10 Sensitive Areas

I. INTRODUCTION

The Economic Growth, Resource Protection, and Planning Act (commonly referred to as the Growth Act) requires local governments to adopt a "Sensitive Areas" element in the Comprehensive Plan to address specific environmental resources. The Growth Act requires protection of the following four types of sensitive areas across the State of Maryland: (1) streams and their buffers; (2) 100-year floodplains; (3) habitats of threatened and endangered species; and (4) steep slopes. In addition to these four environmental considerations, this chapter also discusses the Chesapeake Bay Critical Area, non-tidal wetlands, forest conservation, storm water management, and generalized soil types of this region.

Much of the City's environmental regulations, such as stream buffer, floodplain, non-tidal wetland, storm water management, and forest conservation requirements, are mandated by the State of Maryland. For development projects, environmental impacts to these items are addressed at the subdivision and site plan review stages for individual properties. In addition to these regulations, the City's location adjacent to the Chesapeake Bay requires a heightened level of environmental oversight. The City developed its Chesapeake Bay Critical Area Program in 1988, and periodically reviews its program under the auspices of the Chesapeake Bay Critical Area Commission staff. The program is tailored to the historical development patterns of Havre de Grace, and it serves to regulate land uses and development practices immediately adjacent to the tidal waterways of the Susquehanna River and Chesapeake Bay.

State agencies that oversee environmental regulations are the Maryland Department of the Environment (MDE) and the Department of Natural Resources (DNR). These agencies assist with local ordinance review and interpretation and, in some cases, carry out enforcement actions for environmental infractions. MDE enforces 100-year floodplain compliance and is responsible for issues related to stormwater management, shoreline, and tidal and non-tidal wetlands. Offices within DNR address streams and their buffers, forest conservation, habitats of threatened and endangered species, steep slope protection, and individual jurisdictions' Chesapeake Bay Critical Area programs. Recommendations for this chapter are geared toward strengthening the City's local ordinances to address sensitive areas and environmental resources and to clarify the role of State agencies in the City's development review process.

This chapter includes a generalized map of environmental protection areas, such as the floodplain, the Chesapeake Bay Critical Area designations, contours, streams and waterways. Designations on this map are not specific to individual properties. More specific map information may be obtained at Havre de Grace City Hall through the Department of Economic Development and Planning.

II. RECOMMENDATIONS

- Review and revise existing ordinances, such as the Chesapeake Bay Critical Area Program, Forest Conservation Ordinance, and Storm Water Management Ordinance, on a regular basis to ensure consistency with State policies and law.

- Continue to coordinate with State and local agencies to ensure that all environmental resources are adequately protected during the development review process.

- Amend the Site Plan Ordinance to define requirements for stream buffers, steep slopes, and habitats of threatened and endangered species.

- Formalize the City's development review process so that the roles of State environmental regulatory agencies are outlined and clarified.

- Amend the Site Plan and Subdivision Ordinances to reflect proper review authority.

- Evaluate the City's current environmental standards for consistency with State and County requirements.

- Improve our knowledge base of threatened and endangered species within the local region so that protection measures can be applied during the annexation process and/or development review process. This includes identification of plant and animal species on land and within tidal and non-tidal waters.

- Improve storm water management and runoff water quality in the older portions of Havre de Grace through innovative techniques, such as small bio-retention facilities, storm drain filters, and grass filter strips, where appropriate.

- Continue to inspect newer stormwater management facilities on a semi-annual basis so that their effectiveness is maintained.

- Encourage the use of native plantings along the Susquehanna River and Chesapeake Bay shoreline in areas where development already exists.

III. SENSITIVE AREAS

This section describes sensitive areas and other environmental resources, with necessary definitions and justification for protection.

A. Streams and their Buffers

1. Definitions

Streams are parts of a watercourse, either naturally or artificially created, that contain intermittent or perennial base flow of groundwater origin.

Ditches that convey surface runoff exclusively from storm events are not included in this definition.

Stream buffers, as defined by the State, are areas that extend a minimum of twenty-five feet from the top of each stream bank along both sides of a stream.

2. Justification for protection of streams and their buffers

Streams and their buffers are valuable to people and vital to our natural resources. Streams provide drinking water for local communities and crop-saving irrigation for farmers during droughts. They also support recreational fishing and serve as spawning areas for commercial fish stock.
Streams and their buffers are home to countless species of animals and plants, and streams themselves serve as lifelines to the Bay, transporting valuable nutrients, minerals, and vitamins to the Chesapeake. The floodplains, wetlands, and wooded slopes along streams are very important parts of the stream ecosystem, and in many ways determine the diversity and health of a stream.

As development activity becomes more intense and consumes larger amounts of land, forests and natural vegetation along streams are diminished. The cumulative loss of large amounts of open space and natural land reduces the ability of remaining land along streams to buffer the effects of such intrusions as high stream flow and pollution. Many of Maryland's streams have lost part of their "immune system" and are now more vulnerable to harsh conditions and pollution stress than ever before.

