Wildlife Habitat Management Guidelines for the City of Bowie, Maryland

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<table>
<thead>
<tr>
<th>Acronym</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMPs</td>
<td>best management practices</td>
</tr>
<tr>
<td>CDP</td>
<td>comprehensive design plan</td>
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<tr>
<td>CDZ</td>
<td>comprehensive design zone</td>
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<tr>
<td>dB</td>
<td>decibels</td>
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<tr>
<td>DDS</td>
<td>departures from design standards</td>
</tr>
<tr>
<td>DSPs</td>
<td>detailed site plans</td>
</tr>
<tr>
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<td>Environmental and Wildlife Habitat Advisory Group</td>
</tr>
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<td>Forest Conservation Act</td>
</tr>
<tr>
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<td>Federal Emergency Management Agency</td>
</tr>
<tr>
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<tr>
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</tr>
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<td>limits of disturbance</td>
</tr>
<tr>
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<td>Maryland Biological Stream Survey</td>
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</tr>
<tr>
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<td>right-of-way</td>
</tr>
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</tr>
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Executive Summary

The City’s Wildlife Habitat Management Guidelines are the culmination of an eight-month effort of the City’s Environmental and Wildlife Habitat Advisory Group (EWHAG), Planning staff, and a consultant. The Guidelines provide a means by which developers should give consideration to wildlife habitat management as a development proposal goes through the review pipeline. The Guidelines emphasize the importance of the phrase “quality of life,” as well as its relationship to the available amount of wildlife habitat, both before and after the development in the City and adjacent communities.

The City recognizes the environmental benefits of good stewardship practices on a day-to-day basis. A newly identified responsibility on the horizon among stakeholders is that of the applicant in the role of the developer. Current development standards at the County level do not explicitly recognize the value and function in retention of existing habitat areas at a site as a ‘best management practice.’ The Guidelines are one way to shed light on the loss of wildlife habitat in the local landscape as a result of land development and to reverse this trend.

As in any effort of this kind, the City first identified goals as a framework. The goals are representative of emerging challenges in the foreseeable future in land development and wildlife habitat considerations. The goals range from: increasing quality habitat and biological diversity in the city; outlining measures to minimize disturbance and mortality to wildlife during and after development; and providing a protocol for site by site inventorying of natural resources. The goals seek to improve the quality of life through the preservation of a system of open space and viewsheds, as well as to explore the best management practices at selected stormwater management facilities. Last, but no least, the goals promote the use of native plants and conservation landscaping techniques on public and private properties. In putting all of the goals together and by incrementally applying them over time, the end result should be a measurable increase in quality of life for humans and wildlife, less need to substantially alter the natural environment at a development site, and overall improved water quality.

Chapter 7 of the Guidelines is the heart of the document. It is the synthesis of best management practices used in land planning coupled with techniques used in wildlife biology. In addition to developing the baseline information identified in the Guidelines, prospective developers and engineers should focus on implementing the specific recommendations contained in Chapter 7 as they begin to design a development. Techniques in this section represent the ‘leading edge’ of wildlife habitat management. It is the intention of City staff to incrementally, yet methodically, implement the Guidelines with the long-term vision that applicants will gradually incorporate aspects of the Guidelines in their development plans for sites over 10 acres in the City.
1.0 Introduction

Wildlife habitat is an aspect associated with the phrase “quality of life.” The term “wildlife habitat” is also a common thread for other environmental elements such as forests, buffers, and stream corridors. The ways by which a balance can be reached between development and wildlife habitat conservation in today’s landscape is a unique challenge. The group assessed the existing condition and current efforts toward wildlife habitat conservation in the Bowie area and made recommendations to the City Council for inclusion in the City’s Development Review Guidelines. The City Council adopted a report and recommendations in September 2000 and directed that specific guidelines be developed.

At the forefront, the purpose of the Guidelines is the directive from the City Council for the preparation of wildlife habitat preservation and management guidelines in which non-lethal means of wildlife management is the preferred method versus lethal means. These Guidelines are intended to implement the wildlife management policies (see Appendix A) adopted by the Council and to supplement the environmental chapter of the City’s Development Review Guidelines. Good stewardship of the natural environment is a “quality of life” consideration that has long-term ramifications. The Guidelines have been written around a framework that recognizes the necessary steps to be taken to conserve and protect wildlife habitat at the beginning and continuing throughout the development process. As land development continues in the City and the Planning Area at-large, it is evident that wildlife habitat proportionately shrinks. This in turn puts a hardship and immediate constraints on the wildlife population as it seeks new habitat, food sources, and shelter when migrating away from former habitat areas. Poor development increases loss of quality of life, diminishes bio-diversity, and accounts for an increase in the occurrence of road kill and human-animal conflicts in suburban areas. While these Guidelines focus on wildlife habitat, there is recognition of additional effects of land development on air and water quality. The Guidelines, once adopted by the City Council, are intended to be presented to Prince George’s County, the Maryland-National Capital Park and Planning Commission (M-NCPPC) and other jurisdictions for inclusion in their development review process, as these jurisdictions address the loss of wildlife habitat.

The Guidelines are also intended to promote action and good stewardship of the natural environment among persons developing land, area residents, and the local business community as to the importance of wildlife habitat conservation and preservation within the City and Planning Area. Sensitivity to wildlife habitat in the Bowie community, especially at the pre-development phase, is an important aspect of good stewardship of the natural environment.
Wildlife management in urban settings has changed from solely controlling perceived nuisance species to encouraging observable and unobservable wildlife by working habitat components into parks and developments. The presence of wildlife in urban settings enhances the quality of life of its residents as more people are becoming interested in bird watching and other forms of passive recreation. A variety of wildlife have become adapted to the altered habitat conditions provided in highly developed areas (see Section 6.6) and are likely to be present in even the most urbanized environments. Other species need larger unfragmented areas to live and reproduce. Preserving and conserving land and specific habitat features is important to ensuring that both groups of species are able to exist in an urban area.

These wildlife habitat management guidelines aim to maintain local character and sustain a high quality of life for Bowie citizens by conserving natural areas and wildlife habitat throughout the City. The City’s Environmental and Wildlife Habitat Advisory Group (EWHAG) developed the following major goals for City staff to use during the preparation and implementation of these Guidelines.

- Increase quality habitat and to protect wildlife species and biological diversity in the City.
- Ensure that wildlife and wildlife habitat is integrated into the development planning process.
- Encourage retention of wildlife habitat on sites beginning at the pre-development for the framework of greenway corridors and an area-wide “green infrastructure.”
- Outline measures to minimize disturbance and mortality to wildlife during and after development, including habitat fragmentation reduction.
- Minimize the need for relocating wildlife during development by providing opportunities for voluntary wildlife movement.
- Improve the quality of life by preserving a system of open space and viewsheds.
- Provide a protocol for inventorying the natural resources within the City.
- Explore the possibility of selected stormwater management facilities to have dual functions by design and engineering for wildlife habitat, where feasible.
- Minimize light and noise pollution.
- Promote the use of native plants and conservation landscaping techniques, and avoid use of exotic invasive plants on public and private properties.
3.0 
**Applicability**

The Wildlife Habitat Management Guidelines will be applied to development plan proposals that are referred to the City from the Maryland-National Capital Park and Planning Commission for sites with a land area of 10 acres and greater. All development review plan proposals (referrals) having at least 10 acres in land area include the following types of development proposals: Certification of and expansion of non-conforming uses, preliminary plans of subdivision (including clusters), detailed site plans (DSP), special exceptions (SE), zoning map amendments (ZMA), comprehensive design zones (CDZ) and all subsequent plans, including mixed use and planned community zones, and special permits. The Guidelines will be applied to sites in the development review pipeline that have a land area of less than 10 acres if the site is within a designated Greenway or Habitat Protection area, once these are mapped. For these sites, the application of the Guidelines will be based on the pre-development environmental characteristics.

The City has stormwater management review and permit issuance authority from the State of Maryland. Stormwater management plans for land development proposals are reviewed to ensure that both water quality and public safety (i.e., prevention of flooding and property damage downstream) issues are addressed. One of the goals of the Guidelines is to explore the possibility of selected stormwater management facilities to have dual functions by design and engineering for wildlife habitat, where feasible. Water quality is an important component in land development, and it is an integral factor in the environmental health of local streams and tributaries of the Patuxent River, and ultimately the Chesapeake Bay.

In recent years, the City has been given the authority from Prince George’s County via the State to review variances and departures from design standards (DDS). Wildlife habitat preservation and protection is connected to the water quality component and considerations associated with land development. Stormwater management plan preparation begins early in the development review process. Wildlife habitat conservation and management considerations in land development will be required upon adoption of the Guidelines by the City Council.
4.0 Administration

It is the responsibility of the City’s Departments of Community Services, Planning and Economic Development, and Public Works to ensure that development plans address wildlife habitat conservation and management consistent with the Guidelines. The Departments of Planning and Economic Development and Public Works will take the lead in this responsibility at pre-development. These two departments have staff responsible for the day-to-day (concept) plan and design review and issuance of stormwater management plan approval and permits (Public Works). Planning Department staff is simultaneously responsible along with Public Works staff as habitat conservation become aspects for consideration and discussion in the public hearing review process and overall “planning” of a development. The Department of Community Services (Parks and Grounds) is responsible at post-development for residential stormwater management facilities that have been built to City standards, and ultimately dedicated to the City in perpetuity.

On the maintenance-side of such facilities is the goal to explore the possibility of selected stormwater management facilities to have dual functions by design and engineering for wildlife habitat, where feasible. Design considerations will include, first and foremost, proper stormwater management controls, and second, the use of native plants and landscaping to attract specific species of wildlife.

One of the goals in the Guidelines expands the definition of the purpose of stormwater management facilities. An aspect of designing and engineering such facilities is so that these facilities accommodate native plants and low-maintenance landscaping for wildlife habitat. Retrofitting of selected stormwater management facilities should reduce the vast areas of turf (requiring regular mowing) and/or fenced-in facilities. The use of native plants and conservation landscaping techniques are the best management practices (BMPs) brought out in the technical portion of the Guidelines.

Typically on commercial sites within the City, the property owner maintains stormwater management facilities. There are exceptions on commercial sites in the City. Exceptions to this standard are in the form of a separate facilities agreement between the property owner and the City. All commercial stormwater management facilities are intended to be designed in a manner that is consistent with the Guidelines.
5.0 Policies and Agreements

The Bowie Wildlife Habitat Management Guidelines are based on existing Federal, State and local natural resources-related laws, regulations, policies, and agreements. These policies and agreements define the boundaries of actions that could affect natural resources including wildlife and wildlife habitat. They address such subjects as threatened and endangered species, migratory birds, forest conservation, wetlands and surface waters, floodplains, environmentally sensitive growth planning, erosion and sediment control, and stormwater management. Current policies and agreements that govern these topics are summarized in Appendix A. Applicants that incorporate these Guidelines into their activities will be complying with these Federal, State, and local policies and agreements.

These Guidelines are also based on the following Bowie-specific guidance documents:

- **Bowie-Collington-Mitchellville and Vicinity Master Plan** [adopted and approved in 1991] – The Environmental Envelope chapter of the Master Plan text identifies environmental issues and concerns, resource conservation areas, natural and physical features that are restricted to development.

- **Bowie Development Review Guidelines** – These guidelines promote sensitively designed development sites by outlining requirements pertaining to the environment and open space, transportation and circulation, parks and recreation, land use, urban design, and historic preservation.

- **Bowie Forest Mitigation Sites Policies and City-Owned Properties Inventory** – Based on the County’s woodland conservation policy, this document identifies the City’s policies regarding on-site and off-site forest mitigation on City-owned properties.
6.0 Baseline Conditions

The following subsections outline the resources that a person developing land could expect to encounter in the City of Bowie.

6.1 GROUNDWATER

Groundwater is water that flows or seeps downward and saturates soil or rock, supplying springs and wells. Groundwater relates to wildlife habitat in that it feeds perennial streams during dry months, providing habitat for a variety of aquatic species. Groundwater often begins as precipitation and soaks into the ground where it is stored underground in rock crevices and in the pores of geologic materials (these are aquifers), the same way as water fills a sponge. The upper surface of the saturated zone is called the water table. In general, Bowie’s water table is very shallow, which means that it lies close to the ground surface. In many areas throughout the City, the groundwater table meets the ground surface, forming springs.

Water is one of the essential elements of wildlife habitat. All plants and wildlife need water for survival. When habitat is fragmented and wildlife is separated from a water source, wildlife must travel to find this necessary element. This often results in wildlife mortality from vehicle collisions and increased predation over areas with no cover. All types of water sources are important to wildlife. Seasonal (intermittent or ephemeral) water sources are equally as important as year-round (perennial) water sources because they provide water at key times, such as breeding season, and create habitat diversity by supporting a specialized suite of vegetation.

Low-lying areas and soils consisting of well-drained deposits of sand or gravel transmit large amounts of surface water downward into the water table. These areas are called groundwater or aquifer recharge areas. Impervious surfaces in areas with high recharge potential decrease actual recharge and may lend to increased groundwater pollution from contaminated runoff. Pollutants such as pesticides, fertilizers, oils, and greases seep into the groundwater and may contaminate local streams.

The City of Bowie draws water from three aquifers, the Magothy, Patapsco, and Patuxent formations. Bowie contains part of the recharge area of the Magothy formation, which is the only aquifer that outcrops within the Bowie City limits. The recharge areas for the Patapsco and Patuxent formations originate further northwest in Prince George’s County. According to the 1995 Wellhead Protection Program for the City of Bowie, all three of Bowie’s drinking water aquifers are “semi-confined”, meaning certain portions are exposed to the land surface with the remainder being covered, or confined, by overlying layers of silt or clay. In the areas where the aquifers outcrop at the land surface, they are unconfined and particularly vulnerable to contamination. The Wellhead Protection Program, which mapped protection areas based on outcrop areas, found that in general, the aquifer and wellhead protection areas are protected from major contamination and degradation. However, potential sources of contamination such as gas stations, manufacturers that generate hazardous wastes, and landfills within the outcrop areas should be minimized.

It is important to maintain groundwater quality and quantity at a high level, even when not associated with a drinking water aquifer due to its connection to surface water. During dry times of the year,
groundwater seeps into many perennial streams. If groundwater is not allowed to recharge, or if recharge is contaminated, aquatic systems will be affected. The Bowie Master Plan stresses the importance of protecting ground water quality and quantity, and encourages the use of structural and nonstructural controls in recharge areas to minimize contamination and provide adequate recharge. The Maryland Department of the Environment (MDE) has a Water Management Administration that is responsible for coordinating and regulating ground water protection activities. MDE sets limits on the contaminants that can be discharged into the ground water and establishes best management practices and operational requirements (Maryland Water Quality Inventory Report, 1993-1995).

6.2 SOILS

Although soils may seem to be unrelated to wildlife conservation concerns, they play a key role in the habitat that an area will support. Some soils are more likely to support forests, while other may support meadows. Soil variation over a landscape provides a diversity of habitat that is visible to the eye. Soils and topography have a great influence on the natural resources and wildlife that a property supports. Soils are linked to wildlife by both their physical characteristics and the plant communities that they support. Soil texture influences the presence and breeding preference of many species of wildlife. Soils and topography also determine the plant communities that can be supported in an area, as native plants are specially adapted to local physical conditions. Differing conditions across a property create a mosaic of habitat lending to increased biodiversity. Environmentally sensitive site design depends on knowledge of the nature and degree of soil and topographical constraints and opportunities offered by a given site. Identification of unsafe or unsuitable land is an integral part of this analysis, both from the standpoint of providing safe and habitable buildings, and for providing protection and conservation of the natural resources associated with wildlife habitat such as streams, wetlands, floodplains, forests, and trees. The primary reason for classifying land as unsafe or unsuitable for development has to do with public safety or unacceptable environmental degradation.

The most recent soil survey covering the City of Bowie is the 1967 Soil Survey of Prince George’s County Maryland (NRCS). This survey is being re-written, and should be available in 2002. According to the soil survey, a soil association is an area of land that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. While the associations are useful in providing a general understanding of the types of soils in an area, this information should not be used for planning purposes because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect management. The dominant soil associations in the vicinity of Bowie include the Sassafras-Croom association, the Bibb-Tidal Marsh association, and the Collington-Adelphi-Monmouth association.

Each association is made up of several soil series. Series are a group of soils that come from the same parent material and have similar properties. Soils with limitations for development and soils that are highly erodible generally fall within the Conditional Reserve Areas as defined in the Bowie Master Plan. According to the Master Plan, soils with limitations for community development, which generally fall within designated Conditional Reserve Areas, include the Adelphia, Bibb, and Shrewsbury series. These series are associated with floodplains, perched or high water tables, and potentially unstable clay soils. They are damp throughout the winter and spring and are susceptible to frost action.

Within these series, potentially unstable clay deposits are of the Marlboro Clay type. Marlboro Clay consists of very deep, well-drained, moderately permeable, clayey soils that formed in marine sediments with slopes 0-15%. These soils are subject to potentially dangerous earth slides and cave-ins from exposure to prolonged wetting and when disturbed by grading (Bowie-Collington-Mitchellville Master Plan, 1991). Marlboro clays are generally located adjacent to the Patuxent River and its tributaries,
particularly near Honey Branch, Mt. Nebo Branch, District Branch, and Collington Branch. They can also be found throughout the Pointer Ridge subdivision.

Soils with limitations for septic tank use are commonly within the Adelphia, Bibb, Mixed Alluvial, Monmouth, Sandy Land, and Shrewsbury series. Highly erodible soils are found throughout the City and are generally associated with the Monmouth, Shrewsbury, and Westphalia series found along several streams when associated with slopes.

6.3 SURFACE WATERS

A watershed is the land that drains, or sends its snow, rain, and usually groundwater, to a single water body. The City of Bowie lies within the Western Branch Watershed of the Patuxent River Basin (as defined by the Maryland Department of Natural Resources (MD DNR)), which drains to the Chesapeake Bay. Within the City of Bowie, major tributaries to the Patuxent River include Horsepen Branch, Whitemarsh Branch, Mill Branch, Northeast Branch, Collington Branch, Green Branch, and Black Branch. Other bodies of water in the City include New Town Center Pond, Allen Pond, and Foxhill Lake. The Maryland Biological Stream Survey, run by the MD DNR, has assessed the fishability and biological integrity of streams and rivers in Maryland. Data exist for Horsepen Branch, Northeast Branch, Collington Branch, and Black Branch, and can be found online on MD DNR’s Web site (Appendix B) (MD DNR, 2001a).

The Patuxent River is recognized as a vital natural resource in this region that provides vast wildlife habitat for a variety of waterfowl and land animals. It is a unique ecosystem within the Chesapeake Bay that is known as an estuary. It is Maryland’s largest intrastate river (110 miles). Prince George’s County has 67 miles of shoreline. The river’s watershed is the wintering and breeding area for tens of thousands of migratory waterfowl, including the Canada goose (*Branta canadensis*), snow goose (*Chen caerulescens*), tundra swan (*Cygnus columbianus*), and dozens of species of ducks.

6.4 WETLANDS

Wetlands are areas that hold water for significant periods during the year and are characterized by anaerobic (low oxygen) conditions favoring the growth of specific plant species and the formation of specific soil types. Wetlands are important flood control and water storage areas, and provide unique and very rich wildlife habitat. They also help to improve water quality by holding and biologically filtering pollutants. Significant nontidal wetlands in Bowie, in terms of size, are located along portions of Collington Branch and the Patuxent River and many of its smaller tributaries listed in Section 6.3.

Additionally, Coastal Plain Bogs, an unusual form of wetland, have been found in Prince George’s County. Bogs, which are threatened in Maryland, provide habitat for a variety of rare species including carnivorous plants and wild orchids, and the minute bog beetle, which is indigenous to sphagnum bogs. It is believed that many of these bogs formed when fires removed woody vegetation and organic material from swamps during periods of drought. Then, when the water table returned to normal levels the lack of vegetation allowed bog species to invade the edges of the wetland where soil conditions were appropriate. Coastal Plain bogs may also have developed in “oxbow” lakes, where a meander is disconnected from a stream that changes course and in old beaver ponds.

Other special-status wetlands in the area include Nontidal Wetlands of Special State Concern and Chesapeake Bay Critical Area Wetlands. Nontidal Wetlands of Special State Concern are listed in COMAR 26.23.06.01 and include Belt Woods and the Patuxent Maple Swamp in the Bowie area. According to the MD DNR, Chesapeake Bay Critical Area wetlands are generally found along the
Wildlife Habitat Management Guidelines for the City of Bowie, Maryland

January 2002

Patuxent River and vernal pools, which may be considered wetlands, are non-tidal wet areas confined to small depressions and that have surface water for 2 months, no evidence of a fish population, and support amphibians. State endangered species associated with vernal pools include eastern tiger salamanders (Ambystoma tigrinum), greater sirens (Siren lacertina), barking tree frogs (Hyla gratiosa), mountain chorus frogs (Pseudacris brachyphona), eastern narrow-mouthed toads (Gastrophryne carolinensis), and carpenter frogs (Rana virgatipes).

6.5 VEGETATION

The tree, shrub, and herbaceous species on a property provide cover, food, and places to raise young for wildlife. Plant diversity, acreage, habitat connectivity, shape and composition, and proximity to water sources all affect the habitat value of an area. Habitat fragmentation, which reduces the acreage and amount of interior forest or functioning grassland, and disrupts connectivity of habitat, can be minimized through environmentally sensitive planning.

The Bowie-Collington-Mitchellville Planning Area consists of developed areas with urban forests. The species and condition of these urban forests are based on such factors as type of land use, topography, soils, sun exposure, invasive plants, and maintenance regimes. Several large areas of interior or woodland forest exist in the area. The City of Bowie maintains a geographic information system (GIS) database with vegetative cover information. The latest data can be retrieved by contacting City staff. As of 1991, most of the woodland forest was associated with stream valleys and their buffers. Woodlands included species such as white oak (Quercus alba), and northern red oak (Quercus rubra) in the upland areas, and red maple (Acer rubrum), sweetgum (Liquidambar styraciflua), and tulip poplar (Liriodendron tulipifera) near waterways.

Within the Atlantic Coastal Plain, dominant pine and hardwood forest species include loblolly pine (Pinus taeda), Virginia pine (Pinus virginiana), shortleaf pine (Pinus echinata), southern red oak (Quercus falcata), black oak (Quercus velutina), scarlet oak (Quercus coccinea), pin oak (Quercus palustris), willow oak (Quercus phellos), northern red oak (Quercus rubra), black walnut (Juglans nigra), yellow poplar (Liriodendron tulipifera), sweetgum (Liquidambar styraciflua), and red maple (Acer rubrum). Within Maryland, common native fern species include Christmas fern (Polystichum acrostichoides), Maidenhair fern (Adiantum pedatum), common polypody (Polypodium vulgare), and the sensitive fern (Onoclea sensibilis). Common native shrub species include the Virginia sweetspire (Itea virginica) and smooth arrowwood (Viburnum recognitum). Common native herbaceous plant species include a myriad of wildflowers like common blue violet (Viola papillonacea), false solomon’s seal (Maianthemum racemosum ssp. racemosum), and blue wood aster (Aster cordifolius). A list of native plants of Prince George’s County is included as Appendix C.

