

# *Managing Maryland's Growth*

Models and Guidelines

## Preparing a Sensitive Areas Element for the Comprehensive Plan

*A Method for Protecting:*

- *Streams and Their Buffers*
- *100-Year Floodplains*
- *Habitats of Threatened and Endangered Species*
- *Steep Slopes*

***This document may not reflect current law  
and practice and may be inconsistent  
with current regulations.***

The Maryland Economic Growth,  
Resource Protection, and Planning Act of 1992

Maryland Office of Planning  
Maryland Department of Natural Resources

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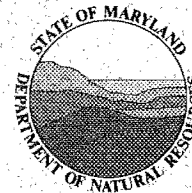
**Maryland Department of Natural Resources**

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MARYLAND *Office of Planning*



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# INTRODUCTION

This publication is one in a series of Models and Guidelines intended to help local jurisdictions meet the challenges and pursue the opportunities of the Economic Growth, Resource Protection, and Planning Act of 1992 (the Act). This booklet suggests a method for preparing the "Sensitive Areas" element for the Comprehensive Plan, as required by the Act. It contains information to aid the identification and definition of sensitive areas and the formulation of protective goals, objectives, and implementation techniques consistent with the Comprehensive Plan and the Act.

This booklet covers four environmentally sensitive areas that require protection under the Act: streams and their buffers, 100-year floodplains, habitats of threatened and endangered species, and steep slopes.

A separate publication will address protection of other types of sensitive areas and provide information on the latest resource protection research at the State level. This latter publication will be valuable to jurisdictions that want to protect a wide range of sensitive areas, as permitted by the Act. A broad array of natural and cultural resources can be protected including, for example, wellheads, aquifer recharge areas, historic properties, archaeological resources, scenic vistas, and cliff areas.

Most local jurisdictions have environmental policies, goals, and objectives in their Comprehensive Plans. Most jurisdictions also have environmental laws and regulations. However, the environmental resources which are subject to local plans and regulations vary from jurisdiction to jurisdiction, as do the purposes of the planning and regulating. The Act seeks protection of at least four basic types of sensitive areas across the State. The Act permits local governments to define each sensitive area and to determine levels of protection.

The Act also calls upon local governments to integrate environmental protection with plans for physical growth. Comprehensive plans and regulations should protect sensitive areas and the environment in general, and should expeditiously allow for compact, efficient, and comprehensively planned growth and economic development in Plan-designated growth areas.

Opportunities within planned growth areas for regulatory streamlining, flexibility, and innovation must be addressed in the Comprehensive Plan and be implemented. This will require planning and regulatory measures that facilitate planned development, but with adequate environmental safeguards. Protection in planned growth areas should be achieved through flexible and innovative development regulations; that is, regulations which aim to implement the growth recommendations of the Comprehensive Plan *and* assure protection of sensitive areas and the environment in general.

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The booklet's purposes are to demonstrate how a Sensitive Areas element can be developed, to provide examples of environmental protection policies and regulations, and to define a work program for local governments seeking basic technical assistance. It is not intended to constrain or dictate the manner in which local governments implement the Act. The booklet is organized as follows:

**Chapter One - The Act.** Statutory requirements are cited, followed by a discussion that proposes an overall theme for sensitive areas and other environmental protection requirements under the Act.

**Chapter Two - Preparing the Plan Element.** A process for preparing the "Sensitive Areas" element of the Comprehensive Plan is included. A basic series of goals, objectives, principles, policies, and standards designed to protect sensitive areas are outlined to guide the formulation of the plan element and to serve as a foundation for the land development regulations that will be enacted after the element has been incorporated into the adopted Plan. A commentary on regional characteristics and sensitive areas protection is offered.

**Chapter Three - Technical Information.** An overview is provided for each of the four sensitive areas including: justification for protection, definitions, methods for sensitive area protection, and sources of maps and data to inventory sensitive areas. A set of model legislative findings is included to provide a basis for the regulations that will implement the Sensitive Areas element.

For purposes of brevity and efficiency, this booklet does not fully explain environmental concepts and terms. While the concepts and terms in this booklet should be familiar to technicians and practitioners involved in the land development process, readers having questions or needing additional information should contact the Maryland Office of Planning and the Maryland Department of Natural Resources. Telephone numbers appear throughout this booklet.

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# CHAPTER ONE: THE ACT

## *Statutory Framework*

The Economic Growth, Resource Protection, and Planning Act of 1992 requires local governments to incorporate and implement seven visions through the Comprehensive Plan, to adopt a "Sensitive Areas" element in the Plan, and to encourage compact and efficient development and economic growth in suitable Plan-designated areas through streamlined, flexible, and innovative development regulations. Each of these requirements affect the Sensitive Areas element.

***The Visions.*** " ... the [planning] commission shall implement the following visions through the plan ... (1) development is concentrated in suitable areas; (2) sensitive areas are protected; (3) in rural areas, growth is directed to existing population centers and resource areas are protected; (4) stewardship of the Chesapeake Bay and the land is a universal ethic; (5) conservation of resources, including a reduction in resource consumption, is practiced; (6) ... economic growth is encouraged and regulatory mechanisms are streamlined; and (7) funding mechanisms are addressed to achieve these visions." (Codified at § 3.06(b), Article 66B, Annotated Code of Maryland).

The seven visions are a comprehensive set of guiding principles. The visions describe how and where growth and development should occur, and call for a land and water stewardship ethic to guide individual and group action. These visions have been adopted as official State policy.

***Sensitive Areas Element.*** "[The plan shall include] a sensitive area element that contains goals, objectives, principles, policies, and standards designed to protect, from the adverse effects of development, sensitive areas, including the following: 1) streams and their buffers; 2) 100-year floodplains; 3) habitats of threatened and endangered species, and 4) steep slopes." (Codified at § 3.05(a)(1)(viii), Article 66B, Annotated Code of Maryland.)

This citation embodies the central charge from the legislature for preparation of a Sensitive Areas element in the Comprehensive Plan. In addition to requiring protection for these four areas, the Act permits the Sensitive Areas Plan element to include other areas which the jurisdiction determines are in need of protection (see § 3.05(a)(2), Article 66B, Annotated Code of Maryland).

***Land Development Regulations.*** "[The plan shall contain] an element ... which encourages the following: 1) streamlined review of applications for development ... within the areas designated for growth in the plan; 2) the use of flexible development regulations to promote innovative and cost-saving site design and protect the environment; and 3) economic development in areas designated for growth in the plan through the use of innovative techniques." (Codified at § 3.05(a)(1)(vi), Article 66B, Annotated Code of Maryland.)

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Here, the Act requires adoption of a regulatory policy that will encourage development and economic growth in plan-designated areas, innovative and cost-saving site design, and flexible development regulations to protect the environment.

*Sensitive Areas  
and  
Comprehensively  
Planned Growth*

One of the challenges posed by the Act is to develop environmental protection policies within Plan-designated growth areas.

Conflict resolution between sensitive area protection and development should be based on the Comprehensive Plan. Comprehensive land use planning in both non-growth and growth areas should, when possible, protect unique habitat and natural floodplain, steep slope, and stream buffer systems by directing development away from these areas. In order to achieve the growth recommendations of the Comprehensive Plan, flexible development regulations will improve opportunities for both planned development and environmental protection.

The Comprehensive Plan should have specific policies, principles, and standards to guide decision-making. The extent and nature of affected public interests (e.g., the environment, economic growth, public investment in infrastructure, and jobs) and the relative resource value of the sensitive area in question (e.g., an already-paved floodplain or stream buffer, as opposed to one that constitutes a natural environment) should be addressed and documented in the Plan. The Plan should also address the value of sensitive areas as an asset to the community, and how maintenance of a quality natural environment is important to economic growth. The Comprehensive Plan should recognize areas where development activity has largely converted steep slopes, floodplains, or stream buffer systems into a built environment.

If it is simply not possible to direct development away from sensitive areas, the Comprehensive Plan should call for protection goals, policies, and standards that focus on measures which will minimize the adverse impacts of development and redevelopment including the use of "best management practices."

Once goals, policies, and standards have been drafted, regulations that guide the physical form of development should be examined to determine where flexibility and innovation can be used to accommodate both planned growth and environmental protection. This includes, for example, the following:

Use of developer incentives (e.g., increased density) to achieve high levels of environmental protection.



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Use of relaxed yard setbacks to permit a structure to locate outside of a stream buffer or away from steep slopes;

Use of cluster development or density zoning to avoid development on the portion of a site that includes a sensitive area, while maximizing the zoning potential of the property by building on the remaining parts of the site; and

Use of narrower roads, flexible bulk standards, innovative design, fewer sidewalks, larger community open spaces, and creative stormwater management ponds and tree plantings to minimize environmental impacts and enhance the environment.

The Act reflects the conviction that both economic growth and resource protection are best accomplished if planning and regulation are coordinated and consistent with each other and are responsive to the visions. There are certain limited situations, usually arising in areas largely comprised of a built environment, where public investment in and benefit from development are paramount. On the other hand, the protection of a unique and fragile habitat, even in a designated growth area, serves a public interest that may easily, in the regulatory scheme, outweigh a competing private interest. The following principles are suggested as a guide to stimulate ideas about how to prepare a Sensitive Areas element consistent with the Act's requirements for both protection and growth.