Buffers are a crucial "best management technique" that reduces sediment, nitrogen, phosphorous, and other runoff pollutants by acting as a filter, thus minimizing damage to streams. The effectiveness of buffers depends on their width (which should take into account such factors as contiguous or nearby steep slopes, soil erodibility, and wetlands), the type of vegetation within the buffer (some plants are more effective at nutrient uptake than others), and maintenance of the buffer (natural, unmowed vegetation is preferable).

The Healthy Stream: The character of a stream is determined by the soil type, steepness, vegetation, climate, and artificial ground covering in its upstream watershed. Healthy streams, however, have certain things in common. Within each healthy stream is a diversity of habitat, including slow-moving runs, deep pools, gravel riffles, bends, and cover such as overhanging vegetation, submerged logs, and branches. Just as important is the stream's response to rainfall. A healthy stream will have much of its stormwater captured in its watershed upstream. Wetlands, upland vegetation, and organically rich soil help hold floodwater and release it gradually between storms. Healthy streams rise more slowly during storms, do not flow as high at peak flow, and have more water in them at low flow than damaged streams. Higher and steadier base flows provide more habitat for aquatic life.

Less visible, but no less important, is the overall water quality of a healthy stream. Stream water should contain sufficient oxygen and provide suitable temperatures for plants and animals. Each animal and plant species has optimum temperature requirements for feeding and breeding. Trout and other types of fish, for example, require cool waters. Stream acidity and alkalinity should be balanced, the water should be clear, and dissolved minerals should be in natural proportions. Toxic substances such as oils, metals, solvents, and pesticides should not be carried in the water or concentrated in the bottom sediments.

As a result of both steady flows and good water quality, the diversity of habitat in a healthy stream provides for a complex and balanced community of plankton, streamside and instream vegetation, aquatic insects, worms, clams, snails, crayfish, fish, salamanders, frogs, turtles, snakes, birds, and mammals. This biota is not only found directly in the stream, but is also found burrowing in its banks, hiding in its wetlands, resting in the adjoining thickets, and browsing on the rich organic matter in its wooded ravines. While a healthy stream is dependent on the many activities occurring throughout the watershed, a large measure of protection can be provided by insuring the integrity of the stream's adjoining natural areas--particularly floodplains, wetlands, steep slopes, and wooded areas.

The Damaged Stream: With the growth of human population and its increasing need for food, shelter, and goods, natural areas and farmland are being converted into developed areas. Changes in ground cover and intensity of land use have the greatest impact on the quality of streams. Increased use of agricultural chemicals and the farming of marginal lands, combined with urban and suburban development in former woodlands, have dramatically altered the landscape in the watersheds of Maryland's streams, while carrying invisible contaminants as well.

Both the extreme high and low flows carry extra pollutants in a damaged stream. During wet weather, a damaged stream receives warm, muddy water from field ditches and the urban drain spouts and storm drains that form its headwaters. The wet flow can be intensely high. Flooding of developed areas may occur and banks often cave in. Mud and sand deposits in the stream, and the streambeds and banks widen from erosion. Former cool shaded pools, deep runs, and clean gravel beds are now scoured, buried, and open to the hot summer sun.

With development, normal infiltration into the soil is hindered because increased impervious surfaces and cleared land cause rainwater to run off of the land faster. This causes groundwater seeps and springs to dry up following only a short period of dry weather and causes low stream flows to decrease further. Much of the streambed may dry out until the next flush of stormwater. During low stream flow, nitrogen which passed through a farm field or a suburban, grassed yard concentrates in a stream. Without adequate stream buffers or stormwater management, high flows wash heavy metals and oils from automotive and industrial sources into a stream in urban areas, and phosphorous, bacteria, and sediment from farm fields and dairy feed lots. Severely damaged streams no longer perform their natural functions and cannot support the recreation and water supply functions they may also provide.

In Maryland, most of the pollutants from damaged streams find their way into the Chesapeake Bay. Pollution from streams without natural buffers is one of the most serious cumulative factors affecting the overall health of the Bay. The nitrogen and phosphorous compounds, in particular, are overfeeding the Bay – a term called "eutrophication"— creating algae blooms out of once clear water, and depleting the water of its dissolved oxygen as the microscopic plants that thrive on the nutrients begin to die and decay. Greater sedimentation also results where natural buffers are absent.

Buffer Values: Buffers are protection areas or zones placed around streams to preserve some of the biological and hydrologic integrity of the stream basin. Stream buffers act as run-off and groundwater pollution control systems by filtering pollutants through the soil and root zone. For example, microscopic organisms that inhabit the soils in a forested buffer assist in the decomposition of pollutants much like the microbes in a sewage treatment plant.

Buffers provide habitat for wetland and upland plants that form the basis of healthy biological systems. A wide variety of animals use the natural vegetation as a corridor for food and cover. A natural buffer system provides safe passage from one patch of remaining forest to another. The leaves from natural vegetation are diverse and provide a good mix of nutrients, vitamins, and minerals to feed the many aquatic insects inhabiting a healthy stream bottom. A diverse and productive stream buffer leads to a diverse and productive insect community and to a diverse and productive fish community.

