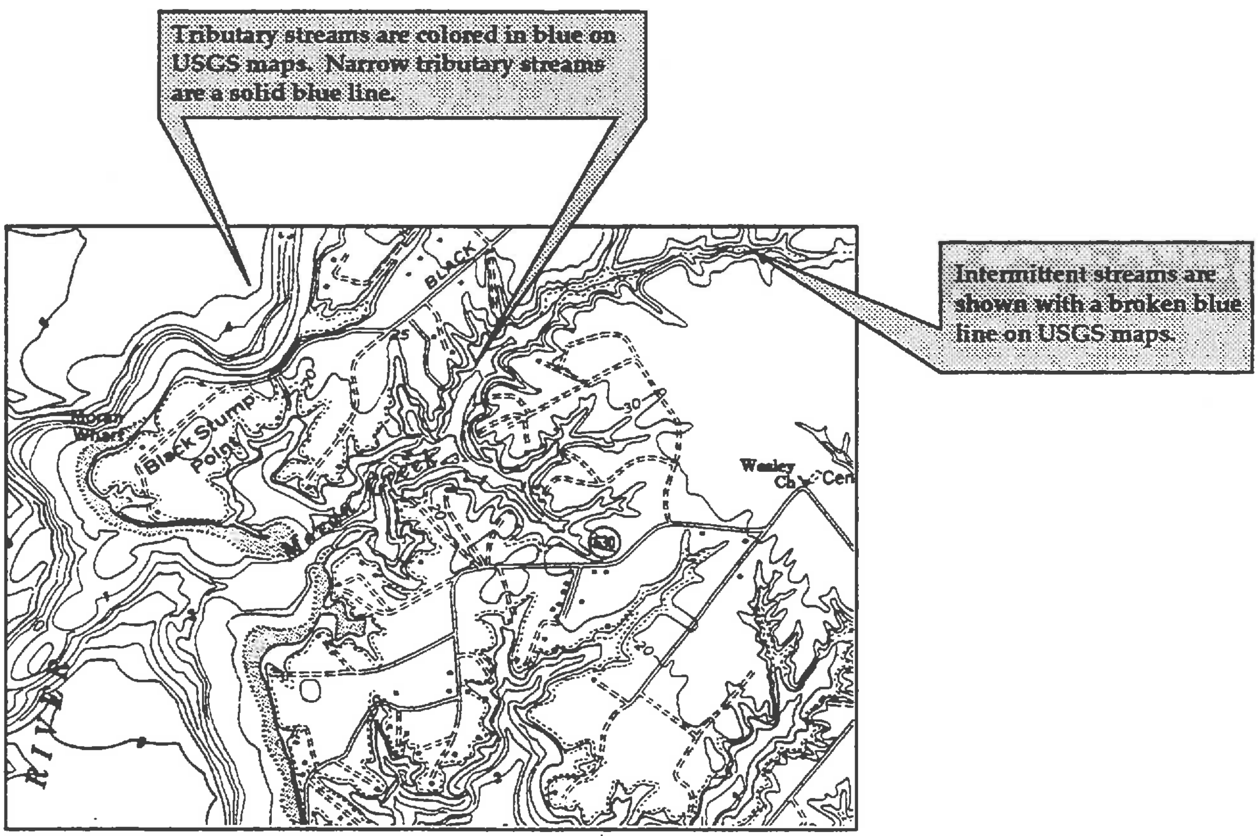
Tributary streams are a reasonable place to begin the mapping process, as they provide the "skeleton" for Resource Protection Area boundaries and they provide linkage to the other elements of a regional watershed network. Where other RPA features don't exist, the RPA may only consist of the 100-foot buffer area along both sides of a tributary stream.

Identifying and mapping tributary streams is not a complicated process, since they are clearly marked on USGS topographic quadrangle maps. On USGS maps, the Bay and its tributaries are shown in blue. Perennial streams, which are portrayed on these maps with solid blue lines, must also be included in mapping tributary streams because their flow of water is constantly connected to the larger rivers. Intermittent streams, which are shown as broken blue lines, are only sporadically connected by water flow to tributary streams, so they are not truly tributaries.

In mapping tributary streams, local governments should also consider the presence of drainage and navigation canals that may be linked to the regional watershed system. Typically, such canals are indicated on USGS maps in the same manner that tributary streams are indicated. However, drainage and navigation canals are generally the results of human intervention into the drainage system and tend to follow rather obvious straight or angular paths.

In addition, it is important to note that tributary streams and drainage/navigation canals may be shown on USGS maps in purple, rather than the standard blue color. As discussed earlier, the purple color indicates features that have been added or revised on more recent quad maps. Therefore, these purple water features should be mapped, along with the more prevalent blue water features, during the environmental inventory process.

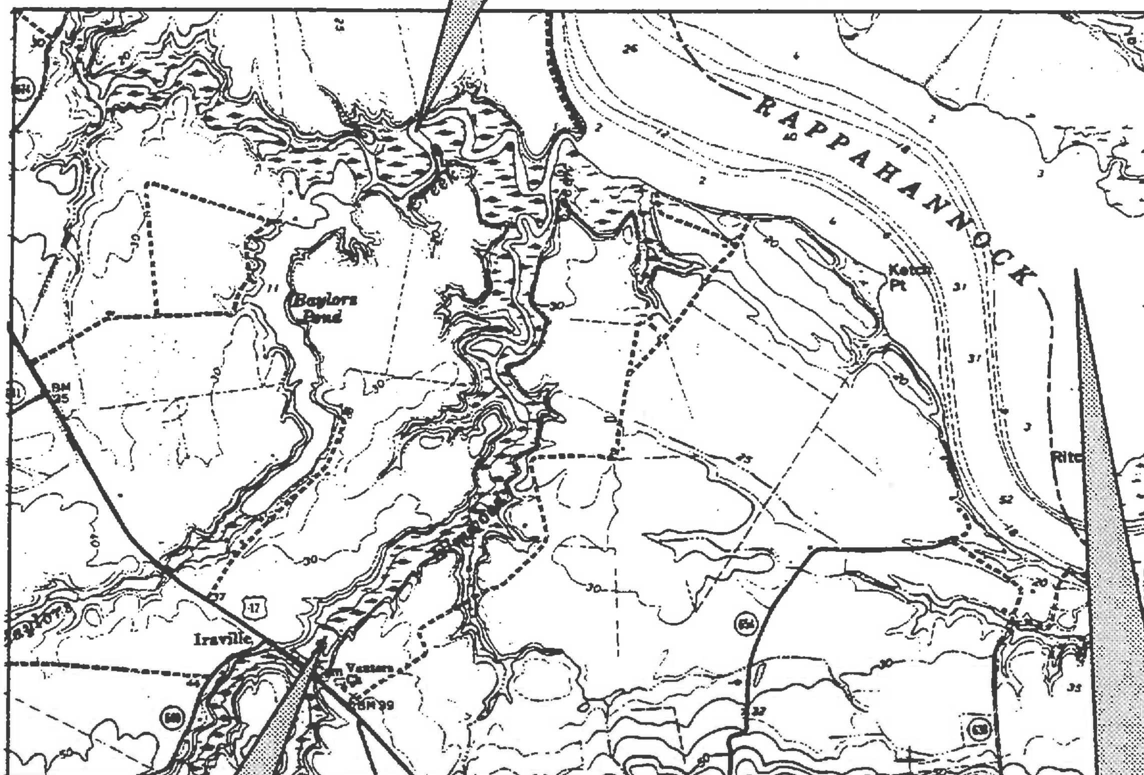
DELINEATION OF TRIBUTARY STREAMS USING USGS MAPS *FIGURE 3-3*



TIDAL SHORES

FIGURE 3-5

All major creeks that directly feed into tidal rivers are themselves tidal.



Major rivers linked directly to the Chesapeake Bay are tidal eastward of the fall line. All major rivers, bays, creeks and first order streams are shown in blue on USGS maps.