### *Principles for Protection*

- ◆ Comprehensive land use planning should, if at all possible, direct growth away from sensitive areas, thus avoiding impacts altogether.
- ◆ Regardless of whether sensitive areas are located in a planned growth area or not, every effort should be made to avoid impacts to sensitive areas.
- ◆ Protection measures should focus on flexible and innovative regulations that affect the physical form, design, and layout of development on a site so as to increase opportunities for protection.
- ◆ Where growth is not planned, stringent standards and application procedures are warranted to protect sensitive areas because:

The Act and local Comprehensive Plans discourage development where it is not planned;

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Sensitive areas in rural locations are especially valuable because the ecosystems of which they are a part tend to be healthier and thus deserve strong protection;

Rural development practices make possible, through lower densities, larger minimum lot sizes, and open space requirements, alternative site selection and other flexibility to avoid impacts to sensitive areas; and

Competing public interests, such as government investments in infrastructure, are less likely to exist.

- ♦ The requirements in the Act for streamlining, flexibility, and innovation should be factored into planning and regulating for sensitive areas and other environmental resource protection within Plan-designated growth because:

The Act and local Comprehensive Plans encourage growth and development where it is planned;

Sensitive areas may be absent or may have already lost their primary purpose for protection, and if so, public policy may weigh in favor of development with requirements to mitigate or minimize impacts, in lieu of avoidance;

Higher density zoning, smaller lots, and substantial public and private investment-backed expectations require innovative and flexible regulations to accommodate growth while affording environmental protection; and

Facilitating planned and efficient growth in suitable areas will reduce development pressures in non-growth areas and thereby reduce impacts to sensitive areas located outside of growth areas.

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# CHAPTER TWO: PREPARING THE PLAN ELEMENT

Preparing the Sensitive Areas Plan element is generally no different than preparing other Plan elements. There are five major areas within the Plan which may require revision and new information to fully incorporate a "Sensitive Areas" element (these are based on terminology and concepts in Article 66B):

- ◆ Background Information Section
- ◆ Goals, Objectives, Principles, Policies, and Standards Element
- ◆ Sensitive Areas Element
- ◆ Other Plan Elements (Land Use Element in particular)
- ◆ Recommended Land Development Regulations Element (Implementation)

## *Background Information*

The Background section of the Plan is typically used to describe the location, history, natural conditions, land use, transportation, community facilities, and demographics of the jurisdiction. The Background section can be used to generally inventory and describe each sensitive area which the local jurisdiction is either required, or has chosen, to protect. (Another possible location for this information is within the Sensitive Areas element itself.)

The text should convey a general impression of which sensitive areas exist in the jurisdiction, the prevalence of those areas, and a general description of their locations.

The suitability and utility of mapping the general locations of sensitive areas within the Comprehensive Plan document will depend on the size of the jurisdiction, the availability of information, and the type and number of sensitive areas in a jurisdiction. For example, the general locations of unique habitats in a county might be readily featured on a map, as might be floodplains and stream buffers within a small municipality.

In any case, some type of geographic inventory will be helpful in preparing the studies that lead to the Plan element since the extent, nature, and locations of sensitive areas will affect planning and policy judgments. For detailed information, it is appropriate to let developers provide site-specific information during the actual development process.

## *Goals, Objectives, Policies Element*

This section of the Plan is used to establish themes that guide the jurisdiction into the future (goals), to spell out means for achieving these themes (objectives), and to establish rules for land use decision-making (principles, policies, and standards). While this booklet discusses goals and objectives as part of the Goals

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element of the Plan, these guiding statements may be placed elsewhere in the Plan (such as directly within the Sensitive Areas element) and may also be incorporated into functional plans.

The seven visions should be incorporated into the Comprehensive Plan, as required by the Act (see § 3.05(b)(1), Article 66B). This booklet suggests that the visions be included in the Goals element. The visions will best serve local governments if treated as overall goals for local planning and land use regulation, especially since those same visions have been adopted as official policy by State government.

Plan goals and objectives are typically organized by subject matter such as community character, land use, growth, public facilities, economic development, government, and the natural environment. Incorporation of sensitive area considerations into the Goals element requires more than mere listing of statements under the subject matter of, for example, the "natural environment." These statements also need to be evaluated in the context of, and made consistent with, other subject areas and the visions. For example, incorporation of sensitive areas goals and objectives may necessitate revisions to the Plan's goals for "government" and "economic development" in order to encourage regulatory flexibility for planned growth and economic development.

The following is a brief conceptualization of how sensitive areas protection can be integrated into the Goals element of the Plan. The information focuses broadly on the subject of the natural environment and is not intended to represent a full array of goals and objectives. Local governments can develop more precise goals and objectives by arranging these statements into sensitive area topics and then elaborating upon each topic with detailed policies, principles, and standards. Local governments should elaborate on the following general goal statements, taking into account noted threats, trends, and unique and important resources; the use of quantitative goals and policies should also be considered.

**Goals:**

Protect the quality of the air, water, and land from the adverse effects of development and growth.

Enhance the quality of the air, water, and land where feasible and practical.

Protect the diversity of natural resources, with special attention given to habitats of threatened and endangered species and other unique ecosystems.

Adopt and meet the goals established in the Chesapeake Bay Tributary Strategies.

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**Objectives:**

Define, identify, and protect sensitive and other environmentally significant areas as part of the comprehensive planning and zoning process.

If at all possible, direct growth away from sensitive areas so that impacts are avoided altogether.

Establish a network of streams and other natural areas which connect and protect sensitive areas and other environmental features determined to be of importance.

Integrate and coordinate sensitive areas protection with other locally adopted environmental and growth management programs such as stream valley protection, forest conservation, Chesapeake Bay Critical Area protection, watershed management and protection, transfer and purchase of development rights, rural conservation, economic development, greenways, open space and recreation, water and sewerage, transportation, and community design.

Adopt flexible development regulations and innovative tools that will protect sensitive areas from the adverse impacts of comprehensively planned growth and land use activities.

Encourage environmentally sensitive development and economic growth in Plan-designated areas through the use of streamlined, flexible, and innovative development regulations.

Discourage random-pattern and sprawl development so as to enhance sensitive areas and other environmental resource protection capabilities in rural areas.

Through outreach and education efforts, promote a universal stewardship ethic for the land and water to guide individual and group actions.

**Principles and Policies:**

Development should avoid impacts on sensitive areas which are located outside of Plan-designated growth areas.

If at all possible, the Plan should direct development away from sensitive areas, thus avoiding impacts altogether in both growth and non-growth areas.

If it is not possible to avoid sensitive areas, development in Plan-designated growth areas, as a general rule, should employ flexible development regulations, innovative site design, best management practices, and mitigation measures in order to protect the natural environment and sensitive areas. However, impacts to habitats of threatened and endangered species, or natural systems that are otherwise important and unique, should be avoided altogether.

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As a general rule, in those Plan-designated growth areas where floodplains, steep slopes, and stream buffers are largely developed or do not otherwise provide substantial environmental benefits, development should employ best management practices which are aimed at improving environmental quality.

In recognition of the situation where sensitive areas may constitute all, or nearly all of a property, and where protection may preclude all reasonable uses of the property, environmental protection regulations should provide for variances, special exceptions, and administrative relief to prevent the taking of private property in violation of the Federal and Maryland constitutions. Exceptions may also be warranted to protect public health and safety and avoid property damage.

**Standards:**

As a general rule, in areas which meet Federal or State environmental standards, developers should strive to make the post-development quality of air, land, and water as good as pre-development levels.

For development where Federal or State environmental standards have not been attained, post-development environmental quality should be improved over pre-development levels.

The quality of stormwater runoff associated with redeveloping sites should be improved over pre-development levels by 10%.

Buffer widths should vary with the functional classification of the stream and should be expanded for additional protection where steep slopes, highly erodible soils, wetlands, and natural nontidal floodplains and other fragile lands abut the buffer.

In rural population centers, to conserve rural character and protect sensitive areas, 80% of a subdivision project should remain in protected open space through the use of cluster development or density zoning.

As a general rule, protection of habitats of threatened and endangered species and other unique areas should follow both State and Federal species lists and protection guidelines.

Where the floodplain is not already largely developed, protection of 100-year floodplains should include environmental protection aspects in addition to traditional safety concerns.

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## *Sensitive Areas Element*

The element can take a variety of forms under the Act. For example, local governments may want to revise an existing “natural environment” or “environmental resource” element in the Comprehensive Plan to constitute a new “Sensitive Areas” element, or make the newly required element a sub-part of these more traditional Plan elements. The Sensitive Areas element could also be prepared as a special chapter in the Plan. Counties and municipalities that prepare both jurisdiction-wide and “sub-jurisdiction” Plans have considerable flexibility in meeting the Act’s requirements. Every Plan within a jurisdiction need not repeat the same information. Once a jurisdiction-wide element has been adopted, Plans that cover smaller areas or special issues may incorporate the more general aspects of the element by reference. One approach is to provide a basic Sensitive Areas element within the jurisdiction-wide Plan, while emphasizing important and relevant sensitive areas issues within the sub-jurisdiction Plans.

The Sensitive Areas element should discuss why protection of each particular sensitive area is justified to the extent that it is regulated under the local police power. The element should generally make the connection between disturbance of the sensitive area and the resulting adverse effects which make its protection a matter of public interest. The scope of the Plan element is to lay out a rational basis for protection; it does not need to include highly technical or scientific writings and proofs.

The element should discuss each of the sensitive areas in the jurisdiction by type, general location, and prevalence. Information about particularly critical sites, threats, and trends should be included. The element may also be used to recommend a definition for each sensitive area.

The potential for impacts from adjoining jurisdictions should be noted and used in on-going planning coordination with neighboring municipalities and counties.

Identification of sensitive areas in the comprehensive planning process will help formulate planning and regulatory policy and, in the context of the Land Use element of the Comprehensive Plan, will help to identify possible conflicts between protection and growth. As a guide for formulating implementation recommendations in the Plan, local governments can draw upon regulations from jurisdictions within the same region and from those areas having similar circumstances, to decide how, and how much, land should be regulated.