Stream buffers, in many cases, include adjoining wetlands, the floodplain, forests, and steep slopes. Apart from the valuable habitat in these sensitive areas, there are also clear benefits to people that result from protecting buffers. Wetlands and floodplains slow storm flows and dissipate flood-water energy, allowing more of it to percolate into the ground. The result is decreased flood damage and decreased need for expensive flood control structures. Ground water may be replenished if the buffer areas lie above drinking water aquifers.

In summary, the buffer of a stream should be conceived as more than a line on a map; it is part of the stream ecosystem, whose boundaries often depend on conditions of slope, soil, ground cover, and hydrology. The buffer encompasses parts of the stream ecosystem that are often dry, and yet integral to the stream's health. Although locally-adopted definitions may vary, stream buffers ideally include:

- *Floodplains where most stream's wetlands are formed and where energy dissipation, natural filtration, food storage, and water storage occur.*

- *Stream banks and steep slopes which should remain intact to prevent erosion from clogging the stream bed and provide protected habitat for mammals and refuges for many plants.*

- *Stream side forests and other vegetation, which provide habitat, stabilize banks, provide shading, reduce pollutants, and produce leaf-litter supporting a host of microscopic shredders, filter feeders, and decomposers that form the base of a healthy stream food chain.*

B. Hydrology

1. Definitions

Surficial hydrology refers, in general, to water on the land surface. This includes all visible water, including streams and wetlands.

Subsurface hydrology is generally referred to as *water table*.

Defining the 100-year floodplain involves engineering studies, field observations, and other available information. In this respect, the definition, as it translates to a map, leaves little room for interpretation in comparison to other sensitive areas. Local protection regulations under the Growth Act may exceed, but may not, diminish State standards. Because of the distinction between tidal and non-tidal floodplains under State Law, the definition should reflect that distinction and closely mirror the following:

- ***Tidal 100-Year Floodplain**: The land along or adjacent to tidal waters that is susceptible to inundation by the 100-year flood generated by coastal or tidal flooding due to high tides, hurricanes, tropical storms, or steady off-shore winds.*

- ***Nontidal 100-Year Floodplain:** The land area along or adjacent to nontidal streams and bodies of water that is susceptible to inundation by the 100-year flood as a result of rainfall and runoff from upland areas. Nontidal streams convey flow downstream under the force of gravity and are not influenced by tidal (lunar) forces.*

Definition of **Nontidal Wetlands**: The U.S. Army Corps of Engineers (Federal Register 1982) and the U.S. Environmental Protection Agency (Federal Register 1980) jointly define nontidal wetlands as: those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

Diagnostic Environmental Characteristics: Wetlands have the following general diagnostic environmental characteristics:

- *Vegetation: The prevalent vegetation consists of macrophytes that are typically adapted to areas having hydrologic and soil conditions described above in the definition. Hydrophytic species, due to morphological, physiological, and/or reproductive adaptation(s), have the ability to grow, effectively compete, reproduce, and/or persist in the anaerobic soil conditions.*

- *Soil: Soils are present and have been classified as hydric, or they possess characteristics that are associated with reducing soil conditions.*

- *Hydrology: The area is inundated either permanently or periodically at mean water depths of less than 6.6 feet, or the soil is saturated to the surface at some time during the growing season of the prevalent vegetation.*

Technical Approach for the Identification and Delineation of Wetlands: Except in certain situations, evidence of a minimum of one positive wetland indicator from each parameter (hydrology, soil, and vegetation) must be found in order to make a positive wetland determination.

2. <u>Justification for Protection</u>

a. 100-Year Floodplain

The historical reasons for floodplain protection have been to guard against injury to people and to prevent the destruction of property. In the context of sensitive areas protection under the Act, relatively undisturbed floodplains serve a variety of additional functions having important public purposes and benefits.

Floodplains, the products of natural floods, moderate and store floodwaters, absorb wave energies, and reduce erosion and sedimentation. Wetlands found within floodplains help maintain water quality, recharge groundwater, protect fisheries, and provide habitat and natural corridors for wildlife. Stream buffers found within floodplains also help to maintain water quality.

Safeguarding the many natural functions performed by floodplains benefits adjoining and downstream communities by minimizing the risks and costs associated with the loss of life and property; by contributing to the maintenance of water quality and quantity which may directly affect drinking water supplies and recreation opportunities; and, in many cases, by helping to restore the health of the Chesapeake Bay--a goal which will benefit the entire public.