Information from the MD DNR Forest Service includes research of tree and plant species typically found native in Bowie. According to the Vegetation Map of Maryland by Brush, Lenk and Smith July 1976, the City of Bowie is located in three different associations: the Tulip Poplar Association, the Chestnut oak-Post Oak-Blackjack Oak Association, and the River Birch-Sycamore Association. The tree and shrub species in these associations are as follows: red maple (Acer rubrum), flowering dogwood (Cornus florida), Virginia creeper (Parthenocissus quinquefolia), black gum (Nyssa sylvatica), white oak (Quercus alba), sassafras (Sassafras albidum), black cherry (Prunus serotina), grape (Vitis labrusca), mockernut hickory (Carya tomentosa), southern arrowwood (Viburnum dentatum), black oak (Quercus velutina), poison ivy (Toxicodendron radicans), greenbrier (Smilax rotundifolia), beech (Fagus grandifolia), spice bush (Lindera benzoin), northern red oak (Quercus borealis), mapleaf viburnum (Viburnum acerifolium), early low blueberry (Vaccinium angustifolium), choke cherry (Prunus virginiana), American holly (Ilex opaca), Virginia pine (Pinus virginiana), sweet gum (Liquidambar styraciflua), scarlet oak (Quercus coccinea), Spanish oak (Quercus falcate), sweet pignut hickory (Carya
glabra), dwarf huckleberry (*Gaylussacia dumosa*), mountain laurel (*Kalmia latifolia*), tall deerberry (*Vaccinium stamineum*), tulip poplar (*Liriodendron tulipifera*), ironwood (*Casuarina equisetifolia*), green ash (*Fraxinus pennsylvanica lanceolata*), elderberry (*Sambucus canadensis*), and slippery elm (*Ulmus rubra*).

The MD DNR maintains a list of Federal and State- listed endangered, threatened, rare, and watchlist species and communities on their Web site (Appendix B). The Maryland Native Plant Society also maintains a plant list on their Web site that includes a prevalence of plants determined by the Society (Appendix E). The lists should be consulted whenever a development project is planned in order to ensure that critical habitat will not be lost for any occurring species.

### 6.6 Wildlife

The State of Maryland is home to a variety of wildlife species. The urban and suburban areas, as exists in much of Bowie, provide adequate habitat for many species. More common wildlife adapted to urban conditions include, but are not limited to, eastern gray squirrel (*Sciurus carolinensis*), beaver (*Castor canadensis*), Canada goose (*Branta canadensis*), field mice (*Peromyscus spp.*), voles (*Microtus spp.*), raccoon (*Procyon lotor*), red fox (*Vulpes vulpes*), Carolina chickadee (*Parus carolinensis*), northern cardinal (*Cardinalis cardinalis*), Virginia opossum (*Didelphis virginiana*), white-tailed deer (*Odocoileus virginiana*), and eastern cottontail rabbit (*Sylvilagus floridanus*). Such species have adapted to living in close proximity to humans and the human environment. Larger forested areas in Bowie support a variety of migratory birds, including, but not limited to, some interior-dwelling species such as the wood thrush (*Hylocichla mustelina*) and the worm-eating warbler (*Helmitheros vermivorus*). These interior areas also support a variety of other wildlife species, such as the gray fox (*Urocyon cinereoargenteus*), that require larger areas to feed and breed. More information on wildlife species in Maryland can be found on the MD DNR Web site (Appendix B) (MD DNR, 2001b).

In 1991 the City of Bowie was designated as a bird sanctuary in resolution number R-15-91. The sanctuary declaration recommends that future City of Bowie guidelines give priority to the preservation of wildlife, plants, and the natural environment while promoting balanced development.

State and Federal endangered, threatened, rare, watchlist, and in need of conservation species are listed and tracked by MD DNR and information is available on their Web site (Appendix B). The lists should be consulted whenever a development project is planned in order to ensure that critical habitat will not be lost for any occurring species.

Certain species of wildlife that are found within the City of Bowie create management challenges that result from conflicts between humans and other species of wildlife. Widespread modification of habitat for wildlife species, combined with the lack of natural predators to control populations, can create demands on habitat that exceed the capacity for vegetation to recover. This can cause negative impacts for humans and wildlife species. The browsing habits of large populations of white-tailed deer (*Odocoileus virginiana*) can reduce the lower canopy vegetation that provides interior forest habitat for many species of birds. High concentrations of deer also increase the risk of deer-vehicle collisions and contribute to transmission of Lyme disease. However, it is important to note that both deer and rodent hosts must be abundant to maintain the cycle of the bacteria that causes Lyme disease (Center for Disease Control, 2001). High concentrations of Canada geese (*Branta canadensis*) often result in complaints from the public regarding territorial goose behavior, abundance of goose droppings, and negative impacts to water quality. Occurrence of beaver (*Castor canadensis*) in public places often result in complaints regarding tree damage. Other complaints often involve perceived rabies threats associated with the presence of raccoons, foxes, skunks, and bats on private property, or concerns about West Nile Virus associated with birds and mosquitoes. Despite these occasional conflicts, the presence of wildlife in urban settings has
many benefits. Wetlands created by beavers contribute to enhanced water quality and species diversity, 
and the presence of Canada geese, white-tailed deer, foxes, birds, and other wildlife provide an 
opportunity for wildlife viewing that contributes to the quality of life in a community. Bat boxes may 
entice bats to the landscape, which helps control mosquitoes and other insects.

6.7 CITY AND NEIGHBORING NATURAL AREAS

There are numerous parks and natural areas in and near the limits of the City of Bowie, including 
Whitemarsh Park, Blacksox Park, Tanglewood Park, Foxhill Park, Enfield Chase Park, Huntington South 
Park, High Bridge Park, Buckingham Park, Pope’s Creek Park, Veteran’s Park, and Allen Pond Park. 
Other natural areas of interest include the Belt Woods Natural Environmental Area and the Collington 
Branch Stream Valley Park. Collington Branch is a component of the Patuxent River Watershed that 
originates near Bowie, runs southerly and connects to the Western Branch Tributary in Upper Marlboro, 
which continues into the Patuxent River. The Collington Branch is also planned for a proposed multi-use 
hiker/biker/equestrian trail that will connect the City of Bowie with Upper Marlboro.

The presence of wildlife in urban settings enhances the quality of life of its residents as more people are 
becoming interested in bird watching and other forms of passive recreation. A variety of wildlife have 
become adapted to the altered habitat conditions provided in highly developed areas (see Section 6.6) and 
are likely to be present in even the most urbanized environments. Other species need larger unfragmented 
areas to live and reproduce. Preserving land and specific habitat features is important to ensuring that both 
groups of species are able to exist in an urban area.

The State of Maryland proposes and has identified an open space network that includes portions of Bowie 
along the Patuxent River and identifies Belt Woods as a wildlife “hub.” This hub currently has no links or 
connections. A comprehensive map of the green infrastructure within the Bowie-Collington-Mitchellville 
Planning Area should be prepared in the next update of the Area Master Plan. Such a plan will identify 
the existing situation: hubs, corridors, links and gaps. Mapping the existing situation will serve as a 
planning tool for achieving an interconnected designated Greenway and Habitat Protection system within 
the Planning Area. Where appropriate, additional open space areas will be designated encompassing areas 
with wildlife habitat value, and will include floodplain areas and Natural Reserve Areas. Existing open 
spaces are mapped in the Bowie-Collington-Mitchellville Area Master Plan, and include numerous areas 
along the Patuxent River.

One such natural area within several residential neighborhoods in the City and the vicinity is the Potomac 
Electric Power Company (PEPCO) right-of-way (r-o-w). The r-o-w runs in a north/south direction from 
southern Maryland to northern counties (i.e., Montgomery and Frederick). The width of the r-o-w is 250 
feet. Within the r-o-w are twin towers for high voltage transmission lines. In recent years, PEPCO has 
realized the significance that their r-o-w represents in the landscape. When properly managed, the r-o-w 
provides opportunities in terms of a wildlife corridor/greenway. PEPCO has an initiative underway to 
enhance segments of the r-o-w with the use of conservation landscaping techniques. Other such natural 
areas include the Washington-Baltimore and Annapolis (WB&A) hiker/biker trail, Conrail lines, and 
public utilities such as water and sewer r-o-w and easements throughout the City and Planning Area.

The Maryland-National Capital Park and Planning Commission (M-NCPPC) administers a park 
acquisition program for the protection of stream valley corridors. The County and the M-NCPPC use 
general land use regulations and the development review process to promote greenway development and 
the Countywide walking, biking, and equestrian trail system. Programs for the Chesapeake Bay Critical 
Area and the Patuxent River Primary Management Area contribute significantly to river corridor 
protection efforts. Several designated Greenways under this program link areas of wildlife habitat and 
promote wildlife movement.
The Beaverdam Creek greenway corridor originates north of Bowie near the Beltsville Agricultural Research Center and connects with Indian Creek to the southwest. The greenway corridor is owned by the U.S. Department of Agriculture. The Northern Greenway connects to the U.S. Army’s Fort Meade in Anne Arundel County to link open space areas between Baltimore and Washington. The Beltsville Agricultural Research Center (U.S. Department of Agriculture) and the Patuxent Wildlife Research Center (U.S. Fish and Wildlife Service) properties link to form an extensive resource protection greenway across the northern portion of Prince George’s County. The Collington Branch greenway runs southerly through Bowie. The Patuxent Regional Greenway is a partially established greenway that includes seven jurisdictions extending from central through southern Maryland. The Patuxent River serves as the spine for the greenway, which runs through Howard, Montgomery, Anne Arundel, Prince George’s, Calvert, Charles, and St. Mary’s counties. The MD DNR currently owns about 15,000 acres along the Patuxent River (MD DNR, 2000) and is working with local officials to extend protection along the mainstream. Prince George’s County has adopted land use and development regulations for the Chesapeake Bay Critical Area and the Patuxent River Primary Management Area to channel development away from sensitive areas in the Patuxent corridor. Public acquisition of the Patuxent Regional Greenway will continue, and these policies will provide a mechanism for protecting water quality and riparian resources on non-public lands.
Maintaining habitat is key to sustaining healthy wildlife populations. One of the City of Bowie’s primary goals is to maintain local character and sustain a high quality of life for Bowie citizens by conserving natural areas and wildlife habitat throughout the City. Considering Bowie’s location in metropolitan Washington, D.C., careful consideration of placement and size of natural areas is important to maintaining habitat for wildlife. If well planned, these open areas can provide essential stopover and nesting places for migratory birds, supply the necessary combination of surface water and upland habitat for a variety of reptiles and amphibians, and offer unblocked streams for spawning fish. The following guidelines incorporate natural areas and wildlife considerations into the development planning process. By following these guidelines, natural areas will be better planned to maximize wildlife benefits.

This chapter outlines information that should be collected and guidelines that should be followed to ensure that a development is planned and implemented in a manner that protects wildlife and habitat. The chapter is organized as follows:

- Section 7.1, Pre-Development Survey and Report Requirements specifies the background information that should be collected before a development is designed.
- Section 7.2, Habitat Conservation and Wildlife Management Plan for Development Sites, provides guidance on combining this information to identify important habitat areas and features called Habitat Conservation Areas (see definitions).
- Section 7.3, Impact Avoidance to Habitat Conservation Areas, specifies actions to minimize the effects of development on these areas.
- Section 7.4, Wildlife Damage Minimization, outlines procedures to reduce wildlife mortality and disturbance.
- Section 7.5, Stormwater Management and Soil Erosion and Sediment Control Management addresses ways to design water and sediment control facilities to benefit wildlife.
- Section 7.6, Landscaping Specifications, advises on how to preserve and enhance wildlife habitat by using conservation landscaping.
- Section 7.7, Light and Noise Pollution Minimization, outlines ways to minimize the effects of increased light and noise from a development on wildlife populations.
- Section 7.8, Recreational Facilities, provides guidance on location and materials for construction of such facilities.
- Section 7.9, Public Utilities and Transportation Rights-Of-Way contains information on design and maintenance of these areas to considering their value to wildlife habitat.

Two terms that are used in this chapter require explanation: Habitat Conservation Areas and Habitat Protection Areas. Habitat Conservation Areas are selected on a site-by-site basis by the person developing the land and include any designated Greenways and Habitat Protection Areas on-site along...
with on-site wetlands, vernal pools, and any other natural features that are to remain undeveloped. The term *Habitat Protection Areas*, which is used in “Designated Greenways and Habitat Protection Areas,” provide safe areas for wildlife throughout the City on a larger scale.

### 7.1 Pre-Development Survey and Report Requirements

A Pre-Development Survey and Report is required for all development and redevelopment projects meeting the applicability criteria outlined in Chapter 3. The purpose of the report is to provide the City with the information necessary to ensure that the development is compatible with the natural resources on site and to identify potential human-wildlife conflicts. Much of the information that should be included in the survey and report are already required under the existing development review processes. The survey and report should be completed and submitted to the City of Bowie Department of Planning and Economic Development before, or as an accompaniment to the earliest site development proposal. It is preferred that the survey and report be submitted at least 30 days before the earliest site development proposal. The report is comprised of a complete survey and analysis of existing natural resources of the development site. Information on adjacent undeveloped properties that is publicly available will be required for the first 200 feet. Those sites adjacent to undeveloped sensitive properties may be obtained with geographic information systems (GIS) beyond 200 feet, if the data is publicly available. Survey and reporting requirements for each resource are detailed in Sections 7.1.1-7.1.14 below.

The City will review the report and notify the applicant of additional data or supporting documentation needed. If City review is not complete within 30 days, the City will inform the applicant of the status of the review process and the anticipated completion date. All additional requested materials should be made available to the City for final approval of the report. A report will be considered approved when it is signed and dated by the City Manager or designee. The City will request the pre-development survey at the time of concept stormwater management plan review. An approved pre-development survey and report expires 5 years after the signature date, with no extensions. The pre-development survey and report may be revised and re-reviewed within the 5-year time period, and will then be valid for 5 years from the new review date.

The pre-development survey and report should be submitted with the Concept Stormwater Management Plan. The approved pre-development survey and report should also accompany the following:

- Preliminary plat/conceptual site plan/detailed site plan
- Concept/preliminary/final site plan submittal, including comprehensive design plans (CDPs) and specific design plans (SDPs) [in Comprehensive Design Zones (CDZ)]
- Amendment to detailed site plan application
- Special exception and conditional use applications
The following subsections should be included in the Pre-Development Survey and Report (see Figures 1 and 2):

**Figure 1. Pre-Development Survey and Report Checklist**

New survey parameters are indicated in *italics*. See Sections 7.1.1 through 7.1.14 for detailed instructions. Preferably, maps should be prepared at a scale of 1 inch = 100 feet.

- Property lines and existing buildings should be shown on a map.
- *Designated Greenways and Habitat Protection Areas should be shown on a map.*
- Existing topography and soil types should be shown on a map highlighting steep slopes (15% to 25%), severe slopes (over 25%), highly erodible soil, and *aquifer recharge areas* (*excessively drained soils*). Note soils severely limited to development. Geotechnical report may be required.
- Perennial and intermittent streams and their buffers (minimum of 75 feet); 100-year floodplains; drainage courses; wetlands; *ephemeral channels associated with steep slopes, highly erodible soils or wetlands*; ponds; and *vernal pools* should be shown on a map. Include off-site drainage areas for streams entering or originating on the subject property. Note vegetated versus unvegetated drainage courses.
- Nontidal wetlands (minimum of 100 feet around all Nontidal Wetlands of Special State Concern and Chesapeake Bay Critical Area Wetlands and *50 feet* for all other wetlands)
- *Surface water quality data.*
- *Floristic inventory and map* (can be used to fulfill county requirements for a forest stand delineation and tree and forest cover map)
- *Occurrence of endangered, threatened, rare, watchlist, and in need of conservation plant and wildlife species and habitats.*
- *Wildlife inventory including wildlife habitat features map* (e.g., dens, deer trails, dams, etc.)
- *Adjacent sources of noise and light pollution* (e.g., adjacent roads, ballfields, airports) should be shown on a map.
- Width and locations of all existing or proposed utility easements and rights-of-way.
- Phase I and Phase II environmental site assessments, if prepared.
- *Wildlife and Habitat Conservation Plan including habitat conservation areas map* (information can be used for input into Tree Conservation Plan).
7.1.1 Designated Greenways and Habitat Protection Areas

Greenways and Habitat Protection Areas will be identified by the City of Bowie as part of the Master Plan update to provide movement corridors for wildlife within the City and to other greenways in the state, and to conserve important habitat. In the interim, the following areas should be given a high priority as a Greenway/Habitat Protection Area:

- Areas of Critical County Concern (including the Patuxent River and areas adjacent to the Patuxent Wildlife Research Center)
- Natural reserve areas as defined in the Bowie Master Plan including PMA preservation areas (see definitions), floodplains, surface waters, and wetlands
- Riparian buffers (minimum of 150 feet on both sides of streams)
- Rare communities as defined by the Maryland Department of Natural Resources and the Maryland Native Plant Society
- Rare natural features as defined in the Master Plan.
A vicinity map showing the Greenway or Habitat Protection Areas within 500 feet of the subject property should be included with the pre-development report. The Bowie Master Plan and Sections 7.1.2 through 7.1.13 below provide additional detail on these resources.

7.1.2 Soils and Topography

Soil boundaries and topographical information for a site including a minimum of 50 feet of adjacent property should be identified on the inventory map. In accordance with Maryland-National Capital Park and Planning Commission (M-NCPPC) requirements, existing topography (in 2-foot contours) and soil types should be depicted and submitted with the pre-development report. Steep slopes (15% to 25%), severe slopes (over 25%), and highly erodible soils (as defined in the Soil Survey, Prince George’s County, Maryland) should be highlighted. See Section 6.2 for a description of the highly erodible soils in the Bowie area.

In addition to the M-NCPPC requirements, these Guidelines require that development limitations of soils be provided as a note on the inventory and concept plan. Severely limited areas should also be highlighted on the plan drawing. Soil information, including soils severely limited will be obtained from the U.S. Department of Agriculture, Natural Resources Conservation Service Soil Survey, Prince Georges County, Maryland. Topographic information is available from M-NCPPC, or can be determined by performing a developer’s survey.

A geotechnical report prepared by a registered professional engineer or certified geologist may be required by staff at the preliminary plan (or its equivalent) stage of review. When it is determined that the developer cannot avoid building on soils with severe limitations as identified above, and there are concerns with respect to structural safety and/or environmental degradation such a report is required. The report will provide more detail of soil and geologic characteristics in order to determine that soils can support development using suitable engineering measures.

7.1.3 Aquifer Recharge Areas

Areas that lend the most to aquifer recharge include deposits of sand or gravel, or low points in a landscape such as a wetland or vernal pool. Soils with such properties (excessively drained sands and gravels and less severe hydric soils) should be highlighted on the soils and topography map.

7.1.4 Streams, Ponds, Drainage Courses, and Floodplains

All existing ponds, streams, and drainage courses located on or within 200 feet of the subject property should be shown on the concept and pre-development survey map including the off-site drainage areas for all streams entering or originating on the subject property, if the information is in the public record. Ephemeral channels on the subject property should also be shown when they are associated with wetlands, steep slopes, or highly erodible soils. Streams should be classified as either perennial or intermittent according to the Classification of Wetlands and Deepwater Habitats of the United States (Cowardin et al., 1979). Notes on the map should distinguish between vegetated and unvegetated drainage courses. (See definitions for perennial and intermittent streams, and drainage courses). If necessary, the applicant should contact the U.S. Army Corps of Engineers or the State of Maryland Department of Environment (MDE), Nontidal Wetlands Division to verify the determination of perennial versus intermittent stream classification.

As required by M-NCPPC, 100-year floodplains on subject properties should be shown on the inventory map. A 50-foot building restriction line (based on topographic delineation) should also be shown on the map in accordance with Prince George’s County policy. Sources of floodplain information may include, but are not limited to, Federal Emergency Management Agency (FEMA) Flood Insurance Rate maps, Flood Boundary Map and FEMA Floodway, topographic maps, and engineers’ floodplain studies.
approval of engineer’s studies should be given to the Planning Department prior to City Council review of the preliminary plan. For an engineer’s floodplain study, computations and all other information necessary to support the 100-year ultimate floodplain elevations should accompany the conceptual site plan (or equivalent) submission and be reviewed at that time.

7.1.5 Water Quality and Flow

Information regarding the chemical, physical, and biological quality of the stream(s) on the subject property should be provided with the pre-development report. The MD DNR’s Maryland Biological Stream Survey (MBSS) program should be consulted to obtain existing data. Data and additional information on Maryland’s streams can be obtained at the MD DNR Web site (Appendix B). For guidance and additional information contact Assistant Chief Ecological Assessment Program, MD DNR. If data is unavailable through the MD DNR, a stream survey of the subject property should be conducted in accordance with the MBSS protocol outlined in the *Maryland Biological Stream Survey Sampling Manual*, available online at the MD DNR Web site (Appendix B). City staff may require additional stream quality information if the existing inventory is outdated or if conditions have changed with respect to the stream/(s) in question. Any additional monitoring data requested should be collected using MBSS protocol.

7.1.6 Stream Buffers

Stream buffers provide a variety of functions including flood reduction, sediment and nutrient removal, bank stability, shade, and wildlife habitat. Considering wildlife habitat, specifically for forest interior dwelling species (FIDS), buffers would ideally be a minimum of 400 feet in width on each side of a stream. However, taking into account the limitations that such buffers would impose on certain developments, it is preferred that the stream buffer for all perennial and intermittent streams (including seeps and springs) be as wide as possible.

The Chesapeake Bay Program’s 3-Zone Buffer System provides guidance for considering variables when determining the most suitable buffer width for an area (Figure 3). Each zone is designed to provide a different level of protection based on vegetative targets and management schemes. The Streamside Zone, which covers a minimum of 25 feet from the stream bank, protects the physical and ecological integrity of the stream ecosystem. The Middle Zone extends another 50 to 100 feet to protect floodplains, steep slopes, and wetlands. The Outer Zone extends 25 feet from the Middle Zone, and provides minimal protection in areas such as urban lawns.
### Figure 3. Three-Zone Buffer System

<table>
<thead>
<tr>
<th>CHARACTERISTICS</th>
<th>STREAMSIDE ZONE</th>
<th>MIDDLE ZONE</th>
<th>OUTER ZONE</th>
</tr>
</thead>
<tbody>
<tr>
<td>FUNCTION</td>
<td>Protect the physical integrity of the stream ecosystem</td>
<td>Provide distance between upland development and streamside zone</td>
<td>Prevent encroachment and filter backyard runoff</td>
</tr>
<tr>
<td>WIDTH</td>
<td>Min. 25 feet, plus wetlands and critical habitats</td>
<td>50 to 100 feet, depending on stream order, slope, and 100 year floodplain</td>
<td>25 foot minimum setback to structures</td>
</tr>
<tr>
<td>VEGETATIVE TARGET</td>
<td>Undisturbed mature forest. Reforest if grass</td>
<td>Managed forest, some clearing allowable</td>
<td>Forest encouraged, but usually turfgrass</td>
</tr>
<tr>
<td>ALLOWABLE USES</td>
<td>Very Restricted e.g., flood control, utility right of ways, footpaths, etc.</td>
<td>Restricted e.g., some recreational uses, some stormwater BMPs, bike paths, tree removal by permit</td>
<td>Unrestricted e.g., residential uses including lawn, garden, compost, yard wastes, most stormwater BMPs</td>
</tr>
</tbody>
</table>

Source: Palone and Todd, 1998
The City of Bowie should use the following process for establishing a minimum buffer width for each side of the stream:

### Decision Process for Determination of Forest Buffer Width

<table>
<thead>
<tr>
<th>Perennial or intermittent</th>
<th>Ephemeral</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measure a minimum baseline buffer 25 feet (on each side) from edge of stream bank of the active channel (bank-full flow) to create a Streamside Zone</td>
<td>Recommend widest possible buffer allowed by site</td>
</tr>
</tbody>
</table>

- **Stream order of 1 or**
  - Add 25 feet to create a Middle Zone

- **Stream order of 3 or**
  - Add 75 feet to create a Middle Zone

**For buffers adjacent 100-year floodplain, extend buffer to include entire floodplain plus a 25-foot margin.**

**For buffers adjacent to a wetland, greenway, or other habitat conservation area, extend buffer to include entire area plus a margin of 100 feet for wetlands of Special Concern, 50 feet for other wetland; or 25 feet for greenways or other habitat conservation areas.**

- Add 25 feet to create an Outer Zone

<table>
<thead>
<tr>
<th>Percent slope from stream edge to end of Middle Zone</th>
<th>Width of Buffer</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 14%</td>
<td>no change</td>
</tr>
<tr>
<td>15 to 25%</td>
<td>add 30 feet</td>
</tr>
<tr>
<td>Greater than 25%</td>
<td>add 60 feet</td>
</tr>
</tbody>
</table>
This decision process accommodates the 3-Zone System adopted by the U.S. Forest Service and the EPA Chesapeake Bay Program (Palone, et al., 1998), and incorporates elements of buffer width determinations from the Resource Protection Overlay Zone used in Charles County, Maryland (Center for Watershed Protection, 1998), as well as the Buffer Protection and Management Ordinance for Baltimore County Maryland (§14-334 and 14-342 of the Baltimore County Code). Buffer factors based on stream slope and use are consistent with the U.S. EPA model ordinance language for stream buffers (U.S. EPA, 2001a). Using this decision process, first-order intermittent or perennial streams with recreational contact, minimal slope, and no adjacent floodplains, wetlands, or other habitat conservation areas will have a minimum buffer of 75 feet. The highest minimum buffer value determined by this process, for a high stream order with very steep slopes, floodplains, and wetlands of special concern or conservation areas, is 335 feet, plus the extent of floodplains and wetlands.