## *Addressing Regional Characteristics*

The element should address special regional influences and characteristics and unique local conditions. A local jurisdiction that has addressed regional characteristics and unique and important local conditions in the Sensitive Areas Plan element will enhance its chances at fulfilling planned development potential and protecting sensitive areas. A few examples of regional characteristics are discussed below for the purpose of stimulating discussion and ideas.

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*Tidewater Jurisdictions.* These areas are susceptible to flooding due to high tides, steady on-shore winds, or storms. In tidewater jurisdictions, where the land form is low and flat along the shoreline, tidal flooding covers much larger areas than are normally impacted as a result of nontidal (riverine) flooding. Where at all possible, the Comprehensive Plan should channel growth away from areas subject to flooding. Where this is not possible and floodplain protection conflicts unduly with planned growth, economic development, and public investment, local governments should adopt techniques that minimize the adverse environmental impacts of development in the floodplain and address safety issues. For example, development and land disturbance should avoid impacts to natural wetlands, stream buffers, and habitats and should minimize impacts on the quality of stormwater runoff with the use of best management practices.

The protection techniques chosen may be quite different for tidal floodplains in Plan-designated growth areas than for either tidal or nontidal floodplains in non-growth areas; local jurisdictions can address this issue in any reasonable manner. However in nontidal floodplains, local jurisdictions may not diminish State laws and regulations on floodplain protection.

These jurisdictions may also have to coordinate sensitive areas protection with on-going protection efforts addressed in the Chesapeake Bay Critical Area Law which also includes protection for buffers, habitats, and steep slopes. For example, a jurisdiction would have to determine whether it is more desirable to have two sets of protection regulations (i.e., Critical Area and non-Critical Area), or just one.

*Eastern Shore.* Some parts of the Eastern Shore have few steep slopes. The objective in these areas should be to effectively protect steep slopes, but to do so efficiently. If the background study from the Comprehensive Plan indicates, for example, that most of the significant steep slopes are along rivers and streams, then steep slope protection may be more reasonably accomplished by protecting the stream buffer system, rather than by a separate "slope" regulation.

Since local governments are able to define and set protection levels for "steep slopes," they can direct their protection programs to areas and situations where potential impacts are most likely to exist. Special attention should also be given to specific uses that should not occur on steep slopes (e.g., septic fields).



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*Appalachia.* Maryland's success in protecting sensitive areas depends, in part, on achieving protection within regional contexts. Garrett, Allegany, and Washington Counties make up the Maryland portion of the Appalachian Region. This region extends from Mississippi to New York State and is characterized by abundant and diverse natural resources and economies. The environmental and economic influences of the region upon Western Maryland, in terms of sensitive areas protection, raise interesting planning issues in the context of the Act and the visions.

Due to its geography, Western Maryland is influenced by numerous nearby economic competitors. Maryland jurisdictions will factor such considerations into their planning for both sensitive areas protection and economic growth.

The region also houses an array of natural resources including the four types of sensitive areas identified in the Act. Of these various sensitive areas, habitat and steep slope protection stand out as challenging goals.

Some of the plant and animal species found in the abundant habitats in the region have reached the point of being threatened or endangered within Maryland. The practical question of protecting a resource in Maryland when it is plentiful in the larger region, becomes a difficult question when some of the habitats are literally just over the Maryland line.

There are strong arguments for protecting habitats of local (Maryland) significance. These include: Maryland-located sites are a unique and irreplaceable part of the State, Maryland has no control over the ultimate use of habitats located out-of-State, and some areas which border Maryland do not have land use controls to ensure long-term regional abundance of these habitats.

Local governments may use the Maryland or the Federal species lists in identifying habitats of threatened and endangered species. This booklet recommends that both sources be considered as part of the planning process.

Habitat protection involves difficult planning and regulatory challenges, given the need (ideally) to preserve large land areas in some cases. The habitat protection methods offered in this booklet have been designed to be useful, but also respectful of private property rights.

Large parts of Western Maryland exceed 25% slope, which is a common definition for "steep slopes" in Maryland jurisdictions. This booklet

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raises numerous reasons - from environmental to safety - for avoiding development on steep slopes. Where possible, the Plan should direct growth and development away from areas of steep slope. If this is not possible, there are several measures that should be considered to minimize the impacts of development. These include protecting habitat of threatened and endangered species, minimizing tree cutting, using extra-wide stream buffers, avoiding certain uses such as septic systems, using cluster and other flexible regulations for development, and factoring soil erodibility and the amount of land disturbance into the definition and protection measures for steep slopes.

As a result of mining activities in Western Maryland, the region also contains man-made steep slopes. Since mine reclamation is needed to eliminate safety and environmental concerns, and necessarily involves disturbance to steep slopes, jurisdictions should account for such practical considerations in developing protection measures.

## *Other Plan Elements*

The new Sensitive Areas Plan element should be developed in the context of the entire Plan; it should be coordinated with other elements in the Plan.

Other parts and elements of the Plan may also require amendment in order to comply with other visions and parts of the Act. A local government that has prepared a "compliance schedule" in detailed fashion will already have an orderly strategy on how to coordinate the various requirements of the law.

This process of bringing all the facets of the Plan together as a coordinated whole is where planning turns to an assortment of goals, objectives, and policies to integrate various public interests into the planning and regulatory fields of protection and growth. A significant step in complying with the Act is accomplished when the Sensitive Areas element is integrated with the Land Use and Economic Development elements. This will help identify conflicts between planned growth and sensitive areas protection, thus guiding implementation of the Comprehensive Plan.

## *Implementation*

Once the revised Plan has been adopted by the local legislative body, the local government should move into the implementation stage. This may require revisions to functional plans and programs; and may require changes to ordinances and regulations in such diverse areas as zoning, subdivision, site plan, development design, floodplain management, urban renewal, and stormwater management. Chapter Three of this booklet provides information and guidance for developing regulations to implement the Sensitive Areas element of the Comprehensive Plan.

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# CHAPTER THREE: TECHNICAL GUIDELINES

## *Introduction*



This Chapter provides technical information for preparing the Sensitive Areas element, amending the Land Development Regulations element, and creating implementation tools. This information is organized into five sections. The first four sections address one of the four sensitive areas identified in the Act. Each of these sections begins with a discussion of the importance of protecting the particular sensitive area - this information provides the justification for, and describes the public benefits of, the protection efforts called for by the Act. A summary of definitions, protection measures, and mapping information follows. Wherever possible the guidelines cite examples to illustrate the range of choices available to local governments in developing their sensitive areas programs.

The fifth section provides a model set of legislative findings that can be adapted by local governments when enacting new or revised implementation measures.

Information on the justification for protection should be included in a concise fashion within the Sensitive Areas element. The Land Development Regulations element could include one or more of the definitions of a particular sensitive area as a guide for developing implementation regulations; however, this is less

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important to the Plan document than the justification information. The examples in this Chapter of protective measures and mapping sources are intended to assist local governments in selecting implementation measures, and are not needed in the Plan.

The Act does not establish definitions for the four designated sensitive areas, and it does not specify the physical extent or the degree of protection a jurisdiction must provide for any of the areas. Each jurisdiction will select definitions and enforcement tools for protection that are appropriately matched to conditions within the jurisdiction. Local planning departments are encouraged to consult with other agencies in the jurisdiction as definitions and protection measures are developed. Technical assistance from State agencies should also be considered.

Protection of the four sensitive areas identified in the Act is not intended to diminish the value of other areas that a jurisdiction may elect to protect, nor does the Act override or set aside other State laws requiring the protection of natural resources.

The technical guidelines in this booklet do not prescribe how to conform to the Act; rather, they are expected to reveal the many options available. The guidelines, along with workshops and on-going local and State cooperative studies, should help interested jurisdictions make better decisions on how to protect sensitive areas. Because of the many differences among jurisdictions in terms of natural features, development patterns and pressures, budgetary constraints, manpower, and regional settings, the guidelines are designed to offer a range of choices for local governments, and to raise thought on a variety of issues that bear on the protection of sensitive areas and the accommodation of planned growth.

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*Section One:  
Streams and  
their Buffers*



**Justification for  
Protection**

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. Streams support recreational fishing and serve as spawning areas for commercial fish stock; and streams attract many outdoor enthusiasts such as hunters, bird-watchers, and nature photographers. Without adequate and sustained cooling water in streams and rivers, industries and power plants would pass higher costs on to consumers. Development near stream areas subject to flooding could result in the loss of life and property.

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.

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Buffers are a crucial "best management technique" that reduce 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. It is no wonder that no two streams are alike. Healthy streams have certain things in common, however. 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 as habitat 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 flood water 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 aquatic 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.

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*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, has 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 which 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 stream beds 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 impervious surfaces and cleared land cause rain water 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 stream bed 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 phosphorus, bacteria, and sediment from farm fields and dairy feed lots.

In the damaged stream ecosystem, with natural vegetation cleared, there is no place for kingfishers to perch, no branches and bark for beavers, no secluded slopes for fox dens, no wet peat for salamanders and newts, no cool water for the shiners and sculpins to swim, no food for a thriving insect community, and few, if any, bass or trout. Severely damaged streams no longer perform their natural functions and cannot support the recreation and water supply functions they may have provided as well.

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 phosphorus compounds in particular are overfeeding the Bay - a term called "eutrophication" - creating "algae soup" 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.

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*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 which 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 which 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.



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Healthy buffers hold soils in place, support trees that drop leaves as food, provide a refuge for threatened animals and plants, take up excess nutrients in the roots, recycle nutrients, hold water, filter stormwater runoff pollutants, hide predators and their prey, keep streams shaded and cool, and much more.

## Definitions

Buffer definitions adopted by local jurisdictions will range from standard fixed widths to widths determined by formulas that are based on such factors as soil types, degree of slope, and the presence of floodplains and wetlands.