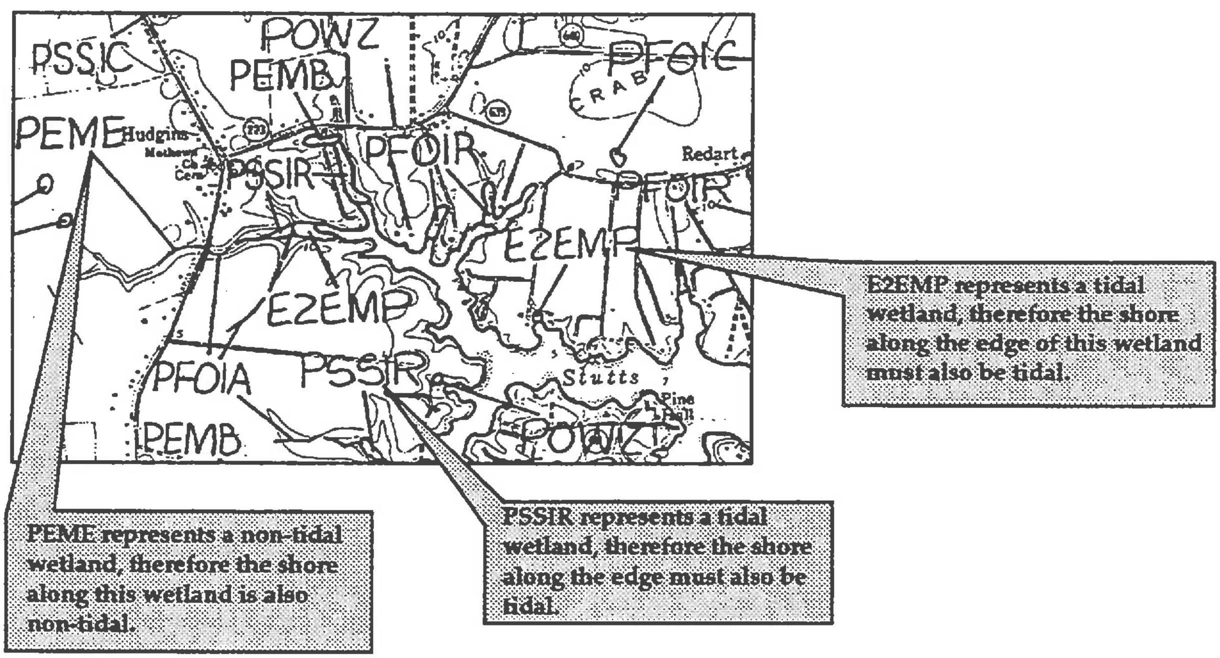
First order streams are shown as solid lines on USGS maps. Not all first order streams are necessarily tidal, however, in many cases they are at least partially tidal until they experience significant elevational change. NWI maps and local meteorological records should be able to verify the extent of tidal influence in those areas that are questionable.

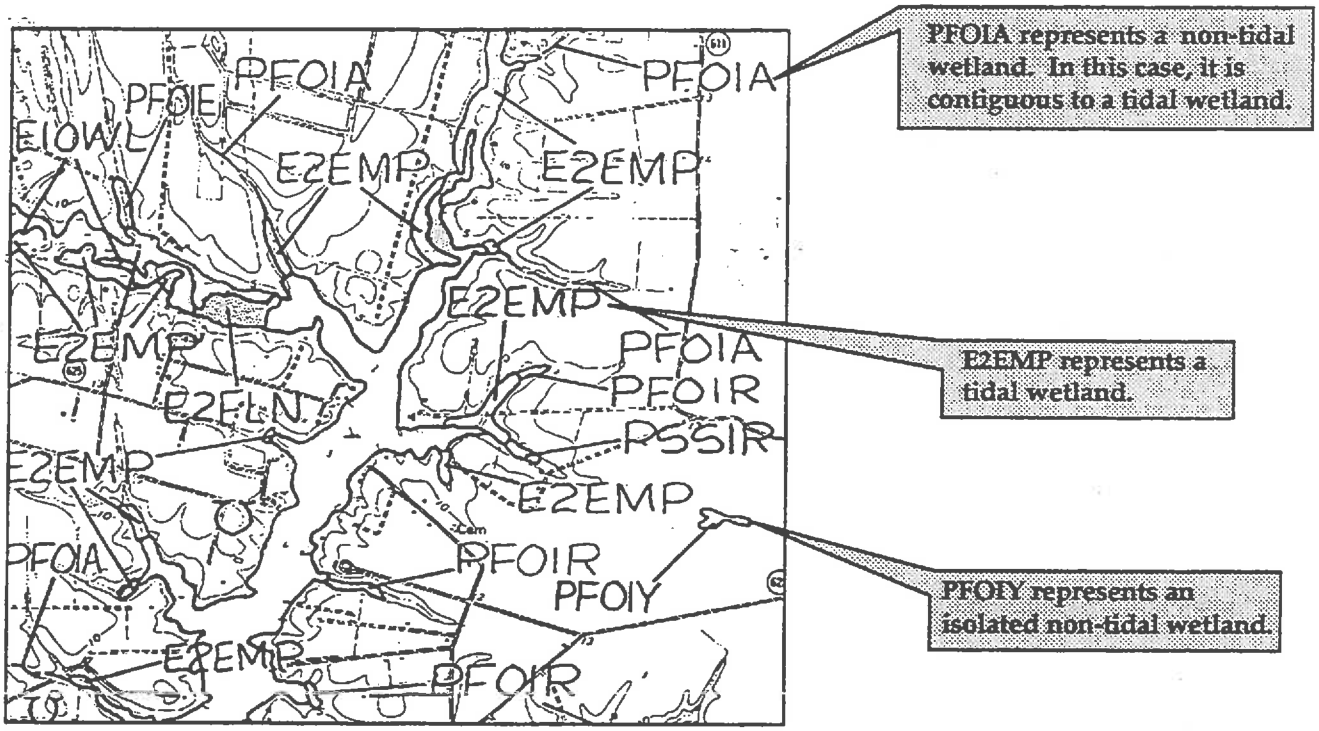
In some parts of Tidewater Virginia, USGS topographic/bathymetric quadrangle maps are also available. These maps depict depth contours (isobaths) at 1-meter intervals to show the land beneath bodies of water. The increased level of shoreline detail shown on these maps may be useful in the delineation of tidal shores.

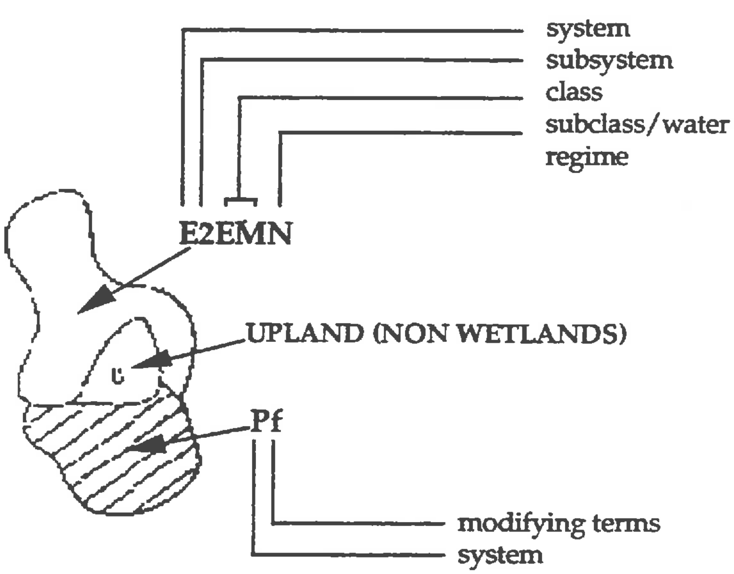
Since the upper reaches of tributary streams may become nontidal, these areas will need to be examined in more detail. Useful information can be obtained from National Wetland Inventory maps, which are published by the U.S. Fish and Wildlife Service. (See Figure 3-7.) The presence of tidal wetlands along a tributary stream is a strong indicator of the probable existence of tidal flows. (The codes used in the National Wetland Inventory maps are explained in the following section on mapping wetlands.) Local navigational data and related data on tidal ranges can also be used to determine tidal influence.

Additional information on the extent of tidal flows necessary for tidal shore designation is available from the Virginia Institute of Marine Science (VIMS), the U.S. Army Corps of Engineers, and the U.S. Fish and Wildlife Service, as well as from other public and private maritime organizations and clubs.

DELINEATION OF TIDAL SHORES USING NWI MAPS — *FIGURE 3-7*







The hierarchical classification scheme used by the Fish and Wildlife Service divides wetlands into five major systems which reflect the location of the wetlands: marine, estuarine, riverine, lacustrine, and palustrine. These systems, with their subsystems, are further divided into classes which reflect both the types of vegetation and the types of soils or substrates found in the wetlands.