The Bowie Master Plan contains guidelines for management within the PMA Evaluation Area, which consists of an area 300 feet wide immediately abutting the PMA Preservation Area (included in the Streamside Zone above). In the areas where the Middle and Outer Zones overlap with the PMA Evaluation Area, the larger of the buffer widths should apply.

For the pre-development survey and report, proposed stream buffers for all perennial and intermittent streams (including seeps, and springs) should be shown on an inventory map with topography, floodplains, wetlands, and streams. The stream buffer should include steep slopes as defined above in the Topography Section, 100-year floodplains, and wetlands with wetlands buffers. If the proposed stream buffer width is less than the minimum buffer determined by the process described above, then a written justification for contraction of the buffer width should be provided for approval by the City. The statement should provide evidence that habitat value and water quality will not be compromised. Preservation of a larger, contiguous forested area adjacent to a greenway or other habitat conservation area may provide justification for narrowing habitat along a stream. In such cases, it should be demonstrated that water quality would not be compromised.

7.1.7 Wetlands

As required by State law, 100-foot buffers shall be planned around all Nontidal Wetlands of Special State Concern. For all other wetland areas, the minimum buffer width should be increased to a minimum of 50 feet to further reduce the impacts of development. This should be expanded around wetlands with adjacent areas containing steep slopes or highly erodible soils. At the concept plan stage of review, the U.S. Fish and Wildlife Service National Wetlands Inventory maps (U.S. Fish and Wildlife Service, 2001), Maryland Department of Natural Resources maps (MD DNR, 2001f), and other sources designated by Maryland Department of the Environment (Maryland Department of the Environment, 2001) are acceptable in lieu of a detailed assessment and delineation.

If prior authorization by the U.S. Army Corps of Engineers (U.S. Army Corps of Engineers, 2001) and the State is required for activities affecting jurisdictional waters including wetlands, materials submitted as part of the authorization process should be included with the pre-development survey and report. This could include wetland delineations; wetland verifications; permit application and supporting documentation; and threatened and endangered species surveys, if required.

7.1.8 Vernal Pools

Vernal pools may be considered jurisdictional wetlands according to MDE criteria. As part of the pre-development survey and report, vernal pools on the development site should be delineated and identified on the wetland survey map. The vernal pool delineation should be conducted by a professional plant or wildlife biologist. The assessor should also note evidence of occupation by wildlife including, but not limited to amphibian adults or eggs, reptiles, and invertebrate species.
7.1.9  Floristic Inventory

The M-NCPPC requires that a detailed Forest Stand Delineation of the subject property be prepared according to *A Technical Manual for Woodland Conservation with Development in Prince George’s County*. To provide a more accurate picture of the existing wildlife habitat associated with a property, these guidelines suggest that the applicant prepare a floristic inventory of the development site. In addition to the requirements in the manual, applicants should record all plant species observed on the site. [Note: A wildlife inventory (see Section 7.1.11) is also required and would best be performed in conjunction with the floristic inventory.] The floristic inventory may be conducted in conjunction with the Forest Delineation. The inventory team should include a botanist or other qualified professional capable of identifying all on-site flora. A map of the subject property should be prepared that shows forests and trees, grasslands, and shrublands (see definitions) as distinguishable circumferential lines. The forest and tree circumferential outlines should include the outer perimeter of the forest edge and the branches of the individually standing trees (in accordance with M-NCPPC requirements). Information for the map can be obtained from recent aerial photographs, which are available at City Hall.

The floristic data should be divided into forest (including all tree, shrub, and herbaceous species), grassland, and shrubland habitat types. The inventory should be performed once each during the spring and summer to ensure that all spring ephemeral and summer season plants are counted. This information will be used by the City of Bowie to determine the necessity for a rare, threatened, and endangered species survey (see below). It will also be used to determine habitat connectivity and to determine the most suitable and practical areas for habitat conservation. By providing information on sensitive habitat conservation areas at the beginning of the development process, this component of the survey can serve as the base plan for the conceptual development plan. Data from the floristic inventory can be used to satisfy the County’s requirements for a Forest Stand Delineation under the *Woodland Conservation and Tree Preservation Policy*. These areas also often provide valuable and unique habitat for wildlife. Such resources include the following:

- Rare Natural Features as defined in the Bowie Master Plan (see definition)
- Trees listed on the county, state, or federal champion list

7.1.10 Rare, Threatened, and Endangered Plant and Wildlife Species

Known locations and habitat for all state- and federal-listed endangered, threatened, rare, watchlist, and in need of conservation species and communities (as designated by the Maryland Wildlife and Heritage Division, Department of Natural Resources) existing on or within 200 feet (when available on public record) of subject property should be shown on a pre-development survey map. Habitat and location information should be obtained by sending a property map (showing the property outline on a Prince George’s County ADC map, U.S. Geological Survey 7.5 minute quadrangle map, or other similar map) to an Environmental Review Specialist at the MD DNR Natural Heritage Program and to the Maryland Native Plant Society.

Additionally, the City will analyze the data collected during the floristic inventory described in Section 7.1.9 for indicators of state- or federal-listed endangered, threatened, rare, watchlist, or in need or conservation species or communities. If such species or communities may exist on the subject property, the person developing the land will be asked to hire a professional wildlife biologist, botanist, ecologist, or other qualified professional capable of identifying the potential species or communities to perform a survey of the property. All findings should be submitted to the City.
7.1.11 Wildlife and Habitat Features

A pre-development wildlife inventory should be performed in conjunction with the floristic inventory (see Section 7.1.9) on the subject property by a professional wildlife biologist. The wildlife inventory should be conducted once each during the spring and summer seasons, and should note all wildlife seen and heard along the inventory transects selected for the floristic inventory. The wildlife inventory should also note the location of wildlife habitat features including, but not limited to, all beaver dams; beaver-chewed trees; deer trails; groundhog or other burrowing animal dens; and other nesting, breeding, and hibernation sites of all species. Wildlife habitat features should be shown on a pre-development survey map. The notes section of the map should include the listing of all wildlife species seen or heard, or which there is evidence on the property.

A pre-development wildlife inventory should provide quantitative information that will help assess the present population of deer and the effect of future development. This information can include an estimate of deer per square mile, extent of impacts to lower canopy vegetation, occurrence of deer trails, or deer-vehicle collisions on local roads. The pre-development wildlife inventory should also estimate resident goose populations, note evidence of Canada goose habitation, or report public complaints involving geese. Public complaints regarding beaver activity should also be reported.

7.1.12 Noise and Light Pollution

Excessive noise and light are a nuisance to people and wildlife alike. Bright lights interfere with the instinctive daily and seasonal cycles of animals and plants, and detract from the human quality of life by blocking the view of the nighttime sky. Loud noises disturb wildlife, especially during breeding season, and aggravate humans.

Existing and adjacent sources of noise and light pollution that may affect the subject site should be identified on the inventory map. These sources may include, but are not limited to the following: (a) highways and roads, (b) airports, (c) industrial facilities, (d) gun clubs, (e) athletic fields, (f) transportation facilities, (g) mass transitways, (h) commercial areas, (i) amusement parks, and (j) public facilities.

7.1.13 Public Utilities, Property Lines, Existing Buildings, and/or Transportation Easement and Rights-Of-Way

The pre-development survey and report should delineate existing or planned utility easements and rights-of-way and dedicated, or to be dedicated, transportation rights-of-way for transit roadways, bikeways, and pedestrian walkways. In addition, all property lines, lot lines, utility lines, and existing buildings and structures should be included in the pre-development survey and report map submitted for preliminary and final site plan approval.

7.1.14 Previous Land Use

Provide a land use history that identifies the previous known use(s). If Phase I and Phase II Environmental Site Assessments were prepared for the subject property, results should be included as part of the pre-development survey report.

7.2 HABITAT CONSERVATION AND WILDLIFE MANAGEMENT PLAN FOR DEVELOPMENT SITES

If habitat disturbance is unavoidable, the person developing the land should prepare a Habitat Conservation Plan for the development site in consultation with a qualified wildlife biologist for submittal.
with the site design. The purpose of this plan is to incorporate wildlife habitat needs into the development planning process and to minimize direct disturbance to wildlife. Information from this portion of the plan can be used to prepare a Tree Conservation Plan as required for any plan that requires a Forest Stand Delineation under the Prince George’s County Woodland Conservation and Tree Preservation Policy Document. [Note: The Tree Conservation Plan must be prepared by a Registered Professional Forester, Licensed Landscape Architect, or other county and state approved professional under the criteria in COMAR 08.19.06.01.]

Major goals of the habitat conservation plan should include the following:

- Reducing habitat fragmentation especially associated with forest interior (consider also neighboring properties)
- Minimizing edge (boundary between ecological communities) by preserving large areas of habitat rather than small scattered areas
- Maintaining or creating connectivity between natural areas (i.e., corridors to connect isolated habitat areas) including habitat areas on neighboring properties
- Enhancing designated Greenways and Habitat Protection Areas
- Preserving those habitat elements required by federal or state law (e.g., wetlands, floodplains, threatened and endangered species habitat, open areas associated with historic resources)
- Protecting other habitat areas such as vernal pools, ephemeral channels, aquifer recharge areas, beaver dams, dens, and other habitat features
- Minimizing direct impacts to wildlife during development

The plan should have three key components: Existing Habitat and Wildlife, Habitat Conservation Area Location Analysis, and Wildlife Response Plan. Information to be covered in each section is as follows:

**Existing Habitat and Wildlife** – This section should include an analysis of habitat currently provided on the site. It should consider the information collected during the pre-development survey as it relates to wildlife and wildlife habitat. Key components of wildlife habitat, which should be considered, include food, water, shelter, and places to raise young.

**Habitat Conservation Area Location Analysis** – Referring to the Existing Habitat and Wildlife Section, this chapter should designate areas for habitat conservation. Conservation priority should be given to areas that are required for protection under federal or state law; to areas that present conditions that are generally considered unbuildable (e.g., steep slopes, highly erodible soils); and to areas that provide habitat for endangered, threatened, rare, watchlist, and in need of conservation species and communities. Other natural areas should be evaluated for conservation on a case-by-case basis giving higher priority to the following:

- Natural areas that border or connect (or that could be enhanced to connect) Greenways and Habitat Protection Areas
- Large areas of mature forest (focusing on minimizing edge to area ratio and preserving forest interior – see Appendix D)
Areas that provide habitat for the greatest diversity of species or that serve multiple functions (e.g., forest interior, vernal pools, rare communities, etc.)

Areas of county, state, or local conservation priority or interest (e.g., areas that would contribute to water quality improvements in the Patuxent River)

To ensure that the locations of habitat conservation areas in relation to development features are placed to benefit wildlife to the extent that the site allows, an analysis of the various possibilities for locations of these features should be prepared. It should examine the effects of each possibility on wildlife habitat from both on- and off-site actions (considering past, present, and reasonably foreseeable future actions). Off-site activities could include other development activities in the area also affecting habitat, nearby roads adding to compounded noise pollution, etc.

All priority conservation areas should be shown on a map that identifies the reason for conservation (e.g., steep slope area, rare species habitat, significant view, etc.). Once these conservation areas are mapped, corridors connecting isolated habitat areas should be identified. When connecting like habitat areas (e.g., forest to forest or field to field) the corridor should also be a like habitat. When connecting differing habitat areas, the corridor should ideally be designed to smooth the edge between the habitats. For example, a corridor between a forest and a field could be designed as a shrubland, where the horizontal element of the field blends with the vertical element of the forest. Corridors should be wide enough to allow passage for all wildlife on the property. The plan should identify how the development should minimize bottlenecks in wildlife movement corridors. Development elements can then be designed around these conservation areas and wildlife corridors to maximize views and minimize habitat encroachment.

This section of the plan should also include actions that will be taken for habitat enhancement using landscaping and habitat structure augmentation. Landscape design should follow the guidelines outlined in Section 7.6. Other options for habitat enhancement that could be worked into the landscape include the following:

- Leaving a portion of downed wood on-site
- Installing bird nesting boxes and platforms
- Erecting bat boxes
- Installing artificial dens

**Wildlife Response Plan** – This section should outline the actions to be taken during development to minimize damage to wildlife and limit human-wildlife conflicts during and after development. It should address the following:

- Schedule for land clearing and construction activities so as to have minimal disruption on wildlife by:
  - Avoiding land clearing and grubbing, and minimizing noise during breeding season
  - Minimizing disturbance during spring and fall bird migration
  - Allowing phasing of land clearing to promote voluntary dispersal of wildlife

Considering these elements, land clearing should generally be avoided during April through August and development activity that creates excessive noise should generally be avoided during mid-April through mid-July. However, these dates may be altered based on the following:

- The wildlife identified on and adjacent to the subject property indicate that these dates should be altered (to accommodate the species identified)
- The subject property and adjacent sites do not contain natural wildlife habitat
- It can be demonstrated that the activities will not impact breeding wildlife
Phasing during land clearing and grubbing should be planned to maintain wildlife escape routes to habitat areas that will be preserved as part of a development’s habitat conservation plan.

- Other plans to minimize direct wildlife damage including wildlife flushing, den excavations, installation of reflectors along roads, etc. More information on minimizing direct wildlife damage during development can be found on the Humane Society of the United States Web site (Appendix B) or by contacting the Society’s Manager of Business Development and Corporate Relations.

- Identification and non-lethal management of potentially problematic species, and short and long-term success of these options in managing the potentially problematic species. Examples include wrapping the bases of trees to minimize beaver damage, using trickle levelers to prevent flooding associated with beaver dams, planting trees around a pond to limit goose overpopulation, and other similar activities as recommended by a qualified wildlife biologist.

- Human-wildlife interactions before and during development, particularly with medium to large sized mammals.

- Stormwater management pond siting and landscaping to minimize human-wildlife conflicts.

After the receipt of the habitat conservation and wildlife management plan from the applicant, the City will make recommendations to the applicant regarding the appropriate wildlife management techniques to be implemented. If necessary, the City may consult with other public agencies, outside organizations, or consultants prior to making a decision. Also, City staff may request additional information from the applicant before making a decision.

7.3 **Impact Avoidance to Habitat Conservation Areas**

Habitat Conservation Areas are defined by the person developing the land as part of the development planning process (Section 7.2). Habitat Conservation Areas include designated Greenways and Habitat Protection Areas (including riparian buffers); wetlands; floodplains; endangered, threatened, rare, watchlist, and in need of conservation species and communities; steep slopes and highly erodible soils; and open areas associated with cultural resources. Ideally, developments will be designed to avoid all direct and indirect impacts to Habitat Conservation Areas. When this is not possible, every effort should be made to minimize the negative impacts associated with development and post-development activities on these areas as outlined in the following sections.

7.3.1 **Designated Greenways and Habitat Protection Areas**

Designated Greenways and Habitat Protection Areas should be identified and mapped by the City within one year of adoption of the Guidelines and completion of the next Area Master Plan update, with technical assistance from the M-NCPCC Environmental Planning section (see Section 7.1.1) and should incorporate a minimum of 150-foot riparian forest buffers on both sides of perennial and intermittent streams. The designated Greenways and Habitat Protection Areas may also include steep slopes and highly erodible soils; streams and channels; wetland habitat; vernal pools; floodplains; habitat for rare, threatened, and endangered species; rare communities; and open areas associated with cultural resources. In cases where there is such overlap, refer to Sections 7.3.2 through 7.3.10 below for additional resource-specific guidelines.

All activities associated with development should avoid impact to the designated Greenways and Habitat Protection Areas. These areas should be treated as limits of disturbance (LOD) areas as found in cluster
subdivision sites. As discussed in Section 7.1.6, the City’s riparian forest buffers may be reduced or expanded with prior approval from the City. In such cases, the following requirements apply both to the agreed-upon buffer width and to areas that are preserved for wildlife habitat in exchange for buffer reduction.

No buildings, structures, impervious surfaces, or activities requiring clearing or grading should be permitted in Greenways and Habitat Protection Areas, except for public uses such as infrastructure, bikeways and trails (see Section 7.8 regarding bikeways, and trails) found to be necessary and unavoidable. Clearing and construction must adhere to standards outlined in Section 7.3 to minimize habitat degradation and wildlife damage. These intrusions into the Greenways or Habitat Protection Area may be allowed as long as the modification is consistent with a comprehensive approach to protecting areas that are critical to maintaining wildlife habitat value, and to preserving or enhancing streams, wetlands, and their ecosystems. The applicant should provide rationale for Greenway and Habitat Protection Area intrusions addressing at a minimum the factors below. The extent to which the proposal meets all the following factors will form the basis for review:

- Reasonable alternatives for avoidance of the areas are not available.
- Encroachment into the areas and fragmentation of habitat has been minimized.
- Existing sensitive areas including forest (and forest interior); wetlands and their designated buffers; floodplains; streams, natural springs, and seeps; steep slopes; rare, threatened, and endangered species and their habitat and associated protection buffers; and rare communities have been avoided.
- The proposed activity is being undertaken to enhance the integrity of the area (e.g., slope stabilizing best management practices (BMPs), etc.).
- The plan design provides mitigation (preferably on-site) for the loss of habitat value and stream buffering.

Specific guidance pertaining to the types of activities that may be permitted in a Greenway or Habitat Protection Area is as follows:

1) Roads through designated Greenways and Habitat Protection Areas should be avoided whenever possible. However, when avoidance is impossible, the following methods are recommended to be taken to minimize impacts to wildlife and their habitat:

- The road alignment should be placed where it will fragment the least amount of habitat and have the least effect on wetlands, streams, forest interior, endangered species and their habitats, and rare communities.
- Stream and buffer crossings should follow the criteria outlined in Section 7.3.4.
- Wildlife underpasses and/or overpasses should be installed to accommodate the needs of the largest wildlife species found on-site. Fencing should be installed to encourage wildlife to use underpasses and overpasses. Case studies of underpass/overpass structures are included in a publication of the U.S. Federal Highway Administration (FHWA) entitled *Critter Crossings: Linking Habitats and Reducing Roadkill*. Copies of this publication can be found on the FHWA’s Web site (see Appendix B).
■ Ninety-degree reflectors should be installed along the roadway to minimize wildlife-vehicle collision.

■ Streetlights in the area should be minimized and should be carefully designed to avoid light pollution (see Section 7.7)

2) Temporary sediment and erosion control facilities are discouraged in Greenways and Habitat Protection Areas.

3) Where site conditions and engineering allow, preference is given to location of permanent stormwater management ponds immediately adjacent and connected to Greenways and Habitat Protection Areas. These ponds provide water for wildlife and enhance habitat value (see Section 7.5). In general, permanent stormwater management facilities are discouraged within the boundaries of Greenways and Habitat Protection Areas since location of this permanent use within these areas increases edge and fragments habitat. However, maximum long-term effectiveness of the stormwater management facilities is also important to maintaining aquatic habitat, and should be considered together with the Greenway and Habitat Protection Area objectives in siting decisions. Minimal intrusions are allowed for construction of suitable stormwater management facilities or non-erosive storm drain outfalls, and unavoidable and consolidated sanitary sewer connections.

A permanent stormwater management facility may be allowed within a Greenway or Habitat Protection Area on a case-by-case basis. The following factors may be considered by City of Bowie staff in evaluation of which facilities or BMPs may be appropriate in these areas.

■ Documented and measurable improvement in the effectiveness of the stormwater control system if placed in the area.

■ Measurable habitat enhancement value (i.e., provides a water source where there currently is none).

■ Minimization of encroachment into the area.

■ Avoidance of existing sensitive areas (forest interior, wetlands and their designated buffers; floodplains; steep slopes; and habitat for rare, threatened, and endangered species with their associated protection buffers).

■ Extent to which the stormwater management or BMP can be designed to maintain the existing vegetative community/ies.

■ Reduction of excessive habitat, erosion, or water quality damage by locating the facility in a Greenway or Habitat Protection Area as opposed to another location.

■ Existence of severely degraded conditions within the Greenway or Habitat Protection Area that could not be restored with reasonable effort may warrant placement of a stormwater management facility on the degraded area rather than disturbing another site.

■ Presence of man-made structures (e.g., farm ponds) in the area under pre-development conditions that can be converted to stormwater management use without excessive stream disturbance.

■ Ability to provide wildlife habitat mitigation for the loss of habitat, water quality and quantity control, and flood control functions from the disturbance and permanent absence of vegetated areas. Preference should be given to on-site wildlife habitat mitigation.
City of Bowie staff may evaluate the stormwater management facility alternatives that provide for effective stormwater management in a manner (secondarily) that best preserves habitat value (including reduced fragmentation) and buffer function without compromising the primary function of the facility. City staff will jointly determine where stormwater management facilities are appropriate in Greenway and Habitat Protection Areas. When a stormwater management facility is allowed in a Greenway or Habitat Protection Area, the person developing the land should propose an on-site area of equal or greater size for wildlife habitat mitigation to City of Bowie staff. Staff may recommend arranging off-site mitigation if an on-site proposal does not fully mitigate loss of Greenway or Habitat Protection Area. Forest mitigation should be in compliance with the City’s Forest Mitigation Sites Policies. The mitigation area should have the following characteristics:

- Connectivity to an existing Greenway and Habitat Protection Area (i.e., the mitigation site should not be isolated).
- Function (e.g., a buffer area should be mitigated with an extended buffer in a nearby area. A forested area should be mitigated by preserving another forested area).

4) Utility easements by design, ideally, should not be located through Greenways or Habitat Protection Areas. When utilities cross a stream or its associated buffer, the criteria in Section 7.3.4 should be followed. New utility easements should be set back a minimum of 50 feet (100 feet for Nontidal Wetlands of Special State Concern) from wetlands and their designated buffers. Following the clearing of vegetation within a Greenway or Habitat Protection Area for the installation of utilities, regrading and revegetation of the cleared area with native plants should be accomplished as outlined in number 6 below.

5) Deposition or stockpiling of any material such as excavated rock, topsoil, stumps and shrubs, grass clippings, and building material within the designated Greenway or Habitat Protection Area is prohibited. Activities such as composting or topsoil stockpiling, which are necessary to restore an area within a utility easement, may be suggested on a case-by-case basis by City of Bowie staff.