The measures a community adopts to protect stream and buffer systems are the products of a number of complex local factors working together. Chief among these factors are community values, land use patterns and development pressures, administrative constraints, the lay of the land, the distribution of natural resources, and the availability of useful information.

The following definitions reflect the variety of approaches that Maryland jurisdictions have taken to define stream buffers:

### **Example 1 ( A “Systems” Approach):**

Baltimore County identifies streams with a field survey. These streams are buffered with a minimum width of 75 to 100 feet depending on stream class, or 25 feet beyond wetlands or 25 feet beyond 100-year floodplain, whichever is greater. These buffers are measured from the centerline of 1st and 2nd order streams and from the stream bank of higher order streams.

The width may be increased to include steep slopes and erodible soils which are within 500 feet of the stream. Steep slopes and erodible soils are evaluated by subdrainage area using established criteria. The criteria examine length and steepness of slope, vegetative cover, and distance from limit of proposed disturbance to wetland or stream bank to determine if development will be prohibited or restricted on the slope.

In addition to the buffer, a development setback is also required.

**Comments:** This is a comprehensive formula, providing protection for wetlands, floodplains, streams, and steep, erodible slopes. Because it identifies streams in the field rather than relying on USGS quad maps, this program provides buffers on the smaller streams and headwaters that the USGS may not have mapped. Field checks are needed to accurately identify these small streams.

Although this formula examines slopes as far as 500 feet from the stream, the regulations do not automatically prohibit development on the steep

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slopes. The complex evaluation process results in more stringent restrictions for disturbances in areas with more potential negative impact and less stringent restrictions for disturbances in areas with less potential negative impact.

The disadvantage with this approach is that it is more difficult and costly to administer than a fixed buffer.

**Example 2 (The Chesapeake Bay Critical Area Law and Local Programs):**

These local and State laws require a standard buffer width. A formula is used to expand the standard buffer width under certain environmental conditions. The standard or minimum buffer width is 100 feet for tidal waters, tidal wetlands, and tributary streams. (Tributary streams are defined as those perennial or intermittent streams designated on a USGS quad map, or on a more detailed map at the jurisdiction's discretion.) The standard 100-foot buffer width is expanded to include contiguous sensitive areas including hydric soils, highly erodible soils where development may impact streams, wetlands, or other aquatic environments. For contiguous steep slopes, the 100-foot buffer is increased four feet for every 1% slope for slopes greater than 15%. Streams not designated on USGS quad maps and found by site survey are considered nontidal wetlands and require a 25-foot buffer.

**Comments:** The standard 100-foot buffer is generally considered sufficient for protecting water quality and natural habitat on the majority of sites in the Critical Area.

A standard width can be easily and consistently enforced. The formula allows for expansion of the buffer to protect sensitive resources on a site-specific basis.

The standard 100-foot buffer may not be sufficiently wide to protect certain areas of quality plant and wildlife habitat occurring adjacent to water bodies.

The expansion formula can be difficult to implement on sites of variable topography. In Example 1, above, Baltimore County directs the study of a certain number and location of transects, thus directing and facilitating the required analysis in areas of variable topography.

**Example 3 (Resource Protection Zoning):**

Charles County recently adopted a resource protection zone (RPZ), which includes the 100-year floodplain, adjacent nontidal wetlands, and an additional setback width. The entire RPZ essentially constitutes a buffer as defined in this booklet.

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When the 100-year floodplain or nontidal wetlands are present, the RPZ includes these areas plus a setback width. The setback width is measured outward from the outermost combined limit of the existing 100-year floodplain, and adjoining nontidal wetlands, if present. The setback is a minimum 100 feet wide for streams of stream order three or higher and a minimum 50 feet for intermittent or perennial streams of stream order one and two. In the absence of a 100-year floodplain or nontidal wetlands, the setback is measured from the centerline of the stream channel. The width of the setback is doubled or extended to the top of the slope, whichever is less, where average slopes greater than 15% adjoin the additional strip of land or are within 25 feet of the additional strip of land.

The County Planning Commission may extend the RPZ, upon receiving an application for extension, to include hydric soils, erodible soils, entire steep slopes, Natural Heritage Areas, wetlands of special concern, habitat of threatened and endangered species, other critical habitat, and "priority one" forested areas. (The extensions are handled like a local zoning map amendment and may occur only twice a year.)

**Comments:** The RPZ is a zoning district. The County has mapped the RPZ on County tax maps, providing predictability. Like the Baltimore County example, the RPZ is a comprehensive regulation, protecting floodplain, nontidal wetlands, streams, and steep slopes. However, when a steep slope is long, the entire slope face may not be protected without an application to extend the RPZ zoning.

This approach is more difficult to administer than a fixed buffer. The process for extending the RPZ is handled like a local zoning map amendment to provide due process to development applicants.

**Example 4 (Standard Width):**

Kent County requires a 100-foot buffer for perennial and intermittent streams. Allegany County requires a 25-foot buffer, measured from the centerline, for streams with drainage areas of less than 400 acres. The County requires a 50-foot buffer, measured from the stream bank, for streams with drainage areas of greater than 400 acres.

**Comments:** Fixed buffer widths are relatively easy to administer. Fixed widths are easier for the public to understand, and likely provide a greater level of predictability than the more complex buffer formulas.

Fixed widths may not provide adequate levels of protection in certain cases. For example, steep erodible slopes may extend beyond a fixed

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width buffer. Fixed buffers may not be sufficiently wide to protect areas of quality plant and wildlife habitat occurring adjacent to waterbodies. In some cases, other sensitive areas regulations may provide protection to areas beyond the fixed width, (e.g., a restrictive floodplain ordinance, steep slopes regulations, or nontidal wetland regulations).

**Example 5 (Two-tiered Widths):**

Buffers of 100 feet, measured from the stream bank, are applied in rural areas; and buffers of 100 feet for perennial streams and 50 feet for intermittent streams are applied in plan-designated growth areas. These buffers apply to streams designated on USGS quad maps.

**Comments:** This example provides buffers only on streams designated on USGS quad maps. This is less desirable than regulations which provide buffers for streams identified by field survey. Any method that uses USGS quad maps or other topographical maps may fail to protect important headwaters including trout habitat which would be identified in the field. These headwaters are critical; small trout streams may only be a few feet wide. Better protection will result when the buffer is measured from the top of bank rather than from the stream centerline.

**Protection  
Measures**

Equal in importance to how a jurisdiction defines its stream buffer areas, are the uses that are permitted (and prohibited) within the buffer. The permitted uses listed below have been gathered from a number of sources, including local ordinances, and are representative of the types of activities most frequently allowed in buffer areas. Many of the permitted uses are required to meet conditions such as best management practices (BMP's), feasibility analyses, and impact mitigation before locating in the buffer.

*Permitted Uses*

**Natural Resource Activities:**

- ◆ Natural resources protection, monitoring, restoration, management permitted.
- ◆ Stream restoration projects, scientific studies approved by jurisdiction permitted.
- ◆ Practices to maintain health of individual trees permitted.
- ◆ Periodic harvesting and timber stand improvement to maintain vigorous growth and leaf litter replacement, and to remove nutrients sequestered in the form of

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wood in tree boles and large branches permitted. Management for wildlife habitat, aesthetics, and timber are not incompatible with riparian forest buffer objectives as long as shade levels and production of leaf litter, detritus, and large woody debris are maintained. Mechanical logging equipment usually not appropriate, recommended methods should be determined in consultation with State and Federal forestry agencies.

### **Forestry**

- ◆ Forestry permitted, with a minimum undisturbed buffer (perhaps 50 feet or 50 feet plus 4 feet for every 1% slope); BMP's and forest management plan required.

### **Existing Structures**

- ◆ Existing structures may be removed, restored, repaired, maintained, or enhanced. Enlargements no more than 20%, with BMP's.

### **Agriculture**

- ◆ Agriculture permitted, with a minimum buffer (e.g., 25 feet) or approved soil conservation and water quality plan. BMP's required.
- ◆ Necessary livestock stream crossings permitted, design approval required.

### **Stormwater Management**

- ◆ Stormwater management facilities permitted when a feasibility analysis has clearly demonstrated that no other feasible alternative exists and that minimal disturbances will take place. The facility must provide water quality management. As a general rule, no wet ponds on trout streams because of temperature concerns.
- ◆ Outflow from subsurface drains must not be allowed to pass through the buffer in pipes or tile thus circumventing treatment processes. Subsurface drain outflow must be converted to sheet flow for treatment by forest buffer or treated elsewhere prior to entering the surface water. Grassland outside the buffer can be used to convert concentrated flow to uniform, shallow, sheet flow through the use of techniques such as grading, shaping, and devices such as diversions, basins, and level lip spreaders. Piping, however, may be appropriate where erodible soils or steep slopes exist.

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### **Other Utilities, Roads**

- ◆ New structures or alteration of existing structures for transportation facilities, transmission lines, and sewer, water, and gas lines permitted. Limited water-dependent recreational access such as roads, causeways, boat ramps with minimum disturbances permitted.
- ◆ May be constructed in a buffer only if no practicable or feasible alternative exists for locating the structure outside of the buffer. If constructed within the buffer, BMP's, soil conservation, and water quality plan required.
- ◆ Permitted structures must be located, designed, constructed and maintained to provide maximum erosion protection, to have the least effects on wildlife, aquatic life, and habitat, and to maintain hydrologic processes and water quality.
- ◆ When feasible, utility easements shall be set back (50 or 75 feet) from all stream banks. Instream placement of sediment control devices, stream crossings, and channel modifications must be avoided whenever possible.