b. Wetlands

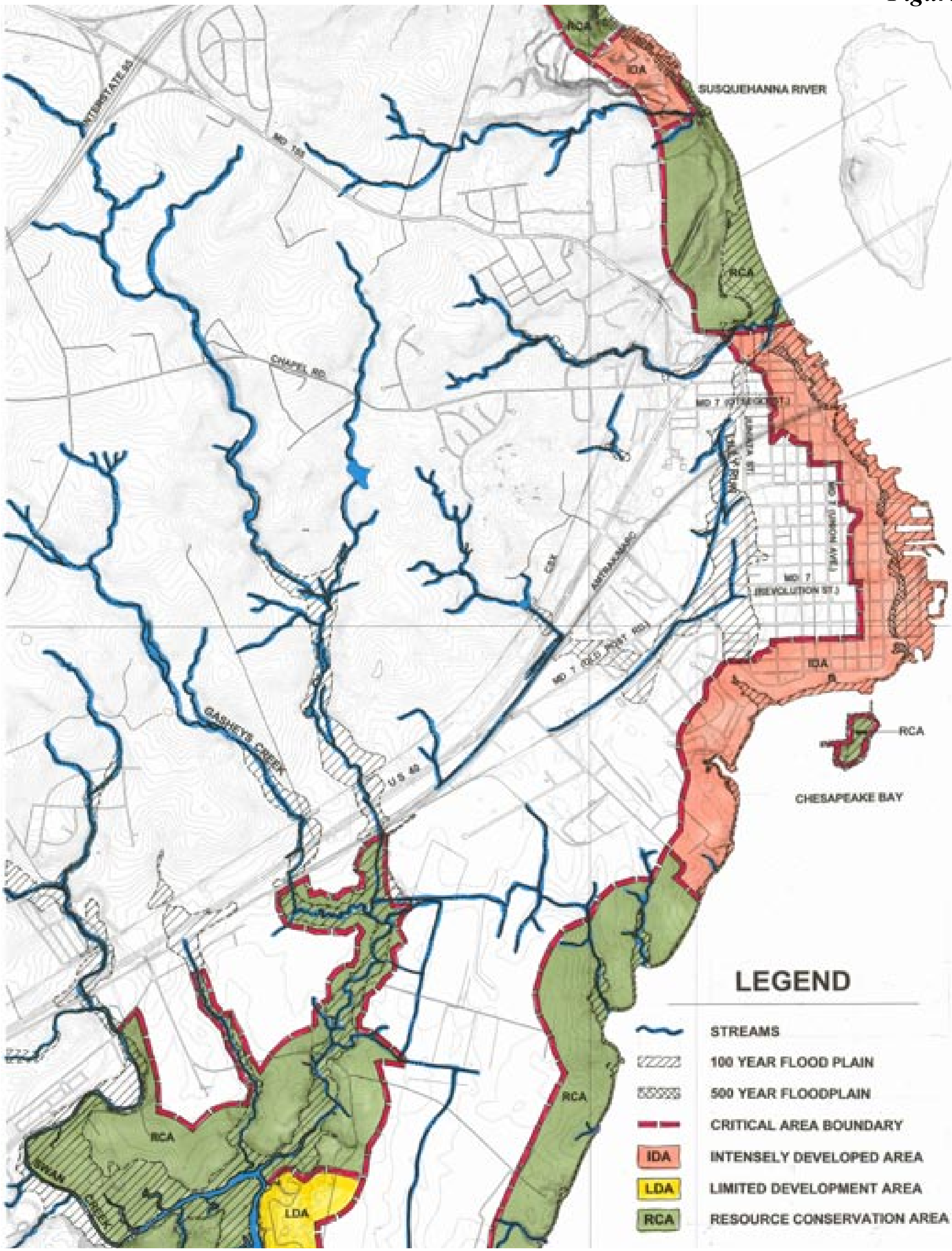
Upstream wetlands perform various functions within a given watershed:

- Influence the water quality of the adjacent river or stream by removing pollutants such as sediments, nutrients, and organics/inorganics.
- Increase detention time of floodwaters thereby reducing flow velocity, erosion, and flood peaks in downstream areas.
- Provide habitat for wildlife including waterfowl, mammals, and unique vegetation.
- Serve as spawning and nursery grounds for many estuarine and marine species of fish.
- Contribute to the aquatic food chain by providing detritus (decaying organic matter) to the biota of the adjoining waters.
- Prevent excessive water temperatures during summer months which could be lethal to invertebrates or fish.

There are many threats to wetland resources due to physical, chemical, and biological impacts. A few examples are:

- When an agricultural area is cultivated right to the edge of a river or stream, runoff of agricultural chemicals or pesticides increases. As these chemicals are deposited into the tributaries, the chances of transport to the estuary are greatly increased. In addition, some timber harvesting practices, such as clear cutting , may significantly degrade wetlands.
- Development activities in urban areas pose threats to wetlands. The most obvious impacts are filling or draining

Figure 10.1



SENSITIVE AREAS

City of Havre de Grace Comprehensive Plan wetlands for development. Urbanization of these areas typically has introduced high levels of nutrients, toxics, and sediments into upland runoff.

- Levees for flood control and water supply may completely eliminate some wetlands and may substantially change water flow patterns.

- Other channel alterations such as dams, channel diversion structures, and linear canal diversion structures, and linear canals all contribute to the limitations placed on wetlands in the natural functions they perform.