6) When a temporary disturbance (e.g., a stormwater or erosion control device is installed during development that will be removed after development) is approved by the appropriate agency in conjunction with the City within a Greenway or Habitat Protection Area, ideally, the site should be regraded and revegetated as quickly as possible. Topsoil from the disturbed site should be reserved and stockpiled for re-use during restoration. No topsoil should be stockpiled on the critical root zones of remaining trees in the vicinity. Once the site is regraded and topsoil is replenished, it should be planted with a stabilizing cover immediately, and revegetated using native plants or trees planted by the next planting season. Emphasis is on restoring a site to its pre-disturbance plant composition unless otherwise suggested by the City. Whenever possible, existing vegetation (including small caliper trees, shrubs, and groundcover) should be extracted from the site prior to initial grading and should be re-planted during restoration work. If the amount and species of salvaged native vegetation is not sufficient the following restoration standards should be adhered to:

- Reforestation of disturbed areas should use native 1½ to 2-inch caliper trees and should include understory trees and shrub plantings for diversity (no monocultures).
- Shrubland revegetation should include native shrub species at the approximate density as existed prior to initial grading.
- Grasses for restoration have a greater rate of survivability when plants of native and of local genetic origin are planted (see definitions).
7.3.2 Steep Slopes and Highly Erodible Soils

Hydraulically remote steep slope areas should be incorporated into the site’s open space and/or remain undisturbed. However, development of these areas may be approved by the appropriate agency on a case-by-case basis, where the developer can demonstrate that safety, City road standards, storm drainage/stormwater management, erosion and sediment control, engineering, tree preservation, soil stabilization, design, and planning issues are satisfactorily addressed. Sediment and erosion control measures will be approved by the Prince George’s Soil Conservation District (PGSCD).

In instances when a limited amount of clearing and grading is approved within a stream buffer area or in areas of hydraulically remote steep slopes, and when clearing and grading of surrounding areas may impact these areas, the following should be adhered to:

- All clearing and grading activities should strictly adhere to the Maryland State standards and specifications. Furthermore, it is strongly recommended that phased clearing and grading be used whenever feasible. Phased clearing and grading should be incorporated in the original clearing and grading plan, subject to review by the City of Bowie. The sediment and erosion control measures will also be approved by the appropriate agency. Close coordination should be maintained with the Washington Suburban Sanitary Commission (WSSC). All disturbed areas should be revegetated, and reforested/afforested with native plants using the Native Plant List in Appendix C, as soon as possible as required by the Maryland Standards and Specifications for Sediment and Erosion Control and in accordance with number 6 in Section 7.3.1.

- Stormwater management plans, which address water quantity and quality, must be approved by the City of Bowie. These plans should incorporate BMPs and/or respect natural stream channels.

- The location, design and construction of all development activity should be carefully reviewed to avoid introduction of pollutants and toxic materials into stream systems. If Phase I and Phase II site assessments indicate that pollutants or toxic materials could be an issue at the disturbed site, sediment control measures should be designed that eliminate the risk of stream contamination. All equipment should be checked for petroleum, oil, or other lubricant leaks prior to any development activity.

- In instances where an Area Master Plan or citywide program identifies a need for water quality or other monitoring, or in environmentally sensitive watersheds, the performance monitoring to evaluate impacts of development proposals on the environment (see Appendix E).

- Monitoring should not be considered a BMP or measure that, in itself, can maintain or improve environmental conditions.

Plans showing development on highly erodible soils should be prepared to propose management strategies in the following order of priority:

- Avoidance and minimum of disturbance, including expansion of stream buffer.

- Environmentally sensitive site design.

- Reforestation/afforestation and vegetative stabilization.

- BMPs including expansion of stream buffer and cluster design.
At a minimum, on-site stormwater BMPs should be used, inspected, and properly maintained on each lot to limit the off-site transport of sediment from the grading and construction activities on soils with severe limitations, or when the slope is between 8 and 25 percent.

When no other options exist and development on problem soils cannot be avoided, a geotechnical report prepared by a registered geotechnical engineer may be required. This report should describe the soil limitations and the engineering measures necessary to protect against development hazards. When suitable measures are available that the appropriate agency is convinced will mitigate the soil constraints over the long term, development will be allowed. Should unforeseen soil problems become evident during construction, a stop-work order may be issued until the necessary geotechnical reports are submitted to the County and suitable measures to mitigate the problems are determined.

7.3.3 Aquifer Recharge Areas

Aquifer recharge areas should be avoided for construction when other parts of the property are available for development. If development is to occur in an aquifer recharge area impervious surface should be minimized with BMPs, as outlined in Section 7.5.

7.3.4 Streams, Ponds, Channels, and Floodplains

In addition to the Greenway and Habitat Protection Area/Habitat Conservation Area guidelines specified in Section 7.3.1, the following criteria should be followed when considering streams, ponds, channels, and floodplains. Stream and stream buffer crossings for roads, underground utilities, railways, and open and enclosed storm drains should be avoided whenever possible. These structures fragment habitat, create surface and subsurface barriers to wildlife and fish passage and hydrologic flows, and often increase impervious surface. In instances where such intrusions are unavoidable, the following criteria (based on the Chesapeake Bay Riparian Handbook, Palone and Todd, 1998) should be followed to minimize impacts:

- Crossing width should be minimized to allow only what is necessary for maintenance access.
- Crossing angles should be direct right angles rather than oblique crossing angles, since they require less clearing in the buffer.
- Road and utility crossings should be minimized. (No more than one road crossing within each subdivision, and one parkway crossing for every 1,000 feet of stream and buffer should be planned.) When underground utility and pipe crossings cannot be avoided, they should be located at least 3 feet below the stream invert, so that future channel erosion does not expose them, creating unintentional fish barriers. All direct outfall channels should discharge to the invert elevation of the stream (see Figure 4).
- All roadway crossings and culverts must be capable of passing the ultimate 100-year storm event. Bridges should be used in lieu of culverts when stream crossings require a 72-inch or greater pipe.
- Small stream crossings should be avoided altogether, as they tend to create fish barriers. Slab, arch, or box culverts are better alternatives to round metal culverts for small stream crossings. Where possible, the culvert should be “bottomless” to ensure passage of water during dry weather periods.
- The clearing and grading specifications outlined in Section 7.3.2 should be followed.
Figure 4. Stream and Buffer Crossing Techniques

Crossing Options
a Invert all open and enclosed channels at streambed and stabilize
b no more than one roadway crossing per subdivision
c reduced road right-of-way in buffer zone, utilities under pavement
d perpendicular crossing results in less buffer cleaning than an oblique angle
e utility crossings narrow as maintenance allows
f avoid crossing stream with mainline sewer
g examine the stream to avoid creation of fish barriers
h culver capacity to handle ultimate 100 year peak discharge, at full buildout
i bottomless culvert allows upstream fish passage
j lower one culvert below stream invert to ensure water during low-flow periods

Source: Palone and Todd, 1998
If a development activity results in stream water quality or channel degradation from direct disturbance, increased flow, or sedimentation, the person developing the subject property is responsible for mitigating damages. A plan addressing bioengineering or stream stabilization should be submitted for City of Bowie approval. Mitigation should minimize additional damage to streams and involve use of bioengineering techniques such as installation of live stakes, brush layering, fascine bundles, tree revetments, and other non-invasive methods.

Floodplain standards are based on existing state and county regulations, which govern development activities in these areas. County floodplain management regulations are located in the Floodplain Ordinance (Title 17 of the Public Laws of Prince George’s County, Subtitle 4, Division 2). As required by law, no building/structure will be permitted, and no land-disturbing activity will occur within a horizontal distance of 50 feet of the 100-year ultimate floodplain (except as permitted in the Floodplain Ordinance).

The applicant should analyze the impact the development will have on ephemeral channels and the water quality impact in the receiving waters through the loss of ephemeral channels. If necessary, City of Bowie staff may recommend the protection of ephemeral channels. If protection is recommended, the City of Bowie staff may require the land adjoining the ephemeral channels to be undisturbed or designated as open space with a buffer.

7.3.5 Stream Buffers

In addition to the Greenway and Habitat Protection Area/Habitat Conservation Area requirements listed in Section 7.3.1, stream buffers should be designed/managed based on the principles outlined in the 3-zone concept (Section 7.1.6) and the Bowie Master Plan. Land use restrictions are as follows:

- No land use should occur in the Streamside Zone.
- Land use in the Middle Zone is also highly restricted, but may include limited access points for recreational purposes.
- Land use in the Outer Zone is less restrictive, but should minimize use of impervious materials. The Outer Zone is the preferred location for hiking/biking trails and other recreational facilities.
- The width requirement for the PMA Evaluation Area, as designated in the Bowie Master Plan, is permitted to overlap with the Middle and Outer Zones of the 3-zone concept. However, Middle Zone restrictions as discussed above still apply. According to the Master Plan, the Evaluation Area may accommodate some development, with a goal of limiting impervious surface coverage to 10 percent or less.
- Buffer and stream crossings for roads, railways, underground utilities, and open and enclosed storm drains should be avoided. When such crossings are necessary, the criteria in Section 7.3.4 should be followed.

7.3.6 Wetlands

All wetlands are be regulated in accordance with applicable state, and federal law.

- As required by state law, 100-foot buffers should be planned around all state or county Wetlands of Special Concern and Chesapeake Bay Critical Area Wetlands. For all other wetland areas, the minimum buffer width should be a minimum of 50 feet. This should be expanded around wetlands with adjacent areas containing steep slopes or highly erodible soils. City staff may recommend the expansion of the wetland buffer to the Advisory Planning Board for the protection of associated ephemeral channels.
Wetlands and their associated buffer areas should be maintained in their natural condition unless the proposed disturbance is for a project determined to be necessary and unavoidable for the public good, such as:
- Road crossing, sewer lines, and storm drain outfalls for which no alternative exists.
- Stormwater management facilities, when it can be demonstrated that upland areas are infeasible or would severely limit the performance/effectiveness of the facility.
- Park projects for wildlife and habitat.
- Wetland quality improvement projects.

7.3.7 Vernal Pools

The Maryland Department of the Environment and the U.S. Army Corps of Engineers may consider vernal pools as wetlands (refer to their Web sites in Appendix B). In such cases, all state and federal wetlands policies must be followed. In all cases, impacts to vernal pools should be minimized and a vegetative buffer should be left to minimize damage from stormwater runoff.

7.3.8 Forests and Trees

As specified in Section 7.2 and 7.3.1, damage to forests and trees should be minimized through careful planning and avoidance. When forest damage is unavoidable, mitigation should be carried out as specified in the State’s Forest Conservation Act (FCA), the Prince George’s County *Woodland Conservation and Tree Preservation (WC/TP)* Policy Document and must be consistent with the City’s Forest Mitigation Sites Policies. The mitigation ratio must be consistent with the FCA or the WC/TP requirements, whichever is applicable. The following guidelines are recommended to maximize the value of forest mitigation projects for wildlife:

- Plan the mitigation area to maximize forest interior while minimizing forest edge (a circle is generally the most favorable shape).
- Locating a mitigation project adjacent to an existing natural area can enhance the habitat value of that area.
- Use native species and include berry- and fruit-producing trees and shrubs to enhance the value for wildlife.

7.3.9 Rare, Threatened, and Endangered Wildlife and Plant Species and Communities

The Guidelines endorse the existing federal and state lists. Both of these lists should be checked early in the plan preparation process. When an endangered, threatened, rare, watchlist, or in need of conservation species or community as designated by the MD DNR Wildlife and Heritage Division or its habitat is identified at a site, notify the MD DNR immediately for further guidance. The applicant must avoid these areas unless an alternate plan is approved by the U.S. Fish and Wildlife Service or MD DNR. This includes the applicant devising programs for the protection of identified species or habitat in conjunction with the appropriate agency.

7.4 WILDLIFE DAMAGE MINIMIZATION

If wildlife habitat will be damaged during development activities, a Habitat Conservation and Wildlife Management Plan should be prepared (see Section 7.2). The management actions described in the plan should be followed during land clearing, grading, and construction. The person developing the land is responsible for monitoring implementation of the plan and reporting findings to the City of Bowie. If
development activities will have no direct impact on habitat (as in redevelopment areas), but are adjacent to a natural area, every effort should be made to reduce noise during the April through August core breeding season.

7.5 STORMWATER MANAGEMENT AND SOIL EROSION AND SEDIMENT CONTROL MANAGEMENT

The primary function of stormwater management controls is to prevent flooding, in the best interest of public safety, and improve water quality within a watershed. Stormwater management, and sediment and erosion control also functions to conserve wildlife habitat by reducing soil loss and minimizing non-point source pollution. Prior to any construction activity for a new development, stormwater management must be considered and implemented in accordance with the City of Bowie Stormwater Management Ordinance and City Code Section 21B. Stormwater management and sediment and erosion control should be implemented before, during, and after development activity. When construction activity will impact an area with a steep slope or highly erodible soil, refer to Section 7.3.2 of these Guidelines for standards on clearing and grading activities, as well as necessary management strategies for the protection of wildlife habitat. Increased runoff due to soil compaction should be minimized or corrected (e.g., through soil aeration).

In addition, certain elements of low-impact development (LID) used for the management of stormwater can also provide habitat value in areas where conventional stormwater controls would otherwise provide no benefits to wildlife. Persons developing land should also refer to the Prince George’s County Low-Impact Development Design Manual, and Prince George’s County Low-Impact Development Guidance Manual for information about stormwater management methods. Prior to construction, development should be designed to maintain the natural hydrology at a site by reducing impervious surfaces and retaining stormwater runoff in areas throughout the site that will allow maximum infiltration. This approach controls runoff at the source rather than at end-of-pipe. It also enhances the habitat value of the developed area by encouraging greater conservation of trees and use of more plant landscape materials.

7.6 LANDSCAPING SPECIFICATIONS

It is the City’s policy to promote and encourage the use of principles of conservation landscaping at all development sites. Conservation landscaping is a method of landscaping management that works with nature to reduce pollution and enhance wildlife habitat. Conservation landscapes use native/beneficial plants (Appendices C and E), avoid use of exotic invasive plants (see Appendix F) and require less fertilizer and pesticide use, less water use, and less maintenance. These principles contribute to plant survivability.

Conservation landscaping guidelines for new developments are described in the following sections. Of the conservation landscaping principles, most important is plant selection for the right location.

7.6.1 General Practices

The following are general practices that should be considered when planning and installing any landscape. Specific information on using native/beneficial plants, creating wildlife habitat, reducing turf lawns, and using landscaping to conserve energy are contained in Sections 7.6.2 through 7.6.5.

- All landscapes should be carefully designed to account for site-specific conditions and should avoid plant species that require excessive watering or pesticide use. Mimicking the existing
natural habitat on a property by selecting many of the same species for use in landscaping will maintain the most habitat value for existing wildlife onsite. The plant survival rate should also be higher since the species are adapted to site-specific conditions.

- Topsoil that must be disturbed during construction activities should be stockpiled onsite and reused (without being mixed with fill) in landscaping. This will help to maintain the natural soil conditions of the site and lend to habitat preservation.
- Whenever possible, small trees, shrubs, and native groundcover from areas that must be disturbed for construction should be salvaged and re-used in landscapes. This helps to maintain the natural habitat of a site by providing the same types of food and cover sources that existed on the property in an undisturbed state. It may also save money since landscape materials costs will be reduced.
- Prior to planting, areas that were compacted by development activity should be aerated to increase plant survival and improve water infiltration.

7.6.2 Native/Beneficial Plants

Native plants are adapted to local physical and climatic conditions, and do not displace other vegetation. Executive Order 13112 (Invasive Species) defines native species as a species that, other than as a result of an introduction, historically occurred or currently occurs in a particular ecosystem. Native plants have the following characteristics:

- Require low inputs of fertilizers or pesticides
- Require little supplemental watering or seasonal care
- Provide exceptional wildlife value

At least 80 percent of all plant material used in a landscape associated with a new development must consist of plant and tree species that are native to the Chesapeake Bay region (Appendices C and F). The remaining 20 percent of landscaping species may consist of exotic plants provided that they are not considered to be invasive. Invasive species are those species that demonstrate rapid growth and spread, invade habitats, and displace other species. Species that are prolific seed producers, have high seed germination rates, are easily propagated asexually by root or stem fragments, and/or rapidly mature predispose a plant to being an invasive (NRCS 1999). A list of exotic invasive plant species that should never be used in a landscape is provided in Appendix F or can be found by visiting the MD DNR Web site (Appendix B).

7.6.3 Landscaping to Create Wildlife Habitat

With proper design considerations, landscaping at a development can enhance wildlife habitat and increase interest for humans. Landscaping should be designed to provide the following essential wildlife habitat needs during all seasons:

- Food – Native plants that produce fruits, nuts, or berries provide food for a multitude of wildlife such as birds, turtles, and small mammals. Flowering perennials provide food for native pollinators such as butterflies, hummingbirds, and moths. The seeds of many flowers also provide fall food for a variety of seed-eating birds. Some winter food sources include northern bayberry (Myrica pennsylvanica), eastern red cedar (Juniperus virginiana), winterberry holly (Ilex verticillata), and staghorn sumac (Rhus typhina). Some spring and summer fruits include
chokeberry (*Aronia arbutifolia*), high bush blueberry (*Vaccinium corymbosum*), and wild plum (*Prunus americana*). For autumn foods, plant dogwood (*Cornus florida*), American bearberry (*Arctostaphylos uva-ursi*), smooth arrowwood (*Viburnum dentatum*), elderberry (*Sambucus canadensis*), Serviceberry (*Amelanchier laevis*), Spice bush (*Lindera benzoin*), Paw Paw (*Asimina triloba*), Sweet Pepper bush (*Clethra alnifolia*), and Persimmon (*Diospyros virginiana*).

- **Water** – Water is often the limiting factor for wildlife habitat in a landscape. Where water does not naturally occur, it should be supplemented with artificial sources such as ponds, birdbaths, and fountains. At least one year-round supply of water should be included in isolated habitat patches. When designing water sources into the landscape it is important to consider wildlife entrance and exit of the water. On-the-ground water sources should be designed with an edge treatment that is sensitive to the needs of wildlife.

- **Cover** – Wildlife uses cover as a place to rest or to hide from predators and storms. Evergreens such as pines (*Pinus spp.*), junipers (*Juniperus spp.*), and hollies (*Ilex spp.*), provide year-round cover (and food) for wildlife. Deciduous and evergreen shrubbery hedges provide excellent cover and nesting sites. Hedges composed of a variety of plant species of differing heights attract more wildlife than a single species hedge. Log, brush, and stone piles consistent with City Code, also provide cover for a variety of small mammal and amphibian species.

- **Places to raise young** – Many of the same species that provide cover can also provide places to raise young. Leaving dead standing trees (or snags) other than those that would create a public safety/health hazard, will provide nesting habitat for woodpeckers and other cavity nesters. Artificial habitat structures will also attract wildlife and will enhance the landscape. Bird boxes and birdhouses can bring songbirds to nest.

More information on landscaping to provide the four essential habitat elements for wildlife can be found at the National Wildlife Federation (NWF) Web site (Appendix B). Through the NWF Backyard and Community Wildlife Habitat programs, a development or community can be certified if it demonstrates that it provides the necessary habitat elements.

Other techniques that should be followed to improve the habitat quality of a landscape include the following:

- In general, clustering a mixture of native small trees, high and low growing shrubs, and low ground covers offers food, cover, and places to raise young for the greatest number of species.

- Planting shrubs, bushes, and small trees to create a transition zone (or smooth the edge) between lawns and trees or forest edges.

- Retaining cut trees on-site for use in the landscape to provide decaying organic matter for other plants and a food source for insects and woodpeckers.

- Providing cover near water sources.

- Connecting landscaped areas through a system of hedgerows.

### 7.6.4 Landscaping to Manage Deer Damage

Recent increases in deer populations coupled with decreasing natural habitat has caused deer to resort to browsing on landscaping around homes and buildings. This can be avoided in new landscapes by planting species that are unpalatable or not preferred by deer in combination with using products that repel or exclude deer. Examples of deer-resistant herbs and vines include coral honeysuckle (*Lonicera*...
spermervirens), wild ginger (Asarum canadense), pachysandra (Pachysandra terminalis), bee balm (Monarda didyma), bleeding heart (Dicentra spectabilis), butterfly weed (Asclepias tuberosa), wild columbine (Aquilegia canadensis), christmas fern (Polystichum acrostichoides), New York fern (Thelypteris noveboracensis), sensitive fern (Onoclea sensibilis), foam flower (Tiarella cordifolia), goldenrod (Solidago spp.), joe-pye weed (Eupatorium purpureum), partridgeberry (Mitchella repens), black snakeroot (Cimicifuga racemosa), and turtlehead (Chelone glabra). Deer resistant shrubs and trees include serviceberry (Amelanchier laevis), American holly (Ilex opaca), inkberry (Ilex glabra), mountain laurel (Kalmia latifolia), northern bayberry (Myrica pensylvanica), paw paw (Asimina triloba), red maple (Acer rubrum), river birch (Betula nigra), and sumac (Rhus spp.). Appendix F contains a list of exotic invasive plants that should never be used in landscapes.

Deer repellents may include sprays that smell or taste badly to deer, or sound devices that frighten deer. Deer exclusion may be accomplished by using plastic, wire, or electric fencing. More information on these sprays and devices can be found by visiting the Maryland Cooperative Extension Web site (Appendix B).

7.6.5 Lawn Reduction

Traditional turf grass lawns can be costly to maintain and difficult to grow under some conditions. Additionally, they provide almost no habitat for wildlife and do not contribute as significantly to water quality and quantity control as do more natural landscapes. Considering this, the use of turf grass lawns in landscapes should be minimized. The following techniques can be used to reduce the amount of lawn area:

- Use native tall grasses of the Coastal Plain and ground covers on steep slopes, wet or shady areas, and highly erodible sites. Ground covers improve infiltration of water into the soil, slow runoff, and reduce maintenance. They also come in a variety of textures and color.

- Use native warm season grasses and groundcovers. These include native grasses given by common and Latin names, respectively: blue wood sedge (Carex glaucoidea or C. flaccosperma), tussock sedge (Carex stricta), wild oats (Avena fatua), river oats (Chasmanthium latifolium), Virginal wild rye (Elymus virginicus), Virginia switchgrass (Panicum virgatum), little bluestem (Schizachyrium scoparium) and Indiangrass (Sorghastrum nutans). Native groundcovers include: wild ginger (Asarum canadense), blue wood sedge (Carex glaucoidea or C. flaccosperma), sedge (Carex pensylvanica), striped wintergreen (Chimaphila maculata), partridge pea (Cassia fasciculata), green-and-gold (Chrysogonum virginianum), wintergreen (Gaultheria procumbens), round-lobed hepatica (Hepatica americana), eastern prickly-pear cactus (Opuntia humifusa [O. compressa]), Canada mayflower (Maianthemum canadense), partridgeberry (Mitchella repens), mountain stonecrop (Sedum ternatum) and straw lily (Uvularia sessilifolia). [Source: U.S Fish and Wildlife Service – Native Plants for Wildlife Habitat and Conservation Landscaping, Maryland: Coastal Plain, May 2001] They are adapted to the growing conditions of this area, and they require less watering during the dry season.

- Wildflower meadows provide a colorful, low-maintenance alternative to lawns, where ordinances allow and create habitat for birds, butterflies, and mammals. Where a meadow is not feasible, gardens planted with native meadow species can provide some of the same benefits.

- Water gardens introduce sound and texture into the landscape and attract wildlife.

- Decks and brick-on-patios offer places for outdoor seating, while allowing water to permeate through to underlying soil.
For more information on conservation landscaping (also called “BayScaping”), creating wildlife habitat, native plants and nurseries that carry them, see the U.S. Fish and Wildlife Service’s Web site in Appendix B.