### *Prohibited Uses*

#### **Streambed Alterations**

- ◆ No alteration of streambed or bank, except for BMP's to reduce erosion, and maintenance of stream crossings for agricultural purposes. Stream, natural surface springs, and seeps must be maintained in a natural condition so that the hydraulic regimen and State water quality standards can be maintained.

#### **Disturbances to Vegetation**

- ◆ In general, disturbances to natural vegetation are prohibited. These include disturbances by tree removal, shrub removal, clearing, burning, and spraying. No pesticide use or storage.

#### **Motorized Vehicles**

- ◆ No storage of motorized vehicles. No use of motorized vehicles, except for approved maintenance and emergency uses.

#### **Septic**

- ◆ No septic fields in the buffer.

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- ◆ No sewage disposal systems may be located within 300 feet of the normal high water level of a water supply or within 200 feet of the banks of any stream that feeds into a water supply.

#### **Grading, Excavation and Dumping**

- ◆ No soil disturbances from grading, plowing, except with approved soil conservation and water quality plan.
- ◆ No mining or excavation, except existing uses, no dredging except as permitted by State law.
- ◆ No deposit or landfill of refuse, solid or liquid waste; fill allowed only as approved by the Army Corps of Engineers.
- ◆ No storage of materials.
- ◆ No dumping.
- ◆ No fill to expand development area.

#### **Waivers**

- ◆ In hardship cases, buffer requirements may be waived or modified by the jurisdiction in accordance with an approved stormwater management plan that provides equal or better water quality protection, requires mitigation measures to compensate for loss of general habitats, and does not adversely affect habitats of threatened and endangered species.

## **Mapping**

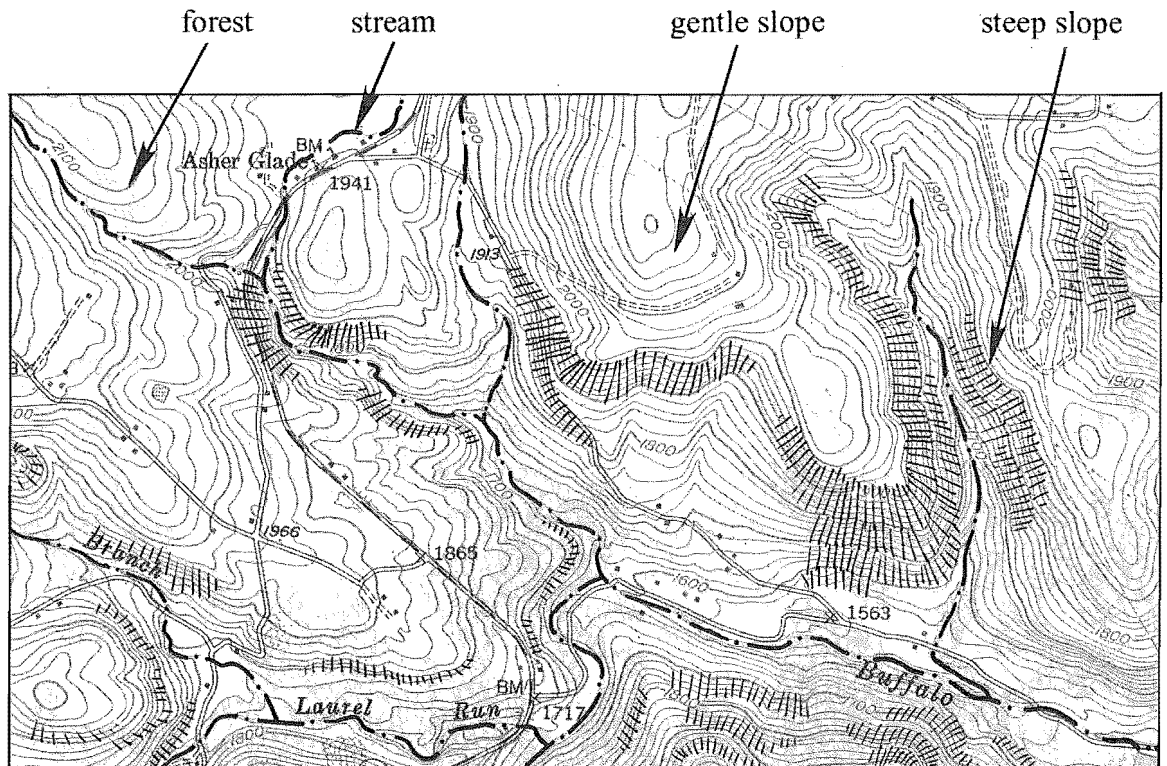
A number of jurisdictions use readily available USGS topographic quad maps (1"=2000') for the purpose of identifying permanent and intermittent streams requiring buffer protection. Field checking these maps often reveals the presence of additional streams, particularly in headwater areas, that are not identified but nonetheless warrant buffer protection. Other jurisdictions have developed their own topographic base maps at larger and more usable scales (1"=600', 1"=200', etc.). These maps are more accurate than the quad maps and permit a more complete identification of streams and channels that need buffer protection.

Charles County is an example of a jurisdiction that has used 1"=600' tax maps as the base upon which to delineate streams and approximate buffers. In simplified

terms, the County defines the collective width of a stream, its floodplain, associated wetlands, and an additional strip of land as an official zoning district, the Resource Protection Zone (RPZ). The RPZ maps are only an approximation. They were created using Flood Insurance Rate Maps and Nontidal Wetland Inventory (NWI) maps. The actual RPZ is delineated during the project review process and may include steep slopes (not mapped on the tax maps) and additional wetlands (not identified on the NWI maps).

The most accurate way to identify streams and associated buffers is to require developers to map the information on large scale site evaluation/design base maps normally required as part of the development review process. Where staff is adequate, routine visits to proposed development sites can be used to verify the accuracy of mapped stream and buffer information, as well as to confirm that project proposals comply with local stream and buffer protection requirements.

**For more information about the subject matter in this chapter, contact:**  
Coastal and Watershed Resources Division, DNR, (410) 974-2784.

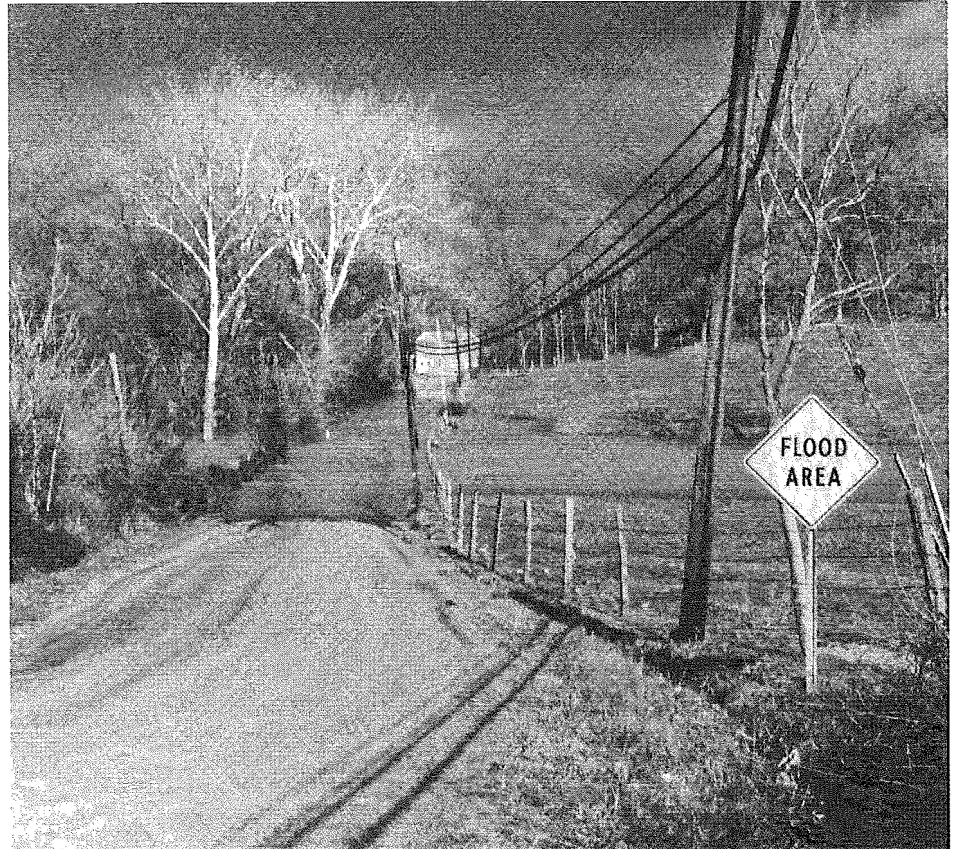


USGS Quad Map



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*Section Two:  
100-year  
Floodplains*



**Justification for  
Protection**

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 recreational opportunities; and in many cases, by helping to restore the health of the Chesapeake Bay - a goal which will benefit the entire public.

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## Definitions

Defining the 100-year floodplain involves engineering studies, field observations, and other available information. In this respect, the definition, as it translates on to a map, leaves little room for interpretation in comparison to other sensitive areas. Local protection regulations under the Act may exceed but may not diminish State standards. Because of the distinction between tidal and nontidal 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 on-shore winds. Tidal floodplains are regulated by local governments.
- ◆ 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. These floodplains are defined assuming build-out of the watershed in accordance with current zoning.

## Protection Measures

The minimum requirements of the National Flood Insurance Program do not restrict the 100-year floodplain from development. A community adhering to the minimum Federal requirements may allow development and new structures in the floodplain provided certain flood protection measures are implemented (e.g., elevate the first floor to the level of the 100-year flood and assure adequate drainage).