C. Habitats of Threatened and Endangered Species

1. Definitions

The following definition for **habitat of threatened and endangered species** has been adopted by the State:

An area which, due to its physical or biological features, provides important elements for the maintenance, expansion, and long-term survival of threatened and endangered species listed in COMAR 08.03.08. This area may include breeding, feeding, resting, migratory, or overwintering areas. Physical or biological features include (but are not limited to): structure and composition of the vegetation; faunal community; soils, water chemistry and quality; and geologic, hydrologic and microclimatic factors. This area may need special management or protection because of its importance to conservation of the threatened or endangered species.

2. Justification for Protection

In Maryland, over 200 species have been documented as disappearing over the past 350 years. Although elimination of large predators, such as wolves and panthers was intentional, essentially all human-induced disappearances in Maryland were incidental, due to habitat destruction. At least one ecosystem, the prairie-like grassland of the Hagerstown Valley, has been totally destroyed.

Other natural communities such as serpentine grasslands, bogs, and Delmarva bays have been reduced in number or altered to the point that they are in danger of disappearing. This habitat destruction and degradation threatens another 400 native Maryland species with elimination.

There are ethical and cultural reasons for stemming the loss of species. When a species is driven to extinction by the current generation of humans, all future generations must bear the cost. The well-being of future generations is the social responsibility of the present generation. Support is growing for an ethic that recognizes that every form of life warrants respect, regardless of its worth to humans. This ethic has been adopted by the United Nations in the World Charter for Nature as a part of its principle for conserving biological diversity. Additionally, the plants and animals that make up "nature" have considerable abstract value, playing significant roles in art and many religions.

The key to protecting threatened and endangered species is protecting the habitat in which they occur. Propagation in zoos or botanical gardens is prohibitively expensive. Transplants of plants and animals are both expensive and often unsuccessful. Maintaining rare species in their habitats is cost-effective and biologically sound over the long term.

D. Topography/Steep Slopes

1. Definitions

Topography is the slope gradient of a site expressed as a relationship of vertical feet of elevation over horizontal feet of distance (rise over run) as well as the visual lay of the land. Topography has specific implications for site development. It controls the location of roads, pathways, buildings, and utilities. Topography also affects the overall visual character of the site.

Steep slopes are defined as areas with slopes greater than 25%.

2. Appropriate Uses

In most climates and locales 0 to 8% is an optimum slope range for driving a vehicle or walking. Depending upon building design, a site can accommodate structures on grades of up to 15%. Slopes of more than 15% are prohibitive for most uses. Optimum gradients for general development are 2% to 8%. Slopes of less than 2% require grading to enable drainage, whereas slopes more than 8% often require excessive grading as well as costly structural solutions. Although severe topographical conditions often create dramatic landscapes, the ability to develop steeply sloping sites in conventional ways is limited.

Slopes beyond 20%, on the average, create cut and fill difficulties for siting structures with rear level walkouts for basement or ground floors. Private streets and walks also become unworkable on slopes over 20%. In terms of public utilities, slopes beyond 20% become unmanageable for the efficient and environmentally acceptable construction of storm drainage systems and sanitary sewer laterals. A slope of 30% is normally the cutoff beyond which cut and fill can be benched without accelerated engineering treatment. Furthermore, it should be noted that the great majority of soils found in Maryland are highly erodible at 30% or greater and are unacceptable, for the most part, for useable yards, active recreation open spaces, or accessory uses.

3. Justification for Protection

Slopes provide an environment for movement of soil and pollutants when land disturbance occurs. While soils have varying degrees of erodibility, all soils are, nonetheless, subject to movement and increasingly so as the slope of the land increases. Control of erosion potential is usually achieved in the context of slope regulation, where environmental protection is focused on those where soil movement is most likely to be a problem, i.e. on steep slopes.

There are multiple reasons for protecting steep slopes:

- Preservation of steep slopes adjacent to watercourses is especially important because of the potential harm to water quality and aquatic habitat. Communities must pay the economic costs associated with loss of water quality, as well as hazards such as flooding and landslides and other problems caused by disturbances to steep slopes.

- The identification and protection of steep slopes within a community helps to protect the community and downstream communities from these hazards.

- Protection also provides aesthetically pleasing open space and maintains local biodiversity found on the slopes.

Effects of Erosion and Sedimentation: Clearing and grading land results in increased runoff and accelerated erosion and sediment transport, even on moderate slopes. Once vegetation is removed from steep slopes, it is often difficult to re-establish. Bare slopes expose soils to repeated rainfall. Rainfall carries the sediment into streams which previously carried smaller amounts of material. The increased sediment results in channel bars, the stream banks erode, and the channel becomes wider and more shallow. As sediment fills culverts, and the stream's ability to carry water is decreased due to excess sedimentation and channel enlargement, flooding becomes a serious problem.

Economic Costs of Erosion and Sedimentation: Significant expenditures are often required to repair damage by flooding, sedimentation, and erosion. For example, floods undercut roads, scour bridge abutments, and destroy homes and property. Costly stream bank stabilization may be needed to combat erosion in developed areas, and sedimentation decreases reservoir capacity and increases water treatment costs.