7.6.6 Energy Conservation

With proper planning, landscapes around buildings, streets, and parking lots can be designed to reduce long-term heating and cooling costs, decrease reflected heat from paved surfaces, and provide a more pleasant environment for City residents. Cooling Our Communities: A Guidebook on Tree Planting and Light-Colored Surfacing (U.S. Environmental Protection Agency, 1992) contains detailed information on using trees in urban environments to maximize environmental and economic benefits. According to the guidebook, trees used for energy conservation fall into three categories:

- Rural trees
- Street/Park trees
- Shade trees

Rural trees sequester carbon dioxide, a greenhouse gas that contributes to ozone depletion. Street and park trees help cool communities through evapotranspiration. Shade trees, in addition to evapotranspiration, can reduce air-conditioning needs for an individual building by shading roofs, walls, windows, and air conditioners. Both shade trees and street/park trees also help reduce the amount of carbon dioxide in the atmosphere by lowering electricity demand.

The following guidelines will be considered by City Planning staff during the review of detailed site plans, comprehensive design plans, and specific design plans:

- **Shading the Air Conditioner** – Air conditioning is the primary component of electrical peak demand. The single most cost-effective way to reduce cooling needs is to shade the building’s air conditioner and the immediate area around it. Air conditioners become less efficient as temperatures get higher. Preliminary measurements show that planting trees or erecting a trellis covered with vines around an air conditioner can reduce air temperatures around it by 6 or 7°F. This can increase the efficiency of the air conditioner by about 10% during peak periods. To cool a building’s air conditioner, several trees should be planted so that after a 5-year growth, their canopies will completely shade the air conditioner and the adjacent area during mornings and afternoons throughout the entire cooling season.

- **Shading Buildings and Adjacent Grounds** – Because heat transfer through walls (particularly concrete and brick walls) causes a delayed impact on air conditioners, planted trees should shade the east- and south-facing walls to reduce peak period consumption. Trees should also be planted along the west wall to reduce air-conditioning needs during the late afternoon and evening after the period of electrical peak load. Air conditioning energy use can be reduced 40 to 50%, or even more, by shading windows and walls.

The ideal pattern for shading walls is to plant trees so that near maturity, the limbs reach within 5 feet of west or east walls and overhangs, and 3 feet of south walls or overhangs. Carefully placed trees provide optimal shading patterns and create cool microclimates directly adjacent to the house or building. Trees should not be planted too close to houses or buildings. Roots can damage the foundation, and large limbs can cause severe damage if they fall.
Tall shrubs should be placed within 4 feet of west, east, and south walls, so that the inside edge of the hedge will reach within 1 foot of the walls within 4 years. To further optimize cooling, plant an understory of shrubs and groundcovers, especially if the trees are already surrounded by concrete and asphalt. Similarly, planting trees in clusters helps them keep each other cool.

- **Choosing Species** – The species that are chosen should be appropriate for both the general climate of the City and for the microclimate of the site. Local nurseries, the Maryland Cooperative Extension, or the Maryland Department of Natural Resources can provide suggestions on selecting appropriate tree species. In addition, since native tree species are required, the U.S. Fish and Wildlife Service, Chesapeake Bay Field Office, and the Maryland Native Plant Society will also have useful information (see Appendix B for each of these agencies’ Web sites and Appendices C and E).

Trees that can survive the extremes of hot and cold should be selected. The U.S. Department of Agriculture has a number of maps that delineate plant hardiness zones for the entire country. Choose trees that resist disease and insect pests, and that are fairly drought tolerant.

Tree shape has direct bearing on how well a tree grows in a selected site. Oval or columnar trees fit well in narrow spaces, often close to buildings, because they generally grow upward rather than outward. They are not, however, a good choice for spaces near utility lines. Round trees with descending branches demand a considerable amount of space, but are beautiful to look at. Round trees with ascending or lateral branches work well in spaces where trucks, pedestrians, and other traffic needs to pass beneath the tree. Vase-shaped trees are particularly well suited to city streets because they grow up and out, while forming a shady canopy over streets, walls, and sidewalks.

Landscaping trees on the east and west sides of a building should be selected for height if planting at a distance from the building. They will create a long shade in the early morning and late afternoon. If planting close to a building, plant broad-canopied trees.

For trees on the south, southeast, and southwest corners of a building, plant deciduous trees. In the winter season, these species will allow more sunlight to reach windows and wall than will evergreens. Be sure not to create a shade across south-facing windows as well, because this will block desired sunlight.

For parking lots, broad canopies are most effective since their shade covers the larger areas. It is also important to choose species with leaves, berries, and blossoms that do not drip or stain. Create islands of trees, rather than planting individual trees across the area. Trees clumped together share soil, help keep each other cool, and create a broader shade shape than do isolated trees. Trees planted throughout a parking lot are far more effective “coolers” than those planted around the edges only.

### 7.7 LIGHT AND NOISE POLLUTION MINIMIZATION

Where lights are necessary in a development, lighting design should take into account consideration of energy conservation, light trespass, and impacts to wildlife. In general, the following are principles of good lighting design:

- Directs light down and to the sides as needed
- Reduces glare
- Reduces light trespass onto neighboring properties
Helps preserve the dark night sky

Is more cost efficient and energy efficient

The following design techniques suggested by the National Electrical Manufacturers Association may be used to create a lighting design that minimizes light pollution and light trespass while saving energy:

- Limit the use of non-cutoff luminaries.
- Use control systems to reduce light levels during inactive periods or at predetermined times late in the evening such as along paths or sidewalks.
- Select luminaires emitting little to no light above the plane of the horizon.
- Use internal or external shielding that minimizes light above horizontal when luminaires need to be tilted or aimed.
- Carefully select reflectors and design aim and shielding to keep the projection of light within the desired area.
- Design to appropriate light levels and space poles such that illuminance on the ground is uniform. Excessive illuminance will increase reflected light into the sky.
- Use pole heights appropriate to the application.
- Carefully review light placement to avoid illuminating a neighboring property or natural area.
- Select the minimum necessary wattage for an area.
- When using floodlights or wall packs in areas close to adjacent properties or natural areas, select products that use advanced optical techniques to minimize light trespass.

Noise levels must be minimized in accordance with the State standards for acoustical site planning and construction attenuation. Noise levels should also be in compliance with the City Code. In general, noise levels in residential areas and near natural areas should be kept below 55 decibels (dB) during nighttime hours and 65 dB during daytime hours. When designing a development that nears this noise level adjacent to a natural area, buffers of dense native vegetation such as Eastern red cedar or American holly should be installed to reduce disturbance to wildlife. Enforcement of State dB standards also applies to natural areas.

### 7.8 RECREATIONAL FACILITIES

Recreational facilities enhance the quality of life for City residents by providing opportunities to interact with other people and with nature. Facilities ranging from ball fields to hiking trails and birding blinds each serve a unique purpose in a community. Pedestrian trails provide opportunities to reduce car traffic and enhance environmental education. A system of trails linking a development to other properties often increases community property values. Regardless of size, recreational facilities should be carefully designed considering the effects to wildlife habitat. Construction and maintenance of all state, county, city, and privately owned recreational facilities should abide by the development guidelines. Some considerations when designing recreational facilities include the following:
Habitat Conservation Areas are not intended for recreational uses.

Recreational facilities within designated Greenway and Habitat Protection Areas or Habitat Conservation Areas should be limited to hiking trail access points to select natural features. When designing a trail system to follow a Greenway and Habitat Protection Area or Habitat Conservation Area, the bulk of the trail system should be located just on the outside edge of the area. When building trails near riparian forest buffers, most of the trail should be limited to the Outer Zone. No trails should be located in the Inner Zone.

Forest interior should be avoided when considering locations for recreational facilities. Even hiking trails should be minimized through forest interior, because these provide entrance for feral animals and other predator species that would not normally have access to interior-dwelling species.

Recreational facilities should be designed to disturb as little natural area as possible. Trail width should be minimized to accommodate only the intended usage; however, trail widths and design considerations should be consistent with Americans with Disabilities Act (ADA) requirements. Damage to existing tree roots should be minimized by building up rather than digging down (see Appendix G).

Construction materials for trails should be pervious to minimize effects on local hydrology, consistent with ADA requirements, where applicable.

Informational kiosks should be strategically placed near trail intersections outside of the Greenway and Habitat Protection Areas or Habitat Conservation Area.

Unlighted ball fields or unpaved hiking trails can be located on the outside of Greenway and Habitat Protection Areas or Habitat Conservation Areas and may serve as a pervious buffer to the riparian zones.

Luminated ball fields should be placed farther from natural areas to minimize light disturbances to wildlife. In cases where a luminated ball field is located near a natural area, a light and noise buffers planted with dense vegetation should be created between the areas.

7.9 **PUBLIC UTILITIES AND TRANSPORTATION RIGHTS-OF-WAY**

All utilities and rights-of-way should be considered in the planning process as outlined in these Guidelines. No utilities or rights-of-way should be located through Greenways and Habitat Protection Areas or Habitat Conservation Areas unless no other option exists. Section 7.3.1 contains information regarding minimizing impacts on wildlife habitat if encroachment of these areas is unavoidable.

Landscaping within rights-of-way should focus on maintaining native species to enhance habitat value (see Section 7.6). Maintenance activities in these areas should be sensitive to wildlife and surrounding landowners. Mowing, disking, bush hogging, and other techniques used to control woody species have less impact when these are not performed during April through August. It is a goal of the Guidelines for persons maintaining these areas to make reasonable efforts to avoid impacts to nesting wildlife within the path of the maintenance areas. Surrounding landowners should be informed in writing at least two weeks prior to maintenance activities.
References


**Afforestation.** The establishment of a tree cover on an area from which it has always or very long been absent, or the planting of open areas that are not presently in forest cover (M-NCPCC, 1993).

**Alien (non-native) species.** A species introduced and occurring in locations beyond its known historical range. This includes introductions from other continents, bioregions, and also those not native to the local geographic region (USDA NRCS). Executive Order 13112 (Invasive Species) more narrowly defines an alien species and ties the definition to an occurrence outside a native ecosystem. An alien species is defined with respect to a particular ecosystem as any species, including its seeds, eggs, spores, or other biological material capable of propagating that species, that is not native to that ecosystem.

**Applicant.** Person or persons submitting site plan, variance, conditional use, special exception, or rezoning applications (adapted from City of Gaithersburg Environmental Standards).

**Aquatic.** Describing a plant growing in (immersed) or on (floating) water (Brown and Brown, 1984).

**Aquifer.** A formation, group of formations, or part of a formation that contains sufficient saturated permeable material to yield sufficient, economical quantities of water to wells and springs (U.S. EPA, 1993).

**Aquifer recharge area.** The land area from which an aquifer receives surface water (U.S. EPA, 2001b).

**Basic Plan.** The initial phase review (in Comprehensive Design Zones CDZ’s) that shows the types, amounts, and general location of land uses proposed. The Basic Plan shall be reviewed concurrently with the review of, and action on, the Zoning Map Amendment application (Prince George’s County Zoning Ordinance, 1999 Edition).

**BayScapes.** These are environmentally sound landscapes benefiting people, wildlife and the Chesapeake Bay. BayScaping advocates a “holistic” approach through principles inspired by the relationships found in the natural world (U.S. Fish and Wildlife Service, 1994).

**Best Management Practices (BMPs).** A practice or combination of practices that are the most effective and practicable (including technological, economic, and institutional considerations) means of controlling point or nonpoint source pollutants at levels compatible with environmental quality goals (Maryland Department of Environmental Resources, 1999).

**Biological Diversity.** The variety of living organisms, the genetic differences among them, the communities and ecosystems in which they occur, and the ecological and evolutionary processes that keep them functioning, yet ever changing and adapting (Leslie et al., 1996).

**Bio-retention.** On-lot retention of stormwater through the use of vegetated depressions engineered to collect, store, and infiltrate runoff (Maryland Department of Environmental Resources, 1999).

**Bog.** A habitat characterized by soil consisting of peat and other organic matter saturated with acid water (Brown and Brown, 1999).

**Browse.** The twigs and leaves of woody plants used as a food by deer and farm animals; also the act of eating them (Brown and Brown, 1999).
Channel. A landscape element consisting of two banks and a bed that is capable of conveying confined surface flows downstream in a watershed. The morphology of a channel can be formed and maintained by incision associated with hillslope erosion or by processes of erosion and deposition within alluvial valleys (MDNR, 2000).

Chesapeake Bay Critical Area. All lands and waters defined in Natural Resources Article, §8-1807, Annotated Code of Maryland. Critical Areas include the following:

- All waters of and lands under the Chesapeake Bay and its tributaries to the head of the tide as indicated on the State tidal wetlands maps, and all State and private tidal wetlands designated under Environment Article, Title 16, Annotated Code of Maryland.
- All land and water areas within 1,000 feet beyond the landward boundaries of State or private tidal wetlands and the heads of tides designated under Environment Article, Title 16, Annotated Code of Maryland.
- Modification to the areas in this subsection through inclusions or exclusions proposed by local jurisdictions and approved by the Critical Area Commission as specified in Natural Resources Article, §8-1807, Annotated Code of Maryland (COMAR 26.23.01.01).

Coastal Plain or Coastal Zone. The Coastal Zone includes both the Eastern and Western shores, or it may be thought of as that region east of the Fall Line. It is geologically much younger than the remainder of the state, having been uplifted above sea level long after the Cretaceous Period. Following this uplift, it was invaded by species from the Piedmont and mountains to the west by species moving up the Coastal Plain from the south, and by a few species coming southward from the Susquehanna Valley (Brown and Brown, 1984 (page xix).

Comprehensive design plan. The second phase of the review process for a development proposal in a comprehensive design zone. The comprehensive design plan refines the approved basic plan. It establishes the general location, distribution, and size of proposed structures, and includes various standards and guidelines. Proposed public benefit features are described, and a determination must be made that the development will not be an unreasonable burden on public facilities (Prince George’s County Zoning Ordinance, 1999 Edition).

Comprehensive design zone. One of four floating zones, which permits a mix of land uses and/or densities. Comprehensive design zones also allow an increase in residential density or commercial intensity, in exchange for the provision of public benefit features, such as a community park or neighborhood bike path, that improve the quality of the project. Development proposals in a comprehensive design zone are approved in a three-phase review process including the following:

- Phase I (Basic Plan)
- Phase II (Comprehensive Design Plan)
- Phase III (Specific Design Plan) (M-NCPPC, 1991).

Conditional Reserve Areas. Areas identified within the Bowie-Collington-Mitchellville and Vicinity Master Plan with moderate development constraints and some bearing on natural processes. Parts of these areas may be appropriate for active recreation facilities, and some portions may bear limited development within prescribed guidelines. These areas include Primary Management Area (PMA) Evaluation Areas, soils with limitations for community development, highly erodible soils, steep and severe slopes, and rare natural features (M-NCPPC, 1991).
**Conservation.** The controlled use and systematic protection of natural resources. The management of a renewable natural resource with the objective of sustaining its productivity in perpetuity while providing for human use compatible with sustainability of the resource (Helms, 1998).

**Conservation easement.** A legal agreement a property owner makes to restrict the type and amount of development that may take place on his or her property. Each easement’s restrictions are tailored to the particular property and to the interests of the individual owner (Diehl, 1988).

**Conservation landscaping.** Conservation landscaping promotes landscaping management that works with nature to reduce pollution and enhance wildlife habitat. It encourages a low input formula for yard care: less fertilizer and pesticide use, combined with less lawn area and the use of beneficial plants, equals less water use and less overall maintenance. The goal of the BayScapes program is the protection of vital soil and water resources (U.S. Fish and Wildlife Service, 1994).

**Critical habitat area.** A critical habitat for endangered species and its surrounding protection area. A critical habitat area shall (1) be likely to contribute to the long-term survival of the species, (2) be likely to be occupied by the species for the foreseeable future, and (3) constitute habitat of the species which is deemed critical under Section 4-2A-06, or Section 10-2A-06, Natural Resources Article, Annotated Code of Maryland (Maryland State Forest Conservation Manual, July 1995).

**Critical root zone.** A circular region measured outward from a tree trunk representing the area of the roots that must be maintained or protected for the tree’s survival. For the purpose [of this manual], critical root zone is one foot of radial distance for every inch of tree diameter (dbh) measured at 4.5 feet above the ground, with a minimum radius of 8 feet. For specimen trees the critical root zone shall be 1.5 feet for every inch of tree diameter (Maryland State Forest Conservation Manual, July 1995).

**Deciduous.** Falling promptly after the normal function is completed, e.g. leaves of trees in autumn or petals of flowers after blooming (Brown and Brown, 1999).

**Development.** Any activity that materially affects the conditions land, land under water, or any structure (Prince George’s County Zoning Ordinance, 1999 edition).

**Development Plan Proposal.** Any application and associated plans filed with the Maryland-National Capital Park and Planning Commission, or the Clerk of the Council of Prince George’s County pursuant to Subtitles 24 and 27 of the Prince George’s County Code or filed with the City of Bowie pursuant to Article II of the Code of the City of Bowie, Maryland.

**Diameter at breast height (DBH).** The diameter of a tree as measured at a height 4.5 feet from the ground (Prince George’s County Woodland Conservation and Tree Preservation Policy Document, February 1993).

**Drainage area.** An area of land that drains to one point (U.S. EPA, 2001b).

**Drainage course.** A natural or man-made drainage network having a defined channel which appears on either MNCPPC 200-foot scale topographical coverage, a developer’s field topographic, or is located in the field.

**Ecosystem.** The system formed by the interaction of a community of organisms with their environment (Palone and Todd, 1998).

**Ecotone.** A transition area between two distinct, but adjoining communities (University of Maryland Cooperative Extension Service Fact Sheet 620, Woodland Management - Glossary of Forestry Terms).
**Edge.** The boundary between two ecological communities, for example, field and woodland. Edges provide valuable wildlife habitat. Consideration of an edge can reduce the impact of a timber harvest (University of Maryland Cooperative Extension Service Fact Sheet 620, Woodland Management - Glossary of Forestry Terms).

**Edge to area ratio.** An expression of the average number of feet in the edge to every acre in the forest stand. The ratio provides information related to a forest area’s inherent value or priority ranking for preservation nomination (City of Gaithersburg, 2001).

**Endangered Species.** Any species or subspecies in immediate danger of becoming extinct throughout all or a significant portion of its range (University of Maryland Cooperative Extension Service Fact Sheet 620, Woodland Management - Glossary of Forestry Terms).

**Ephemeral stream.** A stream or portion of a stream that flows only in direct response to precipitation, receiving little or no water from springs and no long continued supply from snow or other sources, and whose channel is at all times above the water table (Helms, 1998).

**Erosion.** The removal of rock debris and soil by wind, moving water, or gravity (Palone and Todd, 1998).

**Estuary.** Semi-enclosed coastal body of water having free connection to the open sea. Seawater is measurably diluted by fresh water from land drainage. Estuaries are delicate ecosystems; they serve as nurseries, spawning and feeding grounds for a large group of marine life and provide shelter and food for birds and wildlife (Maryland Department of Health and Mental Hygiene, 1982).

**Evapotranspiration.** A collective term for the processes by which water moves from the soil to the atmosphere. It consists of evaporation, the loss of water vapor from land or water body surfaces to the air, and transpiration, the net movement of soil water through plants to the air (Maryland Department of Health and Mental Hygiene, 1982).

**Exotic Invasive Species.** An organism that is out of its naturally occurring range and environment, and occupying the habitat of native species (Palone and Todd, 1998).

**Floodplain.** The level or nearly level land with alluvial soils on either or both sides of a stream or river that is subject to overflow flooding during periods of high water level (Helms, 1998).

**Floodplain, One Hundred (100) Year.** That area of land that would be covered by a flood that has a one percent (1%) chance of being equaled or exceeded in any year (Prince George’s County Zoning Ordinance, 1999 Edition).

**Forb.** A herbaceous plant other than a grass, esp. one growing in a field or meadow (Houghton Mifflin Company, 1985).

**Forest.** A biological community dominated by trees and other woody plants covering a land area of 10,000 square feet or greater. Forest includes (1) areas that have at least 100 trees per acre with at least 50% of those trees having a two-inch or greater diameter at 4.5 feet above the ground and larger, and (2) forest areas that have been cut but not cleared. Forest does not include orchards (Maryland State Forest Conservation Manual, Second Edition, 1995).

**Forest conservation.** The retention of existing forest or the creation of new forest at the levels prescribed by the State or local authority (Maryland State Forest Conservation Manual, Second Edition, 1995).
**Forest fragmentation.** The subdivision of large natural landscapes into smaller, more isolated fragments. Fragmentation affects the viability of wildlife populations and ecosystems (University of Maryland Cooperative Extension Service Fact Sheet 620, Woodland Management - Glossary of Forestry Terms).

**Forest interior.** Areas of a forest that are more than 300 feet from a woodland edge (Based on Rosenberg et al., 1999).

**Forest interior dwelling species.** Species that will only establish breeding territories in the interior of large forest tracts, far from an edge (Based on Rosenberg et al., 1999).

**Forest stand delineation.** The methodology for evaluating the existing natural features and vegetation on a site proposed for development, taking into account the environmental elements that shape or influence the structure or makeup of a plant community (The Urban Forest Management Handbook – A Guide for Managing Our Urban Forest Lands, The Metropolitan Washington Council of Governments, October 1999).

**Geotechnical report.** A report prepared by a professional engineer or geologist discussing the existing soils on a site with respect to structural safety and provides more detail of soil and geologic characteristics in order to determine that soils can support development using suitable engineering measures (City of Gaithersburg, 2001).

**Grassland.** Land on which the vegetation is dominated by grasses, grasslike plants, or forbs (Helms, 1998).

**Green Infrastructure.** Our Nation’s natural life support system — an interconnected network of waterways, wetlands, woodlands, wildlife habitats, and other natural areas; greenways, parks, and other conservations lands; working farms, ranches, and forests of conservation value; and wilderness and other open spaces that support native species, maintain natural ecological processes, sustain air and water resources, and contribute to the health and quality of life for America’s communities and people (Green Infrastructure Demonstration Project, A Partnership between the National Park Service and the Metropolitan Washington Council Governments, 2002).

**Greenway.** A corridor of open land that provides one or more of the following benefits: (1) protection and management of natural and cultural resources; (2) provision of recreational opportunities; and (3) enhancement of the quality of life and the aesthetic appeal of neighborhoods and communities (EPA, 2001a).

**Groundwater.** Water stored underground in the pore spaces between soil particles or rock fractures (Maryland Department of Environmental Resources, 1999).

**Habitat.** The place or community where a plant or animal naturally grows and lives (Sutton, 1992).

**Habitat Conservation Areas.** Areas selected on a site-by site basis on a development site by the person developing the land that are maintained in a natural state due to their legal protection or their value as wildlife habitat. These areas are defined by the person developing the land in the Wildlife Conservation and Wildlife Management Plan (Section 7.1.16). Habitat Conservation Areas include, but are not limited to: streams; ponds; wetlands; vernal pools; habitat for rare, threatened, and endangered species and communities; steep slopes; highly erodible soils; areas that border or connect (or that could be enhanced to connect) designated Greenways and Habitat Protection Areas; large areas of mature forest, grassland, or shrubland; forest interior; areas important to maintaining water quality, etc.

**Habitat Protection Areas** (As used in the term “designated Greenways and Habitat Protection Areas”). Designated lands that provide safe areas for wildlife on a citywide scale.
**Headwater(s).** The uppermost reaches of a stream or river (Palone and Todd, 1998).

**Herbaceous.** Green and leaf-like in texture; a type of plant in which the stems die back to the soil surface in winter as opposed to a woody plant, the stems of which endure winter cold (Brown and Brown, 1984).

**Highly erodible soils.** Soil map units as classified by the Natural Resources Conservation Service (NRCS - formerly the Soil Conservation Service) as being highly erodible. Based on factors from the Universal Soil Loss Equation, the NRCS classification system considers soil erodibility (K factor), climate, slope, steepness, length, and soil loss tolerance (T factor) (City of Gaithersburg, 2001).