All NWI maps are on the same scale as USGS topographic maps (1" = 2,000') and use the same quadrangle system. The wetlands are noted on NWI maps using an alphanumeric code. That code is based on the hierarchical classification scheme used by the

NWI CODES FOR WETLAND WATER REGIMES — *TABLE 3-2*

NONTIDAL	TIDAL
A = Temporarily Flooded	L = Subtidal (submerged)
C = Seasonally Flooded	M = Irregularly Exposed
E = Seasonally Flooded/ Saturated	N = Regularly Flooded
F = Semipermanently Flooded	P = Irregularly Flooded
H = Permanently Flooded	R = Seasonally Flooded
K = Artificially Flooded	V = Permanently Flooded/Tidal
Z = Permanently Flooded/ Intermittently Exposed	

Source: Adapted from Fish and Wildlife Service, ***Classification of Wetlands***, 1979

Wetlands Delineation

The procedure for identifying and mapping wetlands is described in detail in the ***Federal Manual for Identifying and Delineating Jurisdictional Wetlands***. This manual was published in 1989 as a cooperative effort by several federal agencies: the U.S. Army Corps of Engineers, The U.S. Environmental Protection Agency, the U.S. Fish and Wildlife Service, and the U.S.D.A. Soil Conservation Service. The federal manual serves as the technical basis for recognizing and defining wetlands which are jurisdictional, that is, regulated by federal law.

Note: Copies of the federal manual will be supplied to local governments in coming months by the Department.

The federal manual identifies three mandatory technical criteria which must be identified before an area is considered to be a jurisdictional wetland. These criteria are hydrophytic vegetation, hydric soils, and wetland hydrology.

Hydrophytic, or "water-loving," plants are those which require water or wet soils to live, or which tolerate wet conditions that are often deficient in oxygen. Hydric soils are saturated, flooded, or ponded long enough during the growing season to develop anaerobic (no oxygen) conditions in the upper layers. Wetland hydrology is, as the Federal manual says, the "driving force" which creates wetlands, because it is directly responsible for evidence of the other two criteria. Hydrology describes the distribution and circulation of water; in wetlands, hydrology is characterized by flooding or saturation which is either permanent or which recurs for significant periods of time (usually a week or more during the growing season, which is between March and October in Virginia). The Federal manual gives specific parameters for each of these technical criteria, and also de-

Some localities in Tidewater Virginia may have Tidal Marsh Inventory studies available from the Virginia Institute of Marine Science. These studies can be used to supplement the off-site identification procedure.

NOTE: The following section presents the Federal Manual's on-site procedure for wetlands identification. This is provided only as general information for local governments. It may be useful to local governments wishing to field check areas where existing data may be inconclusive. Local governments are not required, however, to field verify data in order to designate Chesapeake Bay Preservation Areas.

On-Site Procedure

On-site field inspection procedures are useful when there are areas which need additional information in order to make definite identification. Tidal wetlands generally are easy to identify, since water usually floods the area twice a day. (Some tidal wetlands may be irregularly tidal, or seasonally tidal. For instance, lagoons may be flooded only during major winter storms, while other areas may be affected only by early spring snow melt. Because of cases such as these, determination of questionable tidal wetland areas is best made during the late spring, summer and early fall.) Nontidal wetlands are often easy to identify as well, since water may stand in them for most of the year. Some areas, however, may not be so easily recognized. In these cases, the three major technical criteria mentioned earlier must be applied in making on-site inspections for wetlands identification.

Hydrophytic Vegetation

Plants that grow in wetlands are classified in two ways. One way is by their stratum, that is, whether they are trees, saplings, shrubs, vines, herbs or bryophytes (mosses and liverworts). The other way is according to their relative ability to live in either wetlands or uplands. If a plant is found only in wet areas, it is classified as "obligate" (OBL). If it is found in either wetlands or uplands, it is classified as "facultative" (FAC), and if it is facultative but is found more often in wetlands it is considered to be "facultative wet" (FACW). Other plants are found only in uplands (UPL) or more often in uplands than in wet areas (FACU). (Specific definitions for these classifications are provided in the Federal manual.)

If all of the plants in an area are obligate species, then that area is likely to be a wetland. If more than half of the plants in all of the strata are OBL, FACW or FAC, then hydrophytic vegetation is considered to be dominant in that area, and it is weighed as a consideration along with hydric soils and hydrology.

A photographic guide to prevalent plants in Virginia's wetlands will be included with forthcoming chapters of the Local Assistance Manual. These plants are listed in the following table. (Table 3-3.)

Hydric Soils

Soils are regarded as hydric if they are saturated, flooded, or ponded long enough to develop anaerobic (no oxygen) conditions in their upper layers. Chemical changes which result from prolonged saturation (at least one week during the growing season) are reflected in the soil color and other physical characteristics which are used to identify these soils. Indicators of these changes, which are explained in more detail in the Federal manual, are the soil's composition, its color, and, in some cases, its smell.

The composition of hydric soils is classified as either organic or mineral. Organic soils are of three types: muck (saprists), peat (fibrists), or a combination of the two which is either mucky peat or peaty muck (hemists). Mineral soils are characterized by mottles or gleying, which reflect chemical processes in the soil.

Hydric soils are also identified and classified by inspection of the soil colors, which are compared to a standardized soil color chart. In some cases, organic hydric soils may be recognized by their sulfurous smell, like rotten eggs, or by their greasy feel.

Determination of hydric soils is assisted by the use of county soil surveys. If hydric soils are found on the soil survey map for the area in question, an inspection in the field can be undertaken to compare the soil to its description in the soil survey report. If there is no information which is specific to a site, then the physical characteristics of the soils in that area can be investigated using the "field indicators" of soil composition, color and smell. These field indicators are described in detail in the Federal manual.

Wetland Hydrology

The occurrence of wetlands is dependent upon the hydrology of an area, which is affected by a number of factors such as the amount of precipitation, topographic variations, soil permeability, and plant cover. Recorded data on the frequency and duration of inundation, which is necessary to determine if an area is flooded or saturated for prolonged periods, is available from several sources. The U.S. Army Corps of Engineers' district offices have data for major waterbodies and other site-specific areas; the U.S. Geological Survey has stream and tidal gauge data; and the National Oceanic and Atmospheric Administration has tidal gauge data, as well. State, county and local agencies have flood data, Soil Conservation Service state offices have data on small watershed projects, and private landowners or developers often have site-specific data such as depths of water tables or groundwater wells.

Aerial photographs can be helpful in showing evidence of flooding and saturation, particularly those taken before trees leaf out completely in the spring. It is best to examine aerial photos from several consecutive years, to account for abnormally dry or wet seasons; the U.S. Weather Service maintains historical weather records for comparisons. The U.S. Department of Agriculture has been rephotographing the state of Virginia in 1989 to produce color infra-red aerial photographs. The state was previously photographed aerially in the early 1980's. These color infrared photographs can be produced at various scales and can be used in conjunction with USGS quadrangle maps, as well as with NWI maps. In addition, the Virginia Department of Transportation (VDOT) often takes color infrared photographs along proposed road align-

STEP 4

Determine whether a disturbed condition exists. If parts of the area's vegetation, soils or hydrology have been significantly altered, the limits of these disturbed areas should be identified in order to evaluate them separately after the undisturbed areas have been evaluated. Disturbed area determination procedures are explained in more detail in the federal manual.

STEP 5

Decide on the field determination method to be used.

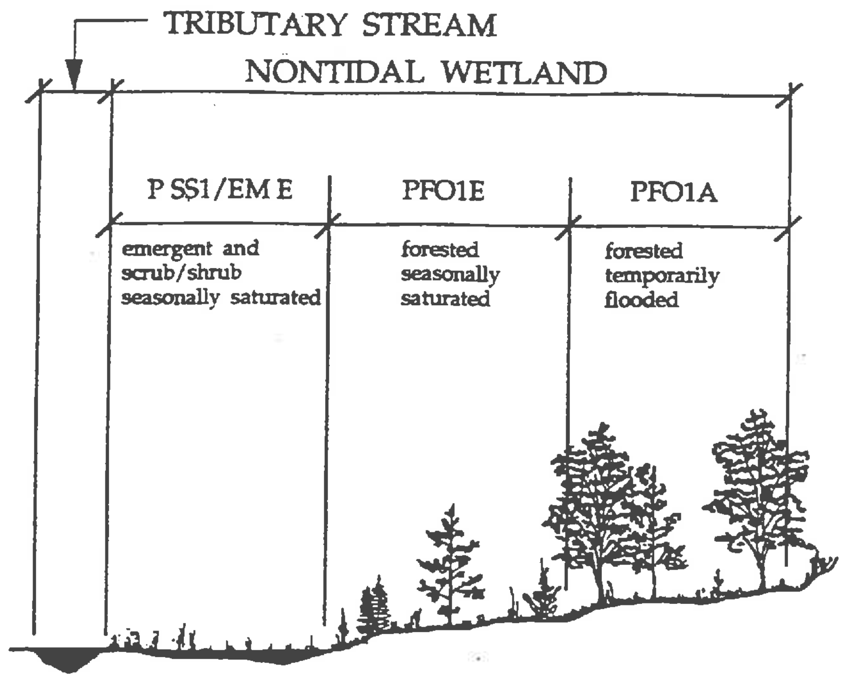
The designation of Resource Protection Areas (RPAs) requires the inclusion of tidal wetlands, as well as nontidal wetlands which are both contiguous and connected by surface flow to either tidal wetlands or tributary (perennial) streams. Figure 3-10 shows the conceptual relationship of various types of wetlands to Resource Protection Area and Resource Management Area (RMA) designations. Note that one of the illustrated noncontiguous nontidal wetlands is along an intermittent (nontributary) stream. This wetland is ultimately connected by surface flow to a perennial stream. Because this particular wetland satisfies only one of the two criteria necessitating designation as an RPA, localities may exercise their judgment and designate such a wetland as either an RPA or an RMA. Another wetland shown on the same illustration is lacustrine, that is, it is associated with a lake. Such a wetland is another type of area for which a locality may wish to exercise its judgment by designating the wetland as part of an RPA as an "other land" which functions to protect the quality of state waters.