Of the 120 flood-prone jurisdictions in Maryland, 112 participate in the national program; and of these, approximately 75 have adopted the State's model ordinance or comparable standards that exceed minimums. This model ordinance was a threshold effort to attend to environmental resource protection issues in floodplain regulation. In this regard, the Economic Growth, Resource Protection, and Planning Act of 1992 provides clear direction and authority for local governments to protect the environmentally sensitive aspects of 100-year floodplains.

In general, undeveloped floodplains offer the greatest promise for achieving the environmental and resource protection required by the Act (these areas also have the greatest potential for flood damage prevention). The Act calls for comprehensive planning and land use regulation at the local government level to protect these 100-year floodplains from the adverse effects of development.

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Developed floodplains, on the other hand, have often been stripped of natural characteristics and beneficial functions - thus lacking in environmental sensitivity. For developed floodplains in plan-designated growth areas, management measures under the Act should tend to focus on minimizing flood damage and ensuring safety by regulating design of in-fill construction and redevelopment.

A number of typical measures for protecting 100-year floodplain areas are listed below. To a considerable extent, application of these measures will depend on a jurisdiction's determination of what portion, characteristics and functions of the 100-year floodplain are to be protected under the Act.

**Example 1: Zoning**

Zoning can be used to guide development away from flood-prone areas. The most restrictive approach is to discourage floodplain development through conservation or open space zoning. In areas where ample flood-free building sites are available, this approach has been successful in preserving natural and beneficial floodplain functions and protecting against future property damage.

In areas where floodplain development may be appropriate, for example shallow fringe areas or extensive tidal floodplains, regulating density through zoning achieves some measure of damage reduction and environmental protection. There are no density limitation provisions in the National Flood Insurance Program. Within the Chesapeake Bay Critical Area the density is one dwelling unit per 20 acres in areas designated as Resource Conservation. Although the Critical Area Program does not explicitly target flood protection among its objectives, protection of natural floodplains and flood damage avoidance will be a long-term result of the program.

A number of jurisdictions have used zoning as a protection measure. Frederick County has zoned the 100-year floodplain, and the areas affected by historic flooding, whichever are greater, as conservation/open space. Montgomery County and the City of Fruitland zone the 100-year floodplain as conservation/open space. St. Mary's and Dorchester Counties have thorough floodplain protection regulations in their zoning ordinances. Dorchester County focuses primarily on safety issues, while St. Mary's County directly addresses environmental issues (as well as safety) by requiring preservation of natural floodplains. Charles County uses a resource protection zone (RPZ) that provides good floodplain protection (see Section One: Streams and Their Buffers for more information).

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### **Example 2: Subdivision Regulations**

Along nontidal waterways and in tidal areas with limited floodplains, an effective protection measure involves requiring new building sites to be flood-free while dedicating the floodplain to open space as part of the subdivision of land. Within tidal floodplains, building sites should be located on the highest natural land available.

Prince George's County requires floodplains within new subdivisions to be dedicated to open space or placed under restrictive easement. The City of Rockville does not allow new lots to be platted in the 100-year floodplain. St. Mary's County has development regulations that require preservation of natural floodplains in all subdivision projects.

### **Example 3: Setbacks (Buffers)**

Significant protection of primary and ancillary floodplain functions can be achieved by requiring all development and land disturbances to be set back from streambanks and tidal waters. While setbacks cannot replace the effectiveness of actual floodplain studies and mapping, setbacks along streams can be used to establish a floodplain protection standard in areas where floodplain maps are unavailable and thus avoid expensive engineering analyses. Where floodplain mapping is not available another approach is to establish setbacks along wetlands, which will typically achieve considerable floodplain protection as a secondary benefit.

There are no provisions in either State or Federal programs that require setbacks. All counties and towns that have adopted the State's Model Floodplain Management Ordinance require a 100-foot flood protection setback from tidal waters and from streams that have Federal Emergency Management Agency (FEMA) mapped floodplains. A 50-foot setback is imposed along streams that are not delineated with floodplains on the FEMA maps. Montgomery County imposes a 25-foot setback from the 100-year floodplain boundary. Prince George's County uses a floodplain buffer.

### **Example 4: Alternative Analyses**

Alternative site analyses should be part of the comprehensive planning process, where the focus is on directing growth, where possible, outside of floodplain areas. Within high hazard floodplains (including floodways and coastal areas where wave energies are high) alternatives to development should be considered in the comprehensive planning process.

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Alternatives analyses should also be part of the site plan and subdivision plat review processes, requiring examination of alternate sites. Within a particular project site, areas that are flood-free and with minimal risk should be developed, while natural floodplains should be set aside for protection as open space.

There are no provisions in either State or Federal programs that require applications for floodplain activities to be accompanied by analyses evaluating alternatives to high hazard floodplain construction. All counties and towns that have adopted the State's Model Floodplain Management Ordinance require alternative analyses for proposals within floodplain areas deemed to be high hazard: floodways along nontidal rivers and streams, and coastal high hazard areas.

#### **Example 6: Floor Area Ratio and Impervious Surface Limitations**

In those developed and Plan-designated growth areas where it is not possible to avoid floodplains and safety issues are adequately addressed, floor area ratio (FAR) standards in combination with limitations on impervious surface can be used to maximize development, while minimizing its impact. The impervious surface standards should be used to limit the "footprint" (i.e., disturbance) of development, while FAR standards should be used to accommodate intensive development in a multi-story fashion. Such development should minimize impacts on wetlands, stream buffers, and important habitats.

## Mapping

#### **FEMA - Flood Insurance Studies**

Studies and maps prepared by FEMA or its predecessor, are adopted by flood-prone counties and towns in their floodplain management ordinances.

#### **FEMA - Flood Insurance Rate Maps (FIRM) and Floodway Maps**

These maps depict the minimum floodplain subject to State and local regulation. The FIRMs show the elevation of the 100-year floodplain in areas where detailed engineering studies have been performed. In other areas, approximate floodplains based on the best available information are delineated without specific flood elevations. Floodway maps delineate the effective conveyance floodway and adjacent flood fringe areas which are assumed to be relatively ineffective flow areas.

#### **FEMA Map Scales**

Map scales range from 1" = 2000' to 1" = 50'. Most Maryland counties and towns are mapped at the property tax map scale. Many local jurisdictions have mylar overlays of the FIRMs for the tax maps. Some counties use more detailed maps.

### Nontidal Floodplain Mapping

As part of the State permit governing activities in nontidal rivers and streams and their floodplains, applicants may be required to delineate nontidal floodplains based on ultimate development of contributing drainage areas. Although used as minimum guidance for regulatory purposes, many FEMA studies for Maryland jurisdictions are more than 15 years old and therefore do not take into account changes in watershed conditions due to upland development during that period. The Maryland Water Resources Administration has prepared detailed studies of more than 35 watersheds. A number of counties have also undertaken watershed studies to define floodplains and evaluate stormwater management options.

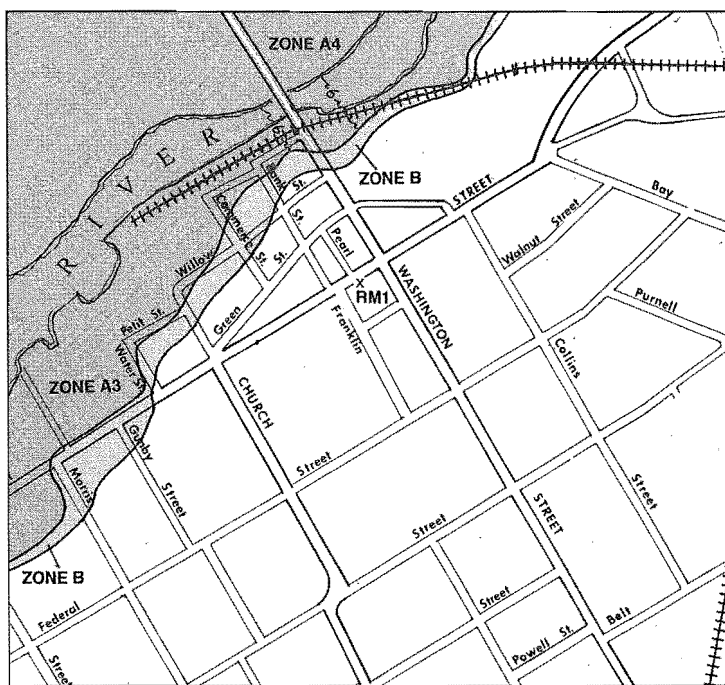
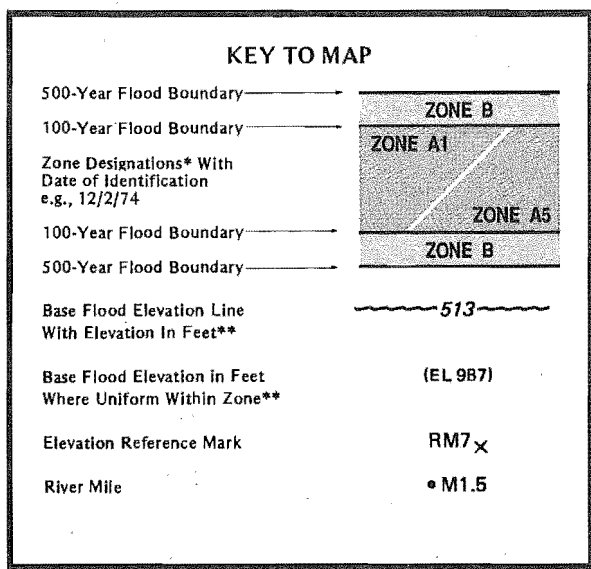
### Tidal Floodplain Mapping

The FEMA maps are the definitive source of detailed information for the tidal 100-year floodplain, and are based on a comprehensive study of historical tidal flooding performed in 1978 by the Virginia Institute of Marine Sciences. The inland extent of tidal flooding as shown on the FEMA maps is the downstream limit of nontidal floodplains subject to State regulation.