Slope Instability: Landslides and other mass movements of soil on a slope can threaten life and property. Landslides are present in all five of the physiographic provinces of Maryland. The largest extent of landslides, with highest total damage costs, occurs in the Coastal Plain province. Most of the landslide problems in the Appalachian Plateau and the Valley and Ridge provinces have been generated by highway construction.

When slope stability is disturbed, downslope movements may occur. As slope angles increase, downslope forces increase, although the interrelationship between slope gradient and stability is not simple. Landslides can occur on moderate slopes. The three most significant natural factors that contribute to landslide potential are water, slope, and geology (underlying lithology and stratigraphy). The structure and form of the slope are important – old slides and incompetent formations (i.e., where soils do not support weight) are vulnerable.

Loss of Local Biodiversity: Steep slopes are known by botanists and wildlife biologists to be areas where a surprising number of different plant and animal species can be found within a short distance from one another. Historically, many of these areas have not been disturbed as they are hard to farm, log, and develop. Ecologists are interested in steeply sloped areas because they are areas of high biodiversity compared with areas of the landscape which have relatively uniform living conditions. Scientists have found that, in places where steep slopes occur, a variety of living conditions also occurs. These small habitats are called microhabitats. Microhabitats are the small shaded bogs, the dry steep slopes, and the nooks and crannies in the larger steeply sloped landscape where very specific living conditions occur on a small scale. They are the home for a diversity of plants and other organisms that have adapted to specific site conditions. Some of these areas provide habitats for threatened and endangered species, which require protection under the Growth Act.

Local biodiversity is important to all of us whether we live in cities, towns, suburban developments, or in the countryside. Local diversity of native plants, animals, fungi, and bacteria survive and flourish in habitats where they are more efficient, and, therefore, more likely to survive than other species. On steep slopes that are altered, for example by construction projects, or by the creation of lawns, other less efficient organisms, or none at all, take the place of the local native life forms. New vegetation is less efficient than the native community of plants and animals which once protected the slope against wind and water erosion. Each community of plants and animals that once occurred on the slope in a specific microhabitat was best suited to hold moisture in the soil, capture energy, capture and recycle nutrients, and produce and preserve soil in the microhabitat without the help of erosion control structures, fertilizers, insecticides, or irrigation.

4. <u>Description of the Area</u>

This eastern Harford County region (including Havre de Grace) is divided into two physiographic provinces which are clearly defined along US 40. To the north and west of US 40 lies the Piedmont Plateau Province, which is characterized by rolling hills and valleys that vary from moderate to extreme in degree of slope. The range of slope is mostly between 1% and 10% and is suitable for residential building sites. Steep slopes from 15% to 20% and generally not suitable for development are found along stream valleys and the western bank of the Susquehanna River.

In contrast to the rolling hills of the Piedmont, the portion of the planning area to the south and east of US 40 lies in the flat terrain of the Coastal Plain Province. Variation in elevation ranges from sea level to sixty feet above sea level with most of the land area within this portion being between twenty to forty feet above sea level. Most of the developed area of Havre de Grace is located in the Coastal Plain Physiographic Province.

The drainage pattern found in the planning area is divided between flows toward the Susquehanna River and upper Chesapeake Bay. The northern part within the Piedmont Plateau drains in both directions - easterly toward the Susquehanna and southerly toward the Bay. The drainage pattern of the area's southern part within the Coastal Plain is less defined.

E. Forest Conservation

1. Definition

A **forest** is a biological community dominated by trees and other woody plants covering a land area of 10,000 square feet or greater. A forest includes areas that have at least one hundred live trees having two-inch or greater diameter at 4.5 feet above the ground. A forest also includes areas that have been cut but not cleared, but does not include orchards.

The **Forest Conservation Ordinance** requires a forest stand delineation and forest conservation plan for a development plan where land disturbance is 40,000 square feet or greater. This local ordinance is guided by State law and contains requirements for forests to be retained and/or replanted upon development.

2. Justification for Protection

Forests, woodlands, groves, hedgerows, and their associated vegetation are perhaps our most conspicuous and most easily appreciated environment and landscape resources. It is when trees are cleared for development that the vulnerability of the environment in suburban areas is suddenly and starkly emphasized. Mitigation of such losses has usually been limited to decorative landscaping rather than the creation of ecologically balanced plant communities.

The benefits of maintaining large tracts of undisturbed woodlands or other natural vegetation within developments are many. Such stands help control stormwater run-off, minimize erosion and sedimentation of streams, provide wildlife habitats, and provide shade to help moderate local temperatures. They form visual buffers and are scenic in their own right. All in all, trees and woodlands are the most efficient means to control and mitigate the most common sources of water quality degradation and the problems this degradation causes for the Chesapeake Bay.