As noted earlier, the three technical criteria which must be met for an area to be identified as a wetland are hydrophytic (water loving) vegetation, hydric (no oxygen) soils, and wetland hydrology. Of these three mandatory technical criteria, wetland hydrology is the most important because it causes hydric soils and a predominance of hydrophytic vegetation. The federal manual states that an area has wetland hydrology when saturated to the surface or inundated with water for usually one week or more during the growing season. The growing season for Tidewater Virginia runs, on the average, from March through October of each year.

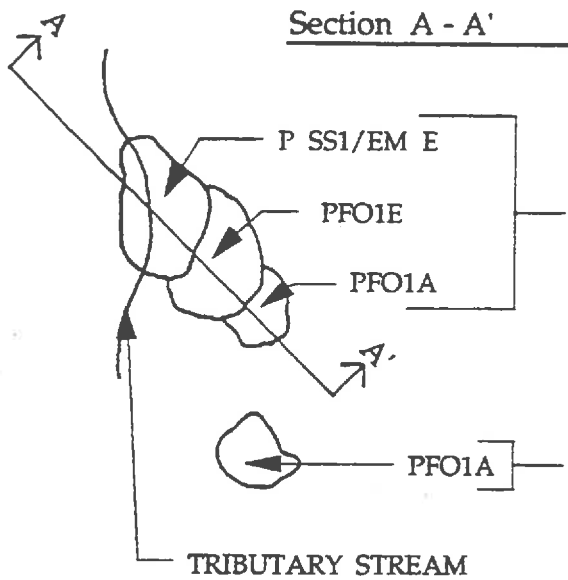
Figure 3-11 (Scenario A) illustrates how the technical criterion for wetland hydrology is related to designation of nontidal wetlands as RPAs and RMAs. A nontidal wetland system is shown in which part of the landscape is saturated throughout most of the growing season and part of it is not. The federal manual defines saturation as that which is within 18 inches of the surface dependent on the soil's permeability. "Surface flow" is to be interpreted literally as actual ground saturation or inundation when designating Resource Protection Areas. To be consistent with the technical criterion for wetland hydrology, designation of a nontidal wetland within a Resource Protection Area should include all nontidal wetlands which are both contiguous and satisfy a hydrological connection, either singularly or as a continuous unit, by surface flow to a tidal wetland or tributary stream **for a week or more during the growing season.**

Figure 3-12 (Scenario B) illustrates some examples of wetland designation based on NWI maps. Some wetlands on these maps are clearly associated with tributary streams.

NONTIDAL WETLAND CONNECTED TO A TRIBUTARY STREAM (SCENARIO A) *FIGURE 3-11*



Section A - A'



These nontidal wetlands must be mapped under the Resource Protection Area (RPA) designation since they are contiguous and connected by surface flow to a tributary stream.

This nontidal wetland will likely be mapped under the Resource Management Area (RMA) designation since it is an isolated wetland not connected by surface flow to a tributary stream.

Where stream channels are narrow, wetlands may show up on NWI maps as heavy dashed lines. Changes in the predominant vegetative stratum or water regime are indicated by the same alpha-numeric code discussed earlier in this chapter. Heavy dashed lines perpendicular to stream channels are also used on NWI maps to mark distinct changes in vegetation along a given stream segment. When using NWI maps, a comparison with USGS maps is useful in order to distinguish perennial from intermittent streams and to locate flatter areas along stream channels where wetlands are likely to occur.

Cross-checking NWI maps with USGS maps may reveal that nearly continuous wetlands occur even where stream flow changes from perennial to intermittent. In such cases these nontidal wetlands are contiguous to perennial waters, and hydrological connection by surface flow (again, for a week or more during the growing season) is virtually certain during any year of average rainfall. These nontidal wetlands should be designated as RPAs. Conversely, as is also shown in Figure 3-12 (Scenario B), a wetland with a given classification on an NWI map might in fact be spatially separated by an intermittent stream from the same type of nontidal wetland. In such instances a locality could designate a wetland as either an RPA (other lands) or as an RMA (noncontiguous).

The 1989 Virginia Outdoors Plan identifies Virginia wetlands that have priority for protection; these wetlands are unique or particularly representative of a certain community type. Table 3-4 lists wetlands in Tidewater Virginia which have been identified as priorities for protection by the Virginia Outdoors Plan, following the U.S. Fish and Wildlife Service's ***Wetlands Priority Protection Plan.***[6] Local governments may find this list useful, generally for planning purposes and in their environmental inventories.

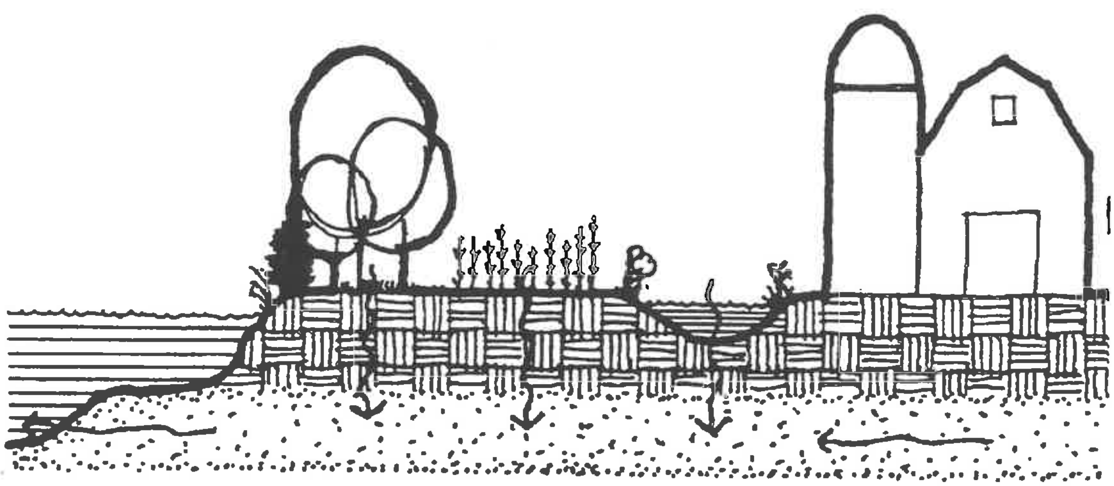


TABLE 3-4 CONT.