### Floodplain Mapping and GIS

The Water Resources Administration is currently investigating the possibility of cooperating with FEMA to import available floodplain mapping data into the State's Map and Image Processing System (MIPS).

For more information about the subject matter in this chapter, contact: Floodplain Management Division, DNR, (410) 974-3825.



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*Section Three:  
Habitats of  
Threatened and  
Endangered  
Species*



**Justification for  
Protection**

Through the 3.5 billion year span of life on Earth, the face and climate of the Earth have undergone changes. Continents moved, atmospheric composition changed, life forms developed, evolved and died out. During cycles of species evolution and mass species extinctions, perhaps as many as three billion species have developed and then disappeared. During the past 600 million years, the natural rate of extinction has been about one species per year.

The current rate of extinction is estimated to be at least 1,000 times that which has occurred over geologic time. These extinctions are the result of human activities, not “natural” changes such as environmental change caused by migration of continents, atmospheric conditions, or meteor strikes.

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A recent Council on Environmental Quality report stated that some 500 plants and animals have disappeared from North America since Columbus landed. The Federal endangered species list numbers 600 plants and animals; another 4,000 await consideration. A recent survey suggests that up to 9,000 U.S. species may be at risk of extinction.

The materials and chemicals produced by plants and animals are a largely unresearched storehouse for products beneficial to people. More than half of all medicines in use today can be traced to wild organisms. Plant chemicals are the sole or major ingredient in 25% of all prescriptions written in the United States each year. And only about 5% of the world's plants have been investigated for pharmaceutical use. Agriculture depends on the development of new varieties of crops to fend off pests and diseases. Many of these strains are created by cross-breeding with wild relatives of crop species. The new technology of biological engineering may create the ability to improve crops by transferring genes from wild strains, allowing the development of drought-resistant crops or crops with built-in pesticides.

There are also 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. Finally, the plants and animals that make up "nature" have considerable abstract value, playing significant roles in art and many religions.

In Maryland, over 200 species have been documented as being extirpated over the past 350 years. Although extirpation 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 at least another 413 native Maryland species with extirpation.

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.



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## Definitions

The Maryland Nongame and Endangered Species Conservation Act (Natural Resources Article, § 10-2A-01 through 06) provides definitions of threatened species and endangered species. Lists of the species considered to be threatened or endangered are found in COMAR 08.03.08. However, neither the law nor the regulations provide a definition of habitat.

Habitat is defined in the American Heritage Dictionary as “the area or type of environment in which an organism or biological population normally lives or occurs.”

“Endangered and Threatened Plants of the United States,” a text published by the World Wildlife Fund and the Smithsonian Institution, states that:

habitat could be considered to consist of a spatial environment in which a species lives and all elements of that environment including (but not limited to) land and water area, physical structure and topography, flora, fauna, climate, human activity, and the quality and chemical content of soil, water, and air.

The Federal Endangered Species Act includes a definition of critical habitat for listed species as follows.

(i) The specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the provision of § 1533 of this title, on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection; and

(ii) specific areas outside the geographical area occupied by the species at the time it is listed in accordance with the provisions of § 1553 of this title, upon a determination by the Secretary that such areas are essential for the conservation of the species.

In 1991, Massachusetts adopted a definition for habitat as a part of its regulations for implementation of the State’s Endangered Species Act. Massachusetts’ definition reads:

Habitat means an area which, due to its physical or biological features, provides important elements for the growth and survival of plants or animals such as food, shelter, or living space, and includes without limitation, breeding, feeding, resting, migratory, or overwintering areas. Physical or biological features include,

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but are not limited to: structure and composition of the vegetation; faunal community; soils, water chemistry and quality; and geologic, hydrologic, and microclimatic factors.

Both legal definitions refer to the physical and biological features which are important to the survival of the species. However, the Massachusetts definition also includes more detailed description of the types of physical and biological features and the functions those features help to support. The Federal definition states that the area may need special management or protection.

Using these two examples as templates, the following definition for "habitat of threatened and endangered species" is suggested.

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.

## Protection Measures

Before habitats for threatened and endangered species can be protected, the locations of the species and the elements necessary for their survival must be determined. Then, techniques which avoid adverse impacts to the particular habitat can be developed. The final step for protection, especially important during construction activities, is to monitor the project site to assure that the agreed-upon techniques are actually being applied. The incorporation of protection measures into development projects is much easier if the developer determines whether listed species are found on, or in the immediate vicinity of, the project site as early in the planning process as possible.

In the Chesapeake Bay Critical Area, local jurisdictions incorporate habitat protection within their planning, zoning, and subdivision processes. Kent County, however, has expanded this program to apply to the entire County. As part of Kent County's development review process, a brief project description and location map are sent to the Department of Natural Resources' Natural Heritage Program. The Program then searches its data base to check for known locations of threatened or endangered species which may be impacted by the project. A response is returned to the County which identifies which species, if any, may be

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affected and, if necessary, recommends a course of action for the development of protection measures.

### **Examples of Protection Measures**

The following protection measures are those that can be incorporated into the Sensitive Areas element of the Comprehensive Plan and implemented through local ordinances or State programs. In general, where flexible zoning and local environmental regulations exist, most of the measures should be fairly simple to implement, particularly in rural areas where significant development is not planned.

- ◆ Channel growth and development away from habitats as part of the comprehensive planning process.
- ◆ When a parcel contains listed species habitat, cluster the development on the portion of the parcel which will minimize adverse impacts.
- ◆ Required open spaces should incorporate the listed species habitat.
- ◆ Where consistent with the Comprehensive Plan, place areas containing listed species habitat in a zoning category which provides for conservation or allows flexible low density rural residential development.
- ◆ Allow the transfer of development rights away from parcels having listed species habitat to areas planned for growth or to rural population centers.
- ◆ Inform local inspectors of special habitat protection requirements which were part of the subdivision or site plan approval, and offer training to recognize when the protective requirements are being violated.
- ◆ Develop and implement a Forest Conservation Program to establish a strong element for protection of listed species habitat in return for property tax benefits to the landowner.
- ◆ Where habitat for threatened and endangered species coincides with other sensitive areas such as stream buffers, 100-year floodplains, steep slopes, or other protected sites, the application of existing regulations will provide protection.
- ◆ Support the efforts of local land trusts to protect listed species habitats.
- ◆ Use local open space and recreation planning to investigate acquisition and protection opportunities. Target a portion of the local jurisdiction's Program Open Space monies for the acquisition of high-quality listed species habitat.

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## Mapping/Site Identification

Currently, the Natural Heritage Program reviews any development project submitted by a developer, consultant, or local jurisdiction. The local jurisdiction, as in the Kent County example, can send the project to the Program for review.

The Natural Heritage Program is in the process of creating a computer-based mapping system. In the near future, the Natural Heritage Program will have the ability to supply aerial photographic maps of sites where construction projects could adversely impact threatened and endangered species habitats. When this system is in place, local jurisdictions may enter into a Memorandum of Understanding with the Program which would provide for the delivery and regular updating of these photographic maps and for assisting with the development of protection measures.

Some jurisdictions require that, during the project review process, the developer supply information on the presence or absence of threatened or endangered species habitat located on the project site.

Some counties (e.g., Prince George's County) are developing their own mapping systems for identifying habitats of threatened and endangered species.

**For more information about the subject matter in this chapter, contact:**  
Natural Heritage Program, DNR, (410) 974-2870.

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## *Section Four: Steep Slopes*



### **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 that erosion potential is usually achieved in the context of slope regulation, where environmental protection is focused on those areas where soil movement is most likely to be a problem - 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 reestablish. 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 streambanks 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.

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Increased runoff and sedimentation from development on steep slopes leads to decreases in water quality. The sediments carry nutrients downstream, impoverishing the upslope soils while causing turbidity, sedimentation, and aggravated eutrophication in receiving waterways. Sediment also carries heavy metals, pesticides, and other pollutants that can accumulate in ponds and water supplies. These pollutants may eventually reach the Chesapeake Bay.

Excessive sediment destroys river and estuarine habitat. Aquatic vegetation is destroyed by scour, burial, and turbidity. The destruction of plants and the associated decrease in photosynthetic activity reduces oxygen levels to the point where aquatic life cannot survive.

Trout and other stream species are very sensitive to impacts from sedimentation, particularly during their early life stages. Two of the most critical periods in the life cycle of fish are the egg and larva stages. Turbidity and siltation can cause egg mortality through suffocation by coating the egg, which excludes oxygen, or by reducing the flow of water containing oxygen past the egg. Larvae can be killed by silt particles that are inhaled, resulting in gill membrane inflammation and death.

*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.

*Septic Problems:* Restrictions on septic systems on steep slopes are needed to protect stream water quality and downslope neighbors from daylighting septic tank effluent. Effluent comes to the surface when septic systems are installed on steep slopes regardless of the soil type or depth of leachate trenches. Maryland Department of the Environment regulations prohibit septic systems on slopes greater than 25%.

*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 landsliding 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

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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.

Factors influencing landslides and other mass movements include:

- 1) changes in slope either by natural processes (stream undermines the toe of a slope) or by human activity (excavation for a road or a building site);
- 2) excess loading - human activity such as construction, filling land, dumping mining waste;
- 3) changes in vegetative cover;
- 4) shocks and vibrations; and
- 5) changes in water content (heavy rainfall can cause a buildup of perched water tables and septic systems can saturate surface and near surface soils).

*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 Act (see Section Three: Habitats, in this Chapter).

Local biodiversity is important to all of us whether we live in towns, suburban developments, or in the countryside. Local diversity of native plants, animals, fungus, 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.