**Hydraulically adjacent slopes.** Slopes lying within 200 feet from the bank of a stream/drainage course, which drain directly to the stream/drainage course or its associated floodplain. When the stream buffer encompasses the toe of a steep slope with the 200-foot section, adjacency will apply to the entire slope even if the 200-foot cutoff is in the middle of the slope (City of Gaithersburg, 2001).

**Hydraulically remote slopes.** Slopes lying beyond the area designated as the stream valley buffer of a stream/drainage course, or slopes lying beyond 200 feet from the bank of a stream/drainage course if the stream buffer is less than 200 feet, which may or may not drain directly to the stream/drainage course or its associated floodplain (City of Gaithersburg, 2001).

**Impervious surface.** Consist of areas that are not water-permeable as a result of pavement, buildings, or compaction of soils during construction (Prince George’s County Zoning Ordinance, 1999 edition).

**Integrated management practices (IMPs).** A low impact development practice or combination of practices that are the most effective and practicable (including technological, economic, and institutional considerations) means of controlling the predevelopment site hydrology (Prince George’s County, 2000).

**Intermittent stream.** A stream, or portion of a stream, that does not flow year-round, but only when it (a) receives base flow solely during wet periods, or (b) receives groundwater discharge or protracted contributions from melting snow or other erratic surface and shallow subsurface sources – see *ephemeral channel*. Distinguished from ephemeral channels by the presence of stony debris in the stream channel (Helms, 1998).

**Invasive species.** A species that demonstrates rapid growth and spread, invades habitat, and displaces other species. Species that are prolific seed producers, have high seed germination rates, easily propagate asexually by root or stem fragments, and/or rapidly mature, predispose a plant to being an invasive species (NRCS, 1999).

**Island ecosystems.** Unique but fragile and vulnerable ecosystems due to the fact that the evolution of their flora and fauna has taken place in relative isolation. Many remote islands have some of the most unique flora in the world; some have species of plants and animals that are not found anywhere else, which have evolved in a specialized way, sheltered from the fierce competition that species face on mainland (U.S. EPA, 2001b).

**Light Pollution.** Any adverse effect of manmade light, including negative impacts to the instinctive daily and seasonal cycles of animals and plants (International Dark-Sky Association, 2001).

**Local genetic origin.** Plants whose seed source is from an area within a 150-mile range of Prince George’s County (City of Gaithersburg, 2001).

**Low Impact Development (LID).** The integration of site ecological and environmental goal and requirements into all phases of urban planning and design from the individual residential lot level to the entire watershed. (Maryland Department of Environmental Resources, 1999)
Marlboro clay. An unstable clay deposit formed in marine sediments (of the Paleudults type), generally located adjacent to the Patuxent River and its tributaries. These clays are characterized by low-strength, high shrink-swell potential, and slope instability. They are subject to potentially dangerous earth slides and cave-ins from exposure to prolonged wetting and when disturbed by grading (M-NCPPC, 1991).

Mature tree or forest. A tree or even-aged stand of trees that is capable of sexual reproduction (other than precocious reproduction), has attained most of its potential height growth, or has reached merchantability standards (Davis, 1996).

Native. As defined by Executive Order 13112 (Invasive Species), a “native species means, with respect to a particular ecosystem, a species that, other than as a result of an introduction, historically occurred or currently occurs in that ecosystem.” A list of native plants of Prince George’s County can be found in Appendix C. Additional information is also available from the Maryland Native Plant Society (see Web site in Appendix B).

Natural reserve areas. Areas identified within the Bowie-Collington-Mitchellville and Vicinity Master Plan that have physical features exhibiting severe constraints to development and that are important to preserving sensitive ecological systems, including PMA Preservation Areas, floodplains, surface waters, and wetlands. These areas are generally prohibited from development under existing laws and ordinances. (see Bowie Master Plan, p. 59).

Nontidal Wetlands of Special State Concern. The areas designated based on criteria in Regulation .04 of [COMAR 26.23.01], and listed in COMAR 26.23.06.01 as having exceptional ecological or educational value of statewide significance. (COMAR 26.23.06.01).

Nonpoint source pollution. Water pollution caused by rainfall or snowmelt moving both over and through the ground and carrying with it a variety of pollutants associated with human land uses. A nonpoint source is any source of water pollution that does not meet the legal definition of point source in section 502(14) of the Federal Clean Water Act (Maryland Department of Environmental Resources, 1999).

Perennial stream. A stream that has running water on a year-round basis under normal climatic conditions (Helms, 1998).

Plant community. Any group of plants belonging to a number of different species that co-occur in the same habitat or area and interact through trophic and spatial relationships; typically characterized by reference to one or more dominant species (U.S. EPA, 2001b).

Pre-development survey and report. A complete taxonomy analysis of existing natural features, including herbaceous plants, animals, reptiles, insects, and amphibians. The natural resource inventory must cover the development site and first 100 feet of adjoining land around the perimeter or the width of adjoining lots, whichever is less. Natural features also include Greenways and Habitat Protection Areas, topography, steep slopes, perennial, ephemeral, and intermittent streams and major drainage courses, one hundred-year floodplain, wetlands, vernal pools, soils and geologic conditions, aerial extent of forest and tree cover, cultural features and historic sites, and necessary buffers.

Preservation. To keep safe from injury, peril, or other adversity; protect. To keep in perfect or unaltered condition; maintain unchanged. To keep or maintain intact (Houghton Mifflin Company, 1985).

Primary Management Area (PMA). Areas used to establish a land use management policy within the Patuxent River watershed. The PMA consists of two zones: a Preservation Area and Evaluation Area. (M-NCPPC, 1991).
**PMA Evaluation Area.** An area 300 feet wide immediately abutting the Preservation Area. The Evaluation Area may accommodate some development so as not to unreasonably interfere with the purposes of the Primary Management Area, with a goal of limiting impervious surface coverage to 10 percent or less (M-NCPPC, 1991).

**PMA Preservation Area.** An area at least 50 feet wide on either side of all perennial tributary streams to the Patuxent River. The area could be wider than 50 feet if there are wetlands, steep slopes, or other sensitive natural features adjacent to the stream. The Preservation Area is preserved in a natural state to the fullest extent possible and enforced at the level of development review (M-NCPPC, 1991).

**Quality of life.** The attributes of amenities that combine to make an area a good place to live. Examples include the availability of political, educational, and social support systems; good relations among constituent groups; a healthy physical environment; and economic opportunities for both individuals and businesses (Planning Advisory Service 1992 Report, “Glossary of Zoning, Development and Planning Terms” – American Planning Association).

**Rare natural features.** Botanical, zoological, ornithological, geological, archeological, paleontological, and anthropological elements that are protected for their uniqueness and historical value by County, State, and Federal governments. (M-NCPPC, 1991).

**Rare species.** Species that have a restricted world range (U.S. EPA, 2001b).

**Redevelopment.** Alterations of a property that change the “footprint” of the site or building in such a way that results in a disturbance of land greater than or equal to 40,000 square feet of land. The term is not intended to include activities such as interior and exterior remodeling, or residential deck building.

**Reforestation or Reforested.** The creation of a biological community dominated by trees and other woody plants containing at least 100 live trees per acre with at least 50 percent of those trees having the potential of attaining a two inch or greater diameter at breast height within seven years. Reforestation includes landscaping of areas under an approved landscaping plan that established a forest of at least 35 feet wide and covering 2,500 square feet of area (Maryland State Forest Conservation Technical Manual, Second Edition, 1995).

**Riparian forest buffer.** An area of trees, usually accompanied by shrubs and other vegetation, adjacent to a body of water and managed to maintain the integrity of stream channels and shorelines to 1) reduce the impact of upland sources of pollution by trapping, filtering and converting sediments, nutrients, and other chemicals, and 2) supply food, cover and thermal protection to fish and other wildlife (Palone and Todd, 1998).

**Sediment.** Fragmented material that originated from weathering rocks and decomposing organic material that is transported by, suspended in, and eventually deposited in the streambed (Palone and Todd, 1998).

**Shrub.** A woody plant less than 5 meters [15 feet] tall usually with several to many trunks from the base; excludes climbers (Brown and Brown, 1999).

**Shrubland.** Land dominated by woody shrubs and saplings (Brown and Brown, 1999).

**Site plan.** A plan subject to review and approval procedures of the Prince George’s County Zoning Ordinance, the Basic Plan within Comprehensive Design Zones, and Preliminary Plans of subdivision (M-NCPPC, 1999).

**Specific Design Plan.** The third phase of the review process for a development proposal in a comprehensive design zone. The specific design plan is a precise site plan that includes architectural
plans, exterior building elevations, and detailed landscaping plans. A determination must also be made that the development will be adequately served by public facilities (M-NCPPC, 1999).

**Specimen tree.** Trees having a diameter measured at 4.5 feet above the ground of 30 inches or more, or trees having 75% or more of the diameter of the current state champion of that species. Also includes Champion Trees (Maryland State Forest Conservation Technical Manual, Second Edition, 1995).

**Spring.** A place where ground water flows naturally from a rock or the soil onto the land surface or into surface water (U.S. EPA, 2001b).


**Stewardship.** The administration of land and associated resources in a manner that enables their passage on to future generations in a healthy condition (Helms, 1998).

**Stream.** A perennial or intermittent watercourse having a defined channel (excluding man-made ditches) which contains flow from surface and groundwater sources during at least 50 percent of an average rainfall year (Palone and Todd, 1998).

**Stream buffer.** An undisturbed strip of natural vegetation contiguous with and parallel to the bank of a perennial or intermittent stream, which may be designed to:

- Protect hydraulically adjacent slope areas.
- Maintain or improve the water temperature regimen/water quality and flow of the stream(s) through provision of shade.
- Protect natural wetlands.
- Provide groundwater storage/recharge for a stream.
- Complement regulations pertaining to the 100-year ultimate floodplain.
- Provide wildlife habitat, open space, corridors, or green infrastructures.
- Complement on-site erosion/sediment control measures by serving as a back-up natural filter/trap. (See Figure 3) (Palone and Todd, 1998)

**Stormwater.** Rainfall that does not infiltrate the ground or evaporate because of impervious land surfaces but instead flows onto adjacent land or watercourses or is routed into drain/sewer systems (EPA, 2001a).

**Stormwater management.** The minimization of impacts to the natural hydrologic function of an area, including water quality, volume, discharge, frequency, and recharge, while conserving natural resources and ecosystem function.

**Surface Waters.** Streams, lakes, wetlands, ponds, and rivers that may provide aquatic habitat, carry nutrient runoff from storms, provide recreation, and offer scenic amenities (M-NCPPC, 1991).

**Threatened species.** A plant or animal species likely to become endangered throughout all or a significant portion of its range within the foreseeable future (Helms, 1998).
**Tree.** A large, woody plant having one or several self-supporting stems or trunks and numerous branches that reaches a height of at least 20 feet at maturity. (Maryland State Forest Conservation Technical Manual, Second Edition, 1995).

**Tree/forest/woodland conservation plan.** A document negotiated during the existing review processes by the applicant and the M-NCPPC addressing woodland conservation, individual tree preservation, and the protection of existing woodlands. It is a site map delineating the areas to be saved and the text that details any general or plan-specific requirements, penalties, or necessary mitigation measures (Prince George’s County Woodland Conservation and Tree Preservation Policy, 1993).

**Understory trees.** Trees with crowns entirely below the general level of the canopy receiving little or no sunlight from above or the sides (Maryland State Forest Conservation Manual, July 1995).

**Upland.** An area inland and well above sea level, with surface usually sloping and well drained (Brown and Brown, 1999).

**Urban forest.** The trees in and around urban areas including those on public and private space (greenbelts, streams, yards, parks and streets) (The Forestry Handbook, The Society of American Foresters, Second Edition).

**Vegetation.** The plants of an area or region; plant life (Houghton Mifflin Company, 2000).

**Vernal pool.** A contained basin depression lacking a permanent above ground outlet. In Maryland, it fills with water with the rising water table of fall and winter or with the meltwater and runoff of winter and spring snow and rain. It contains water for a few months in the spring and early summer. By late summer, a vernal pool is generally (but not always) dry (Based on Tiner and Burke, 1995).

**Watershed.** 1) An area of land that drains into a particular river or body of water; usually divided by topography. 2) The total area of land above a given point on a waterway that contributes surface runoff water to the flow at the point; a drainage basin or a major subdivision of a drainage basin (Palone and Todd, 1998).

**Waiver.** The grant of relief from a term[s], provision[s], or requirement[s] identified in these *Wildlife Guidelines.*

**Wellhead Protection Area.** The area surrounding a drinking water well or well field which is protected to prevent contamination of the well(s) (U.S. EPA, 2001c).

**Water table.** The level of ground water. The upper surface of the zone of saturation of groundwater above an impermeable layer of soil or rock (through which water cannot move) as in an unconfined aquifer. This level can be very near the surface of the ground or far below it (U.S. EPA, 2001d).

**Wetland.** Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas (Cowardin et al. 1979).

**Wetland function.** The physical, chemical, and biological processes occurring in and making up a wetland. Includes water storage, ground water recharge, climate control, oxidation-reduction, biogeochemical cycling and storage, biological productivity, decomposition, and community structure and values support (North Carolina State University, 2001).
**Wetland value.** An estimate of wetland worth, merit, quality, or importance based on wetland function. Includes water quality, water supply, flood control, erosion control, wildlife support, recreation, culture, and commercial benefits. (North Carolina State University, 2001)

**Wildlife.** Native wild animals including birds, mammals, reptiles, amphibians, fish, and invertebrates (Henderson, 1987).

**Wildlife Corridor.** A defined tract of land connecting two or more areas of similar management or habitat type that is reserved from substantial disturbance and through which a species can travel to reach habitat suitable for reproduction and other life-sustaining needs (Helms, 1998).

**Woodland.** An area covered by moderate sized trees, the soil surface usually completely shaded; shrubs are usually present (Brown and Brown, 1999).
Appendix A: Federal, State, and Local Regulations, Policies, and Agreements

Federal Policies

Bald and Golden Eagle Protection Act (16 U.S.C. 668-668C) The Bald and Golden Eagle Protection Act, the successor to the Bald Eagle Protection Act, prohibits, except under certain specified conditions, the taking, possession, transportation, export or import, barter, or offer to sell, purchase or barter a bald or golden eagle, alive or dead, or any part, nest, or eagle egg without a permit.

Clean Water Act, Section 401 (Water Quality Certification) – Under Section 401, states have the authority to review any federal permit or license that may result in a discharge to wetlands and other waters under state jurisdiction, in order to ensure that the actions would be consistent with the state’s water quality requirements. If a state denies certification, the federal permit or license cannot be issued. States can also qualify certifications by specifying conditions that must be met. Pursuant to Section 401, the Maryland Department of the Environment (MDE) is responsible for issuing water quality certification (WQC) for proposed discharges into jurisdictional wetlands and waters of the State of Maryland. The WQC certifies that a proposed Section 404 discharge will not violate the State’s water quality standards contained in COMAR 26.08.02. The WQC must be issued for all U.S. Army Corps of Engineers (USACE) Section 404 permit actions and for USACE planning and navigation projects that include a Section 404 discharge. Generally, application for the WQC is part of the standard joint permit application. However, for proposed Section 404 activities that do not require a State permit (e.g., Federal action in tidal areas) the State issues an individual WQC based upon a request from the Federal agency.

Clean Water Act, Section 404 (Permits for Discharge of Dredged or Fill Material) – Section 404 of the CWA regulates proposed discharges into waters of the United States, including jurisdictional wetlands. Although the USACE is responsible for implementing the Section 404 regulatory program, the final authority rests with the EPA. In Maryland, any proposed discharge of fill material into "waters of the United States" (as defined in 40 CFR Part 230.3) requires authorization from the USACE. The USACE uses two types of permits, General Permits (which include Regional and Nationwide Permits) and Individual Permits, to authorize regulated activities. USACE authorizations are generally subject to conditions imposed at the Federal level or by the State through the Section 401 Water Quality Certification (WQC). Conditions of the State’s WQC automatically become conditions of the USACE authorization. Nationwide Permits (NWPs) authorize a broad range of activities, including most types of structures and fills that may be placed in wetlands. The NWPs are re-authorized every five years, and are subject to Federal Coastal Zone Consistency (CZC) and WQC review by the State. Although the majority of the NWPs were suspended for use in Maryland when the Corps issued the Maryland State Programmatic General Permit (MDSPGP), the State continues to review the NWPs during each re-authorization period, particularly those permits that have not been suspended. Presently, the NWPs have been approved by the State subject to the condition that the applicant obtains all necessary permits and approvals from MDE. The State’s authorization is necessary to validate a NWP. Regional Permits may be issued by the Corps to authorize certain activities with minimal impacts in a defined region, such as Maryland, the Chesapeake Bay, etc. Any proposed regional permits are also subject to the State’s CZC and WQC reviews. All Regional Permits have currently been suspended by the MDSPGP. The Individual
Permit process is used by the Corps to authorize activities that do not meet the conditions of the MDSPGP or other general permits. Discharges into wetlands connected to waters of the United States that are above headwaters, or those isolated from surface tributaries to navigable waters, require individual permits if 5 or more acres of water or nontidal wetlands are lost or have substantial adverse modifications. Applicants for permits must demonstrate that the fill is for a water-dependent activity and that no upland alternatives exist to filling the wetland.

**Clean Water Act Amendments (Water Quality Act) of 1987, Section 402(p) (NPDES Stormwater Program)** In response to the 1987 Amendments to the CWA, EPA developed Phase I of the NPDES Stormwater Program in 1990. Phase I requires NPDES permits for stormwater discharges from the following sources:

- “Medium” and “large” municipal separate storm sewer systems (MS4s) generally serving, or located in incorporated places or counties with, populations of 100,000 or more people; and
- Eleven categories of industrial activity, one of which is construction activity that disturbs five acres or greater of land.

The Stormwater Phase II Final Rule, which became final in 1999, requires NPDES permit coverage - mostly under general permits - for stormwater discharges from the following sources:

- Certain regulated small MS4s (primarily all those located in urbanized areas) and
- Construction activity disturbing between 1 and 5 acres of land.

**Coastal Zone Management Act** – Participation in the voluntary coastal zone management program requires states to manage coastal wetlands and provides states with some control over these resources by requiring that federal activities be consistent with state coastal zone management plans, which can be more stringent than federal standards. Federal grants, policy guidance, and technical assistance are available to individual states for developing and implementing their coastal zone management programs. Some grants can be passed through to local government.

**Endangered Species Act** – States, local governments, and private groups can use the Endangered Species Act to protect wetlands that provide habitat for endangered or threatened species--by actively supporting the listing of wetlands-dependant species as endangered or threatened and by urging aggressive implementation of the act, including strong recovery plans. The Endangered Species Act requires federal agencies to conserve endangered and threatened species. Section 9 of the Endangered Species Act prohibits any person from “taking” endangered or threatened animal species. The statutory meaning of “take” is to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct (16 U.S.C., §1532(19)). Under the regulations, the word “harm” means an act that actually kills or injures wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavior patterns, including breeding, feeding, or sheltering (50 CFR, §17.3). Under Section 7 of this act, all federal agencies must ensure that their actions are not likely to jeopardize the continued existence of any endangered or threatened species or adversely modify or destroy critical habitat of such species. The act prescribes a three-step process to ensure compliance. An agency proposing to take an action must inquire of the U.S. Fish and Wildlife Service (FWS) whether any threatened or endangered species “may be present” in the proposed action. If the answer is yes, then the agency must prepare a “biological assessment” to determine whether such species “is likely to be affected” by the action. If the assessment then determines that the species “is likely to be affected,” the agency must formally consult with the FWS, which results in the issuance of a “biological opinion” by the FWS. If the biological opinion concludes that the proposed action would jeopardize the species or destroy or adversely modify critical habitat, then the action may not go forward unless the FWS can suggest an alternative that avoids jeopardization,
destruction, or adverse modification. If the opinion concludes that the action will not violate the act, the FWS may still require measures to minimize its impact (U.S.C.A. §1536(a), (b), and (c)). These requirements apply to all activities carried out, funded, or regulated by a federal agency, including activities in wetlands. A state can propose or support the listing of wetlands-dependent species, thereby bringing the act's protection to bear on its wetlands. States can identify potential species, petition the federal government to include these species, and conduct the necessary research to justify listing. The federal government is also supposed to designate "critical habitat" for a species at the time it is listed. States can promote strong recovery plans for wetlands-dependent species, including acquisition of new wetlands and restrictions on wetlands territory.

**Fish and Wildlife Coordination Act of 1934** (16 U.S.C. 661 et seq.) – The Fish and Wildlife Coordination Act includes provisions for the protection and conservation of game, fur-bearing animals and fish (Chapter 5A, subchapter I). The Act provides a key role for states in evaluating the impacts on fish and wildlife conservation of water resource development projects or Clean Water Act Sections 402 (NPDES) or 404 permits. This can be a useful tool for protecting wetlands that are important to fish and wildlife conservation.

**Lacey Act** (18 U.S.C. 42; 16 U.S.C. 3371-3378). This Act provides authority to the Secretary of the Interior to designate injurious wildlife and ensure the humane treatment of wildlife shipped to the United States. Further, it prohibits the importation, exportation, transportation, sale, or purchase of fish and wildlife taken or possessed in violation of State, Federal, Indian tribal, and foreign laws. The Amendments strengthen and improve the enforcement of Federal wildlife laws and improve Federal assistance to the States and foreign governments in the enforcement of their wildlife laws. Also, the act provides an important tool in the effort to gain control of smuggling and trade in illegally taken fish and wildlife.

**Migratory Bird Treaty Act** The Migratory Bird Treaty Act prohibits the taking, killing, or possessing of migratory birds. The Act implements various treaties and conventions concerning migratory bird protection between the United States and Canada, Mexico, Japan, and the former Soviet Union. Under the Act, it is unlawful, unless permitted by regulations, to pursue, hunt, take, capture or kill; attempt to take, capture or kill; possess, offer to or sell, barter, purchase, deliver or cause to be shipped, exported, imported, transported, carried, or received any migratory bird, part, nest, egg, or product, manufactured or not. The Act is enforced by the Department of the Interior employees. However, states and territories are permitted to make and enforce laws and regulations that are consistent with the Act or that give further protection to migratory birds, nests and eggs, if such laws do not extend to open seasons.

**National Flood Insurance Program** – The National Flood Insurance Program can benefit wetlands by (1) designating "floodways" along rivers and streams (thereby severely restricting any development within the area), and (2) encouraging communities to protect open space and limit floodplain development by offering advantageous flood insurance rates for communities that exceed minimum federal standards. (This program is subject to change due to pending legislation.)

**Rivers and Harbors Act** (33 U.S.C. 401 et seq.) – The Rivers and Harbors Act regulates development and use of the nation's navigable waterways. Section 10 of the Act prohibits unauthorized obstruction or alteration of navigable waters and vests the USACE with authority to regulate discharges of fill and other materials into such waters. Restoration actions that require Section 404 Clean Water Act permits are likely also to require permits under Section 10 of the Rivers and Harbors Act. However, a single permit usually serves for both. Any person, agency, or entity, either public or private, proposing any alteration of, or any construction activity in, on, or over any federally-listed navigable water of the United States must apply for a permit under the Rivers and Harbors Act. Actions covered by the Act include construction of any structure in or over any Federally listed navigable waters of the United States,
excavation from or depositing of material in such waters, or accomplishment of any other work affecting
the course, location, condition, or capacity of such waters.

**Water Resources Development Acts** – The Water Resources Development Acts include numerous
provisions that relate to wetlands protection, primarily in connection with water resources development
projects.