Lancaster County

Mosquito Island
North Point Marsh
Belle Island
Belle Isle

Mathews County

Lilleys Neck
Mathews County Interior Wetlands

Middlesex County

Dragon Run

New Kent County

Lilly Point Marsh Complex
West Island
Cousiac Marsh
Hill Marsh
Ware Creek & Terrapin Point
Chickahominy River Marshes
Chickahominy Swamp
Lanexa Marsh
Cumberland Thoroughfare
Matton Creek
Whites Landing
Holts Creek
North Anna River Wetlands
Big Creek

Newport News

Mulberry Island
Warwick River

Northampton County

Butlers Bluff
Fishermans Island
Greens Creek
Plantation Creek
Wreck & Bone Islands
Savage Neck Dunes
Eastern Shore of Virginia NWR
Mockhorn Island WMA
Hog Island
Cobb Island
Godwin Island
Ship Shoal Island
Mink Island
Myrtle Island
Smith Island
Rogue Island
Magothy Bay
Fringing Bottomlands

Northumberland County

Hack Creek
Bluff Point Marsh
Bell Swamp/Owens Point
Dameron Mars

Prince George County

Powell Creek Marsh
Kennon Marsh
Ward's Creek
Dutch Gap Fault
Upper Chippokes Creek
Appomattox River Wetlands
Appomattox River Marshes

Prince William County

Neabsco Creek Marsh
Powell's Creek
Quantico Creek
Chopawamsic Creek
Featherstone NWR
Marumsco NWR

Richmond County

Broad Creek
Cat Point Creek
Little Carter Creek Marsh
Totuskey Creek
Downing Bridge Marsh
Jones Creek Wetlands

Spotsylvania County

Alexander Berger Memorial Sanctuary
Ware Creek
Hazel Run Fault

Stafford County

Aquia Creek
Accakeek Creek
Potomac Creek
Chopawamsic Creek
Tank Creek Fault
Crows Nest

Suffolk

Nansemond River/Bennett Creek Marshes
Hoffler Creek Marsh
South Quay Pine Barrens
Blackwater River
Great Dismal Swamp NWR

Surry County

Upper Chippokes Creek
Sunken Meadow Pond
Crouch Creek & Timber Neck Creek
Lower Chippokes Creek Marsh
Hog Island
Lawnes Neck Creek Marsh
Blackwater River Swamp
Surry Site
Swann's Point
Mt. Pleasant

Virginia Beach

North Landing River Wetlands
Pocaty Creek Swamp
Seashore State Park
Blackwater Creek
Pungo Causeway
False Cape State Park
Gum Swamp
Stumpy Lake
Back Bay Wetlands
Back Bay NWR
Pocohontas WMA
Trojan WMA
Barbour's Hill WMA

Westmoreland County

Drake's Marsh
Otterburn Marsh
Nomini Cliffs
Currioman Bay
Hollis Marsh Island
Bridges Creek

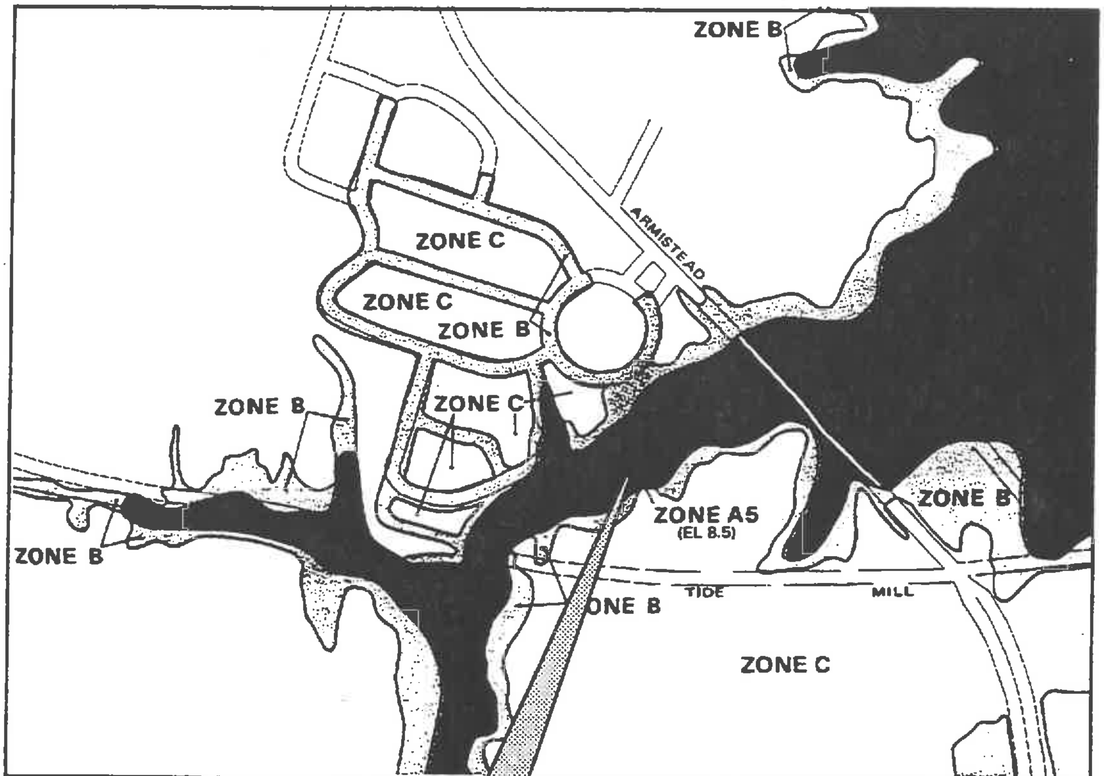
York County

College Woods
Grafton Ponds

Source: Virginia Department of Conservation and Recreation, ***The 1989 Virginia Outdoors Plan.***

Delineation of Floodplains Using FEMA Maps

Figure 3-13



100 year flood zone is designated on FEMA maps as Zone A, and shown with dark shading.

KEY TO MAP

500-Year Flood Boundary	
100-Year Flood Boundary	ZONE B
Zone Designations*	
100-Year Flood Boundary	
500-Year Flood Boundary	ZONE B
Base Flood Elevation Line With Elevation In Feet**	513
Base Flood Elevation in Feet Where Uniform Within Zone**	(EL 987)
Elevation Reference Mark	RM7×
Zone D Boundary	
River Mile	•M1.5

Alternative soil mapping resources that may be useful are the Erodibility Index (EI) maps developed by the U.S. Department of Agriculture, Soil Conservation Service for determining compliance with the 1985 federal Food Security Act (FSA or Farm Bill). The erodibility index for those maps was determined by the same formula applied in these Regulations, but the maps apply only to agricultural lands. Those maps should be available in the local SCS or Soil and Water Conservation District offices.

Another alternative way of mapping highly erodible soils if EI information is unavailable is to use erodibility (K) factors and slope information to determine highly erodible soils. That is, soils depicted in the local Soil Survey having K factors equal to or exceeding .35 should be considered highly erodible. In addition, any soil with a slope exceeding 15% should be considered highly erodible. There are no effective alternatives to the soil survey for providing comprehensive soil permeability information.

The Department does not encourage local governments whose soil surveys have not yet been included in the VirGIS data base to try to calculate the erodibility indices for their soil types, since the process is quite cumbersome to perform manually. It necessitates determining from topography maps slope gradients and lengths for each soil mapping unit, overlaying that data with the soil erodibity and replacement rate information, calculating all those findings with a rainfall factor, and delineating the resulting polygons on a map. However, that process is set forth below for those who might still be interested.

Highly Erodible Soils

Highly erodible soils have a high potential for erosion and sedimentation problems. This potential is due, in part, to excessive steepness and length of slope, which act to increase precipitation runoff velocity. Higher velocities act to loosen and remove certain soil particles. The extent to which these soil particles are moved is related to their structure, texture, percentage of organic content, the infiltration rate and the soil's permeability.

The soil characteristics of erodible soil are discussed in soil surveys with reference to soil mapping units. A thorough discussion of soil mapping units in terms of their relationship to soil classification and land management is provided in each soil survey document.

The calculation of the erodibility index (EI) for a given area is required to delineate "highly erodible soils" as a potential component of Resource Management Areas. The erodibility index for any soil is determined from the following formula:

$EI = RKLS/T$, where
R = the rainfall and runoff factor
K = the soil susceptibility to water erosion
LS = the combined effects of slope length and steepness
T = the soil loss tolerance

In general terms, the erodibility index (EI) is the measure of the ratio at which soil is being eroded in relation to the rate at which it is being replaced. The index of eight (8) is the generally accepted threshold at which the rate of soil loss becomes critical in relation to soil replacement, resulting in severe soil erosion.

tion through the vertical transportation of pollution-charged particles. The amount of water that moves down through the soil varies depending upon the water holding capacity of the particular soil type. That capacity is largely determined by the soil structure, texture, percentage of organic matter and permeability. Soil permeability is especially important in relation to the design of soil drainage systems, septic tank absorption fields, and construction projects where the rate of water movement under saturated conditions affects pollutant behavior. Excessive seepage or infiltration from septic tank absorption fields caused by soils with rapid permeability rates can cause serious health problems through pollution of underground sources of domestic drinking water. Shallow groundwater resources are also a source of water for all streams which flow into larger rivers and the Bay.

Other pollutants such as pesticides, heavy metals, organic wastes, road salts, and nuclear wastes also can adhere to soil particles and be leached lower into the soil horizon until they reach groundwater storage areas. The combined effects of septic tank and chemical pollutants leaching into groundwater storage systems adds significantly to the problem of water resource pollution.