F. Chesapeake Bay Critical Area Program

1. Definitions

The **Chesapeake Bay Critical Area Program** was established by the State of Maryland to protect the important land and water resources of the Chesapeake Bay and its tributaries. The Critical Area consists of all land within 1,000 feet of Mean High Water Line of tidal water of the Bay and its tributaries and the landward edge of tidal wetlands.

The 1,000 foot Critical Area overlay protection zone within the City of Havre de Grace includes areas designated as **Intensely Developed Areas (IDA)** and **Resource Conservation Areas (RCA)**. The majority of the City is designated IDA with only the natural portions of land within the corporate limits, such as North Park and Tydings Island, designated as RCA. Because of the City's intense historic development patterns, much of the IDA area immediately adjacent to the water's edge (the 100 foot buffer) is designated as a **Buffer Exempt Area (BEA)**. Though they are recognized as BEA, these shoreline areas are subject to more stringent design criteria because of their immediate proximity to the Chesapeake Bay.

2. Justification for Protection

The goal of the Chesapeake Bay Critical Area Program is to improve the water quality of the Chesapeake Bay. This is done by reducing and/or mitigating for impervious surfaces in those areas that are most critical to the Bay, and providing intensive planting requirements for any new development immediately adjacent to the shoreline. Impervious surfaces include parking areas, buildings, driveways, and streets – any surface which blocks the soil from absorbing rain and storm water runoff. The object is to slow storm water runoff to allow for natural soil infiltration. Sixty-one (61) counties and municipalities in Maryland are affected by the Critical Area Law and are required to develop individualized protection strategies tailored to their local conditions.

Within the 1,000 foot Critical Area overlay protection zone in Havre de Grace, new development is subject to building guidelines that offset the impact of new impervious surface or a fee of $1.25 per square foot of new impervious area. Building requirements often include the addition of small, gravel-filled rain retention areas adjacent to new improvements. Impervious surfaces reduce the area for soil infiltration of rain and storm water runoff. This is significant, especially next to the Chesapeake Bay shoreline, because soil and vegetation filter pollutants before they reach the Bay. Additionally, parking areas have their own pollutants associated with them. Oil and other fluids from vehicles collect on paved surfaces and are flushed into nearby waterways. Slowing storm water runoff and allowing it to be filtered naturally or treated are the primary goals of the City's Critical Area Program.

With the most recent review of the Chesapeake Bay Critical Area Program, redevelopment and new development projects immediately adjacent to the Bay are also subject to intense planting requirements. This is required as part of recent State policy changes regarding Buffer Exempt Areas (April 2000). These buffers provide a heavily vegetated filter strip adjacent to the shoreline for storm water infiltration and water quality improvements on projects that have direct and immediate impact on the Chesapeake Bay.

G. Stormwater Management

1. Definitions

Stormwater management is for both qualitative and quantitative control of stormwater runoff.

For **quantitative control**, stormwater management is a system of vegetative and structural measures that control the increased volume and rate of surface runoff caused by human-made changes to the land.

For **qualitative control**, stormwater management is a system of vegetative, structural, and other measures that reduce or eliminate pollutants that might otherwise be transported by surface runoff.

A **retention structure** is a permanent structure that provides for the storage of runoff by means of a pond or pool of water.

2. Justification for Protection

Stormwater management laws were put into effect for public safety and improved environmental quality as a result of land development practices. The Maryland Department of the Environment oversees the local implementation of stormwater management regulations for all jurisdictions within the State of Maryland. Because land development impacts the natural flow and infiltration of surface water, stormwater management is a mitigating effort to direct rain and stormwater runoff, often capturing it in stormwater management ponds or retention structures. These retention structures are sized appropriately to handle potential storm events for two-, five-, and ten-year storms.

Stormwater management directs surface runoff to areas that are most advantageous on a site, often enhancing and/or creating non-tidal wetlands in the process. In addition, controlled stormwater management prevents soil erosion and provides areas for soil infiltration of stormwater runoff. Retention ponds are designed with shallow slopes and outfitted with concrete outfalls that control the flow speed of water from the structure into adjoining waterways or wetlands. During the development process, stormwater management ponds serve as sediment and erosion control facilities, and then later graded and planted with native vegetation to serve as permanent retention structures.

Long-term maintenance of the stormwater management ponds is important so that the structures continue to adequately serve their function. Within the City of Havre de Grace, maintenance of these structures is required to be performed by the owner, often a community's Home Owners Association. Trained landscaping companies may be contracted to perform the specialized maintenance that is required annually, which includes inspection of the outfall, mowing twice a year (spring and fall), and removal of any brambles and unwanted trees. The stormwater management facilities are subject to routine inspections and property owners may be fined if the facilities are not adequately maintained.

H. Soils

1. Definitions

A **soil association** is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soil and at least one minor soil, and is named for the major soils. The soils in one association may occur in another, but in a different pattern.

The Havre de Grace area has a wide variety of geologic formations. The geology of a region determines the rock types from which the soils of the area arise. There are numerous types of soils in Harford County. These soils are grouped into thirteen basic soil associations. Three of these associations are in the Havre de Grace area and will be further described.