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## Definitions

The most common approach used to protect steep slopes is to prohibit or restrict development in areas that exceed a specified percent grade. This approach is easy to administer but it may be overly restrictive in some cases and not restrictive enough in other cases. Slightly more sophisticated are regulations that also consider factors such as distance to a water course, soil type (highly erodible soil, expansive clays, and other special characteristics), slope length, and vegetative cover.

Steep slopes adjacent to a stream may be protected by a buffer which is expanded in width to include all or part of the slope face. (See Stream Buffer section for additional information.) Steep slopes also can be defined independent of a stream buffer formula. The following examples define steep slopes in order to prohibit or restrict disturbances.

**Example 1:** Baltimore County evaluates steep slopes within 500 feet of a waterbody as part of its forested stream buffer requirement. Criteria examine slope steepness, slope length, vegetative cover, and distance to waterbody to determine if development will be prohibited or restricted on the slope. The County also requires a finding that adequate measures exist to protect steep and unstable slopes, whether or not the slopes are adjacent to streams.

**Comments:** This method is more restrictive on slopes adjacent to streams with high erodibility, less restrictive on more stable slopes in less sensitive areas, and more complicated to administer.

**Example 2:** The Chesapeake Bay Critical Area criteria prohibit development on slopes greater than 15% in the Limited Development Areas and the Resource Conservation Areas unless the proposed project is the only effective way to maintain or improve stability of the slope. The criteria may also restrict development on slopes greater than 5% with an erodibility coefficient greater than 0.35, as part of a buffer to tidal waters, tidal wetlands, and tributary streams. The criteria expand the buffer by four feet for every 1% slope.

**Comments:** The criteria include the protection of erodible soils in tidal areas on slopes as moderate as 5%. This provides protection from erosion and sedimentation problems.

**Example 3:** Montgomery County defines steep slopes as greater than 25%, or greater than 15% where the erodibility coefficient is greater than 0.32. The County classifies slopes as either:



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- 1) near stream or hydraulically adjacent - area lying within 200 feet of a stream bank. If the 200 foot section encompasses only part of the slope, the hydraulically adjacent area will be expanded beyond the 200 feet to include the entire slope.
  - 2) hydraulically remote. Lying more than 200 feet away from any stream bank.

County guidelines are more restrictive for the near stream slopes. The County also has guidelines for unsafe land.

**Comments:** These guidelines give special protection to slopes adjacent to sensitive stream buffer areas. As in the Baltimore County approach, standards are less restrictive on slopes which are farther from water.

Including 15% slopes with erodible soils provides additional protection from erosion and sedimentation.

**Example 4:** Many counties prohibit development on slopes greater than 25%.

Harford County prohibits clearing for development on areas greater than 25% which encompass over 40,000 square feet. 30% of land having slopes between 15 and 25% may be cleared for development.

Howard County prohibits development on slopes greater than 25% in areas which exceed 20,000 square feet or are adjacent to a floodplain or wetland.

Allegany County prohibits residential building sites on slopes greater than 25%.

Anne Arundel County does not allow grading on slopes that exceed 25% or within 25 feet of the top of the slope. At least 30% of a lot must contain land having less than a 5% grade. In the Residential Low Density zone, a 50 foot buffer is required between structures and the crest of slopes that exceed 25%. Slopes over 15% may not be developed unless the development will facilitate the stabilization of the slope, the principle structure is constructed on piers or pilings, and is approved by the Soil Conservation District.

**Comments:** The 25% restriction is easiest to implement. However, it does not protect unstable or highly erodible slopes of less than 25%. Some counties provide additional restrictions for slopes that exceed 15%.

Setbacks, as required by Anne Arundel County, help prevent stormwater runoff from eroding steep forested areas. Setbacks also help prevent property damage from slope failure. (Baltimore County also has a development setback for steep slopes in their forested buffer.)

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## Protection Measures

The permitted and prohibited uses listed below have been gathered from local ordinances, model ordinances, and other sources. They are representative of the types of activities frequently included in steep slope ordinances.

### *Permitted Uses*

Some uses are permitted with conditions such as requirements for the use of best management practices, feasibility analyses, and impact mitigation.

- ◆ Natural resources protection, monitoring, restoration, management permitted.
- ◆ Forestry permitted, with a minimum buffer by streams (e.g., 50 feet, or 50 feet plus four feet for every 1% slope), BMP's, and forest management plan.
- ◆ Orchards and pasture land permitted, with a minimum buffer by streams (e.g., 25 feet) and approved soil conservation and water quality plan. BMP's must be implemented.
- ◆ Existing structures may be removed, restored, repaired, maintained, or enhanced. Enlargements no more than 20%, with BMP's.
- ◆ New structures or alteration of existing structures for transportation facilities, transmission lines, and sewer, water and gas lines may be constructed on a steep slope only if no practicable or feasible alternative exists for locating the structure elsewhere. If constructed within the steep slope, BMP's, soil conservation and water quality plan are required.
- ◆ Hydraulically remote steep slopes should be preserved when possible. Development may be permitted with BMP's.
- ◆ Disturbed areas should be revegetated as soon as possible.
- ◆ Performance monitoring may be required.

### *Prohibited Uses*

- ◆ Septic fields on slopes greater than 25% (Maryland Department of the Environment regulation).
- ◆ Clearing, grading, and physical development.

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## Mapping

Areas of steep slope are or may be delineated on a variety of base maps. One of the least accurate methods is to plot steep slope areas on USGS quad maps at a scale of 1"=2000'. At this scale and with contour intervals most often at 20 feet, steep slope mapping is best used for regional or large area planning purposes. The Maryland Geological Survey offers for distribution a limited number of quad maps on which slopes of various ranges have been delineated. Similar information is available on a lesser number of county base maps at a scale of 1"=1 mile (e.g., Anne Arundel County, slopes of 15%).

Jurisdictions that have larger scale (e.g., 1"=600', 1"=200', etc.) base maps with more accurate elevation information have the raw material to produce more accurate steep slope maps than can be derived from quad maps.

Harford County and a few other jurisdictions have produced mylar sheets highlighting areas of steep slope that can be superimposed on County property (tax) maps at a scale of 1"=600'. Slope areas on the mylars were derived from County soil survey maps which aggregate certain soils into slope categories (slopes based on soil survey maps, however, can be inaccurate in some locations).

The Maryland Department of Natural Resources is developing a mapping base of orthographic aerial photographs, each photograph covering one-fourth of a USGS quad map. The aerial photos are in digital form and can be converted to hard copy at various scales. Digital elevation information can be superimposed on the aerial photos as contour lines, and areas of given slope (e.g., greater than 25%) can be electronically identified and highlighted. These maps are in the developmental stage and are not available for distribution at this time.

As with stream buffer mapping, the most accurate way to map steep slopes is to require developers to include the appropriate information as part of a site profile or evaluation report. Detailed maps prepared by developers (subject to field checking) seem to work well in terms of establishing more precisely where the areas to be protected are located.

This site specific approach to mapping complements the more generalized smaller scale mapping that is most useful for regional or area planning purposes.

**For more information about the subject matter in this chapter, contact:**  
Coastal and Watershed Resources Division, DNR, (410) 974-2784.

*Section Five:  
Model  
Legislative  
Findings*

The following model legislative findings can be adapted by local governments when enacting a Sensitive Areas Protection Ordinance (the findings are based on a county enacting a separate Sensitive Areas Ordinance and using authority in Article 66B, Annotated Code of Maryland).

**Ordinance No. \_\_\_, Sensitive Areas Protection**

**WHEREAS**, the Board of County Commissioners (the Board) has duly adopted within the Comprehensive Plan, after public notice and hearing, a Sensitive Areas Plan element in accordance with the Economic Growth, Resource Protection, and Planning Act of 1992 (the Act) and Article 66B of the Annotated Code of Maryland;

**WHEREAS**, the Act requires protection of streams and their buffers, 100-year floodplains, habitats of threatened and endangered species (habitat), and steep slopes;

**WHEREAS**, the Act authorizes protection of additional types of sensitive areas;

**WHEREAS**, the Sensitive Areas element of the Comprehensive Plan has determined that, in addition to streams and their buffers, 100-year floodplains, habitats of threatened and endangered species, and steep slopes, that aquifer recharge areas and certain historic sites are also in need of protection;

**WHEREAS**, the Board finds that protection of streams and their buffers, 100-year floodplains, steep slopes, habitats, and aquifer recharge areas is important for protecting water quality and important plant and animal species from the adverse impacts of development including land disturbance, tree removal, sedimentation, impervious surfaces, increased volume and rate of flow of stormwater runoff, decreased quality of stormwater runoff, other forms of pollution, and human activity;

**WHEREAS**, the Board finds that protection of certain historic sites, as documented in the Comprehensive Plan, is important for protecting

community character and unique historical resources and promotes tourism and economic development in accordance with the Act;

**WHEREAS**, the Board finds that protection of water quality, important habitats, and historic sites contributes substantially to the public health, safety, and welfare;

**WHEREAS**, the Board finds that the definitions, standards, procedures, and other regulations in Ordinance No. \_\_\_\_, Sensitive Areas Protection, will substantially advance important and legitimate governmental interests in the areas of land use planning, growth management, environmental and natural resource protection, and economic development, as explained in the adopted "Sensitive Areas" element of the Comprehensive Plan;

**WHEREAS**, the Act requires the use of flexible development regulations to protect the environment; and

**WHEREAS**, said Ordinance, whose purpose is to effectively regulate the use of land, provides for relief, through flexible development regulations, special exceptions, and variance procedures to prevent the taking of all reasonable use of private property in violation of the Federal and Maryland constitutions.

**NOW THEREFORE**, the Board of County Commissioners hereby approves and adopts this Ordinance to implement sensitive areas protection to assure and promote the public health, safety, and welfare.



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