The determination of "highly permeable soils" can be accomplished by using the local SCS soil survey in a three-step process:

Step 1

Find the soil mapping unit in the "Index to Mapping Units" located in the front of the soil survey.

Step 2

Go to the page number listed in the "Index to Mapping Units"; from this listing, the soil series for that mapping unit can be identified.

Step 3

Refer to the soil survey's table of contents for the location of the information on capability units, as well as the tables "Estimated Soil Properties Significant in Engineering" and/or "Physical and Chemical Properties of Soils" in more recent soil surveys. Information pertaining to permeability is presented in these tables and in the soil survey's glossary in terms of seven permeability rate parameters:

- very slow (less than 0.06 inches/ hour)
- slow (0.06 to 0.20 inches/hour)
- moderately slow (0.20 to 0.60 inches/ hour)
- moderate (0.60 to 2.0 inches/hour)
- moderately rapid (2.0 to 6.0 inches/hour)
- **rapid (6.0 to 20 inches/hour)**
- **very rapid (more than 20 inches/hour)**

The Criteria Regulations state that the permeability groups to be included in the mapping of "highly permeable soils" are those soils that exhibit permeability rates equal to or greater than 6 inches/hour, the rapid and very rapid groups as outlined above. Therefore, all soil mapping units that are characterized by permeability rates in these two categories should be delineated as "highly permeable soils" in the mapping of Resource Management Areas.

LENGTH/SLOPE (LS) FACTORS

TABLE 3-6

% Slope	Slope Length In Feet: 10	20	40	60	80	100	110	120	130	140	150	160	180	200
0.2	0.04	0.05	0.06	0.07	0.08	0.08	0.08	0.09	0.09	0.09	0.09	0.09	0.10	0.10
0.3	0.04	0.05	0.07	0.08	0.08	0.09	0.09	0.09	0.09	0.10	0.10	0.10	0.10	0.11
0.4	0.05	0.06	0.07	0.08	0.09	0.09	0.10	0.10	0.10	0.10	0.11	0.11	0.11	0.11
0.5	0.05	0.06	0.08	0.08	0.09	0.10	0.10	0.10	0.11	0.11	0.11	0.11	0.12	0.12
1.0	0.06	0.08	0.10	0.11	0.12	0.13	0.13	0.14	0.14	0.14	0.15	0.15	0.15	0.16
2.0	0.10	0.12	0.15	0.17	0.19	0.20	0.21	0.21	0.22	0.22	0.23	0.23	0.24	0.25
3.0	0.14	0.18	0.22	0.25	0.27	0.29	0.30	0.30	0.31	0.32	0.32	0.33	0.34	0.35
4.0	0.16	0.21	0.28	0.33	0.37	0.40	0.42	0.43	0.44	0.46	0.47	0.48	0.51	0.53
5.0	0.17	0.24	0.34	0.41	0.48	0.54	0.56	0.59	0.61	0.63	0.66	0.68	0.72	0.76
6.0	0.21	0.30	0.43	0.52	0.60	0.67	0.71	0.74	0.77	0.80	0.82	0.85	0.90	0.95
8.0	0.31	0.44	0.63	0.77	0.89	0.99	1.04	1.09	1.13	1.17	1.21	1.25	1.33	1.40
10.0	0.43	0.61	0.87	1.06	1.23	1.37	1.44	1.50	1.56	1.62	1.68	1.73	1.84	1.94
12.0	0.57	0.81	1.14	1.40	1.61	1.80	1.89	1.98	2.06	2.14	2.21	2.28	2.42	2.55
14.0	0.73	1.03	1.45	1.78	2.05	2.29	2.41	2.51	2.62	2.72	2.81	2.90	3.08	3.25
16.0	0.90	1.27	1.80	2.20	2.54	2.84	2.98	3.11	3.24	3.36	3.48	3.59	3.81	4.01
18.0	1.09	1.54	2.17	2.66	3.07	3.43	3.60	3.76	3.92	4.06	4.21	4.34	4.61	4.86
20.0	1.29	1.82	2.58	3.16	3.65	4.08	4.28	4.47	4.65	4.83	5.00	5.16	5.47	5.77
25.0	1.86	2.63	3.73	4.56	5.27	5.89	6.18	6.45	6.72	6.97	7.22	7.45	7.90	8.33
30.0	2.52	3.56	5.03	6.16	7.11	7.95	8.34	8.71	9.07	9.41	9.74	10.06	10.67	11.25
40.0	4.00	5.66	8.00	9.80	11.3[illegible]	12.65	13.27	13.86	14.43	14.97	15.50	16.01	16.98	17.30
50.0	5.64	7.97	11.27	13.81	15.94	17.82	18.69	19.53	20.32	21.09	21.83	22.55	23.91	25.21
60.0	7.32	10.35	14.64	17.93	20.71	23.15	24.28	25.36	26.40	27.39	28.36	29.29	31.06	32.74

% Slope	Slope Length In Feet: 300	400	500	600	700	800	900	1000	1100	1200	1300	1500	1700	2000
0.2	0.11	0.12	0.13	0.14	0.15	0.15	0.16	0.16	0.17	0.17	0.18	0.19	0.19	0.20
0.3	0.12	0.13	0.14	0.15	0.16	0.16	0.17	0.18	0.18	0.18	0.19	0.20	0.21	0.22
0.4	0.13	0.14	0.15	0.16	0.17	0.17	0.18	0.19	0.19	0.20	0.20	0.21	0.22	0.23
0.5	0.14	0.15	0.16	0.17	0.18	0.18	0.19	0.20	0.20	0.21	0.21	0.22	0.23	0.24
1.0	0.18	0.20	0.21	0.22	0.23	0.24	0.25	0.26	0.27	0.27	0.28	0.29	0.30	0.32
2.0	0.28	0.31	0.33	0.34	0.36	0.38	0.39	0.40	0.41	0.42	0.43	0.45	0.47	0.49
3.0	0.40	0.44	0.47	0.49	0.52	0.54	0.56	0.57	0.59	0.61	0.62	0.65	0.67	0.71
4.0	0.62	0.70	0.76	0.82	0.87	0.92	0.96	1.01	1.04	1.08	1.12	1.18	1.24	1.33
5.0	0.93	1.07	1.20	1.31	1.42	1.52	1.61	1.69	1.78	1.86	1.93	2.07	2.21	2.40
6.0	1.17	1.35	1.50	1.65	1.78	1.90	2.02	2.13	2.23	2.33	2.43	2.61	2.77	3.01
8.0	1.72	1.98	2.22	2.43	2.62	2.81	2.98	3.14	3.29	3.44	3.58	3.84	4.09	4.44
10.0	2.37	2.74	3.06	3.36	3.62	3.87	4.11	4.33	4.54	4.74	4.94	5.30	5.65	6.13
12.0	3.13	3.61	4.04	4.42	4.77	5.10	5.41	5.71	5.99	6.25	6.51	6.99	7.44	8.07
14.0	3.98	4.59	5.13	5.62	6.07	6.49	6.88	7.26	7.61	7.95	8.27	8.89	9.46	10.26
16.0	4.92	5.68	6.35	6.95	7.51	8.03	8.52	8.98	9.42	9.83	10.24	11.00	11.71	12.70
18.0	5.95	6.87	7.68	8.41	9.09	9.71	10.30	10.86	11.39	11.90	12.38	13.30	14.16	15.36
20.0	7.07	8.16	9.12	9.99	10.79	11.54	12.24	12.90	13.53	14.13	14.71	15.80	16.82	18.24
25.0	10.20	11.78	13.17	14.43	15.59	16.66	17.67	18.63	19.54	20.41	21.24	22.82	24.29	26.35
30.0	13.78	15.91	17.79	19.48	21.04	22.50	23.86	25.15	26.38	27.55	28.68	30.81	32.80	
40.0	21.92	25.31	28.30	31.00	33.48									
50.0	30.87													
60.0														

Source: Virginia Dept. of Conservation and Historic Resources, Division of Soil and Water Conservation. *Training Notebook: Urban Erosion and Sediment Control in Virginia.*

Significant Wildlife Habitat

The relationship between wildlife habitat and water quality is reciprocal by nature. Many wildlife species depend upon habitats (such as forested wetlands) which provide essential water quality protection functions. At the same time, many species (such as marine fish and shellfish) play an essential role in the ecological processes which support features critical for water quality protection (such as tidal wetlands).