The physical parameters of each soils association reflect the characteristic development potentials for each parcel of land within the Havre de Grace area. For example, specific soils and/or the presence of rock may restrict, to some degree, urban development potentials for building construction and public utility installation, or the presence of wetlands may preclude any development or land disturbance activities in areas before they have been field verified. The three soil associations that overlay the Havre de Grace area are:

- *Soils of the Piedmont Plateau*: The soil association in this group in the Havre de Grace area is formed mainly in residuum that weathered in place from acid or basic rocks. They are nearly level to steep. Some of the steep soils are very stony.

- *Soils of the Atlantic Coastal Plain*: The soils in the two associations in this group formed mainly in thick deposits of Coastal Plain sediments. They are nearly level to steep, and some are sandy and gravelly.

- *Soils of the Flood Plains and Low Terraces*: The soil in these associations formed mainly in alluvium that was washed down from upland areas of the Piedmont or Coastal Plain. These soils are nearly level to gently sloping.

Within the three soil associations, there are seven varieties of soils that are in the Havre de Grace area. These are Chester loam, Elkton silt loam, Keyport silt loam, Manor stony loam, Montalto clay loam, Sassafras gravelly loam, and Sassafras silt loam. Table 10.1 indicates the characteristics of these soils.

The Sassafras silt loam predominates in the area southeast of the AMTRAK Line and covers most of the built-up area of Havre de Grace. Elkton silt loam is found on both sides of the AMTRAK Line in the southeast part of Havre de Grace. This soil may cause problems that will require artificial means of disposing of excessive water upon development. The Keyport silt loam is found around the area of Swan and Gasheys Creeks, and in a strip running from the southwest to the northeast between the CSX Rail Line and the AMTRAK Line.

To the north of the CSX Line are found Chester loam, Montalto clay loam, Manor stony loam, and Sassafras gravelly loam. The Chester loam covers the greatest portion of this area, and the other three soils are found in pockets within it; Manor stony loam along the Susquehanna River, Sassafras in the high lands to the northwest of the City, and Montalto clay loam in the northwest corner of the City.

Table 10.1 shows the suitability of the planning area's soils as they relate to urban and agricultural uses. The drainage characteristics of these soils are of primary concern to urban use, particularly in the sections of the planning area where public sewage service is not yet available.

In general, soils containing silts, such as the Sassafras silt loam, Keyport silt loam, and Elkton silt loam, may be unstable in the presence of water and have a tendency to become "quick" when saturated in a loose condition. Silts are fairly impervious, difficult to compact, and are highly susceptible to frost heaving. Silty soils, however, vary considerably, and, therefore, require analysis prior to development construction. Two additional soils, the Aldino silt loam and the Montalto silt loam, are found in the outlying portions of the planning area.

TABLE 10.1
SOIL TYPES - HAVRE DE GRACE PLANNING AREA

Soil	Soil Depth & Drainage Characteristics	Suitability for Building Development	Surface Condition
Sassafras Silt Loam	Moderately deep, 10 to 16 inches; Good drainage, except in some level spots	Generally suitable	Gently rolling and in places nearly flat
Keyport Silt Loam	Deep, 18 to 36 inches; Fairly good drainage	Generally suitable	Gentle slopes
Elkton Silt Loam	Shallow, 7 to 10 inches; Poor drainage	Fair	Flat to slightly depressed
Chester Loam	Shallow, 7 to 10 inches; Well drained	Generally suitable	Gentle rolling, rolling, or hilly
Montalto Clay Loam	Shallow, 6 to 10 inches; Good drainage	Generally suitable	Level, gently rolling, and hilly.
Manor Stony Loam	Shallow, 6 to 12 inches; Surface drainage excellent, if cleared, it erodes seriously	Steep, but suitable for development	Steeply sloping and hilly
Sassafras Gravelly Loam	Shallow, 8 to 10 inches; Surface drainage good, under-drainage is excessive	Fair	Rolling to steep sloping.

2. Justification for Protection

Soils unsuitable for development have the potential for frost heaving, poor drainage, liabilities in shear strength, and compressibility and potential expansion. Nearness to bedrock and the water table and the presence of a hardpan are also major considerations. Specific soils bearing these traits, or soils which are conducive to wetlands, may restrict development potentials for building construction and public utility installation.

The importance of physiographic conditions in determining the unique potential of future land uses for a given site in the Havre de Grace area must be emphasized. Particularly important to this assessment are the terrain, soils, wetlands, and existing floodplains. From an environmental perspective, these items are mutually dependent. When the physical planning units in the Havre de Grace area are viewed in the aggregate, planning recommendations can be imposed which reflect environmental determinants identified in the early stages of the planning process.

Hydrology, geology, and soils are a set of physiographic characteristics among the components determining development suitability. The Soil Conservation Service of the United States Department of Agriculture has prepared extensive geological and soil conditions studies for the Havre de Grace area (*Soil Survey of Harford County Area, Maryland*). Their findings have been summarized in the previous pages, though it is suggested that the source be consulted for more detailed, site-specific information.