**FEDERAL PROGRAMS AND AGREEMENTS**

**Partners in Flight Program** – The Partners in Flight (PIF) Program strives to address the problems
facing neotropical migratory birds through communication, cooperation, and conservation efforts. The
PIF Bird Conservation Strategy includes elements such as identifying species and habitats most in need of
conservation, and establishing population and habitat conservation objectives. The PIF Program has
developed a series of Bird Conservation Plans based on various physiographic regions of the United
States. The Mid Atlantic Coastal Plain Bird Conservation Plan covers an area from the Atlantic Ocean to
the Fall line where the Piedmont begins, and identifies priority bird populations and habitats for
conservation in this region.

**Chesapeake Bay Program** – The Chesapeake Bay Program is a unique regional partnership that has
been directing and conducting restoration efforts for the Chesapeake Bay since the signing of the historic
1983 *Chesapeake Bay Agreement*. The Chesapeake Bay Program partners include the state of Maryland;
the commonwealths of Pennsylvania and Virginia; the District of Columbia; the Chesapeake Bay
Commission, a tri-state legislative body; the Environmental Protection Agency, representing the Federal
government; and participating advisory groups. In the 1987 Chesapeake Bay Agreement, the Chesapeake
Executive Council agreed to "provide for the restoration and protection of living resources, their habitats,
and ecological relationships." Since this agreement was signed the Chesapeake Bay Program has been
working to restore water quality and key habitats in the Bay. Habitat restoration and protection goals are
outlined in a number of Bay Program directives, including Directive No. 97-1, *Baywide Nutrient
Reduction Progress and Future Directions*; Directive No. 97-3, *Wetlands Protection and Restoration
Restoration*; and Directive No. 93-4, *Fish Passage Goals*. The renewed Bay agreement, *Chesapeake
2000*, contains specific goals for the protection and restoration of vital habitats within watersheds,
habitats, and forests.

**STATE POLICIES**

**Areas of Critical State Concern** – Upon approval by local governments, the Division of State Planning
may designate individual wetlands (or other areas) as Areas of Critical State Concern. These areas will
receive special protection with regards to permitted activities within their boundaries.

**Chesapeake Bay Critical Area Law** – In 1986, the State of Maryland approved the final regulation and
guideline for the establishment of the Critical Area Commission, (Subtitle 8-1801-1816) and criteria for
the Chesapeake Bay Critical Area Law (COMAR 14.15). The purpose of the law is to regulate activities
within 1,000 feet of tidal waters of the Chesapeake Bay with the intent of improving the water quality and
habitat in the Bay. The provision for protecting non-tidal wetlands in the Critical Area was the most
stringent of any federal or state program being implemented in Maryland prior to passage of the State
Nontidal Wetlands Act in 1989. The criteria require that local jurisdictions protect the hydrologic regime
and water quality of wetlands by minimizing alterations to the drainage area, surface/subsurface flow of
water, and overall water quality. The following activities are allowed in nontidal wetlands only when they
are 1) water-dependant or 2) of substantial economic benefit; and are necessary and unavoidable (includes grading, filling, excavating, draining or flooding, and removal of vegetation). The Critical Area Law required that local jurisdictions meet state standards by developing local programs by June 1988. Upon approval of the local program, the Commission may direct the local jurisdiction to enforce the regulations. Nontidal wetlands in the Critical Area Law were initially not regulated under the state Nontidal Wetlands Act. In 1993, the Maryland Nontidal Wetlands Act was amended to regulate nontidal wetlands in the Critical Area. Most local jurisdictions amended their local programs to exclude regulation of nontidal wetlands. However, some counties chose to continue regulating activities in wetlands in the Critical Area.

**Economic Growth, Resource Protection, and Planning Act of 1992** -- Article 66B of the Maryland State Code, Section 3.05 The Act establishes the following visions geared toward placing all County and Municipal Plans within the broader context of State goals for fostering economic development and environmental quality:

- Development is concentrated in suitable areas
- Sensitive Areas are protected
- In rural areas, growth is directed to existing population centers and resource areas are protected
- Stewardship of the Chesapeake Bay and the land is a universal ethic
- Conservation of resources, including a reduction in resource consumption, is practiced
- To assure the achievement of (1) through (5) above, economic growth is encouraged and regulatory mechanisms are streamlined
- Funding mechanisms are addressed to achieve these visions.

Article 66B requires that plans prepared by local jurisdictions contain a series of "plan elements" such as a land use element, a community facilities element and a variety of others. In addition, all comprehensive plans prepared by local jurisdictions will include a sensitive areas element that contains goals, objectives, principles, and standards designed to protect from the adverse effects of development. These sensitive areas include streams and their buffers, 100-year floodplains, habitats of threatened and endangered species, and steep slopes. The sensitive areas element may also include other areas in need of special protection, as determined in the local comprehensive plan.

**Endangered Species of Fish Conservation Act** (Md. Code Ann., Nat. Res. §§4-2A-01 to 09) Under this Act, species that are threatened or endangered under the federal Endangered Species Act shall be deemed threatened or endangered within Maryland. The statute parallels the federal Endangered Species Act in many respects, as is administered by the Maryland Department of Natural Resources.

**Maryland Environmental Policy Act** (Md. Code Ann., Nat. Res. §§1-301 et seq.) The Act requires state agencies to prepare environmental effects reports for each proposed state action that significantly affects the quality of the environment.

**Maryland Forest Conservation Act** – The Forest Conservation Act provides guidelines for the amount of forest land retained or planted after the completion of development projects. These guidelines vary for each development site and are based on land-use categories. These categories include agricultural and resource, medium-density residential, institutional development, high-density residential, mixed use, planned-unit developments, and commercial and industrial use areas. Generally, rural areas with larger forests have higher thresholds to minimize the number of acres cleared. This allows development to occur...
in areas where it is appropriate while protecting forests. Where little or no forest exists, the Act requires that forests be established by planting trees. Under some conditions planting may occur outside of the project site where a forest would provide protection to other natural resources, such as streams or wetlands. The Forest Conservation Act applies to all activities requiring a permit for subdivision, grading, or sediment control that is larger than 40,000 square feet, or slightly less than one acre. Information on the condition of the existing forest and a plan for conserving the most valuable portions of the forest are required. Plans are prepared by qualified resource professionals.

**Maryland Reforestation Law** (Natural Resources Article 5-103). The law requires mitigation for all forest lands cut or cleared in the size of one acre or more. Replacement is required on an acre-for-acre (1:1) basis and must be accomplished on public land. Priority areas for mitigation include onsite or within the same County and watershed as the impact. If the constructing agent cannot locate a mitigation site, they must deposit money into the Reforestation Fund at ten cents per square foot of acre of impact ($4,356/acre). Mitigation must be completed within one year or two growing seasons after the highway construction project has been completed.

**Maryland State Forest Conservation Manual** Contains standards for the protection of trees from construction activity, and requirements and methodology for the delineation of forest and trees within the State. The information gathered in the forest stand delineation is overlaid with the natural resources inventory and becomes the basis for determining priority areas for forest and tree retention.

**Maryland State Nontidal Wetlands Protection Act and Program** (does this require consideration of quality and value of wetlands?) The Nontidal Wetlands Protection Act seeks to protect nontidal wetlands by regulating and restricting all activities that could impact nontidal wetlands or waters of the state. The Act also helps to insure "no net loss" in wetlands, by requiring mitigation or compensation for any wetland losses. The Act also has provisions for the structuring of a smooth and expedient application review process, for dealing with developments in wetlands. Regulated activities include:

- Removal, excavation, or dredging of soil or materials of any kind;
- Changing existing drainage or flood retention characteristics;
- Disturbance of the water level or water table by drainage, impoundment, or other means;
- Filling, dumping, discharging of material, driving piles, or placing obstructions;
- Grading or removal of material that would alter existing topography;
- Destruction or removal of plant life.

Three aspects of Maryland law differ from federal regulation: isolated wetlands, the alteration of vegetation and hydrology, and regulation of a 25-foot buffer. Buffer requirements are expanded to 100 feet for "nontidal wetlands of special State concern". These wetland areas are designated by regulation and mapped as having exceptional ecological or educational value of Statewide significance. The Nontidal Wetlands Protection Act allows for delegation of all or part of the State program to local governments and provides for the development of watershed management plans. Watershed management plans, developed in accordance with the Nontidal Wetlands Protection Act and the Code of Maryland Regulations (COMAR), can be used as the basis for regulatory decisions. The plans are developed in cooperation with local governments and specifically protect wetlands by incorporating them into a jurisdiction's land use decisions. To date, watershed plans have been adopted for the Big Annemessex River watershed in Somerset County and initiated in Baltimore, Calvert and Montgomery Counties.
Maryland State Programmatic General Permit – The Maryland State Programmatic General Permit (MDSPGP) was submitted in 1995, and approved in 1996. The permit, which became effective on July 1, 1996, incorporates both federal and State regulatory standards and authorizes activities in coastal and inland waters and wetlands with minimal adverse environmental impacts. The permit also contains provisions for lessening redundancy in work by increasing cooperation and communication between the federal and state levels.

Nongame and Endangered Species Conservation Act (Md. Code Ann., Nat. Res. §§10-2A-01 to 09) – This Act is supported by regulations (Code of Maryland Regulations 08.03.08) which contain the official State Threatened and Endangered Species list. Secondarily, DNR’s Fisheries Service maintains an official list of game and commercial fish species that are designated as threatened or endangered in Maryland (Code of Maryland Regulations 08.02.12). The Wildlife and Heritage Division tracks the status of over 1100 native plants and animals that are among the rarest in Maryland and most in need of conservation efforts as elements of our State's natural diversity. Of these species, the Maryland Department of Natural Resources officially recognizes 659 species and subspecies as endangered, threatened, in need of conservation, or endangered extirpated. Only 37, or 3% of the total tracked species, are listed by the U.S. Fish and Wildlife Service as nationally endangered or threatened.

Sediment and Erosion Control Law – The Sediment Control Law of 1970 requires that local governments adopt erosion and sediment control ordinances to control runoff from construction sites. State law exempts only agricultural land management practices and the construction of agricultural facilities (except in Calvert County), construction of single-family homes on lots more than 2 acres (provided that earth disturbances are less than 1/2 acre), and minor projects of limited volume and area from the requirement to obtain, implement, and maintain an approved erosion and sediment control plan.

Smart Growth (Executive Order 01.01.1998.04) – The 1997 General Assembly adopted several specific programs, which together form the Smart Growth initiatives. Collectively, these initiatives aim to direct State resources to revitalize older developed areas, preserve some of Maryland's valuable resource and open space lands, and discourage the continuation of sprawling development into rural areas. The Smart Growth legislation allows the State to direct its programs and funding to support locally designated growth areas and protect rural areas. This landmark legislation's passage is a significant accomplishment that will play a major role in Maryland's efforts to better manage land use and growth. The centerpiece of this new legislative package is the "Priority Funding Areas" legislation, which limits most State infrastructure funding and economic development, housing and other program monies to Smart Growth Areas, which local governments designate for growth. The other bills in the 1997 legislative package also support locally identified development areas. They facilitate the reuse of brownfields and provide tax credits to businesses creating jobs in a Priority Funding Area. A new Live Near Your Work pilot program supports this effort by providing cash contributions to workers buying homes in certain older neighborhoods. To increase preservation of undeveloped land, the new Rural Legacy Program provides financial resources for the protection of farm and forest lands and the conservation of these essential rural resources from development.

Soil Conservation Statute (Md. Code. Ann, Agric. §§8-102 et seq.) Provides for the conservation of soil, water, and related resources in order to preserve natural resources.

Stormwater Management – In 1982, legislation was passed to manage stormwater runoff to reduce stream channel erosion, pollution, and flooding to avoid adverse impact on land and water resources. Amended stormwater management regulations (COMAR 26.17.02) accompanied by the 2000 Maryland Stormwater Design Manual, Volumes I & II (COMAR 26.17.02.01-1) have been adopted, with regulatory changes becoming effective on October 2, 2000. Any land developed for residential, commercial, industrial, or institutional use requires an approved plan. The threshold of disturbance is 5,000 square feet. State standards with mandatory local government implementation. Discharges must be treated prior
to discharge in water or wetlands. The Maryland Department of the Environment promotes establishment of wetland plantings in conjunction with wet pond stormwater management facilities. Some indirect protection of wetlands is provided through requirements to maintain streams in pre-development conditions. Treatment is required for a one-year storm event.

LOCAL POLICIES

There are several working policy documents the first three having been approved by the City Council and the latter two acknowledged by the City that are used in the day-to-day review of development plans. These include:

- Bowie’s Development Review Guidelines
- Bowie’s Stormwater Management Ordinance
- Forest Mitigation Sites and Policies
- Patuxent River Policy Plan
- Prince George’s County Landscape Manual

Patuxent River Policy Plan – The Patuxent River is recognized as a vital natural resource in this region that provides vast wildlife habitat for a variety of waterfowl and land animals. It is a unique ecosystem within the Chesapeake Bay that is known as an estuary. It is Maryland’s largest intrastate river (110 miles). Prince George’s County has 67 miles of shoreline. The river’s watershed is the wintering and breeding area for tens of thousands of migratory waterfowl, including Canada geese, whistling swans, and dozens of species of ducks. The Patuxent River Policy Plan is the guidance document used by the Patuxent River Commission/Tributary Strategy Team (PRC/TST). The PRC/TST dates back to 1980 when the Maryland General Assembly established the Patuxent River Watershed Act. The Act is a means by which local governments within the river’s watershed could monitor development activity in relation to the river. Shortly after the Act was approved, the Patuxent River Commission was created. The Commission is comprised of both appointed and elected officials from each of the seven counties within the river’s watershed. These counties include Anne Arundel, Calvert, Charles, Howard, Montgomery, Prince George’s and St. Mary’s. The City’s limits extend to the Patuxent River in several areas. The City is one of two municipalities within the Patuxent’s watershed (the other is the City of Laurel). Both municipalities have staff liaisons/representatives to the PRC/TST.

During the 1980’s the Commission was responsible for preparing and overseeing a Watershed Policy Plan to give direction to State and local government agencies as these agencies carried out programs and made regulatory decisions within the watershed. After a series of public hearings and meetings with State and local government officials and citizens groups, a Patuxent River Policy Plan was completed and approved by the Maryland General Assembly and all seven county governments in 1984.

The Policy Plan includes “ten recommendations for a land management strategy to control nonpoint source (NPS) pollution. NPS pollution originates from multiple sources, carried in runoff across lawns, farm fields, parking lots and roads, and cannot be controlled from one site, unlike point source pollution from industrial or municipal treatment plants. The recommendations are:

- Establish a primary management area to protect environmentally sensitive areas;
- Implement best management practices and vegetative buffers to control stormwater impacts;
![Identify and address major nonpoint source pollution sites;](image1)

- Retrofit existing development;
- Accommodate future development;
- Increase recreation and open space;
- Protect forest cover;
- Preserve agricultural land;
- Manage sand and gravel extraction; and
- Adopt an annual action program.”

In the 1997 update, it was recognized that since the 1984 Policy Plan, “state and local agencies have made significant strides in successfully implementing these ten recommendations and bringing about measurable water quality improvements in the tidal portion of the Patuxent River. By the mid-1990’s, these water quality improvements began to be reflected by increases in submerged aquatic vegetation and juvenile fish. More recent analyses seem to indicate that the bottom dwelling communities are also beginning to show positive responses.” The 1984 Policy Plan included identification of findings that outline how challenges about land use decisions within the watershed can be addressed by the year 2010 and beyond. These include:

- Implement a comprehensive watershed management approach to control all sources of pollution and resource degradation. The Patuxent watershed has an advantage over the other tributary basins due to the established history of interjurisdictional and interagency cooperation of the Patuxent River Commission in achieving common objectives.

- Continue to restore, improve and protect the habitat function of aquatic and terrestrial living resource. Healthy habitats that support fish and wildlife also ensure a variety of other functions: filtering pollutants, controlling stormwater runoff, and providing recreational opportunities.

- Concentrate new development in and around existing developed areas and population centers while protecting rural lands and the associated agricultural economy. Maintaining undeveloped rural areas reduce infrastructure costs and supports economically desirable land uses such as agriculture and forestry.

- Enhance the environmental quality and community design in new and existing communities. Innovative approaches are needed to assure that new and existing communities are attractive places to live.

- Develop a sense of stewardship for the Patuxent River and its watershed through increased public education and participation programs. A well-educated and highly motivated public is necessary for long-term resource protection.

- Provide sufficient funding and staff to support continued programs, policies, and projects to meet the ten recommendations of the Plan. Without funding, it will be impossible
Memorandum of Understanding (MOU) – In June 1979, the City of Bowie and the Maryland-National Capital Park and Planning Commission executed an MOU between the two jurisdictions. The 1979 agreement replaced the September 1968 agreement. The current MOU stipulates the role of the City of Bowie in land development since the City does not have zoning authority. The purpose of the MOU is “to continue the cooperative approach between the parties to planning and zoning in pursuit of the implementation of the Bowie-Collington-Mitchellville and Vicinity Maser Plan and to extend the spirit of that approach to the exercise of responsibilities by the parties in the administration of a park system and recreation program with respect to those matters where the Commission and the City share concern (Page 1).” Page three of the MOU Section II. - Planning A. Planning Administration (2.) refers to “The City of Bowie City Council may make recommendations to the Prince George’s County Planning Board on the following matters:

2. Substantive planning matters within the subregion, including attention to living areas, open space and conservation systems, circulation and transportation systems, activity centers (including the New Town Center), employment areas, public facilities, special treatment areas, staging, and implementing programs, including the Capital Improvement Program, the Community Development Program as well as such other matters as may be deemed appropriate by the Bowie City Council.”

In reference to “open space and conservation systems,” the Guidelines are intended to add a new dimension of awareness and understanding through the establishment of new policy within the Commission, as to the importance of open space and conservation systems for preservation and protection at pre-development. The Commission’s development review process currently lacks such a means, and a progressive program by which to raise expectations and standards toward a common end: inclusion of habitat preservation and protection at pre-development in the Bowie community.
Appendix B: Useful Web Sites


The Fund for Animals: [http://www.fund.org]

The Humane Society of the United States Homepage: [http://www.hsus.org/]


Maryland Department of Natural Resources Homepage: Maryland’s Natural Resources: [http://www.dnr.state.md.us/]

Maryland Department of Natural Resources. Maryland Biological Stream Survey – Data Search: [http://mddnr.chesapeakebay.net/mbss/search.cfm]

Maryland Department of Natural Resources. Endangered Plants in Maryland: [http://www.dnr.state.md.us/wildlife/rtes.html]

Maryland Department of Natural Resources. Maryland’s Wildlife Species: [http://www.dnr.state.md.us/wildlife/mdspecies.html]

Maryland Department of Natural Resources. Maryland Streams: Take a Closer Look: [http://dnrweb.dnr.state.md.us/download/bays/md_streams_wrd.pdf]

Maryland Department of Natural Resources. Maryland Streams: [http://www.dnr.state.md.us/streams/]

Maryland Department of Natural Resources. Invasive Exotic Plants that Threaten Native Species and Natural Habitats in Maryland: [http://www.dnr.state.md.us/wildlife/iep.htm]

Maryland Department of the Environment. Wetlands and Waterways Program: [http://www.mde.state.md.us/wetlands/index.html]

Maryland Native Plant Society. Maryland Native Plant Society Homepage: [http://www.mdflora.org/]


Appendix D: Analysis of Forest Edge

The following statistics about the edges and borders of forest standards within a study area provides useful information related to its inherent value or priority ranking for preservation nomination.

<table>
<thead>
<tr>
<th>Stand #</th>
<th>Area (acres)</th>
<th>Edge (feet)</th>
<th>Miles</th>
<th>Edge to Area Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>23.60</td>
<td>4,241</td>
<td>0.80</td>
<td>180</td>
</tr>
<tr>
<td>2</td>
<td>6.30</td>
<td>2,191</td>
<td>0.42</td>
<td>348</td>
</tr>
<tr>
<td>3</td>
<td>46.66</td>
<td>5,964</td>
<td>1.13</td>
<td>128</td>
</tr>
</tbody>
</table>

The edge to area ratio is expression of the average number of feet in the edge to every acre in the forest stand. For some animal species, the more edge the better. For bird species, nesting at the edge can be wasteful because of parasitism by predators. Birds and mammals seem to "work" the edges eating eggs and nesting.

How far into a forest stand pest and predators penetrate is still being investigated. If the distance is 300-feet as some citations reference, then a stand must be at least 6.5 acres if any portion is to “safe” from such losses. Smaller areas do have more edge per unit area, and these edge zones are excellent foraging areas and are used in many ways other than nesting. The topic of edges and their effect is very complicated.

Forest edges next to fields are good for some wildlife, but bad for others. Similarly, edges can have drying winds that reduce the quality of forest growth, alien plant intrusion, and other conditions at the edges. The phenomena at the forest edge are very complex. Forest structure in Prince George’s County is highly fragmented and linear, hence, any circular or block stands with maximized area versus edge is inherently more valuable for preservation through ecological time.

Excerpted from City of Gaithersburg, 2001.
Appendix E: Native Plants for Central Maryland Landscapes (Piedmont And Inner Coastal Plain)

Compiled by Louisa Thompson
Maryland Native Plant Society
May 1999

This is not an exhaustive list, but contains most or all of the common, reasonably ornamental trees, shrubs, and flowering plants, plus some uncommon but especially beautiful ones, and a few that have special wildlife value. (In general, all native plants have some value to wildlife.)

In each section, the common species are listed first, in alphabetical order by scientific name, followed by the uncommon ones.