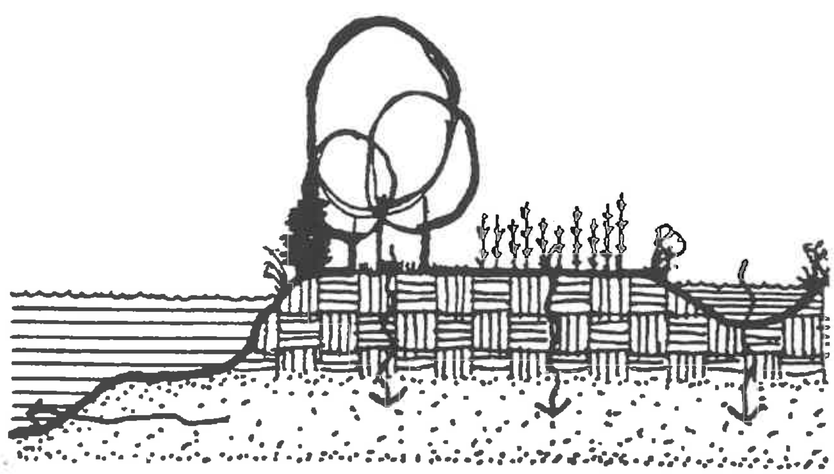
The location and function of significant wildlife habitat areas may be derived from a variety of sources. The Virginia Department of Game and Inland Fisheries' BOVA (Biota of Virginia)[9] and Endangered Species programs, as well as the Department of Conservation's Natural Heritage Program[10], are able to provide useful information for this purpose.

In designating RPAs under the "such other lands" provision, localities should use the RPA criteria in the Regulations.

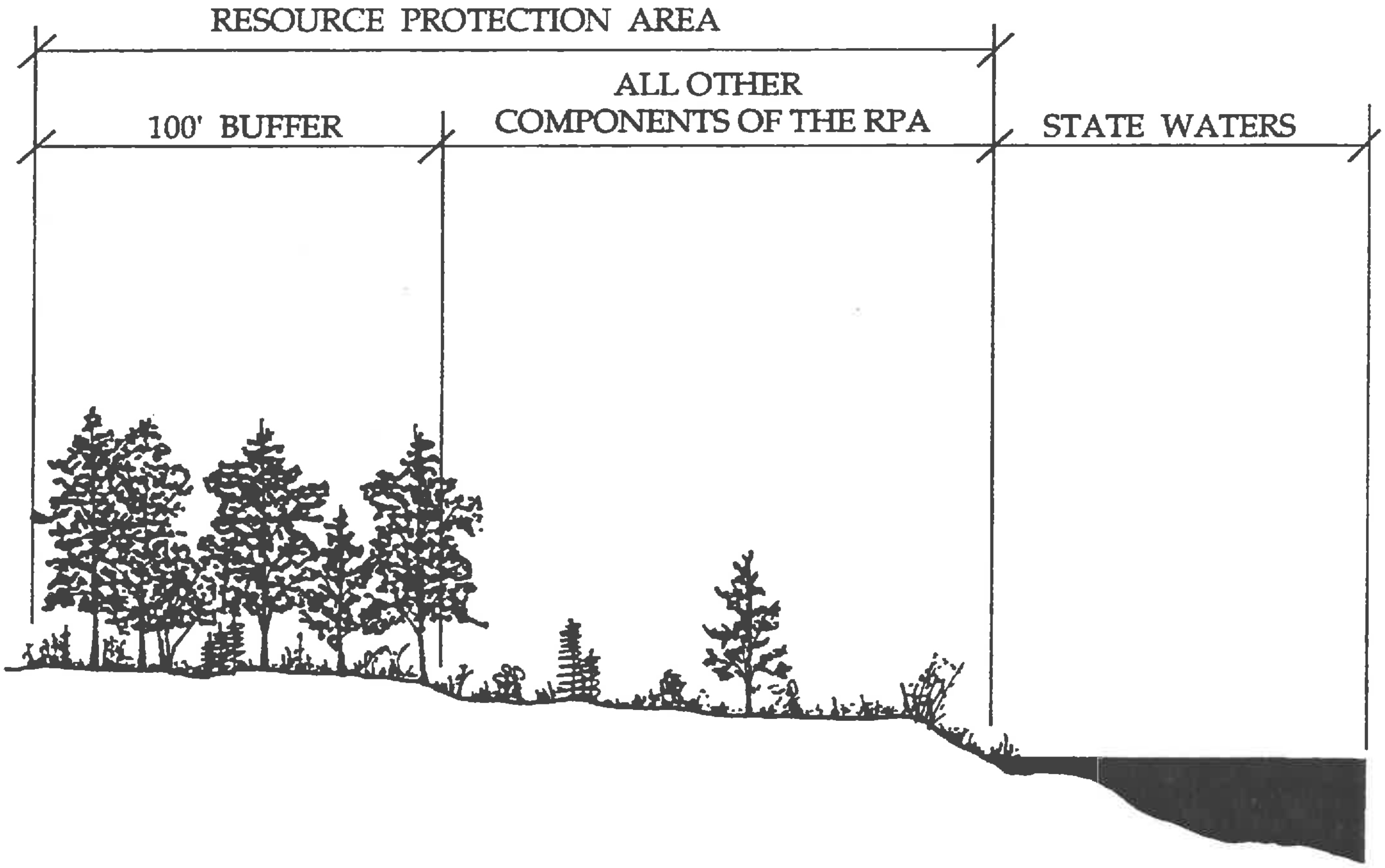
The lands must:

- Be located at or near the shoreline;
- Exhibit intrinsic water quality value due to the ecological or biological processes they perform, or, be sensitive to impacts which may cause significant degradation to the quality of state waters;
- In their natural condition, provide for the removal, reduction, or assimilation 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 state waters and aquatic resources.

Lands which meet some of the above criteria but do not meet the full definition should be considered for designation as Resource Management Areas.



BUFFER AREA CROSS-SECTION *FIGURE 3-15*



The Resource Protection Area designation criteria, coupled with readily available data and mapping resources for most of those components, should provide a rather direct, logical method for designating RPAs. These components will tend to be adjacent to each other, following the dendritic (stream) pattern. Figure 3-16 shows how the components listed in the Regulations might be combined to create a Resource Protection Area, in a hypothetical case.

Resource Management Areas

The Criteria Regulations establish the Resource Management Area (RMA) as the landward component of Chesapeake Bay Preservation Areas. Lands to be considered for designation as Resource Management Areas include the following:

- Non-tidal wetlands
- Floodplains
- Highly erodible soils
- Highly permeable soils
- Other lands at local discretion

Resource Management Areas are important in terms of water quality primarily because, if improperly used or developed, they could release significant amounts of nonpoint source pollutants into the surface and ground water systems. The Regulations do not limit the types of land use and development that may occur within the RMA. Instead, a variety of performance criteria will be applied to any use or development within RMAs to ensure that those land disturbances that do occur will minimize the adverse impact on water quality.

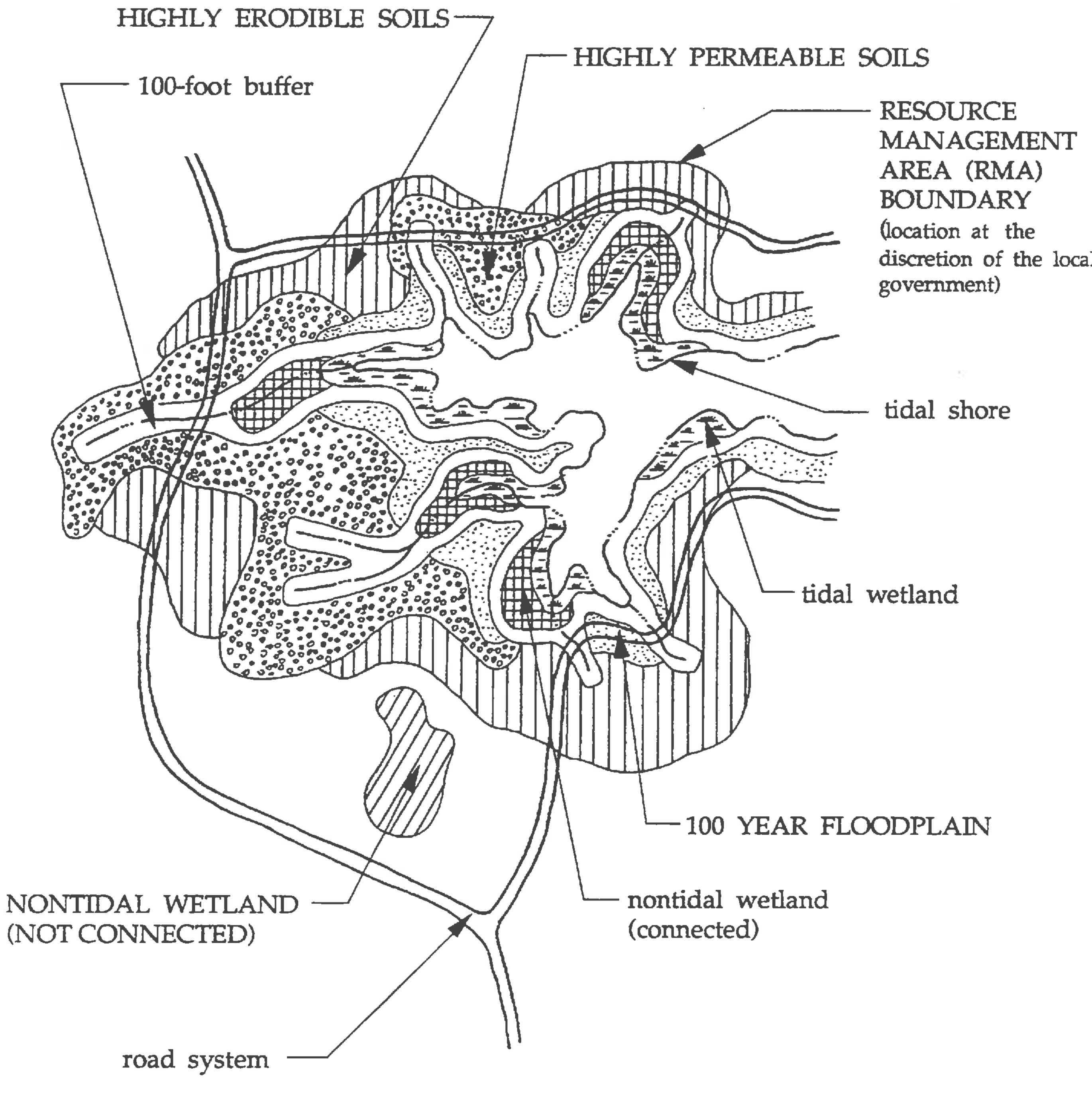
Unlike the delineation of RPAs, the designation of RMAs will be left in large part to local discretion. That is, the delineation of RPAs must follow the natural boundaries of the land features themselves. By contrast, the geographic extent of RMAs is to be determined by each local government according to the analysis of components of RMAs and an examination of local conditions. The features mentioned earlier are land forms which must be **considered** for inclusion within the RMA boundary. For example, a locality may choose not to designate certain isolated non-tidal wetlands which may not have a direct impact on the water quality of the Bay and its tributaries. At the same time, the lands that may be designated as part of the RMA are not limited to those components mentioned here. A locality may choose to include, as part of the RMA, certain other lands which, for example, serve as groundwater recharge areas.

Determining the Geographic Extent of the RMA

While localities have broad authority in the designation of Resource Management Areas and may choose among several options, it is essential to utilize the environmental inventory as a basis for that determination. In the final analysis, the designation must be legally defensible and based upon water quality protection, consistent with the Act, the Criteria Regulations, and other police powers specifically granted under Title 15.1 of the Code of Virginia.

The environmental inventory advances this purpose by clearly establishing priority areas and enabling local governments to make reasonable decisions. Where the suggested RMA components are clustered or predominant in the landscape, the area should be prioritized for inclusion. Human-made boundaries or natural features (roads, ridgelines, etc.) may have utility as easily administered RMA boundaries, if they roughly follow the outlines of the suggested components. The use of a specified linear distance should be avoided unless the distance is based upon a general grouping of features evidenced by the inventory. Without such a basis, this linear approach may be subject to challenge for being without an adequate technical basis. Designation of watersheds as RMAs may

HYPOTHETICAL RMA COMPONENTS *FIGURE 3-17*



NOTE: items in lower case letters indicate the feature that the symbol depicts. ITEMS IN UPPER CASE LETTERS INDICATE THE FEATURE SHOULD BE MAPPED AS AN RMA FEATURE

The Regulations establish two basic conditions which must characterize any area to be designated as an IDA. Section 3.4 of the Regulations states:

Areas of existing development and infill sites where little of the natural environment remains may be designated as Intensely Developed Areas.

This condition is the over-riding test before any area within the local jurisdiction can be delineated as an Intensely Developed Area. In addition to this central requirement, IDA designation is further contingent upon the characteristics of an area meeting any one of the following three conditions:

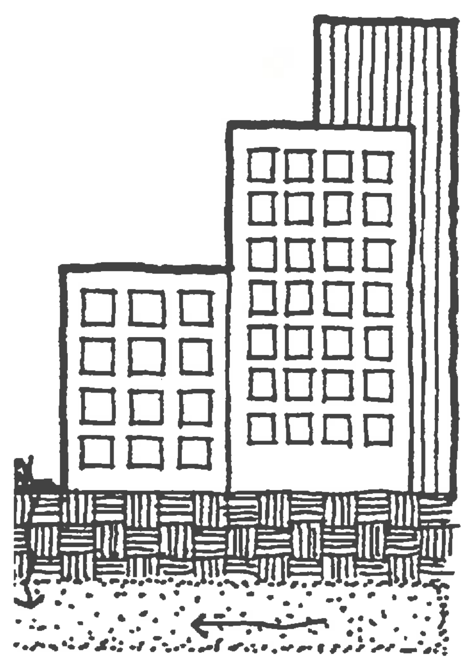
1. Development has severely altered the natural state of the area such that it has more than 50% impervious surface;

2. Public sewer and water is constructed and currently serves the area by the effective date of the Regulations (October 1, 1989). This condition does not include areas planned for public sewer and water;

3. Housing density is greater than or equal to four dwelling units per acre.

Delineating the boundaries of the IDA will entail examining the land use pattern within Chesapeake Bay Preservation Areas to determine where the above conditions are present. Local officials should begin by locating concentrations of high density development. Potential IDAs should be reviewed in relation to the comprehensive plan, particularly where the plan identifies redevelopment areas. The criteria outlined above should then be applied to determine eligibility for IDA status. The IDA boundaries should be drawn so as to bypass larger, naturally vegetated areas. At the same time, the designation process should not isolate small, individual sites as IDAs; rather, IDAs are intended to serve as areas where future redevelopment activity is focused.

NOTE: Although the Regulations do not specify a minimum size criterion for IDAs, it is recommended that local governments use a 20 acre minimum as a guide in delineating these areas.



ENDNOTES

[1] Ian McHarg, ***Design With Nature*** (Garden City, New York: The Natural History Press, 1969)

[2] Inaccuracies in the National Wetlands Inventory are also the result of variations in the resolution of the aerial photo imagery. It should be noted, however, that NWI maps usually underestimate the extent of jurisdictional wetlands, as determined using the new federal manual.

[3] See David G. Burke, Erik J. Meyers, Ralph W. Tiner, Jr., and Hazel Groman, ***Protecting Nontidal Wetlands,*** Planning Advisory Service Report Number 412/413 (Chicago: American Planning Association, 1988), 32-35. Although maps are helpful in identifying wetlands boundaries and often presenting other information about the characteristics of a particular wetland, maps typically provide only a portion of the data necessary for evaluating permit applications.

[4] The National Wetlands Inventory for the Chesapeake Bay region was prepared over a number of years (1979-1984.) U.S. Department of the Interior, Fish and Wildlife Service, ***Atlas of National Wetlands Inventory Maps of Chesapeake Bay,*** vol. 1, 1986.

[5] Burke, et al., ***Protecting Nontidal Wetlands.***

[6] Commonwealth of Virginia Department of Conservation and Recreation, ***The 1989 Virginia Outdoors Plan*** (Richmond, Va.: Division of Planning and Recreation Resources, 1989), 162-166.

[7] The Virginia Geographic Information System (VirGIS) has been developed by the Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation, with assistance from the Agricultural Engineering Department at Virginia Polytechnic Institute and State University. Local governments interested in additional VirGIS products other than those provided by the Department should make their inquiries to the Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation, (804) 786-2064.

[8] DRASTIC is another form of suitability analysis used to aid in planning for the protection of groundwater resources. DRASTIC is an acronym which stands for: D - Depth to water; R - (Net) Recharge; A - Aquifer Media; S - Soil Media; T - Topography (Slope); I - Impact (on zone of saturation between the surface and groundwater; and C - Conductivity (Hydraulic) of the aquifer. These variables represent important factors affecting the relative groundwater pollution potential of an area. A numerical DRASTIC index is calculated from available information and mapped to assess the relative groundwater pollution potential of areas in the jurisdiction. Demonstration projects have been undertaken in three Tidewater localities: Prince William, Henrico, and Middlesex County. Information assessing these projects is available from the Virginia State Water Control Board.