* = Highly ornamental
** = Special importance for wildlife

RIVERBANK, WETLAND, AND BOTTOMLAND PLANTS

Tall Trees

Red Maple *, *Acer rubrum* – orange to red fall foliage

Silver Maple, *Acer saccharinum* (grow only on riverbanks and near springs)

River Birch *, *Betula nigra* (coastal plain and major rivers in the piedmont) – peeling, pinkish bark is interesting and attractive, especially in winter

Bitternut Hickory, *Carya cordiformis*

White Ash, *Fraxinus americana*

Sycamore *, *Platanus occidentalis* – peeling bark, snow-white crown stands out in winter

Swamp White Oak, *Quercus bicolor* (mainly on the coastal plain)

Pin Oak, *Quercus palustris* – pyramidal shape, lower branches droop to the ground

American Elm, *Ulmus americana* (still common in natural sites despite Dutch elm disease)

Medium Trees

Box Elder (Maple), *Acer negundo*
Persimmon, *Diospyros virginiana*

Green Ash, *Fraxinus pennsylvanica var. integerrima*

Sweetgum *, *Liquidambar styraciflua* (coastal plain only) – star shaped leaves, bright fall foliage (yellow, orange, or red)

Black or Sour Gum (Tupelo) *, *Nyssa sylvatica* – bright red fall foliage

Willow Oak, *Quercus phellos* (mainly on the coastal plain) – leaves are willowlike

Black Willow, *Salix nigra*

Slippery Elm, *Ulmus rubra*

Small Trees

Pawpaw, *Asimina triloba*

Ironwood/Hornbeam *, *Carpinus caroliniana* – gracefully twisted trunk (very slow growing)

Serviceberry *, *Amelanchier canadensis* – lovely white flowers in early spring

Hackberry ***, *Celtis occidentalis* – larval host for 7 species of *Lepidoptera*; sole larval host for the rare Hackberry Butterfly

Fringetree *, *Chionanthus virginicus* – spectacular large clusters of aromatic white flowers in late spring

Sweetbay Magnolia *, *Magnolia virginiana* (coastal plain only) – evergreen, white flowers in June

**Shrubs**

Smooth Alder, *Alnus serrulata*

Buttonbush, *Cephalanthus occidentalis*

Sweet Pepperbush ***, *Clethra alnifolia* (coastal plain, more common on Eastern shore) – showy white flower spikes in summer, very attractive to butterflies

Hazelnut, *Corylus americana*

Silky Dogwood, *Cornus amomum*

Witch Hazel, *Hamamelis virginiana*

Inkberry *, *Ilex glabra* – evergreen holly, grows to 6-8'

Winterberry *, *Ilex verticillata* – deciduous holly, bright red berries in winter, grows to 6-10'

American Elderberry, *Sambucus canadensis* – huge cymes of white flowers in June

Southern Arrowwood, *Viburnum dentatum* – coastal plain only
Swamp Azalea *, *Rhododendron viscosum* – beautiful, aromatic white flowers in June

Swamp Rose *, *Rosa palustris* – single pink flowers

**Emergent Herbaceous Plants (stems emerge from water, roots are submerged)**

Sweet Flag, *Acorus calamus*

Hardy Hibiscus *, *Hibiscus moscheutos* – huge flowers

Blue Flag *, *Iris versicolor* – large blue flowers

Yellow Pond Lily, *Nuphar advena*

Fragrant Water Lily *, *Nymphaea odorata* – white flowers; our only native water lily

Lotus Lily *, *Nelumbo lutea* – small pale yellow flowers; interesting seedpods

Pickerelweed, *Pontederia cordata*

Arrowhead, *Sagittaria latifolia*

Lizard’s Tail *, *Saururus cernuus* – tail-like white flower spikes

**Herbaceous Plants for Wet Soil (all are ornamental)**

Green Dragon, *Arisaema dracontium* (uncommon)

Wild Ginger, *Asarum canadense* – a deciduous ground cover

Swamp Milkweed **, *Asclepius incarnata* – pink flowers, larval host for monarch butterfly

New England Aster, *Aster novae-angliae* – purple flowers bloom 2-3 months in fall

Trout Lily (Dogtooth Violet), *Erythronium americanum* – small yellow lily-shaped flowers in early spring

Boneset, *Eupatorium perfoliatum* – a shorter, white-flowered relative of Joe Pye weed

Joe Pye Weed **, *Eupatorium fistulosum, E. maculatum, E. purpureum, E. dubium* – extraordinary huge clusters of mauve flowers, up to 8’ tall, very attractive to butterflies

Cardinal Flower **, *Lobelia cardinalis* – bright red flowers, attractive to hummingbirds

Virginia Bluebells, *Mertensia virginica* – striking blue flowers in spring

Wild Blue Phlox, *Phlox divaricata* – pale blue or pink flowers in spring

Green Coneflower, *Rudbeckia laciniata* – yellow flowers with green cones, very tall

New York Ironweed, *Vernonia noveboracensis* – magenta to purple flowers in large clusters

Yellow Violet, *Viola pensylvanica*
Golden Alexanders, *Zizia aptera* (uncommon) – yellow flowers in umbels (like parsley or Queen Anne’s lace)

### PLANTS FOR RICH, MOIST WOODS

#### Tall Trees

*Oaks* **are the dominant genus. If you have room for a tall tree, plant an oak. If you have plenty of space, plant in a ratio of several oaks to each other tall tree. In addition to the obvious food value of the acorns, oaks provide food for approximately one thousand species of insects on the East Coast. (Insects, in turn, are food for birds and other creatures.)

White Oak *, *Quercus alba* – shaggy bark on the middle portion of the trunk makes this tree especially ornamental in winter; excellent shade tree; leaves have rounded lobes. White oak acorns are sweet and sprout quickly so are eaten in fall

Southern Red Oak, *Quercus falcata* – (more common on coastal plain) leaves have few lobes (pointed); bark appears striped; red and black oak acorns have a lot of tannin and are buried by squirrels to mellow before eating

Northern Red Oak, *Quercus rubra* – leaves have pointed lobes; bark appears striped

Black Oak, *Quercus velutina* – very large leaves with pointed lobes

Red Maple *, *Acer rubrum* – a very attractive tree with red/orange fall foliage, but now rapidly expanding out of its original swamp habitat

Mockernut Hickory *, *Carya tomentosa* – very large terminal leaflet, aromatic foliage turns gold in late fall

American Beech * **, *Fagus grandifolia* – pale gray bark; young trees keep their leaves through the winter; beechnuts are high-quality food for mammals and large birds

White Ash, *Fraxinus americana*

Tulip Poplar, *Liriodendron tulipifera* – a "pioneer" tree, it needs full sun and shades out (and drops) its own lower branches. Don’t allow it to grow close to a house. There is no need to plant tulip poplar – this species is doing just fine in contemporary Maryland.

#### Medium Trees

Persimmon *, *Diospyros virginiana* – checkered bark and fruits hanging on tree provide winter interest

American Holly *, *Ilex opaca* (coastal plain only) – evergreen, handsome pyramidal shape when grown in the open, but found as an understory tree in the wild

Black or Sour Gum (Tupelo) *, *Nyssa sylvatica* – bright red fall foliage

Black Cherry * **, *Prunus serotina* – flowers are quietly ornamental, now showy; fruits are staple food for many birds; leaves are larval host for spring azure, Eastern tiger swallowtail, and red-spotted purple butterfly and many other butterfly and moth species. Black cherry is a pioneer tree; if you have anything for birds to perch on, they will plant it for you. In fact, you may want to weed out its seedlings.
Sassafras **, *Sassafras albidum* – mitten-shaped leaves, brilliant orange fall foliage; larval host for Spicebush Swallowtail butterfly

Red Mulberry **, *Morus rubra*, is now very hard to find because of competition from the non-native white mulberry, which may also be the source of the root disease that kills off many of the natives. The native has large leaves with few or no lobes; the exotic has two or more lobes on most of its leaves, and usually has dark purple fruit. To preserve this native, weed out the other.

**Small Trees**

Dogwood *, *Cornus florida*

Redbud *, *Cercis canadensis* – deep pink, pea-like flowers all along stem, heart-shaped leaves

Black Haw *, *Viburnum prunifolium* – creamy white, flat flower clusters in May; extremely scaly light brown bark provides winter interest

Serviceberry *, *Amelanchier canadensis* (uncommon) – lovely white flowers in early spring

Hackberry **, *Celtis occidentalis* (uncommon) – larval host for 7 species of *Lepidoptera*; sole larval host for the rare Hackberry Butterfly

Fringetree *, *Chionanthus virginicus* (uncommon) – spectacular large clusters of aromatic white flowers in late spring

**Shrubs**

Spicebush ***, *Lindera benzoin* – most common shrub in the piedmont – tiny yellow flowers all along stem in late March, red berries in winter; larval host for Spicebush Swallowtail butterfly

Red Chokeberry *, *Aronia arbutifolia* (uncommon in central Maryland) – white flowers in spring, red berries often last all winter

Strawberry Bush, *Euonymus americanus* (uncommon)

Virginia Sweetspire ***, *Itea virginica* (coastal plain only) – fragrant white flower spires; height 3-5'; good butterfly nectar plant

Smooth Arrowwood, *Viburnum recognitum*

**Herbaceous Plants for Shade**

**Ferns**

Maidenhair Fern *, *Adiantum pedatum* (rare on coastal plain) – leaves attached to an unusual semicircular stem

Sensitive Fern, *Onoclea sensibilis* – leaflets rather amorphous in shape

Common Polypody, *Polypodium virginianum*

Christmas Fern *, *Polystichum acrostichoides* is by far the most common – evergreen
New York Fern, *Thelypteris noveboracensis* – narrows toward base as well as toward tip

**Evergreen Groundcovers**

Partridgeberry, *Mitchella repens* – tiny leaves, covers ground slowly, thinly

Golden Ragwort *, *Senecio aureus* – handsome, scalloped, kidney-shaped leaves; golden dandelion-like flowers on tall stems in spring; covers densely, spreads quickly – may be too aggressive in sun

**Spring Wildflowers** *(Those listed are especially beautiful or valuable for wildlife.)*

Jack in the Pulpit, *Arisaema triphyllum*

Spring Beauty **, *Claytonia virginiana* – corms provide winter food for small mammals

Cut-leaved and Slender Toothwort, *Dentaria laciniata, D. heterophylla*

Dutchman’s Breeches **, *Dicentra cucullaria* and Squirrel Corn, *Dicentra canadensis* – corms provide winter food for small mammals

Wild Geranium, *Geranium maculatum*

Round- and Sharp-lobed Hepatica, *Hepatica americana, H. acutiloba*

Virginia Waterleaf, *Hydrophyllum virginianum*

Showy Orchis, *Orchis spectabilis*

Smooth Sweet Cicely **, *Osmorhiza longistylis* carrot family member, presumed to be a native larval host of Eastern black swallowtail butterfly; flowers small, not showy

Mayapple, *Podophyllum peltatum*

Solomon’s Seal, *Polygonatum biflorum*

Bloodroot, *Sanguinaria canadensis*

False Solomon’s Seal, *Smilacina racemosa*

Star Chickweed, *Stellaria pubera*

Perfoliate Bellwort, *Uvularia perfoliata*

Common Blue Violet, *Viola papilionacea*, and other blue and white violets

**Summer Wildflowers**

Black Cohosh **, Black Snakeroot, Bugbane, *Cimicifuga racemosa* – larval host for the rare Appalachian Blue butterfly; blooms in June

**Fall Wildflowers** *(these will be found at the edge of the woods, along trails, and in clearings)*

Common Blue Wood Aster, *Aster cordifolius* – blue flowers, often with pink centers
Upland Boneset*, *Eupatorium sessifolium* (needs neutral soil) – a white-flowered Joe Pye weed

Blue-stem Goldenrod, *Solidago caesia* – one of the prettier goldenrods, with a long string of small flower clusters in the leaf axils

**PLANTS FOR STEEP, ROCKY SLOPES**

**Tall Trees**

Chestnut Oak **, *Quercus prinus*, is the dominant tree, having replaced the American Chestnut. Other oaks may grow where soil has collected.

Pignut Hickory **, *Carya glabra* (in mature forests)

American Beech **, *Fagus grandifolia* (where humus has built up)

**Medium Trees**

Sassafras **, *Sassafras albidum* – larval host for spicbush swallowtail butterfly

**Small Trees**

American Chestnut, *Castanea dentata* – chestnuts still re-sprout from the roots, but rarely grow more than 20' tall before they are killed by the blight. However, RESEARCH IS UNDER WAY TO INFECT THE BLIGHT WITH A HYPOVIRULENT STRAIN THAT ALLOWS THE TREES TO SURVIVE. If this becomes commercially available, please treat any surviving chestnuts on your property.

Redbud **, *Cercis canadensis* - can grow on steep slopes as long as the soil is rich (e.g., has some limestone in it) and well-watered; the nectar source for Henry’s elfin butterfly, larval host for several butterflies and moths; Rhabdopterus beetles sometimes eat away the leaf edges in a dramatically scalloped pattern.

**Shrubs**

Huckleberries, *Gaylussacia species* (can tolerate acid soil but grow wherever there is little competition, e.g., on these eroded slopes)

Witch Hazel **, *Hamamelis virginiana* (next to streams, including on steep slopes) – sole nectar source for the night-flying moth that pollinates it in fall

Mountain Laurel *, *Kalmia latifolia* (probably very important for erosion control, as it forms large colonies on the steepest slopes) – PLEASE BUY THE SPECIES, NOT CULTIVARS, which will seriously skew the gene pool.

Pinxterbloom, Wild Pink Azalea *, *Rhododendron periclymenoides* (formerly *R. nudiflorum*) – deciduous, but one of the most beautiful shrubs of all

Blueberries, *Vaccinium species* (most common is Lowbush Blueberry, *V. vacillans*; Highbush Blueberry, *V. corymbosum*, from which our cultivated blueberries are bred, is common; Maine Lowbush Blueberry, *V. angustifolium*, is more common in the mountains but is sometimes found here)

Maple-Leaf Viburnum, *Viburnum acerifolium*
Groundcovers

Stripped or Spotted Wintergreen, *Chimaphila maculata* – evergreen but sparse, technically a "sub-shrub"

Trailing Arbutus *, *Epigaea repens* – also a sub-shrub, disappearing because people dig it up

**Herbaceous Plants (all are ornamental)**

Maidenhair Fern, *Adiantum pedatum* – fronds grow from outer side of semicircular stem

Rue Anemone, *Anemonella thalictroides* – white flowers in spring

Alumroot, *Heuchera americana* – evergreen foliage, sprays of greenish or reddish flowers in spring

Christmas Fern, *Polystichum acrostichoides* – evergreen fern, needs moisture

Wild Stoncrop, *Sedum ternatum* – white flowers in spring, evergreen fleshy foliage

Wild Pink, *Silene caroliniana* – pink flowers in spring

Star Chickweed, *Stellaria pubera* – white flowers in spring, exceptionally showy

**PLANTS FOR DRY RIDGETOPS AND SUNNY SITES**

**Tall Trees**

Scarlet Oak *, *Quercus coccinea* – the brightest red fall foliage of our indigenous oaks

Tulip Puplars and Red Maples without having to plant them. They are pioneer trees, brought by the wind, and now overrepresented because so much land has been cleared.

**Medium Trees**

Black Cherry *, *Prunus serotina* (a pioneer tree on cleared sites, also grows in shade) – flowers are quietly ornamental, not showy; fruits are staple food for many birds; leaves are larval host for spring azure, Eastern tiger swallowtail, and red-spotted purple butterfly and other butterfly and moth species.

Post Oak, *Quercus stellata* (on very poor, dry soils)

Red Mulberry **, *Morus rubra*, is now very hard to find because of competition from the non-native White Mulberry, which may also be the source of the root disease that kills off many of the natives. The native has large leaves with few or no lobes; the exotic has smaller leaves with two or more lobes on most of them, and usually has dark purple fruit. To preserve this native, weed out the other.

**Small Trees**

Redbud *, *Cercis canadensis* (can be grown in a lawn) – deep-pink pea-like flowers all along stem, heart-shaped leaves

Dogwood *, *Cornus florida* (although in the wild it grows in partial shade, it also thrives in sun and is actually more likely to escape or survive the anthracnose disease because of lower humidity)
Black Haw *, *Viburnum prunifolium* – creamy white, flat flower clusters in may; extremely scaly light brown bark provides winter interest

**Shrubs**

Pasture Rose *, *Rosa carolina and R. virginiana* – single pink flowers, usually solitary, sometimes in small clusters

**Groundcovers**

Moss Phlox *, *Phlox subulata* (thrives in minimal soil with excellent drainage) – yes, this is the one you buy in garden centers. In the wild, the flowers are usually white or very faintly colored.

For more information about native plants contact the M-NCPPC Environmental Planning section to obtain their Native Plants of Prince George’s County, 1997-1998.
Appendix F: Exotic Invasive Plants Lists

(Maryland Native Plant Society and Maryland Department of Natural Resources)

Control of Invasive Non-Native Plants: A Guide for Gardeners and Homeowners in the Mid-Atlantic Region

In the next century, the greatest threat to our native plants and the wildlife species that depend upon them may well come from other plants. Thousands of plant species have been brought to North America in the past three centuries. Most are well-behaved, rarely penetrating natural areas. Several hundred, however, have no natural controls here, and are able to out-compete and gradually displace our native plants, even deep in forests and undisturbed ecosystems. Variously called alien, introduced, or exotic, these non-natives are highly invasive.

Some of these plants were brought here intentionally, for their medicinal, ornamental, or food value. Others hid in soil, crop seed, or ballast. Most came from other continents, but a few have spread from other parts of the US. In each region, different species are better adapted and therefore pose a greater threat. This guide is for the piedmont and inner coastal plain regions of Maryland, northern Virginia, the District of Columbia, Delaware, and southeastern Pennsylvania.

Many of the plants in this guide are popular, even beloved, landscape plants, but it is now clear that they pose a threat to our environment. If you cannot effectively contain these plants within your property, by clipping seeds, fruits, or runners, PLEASE CONSIDER REMOVING THEM. It is a difficult decision, but each of us has a responsibility not to damage the local ecosystem that cleans our air and water, stabilizes the soil, buffers floods, and provides food and shelter for innumerable species besides our own. EACH OF THE NON-NATIVE PLANTS IN THIS GUIDE SIGNIFICANTLY REDUCES THE NUMBER OF PLANT AND ANIMAL SPECIES ON ANY SITE IT INVADES.

When evaluating exotic plants for your garden, ask these questions:

- **Does it naturalize or self-sow?** How far does it spread? Are the seeds spread by wind or water? If so, don't plant it unless you are prepared to remove all seeds, every year.

- **Is it a wildlife food plant?** If the answer is yes, wildlife will spread it to woods and wetlands. In other words, these are plants to avoid. Plant natives instead.

- **Is it a rapidly spreading ground cover?** If so, don't plant it adjacent to open space.

- **Is it low maintenance - hardy, tolerant of drought or flooding, shade-tolerant, pest-free?** If so, it has no natural controls here. Do not plant it if it can spread out of the garden.

- **Does it have the ability to kill or suppress growth of surrounding plants by shading them out, chemically poisoning them, or out-competing them for food and water?** (Norway maple, a common landscape tree, is a prime example.) If so, you don't want it in your garden anyway!
This guide lists garden plants and weeds that are already causing significant changes to natural areas in the Mid-Atlantic. **Measures for controlling each species are indicated by number, e.g., (3), in the text with a full explanation at the end of this article.** Following each section suggested alternative plants are given. These alternatives are native plants, well adapted and needing little care, attractive to birds and butterflies, and an important part of the food web for our indigenous species.

**MEDIUM-TO-TALL INVASIVE, NON-NATIVE TREES**

NORWAY MAPLE (*Acer platanoides*) has large leaves similar to sugar maple. Break a leaf or stalk - a drop of white sap will show if it is Norway maple. Fall foliage is yellow. (Exception: cultivars such as 'Crimson King,' which have red leaves in spring or summer, may have red autumn leaves.) The leaves turn color late, usually in November. This tree suppresses growth of grass, garden plants, and forest understory beneath it, at least as far as the drip-line. Its wind-borne seeds can germinate and grow in deep shade. The presence of young Norway maples in our woodlands is increasing. Our mixed deciduous forests will give way to pure stands of Norway maple in the next century unless we control its spread now.

**Control:** (1); (7), (8), (9), or (10); (11) in mid-October to early November, before the leaves turn color.

TREE OF HEAVEN (*Ailanthus altissima*), known from *A Tree Grows in Brooklyn*, is incredibly tough and can grow in the poorest conditions. It produces huge quantities of wind-borne seeds, grows rapidly, and secretes a toxin that kills other plants. Its long compound leaves, with 11-25 lance-shaped leaflets, smell like peanut butter or burnt coffee when crushed. Once established, this tree cannot be removed by mechanical means alone.

**Control:** (1) - seedlings only. Herbicide - use Garlon 3a (9) with no more than a 1" gap between cuts, or (10); plus (11) on re-growth. Or paint bottom 12" of bark with Garlon 4 (in February or March to protect surrounding plants). USE MAXIMUM STRENGTH SPECIFIED ON LABEL for all herbicide applications on Ailanthus. Glyphosate is not effective against Ailanthus.

SAWTOOTH OAK (*Quercus acutissima*) has oval leaves with sawtooth edges and huge acorns. Often recommended for wildlife, this Asian tree has spread into our region from forestry plantings, displacing indigenous forest trees.

**Control:** (1); (7), (8), (9), or (10); (11) on small trees and re-growth.

**RECOMMENDED NATIVE SHADE TREES:** White oak (*Quercus alba*), northern or southern red oak (*Q. rubra, Q. falcata*), and mockernut hickory (*Carya tomentosa*) are widely adapted shade trees. Other oaks and hickories are suited to very dry, wet, or steep sites. Tupelo, also called black or sour gum (*Nyssa sylvatica*) has brilliant red fall foliage and small fruits eaten by birds.

**SMALL TO MEDIUM INVASIVE, NON-NATIVE TREES**

**EMPERESS TREE, PRINCESS TREE** (*Paulownia tomentosa*): Large panicles of lavender flowers, like upside-down wisteria, identify this tree in spring; the large brown seed capsules remain all year. The leaves are very large and heart-shaped. Winged seeds allow it to spread deep into undeveloped areas, though it needs some sunlight and is most common along trails and waterways. It grows very rapidly and sprouts readily from roots and cut stumps.

**Control:** (1) - seedlings and small saplings only; (7), (8), (9), or (10) - use 50% solution, anytime the ground is not frozen; (11) on small trees and re-growth.

**MIMOSA** (*Albizia julibrissin*) has rather garish pink flowers in summer and feathery compound leaves. It spreads slowly by wind-borne seedpods, or in water or fill-dirt. It re-sprouts when cut or burned. Needs
some sunlight.  
 Control: (1); (7), (8), (9), or (10).

**SIBERIAN ELM** (*Ulmus pumila*), a fast-growing medium-height tree also sold for hedges, displaces our native elms, which are already under pressure from Dutch elm disease. It forms dense thickets under which nothing else grows. Its small oval leaves have a single tooth.  
 Control: (1); (7), (8), (9), or (10).

**RUSSIAN OLIVE, AUTUMN OLIVE** (*Eleagnus angustifolia, E. umbellata*): Formerly recommended for erosion control and wildlife value, these have proved highly invasive and diminish the overall quality of wildlife habitat.  
 Control: (1) - up to 4” diameter trunks; (7) or (10) or bury stump. Do not mow or burn.

**FLOWERING FRUIT TREES:** These displace our native fruit trees.  
 - CHERRY, edible and ornamental (*Prunus avium, P. cerasus*, Japanese species and hybrids).  
 - PEAR, BRADFORD and other ORNAMENTAL PEARS (*Pyrus calleryana*) - self-sterile but can pollinate other cultivars, now spreading rapidly from street plantings.  
 - WHITE MULBERRY (*Morus alba*) - the fruits may be white, purple, or black; leaves are lobed. Our delicious native red mulberry, which has very large, usually unlobed leaves, is dying out from a root disease carried by white mulberry.  
 Control: of flowering/fruit trees: (1; (7) or (10); (8) if very large; or if grown for harvest, protect fruit from birds with netting or hardware cloth.

**RECOMMENDED SMALL NATIVE ORNAMENTAL TREES:** Serviceberry (*Amelanchier spp.*), fringetree (*Chionanthus virginicus*), black haw (*Viburnum prunifolium*), and red chokeberry (*Aronia arbutifolia*) are beautiful flowering trees that also produce fruit for birds. Plant red mulberry (*Morus rubra*) if there are no white mulberries nearby that could transmit disease to them.

**RECOMMENDED NATIVE TREES FOR HEDGES:** American hazelnut (*Corylus americana*) makes an excellent hedge. In damp soils, slippery elm (*Ulmus rubra*) is a good substitute for Siberian elm. On sunny, dry sites, staghorn sumac or shining sumac (*Rhus typhina, R. copallina*) form thickets; keep suckers in check by mowing.

**INVASIVE, NON-NATIVE SHRUBS**

**MULTIFLORA ROSE** (*Rosa multiflora*), formerly recommended for erosion control, hedges, and wildlife habitat, becomes a huge shrub that chokes out all other vegetation and is too dense for many species of birds to nest in, though a few favor it. In shade, it grows up trees like a vine. It is covered with white flowers in June. (Our native roses have fewer flowers, mostly pink.) Distinguish multiflora by its size, and by the presence of very hard, curved thorns, and a fringed edge to the leaf stalk.  
 Control: (1) - pull seedlings, dig out larger plants at least 6” from the crown and 6” down; (4) on extensive infestations; (10) or (11). It may remain green in winter, so herbicide may be applied when other plants are dormant. For foliar application, mix Rodeo with extra sticker-spreader, or use Roundup Sure Shot Foam on small plants.

**BUSH HONEYSUCKLES** (*Lonicera spp.*), including Belle, Amur, Morrow's, and Tatarian honeysuckle. (In our region, assume that any honeysuckle is exotic unless it is a scarlet-flowered vine). Bush honeysuckles create denser shade than native shrubs, reducing plant diversity and eliminating nest sites for many forest interior species.
**Other Ornamental Shrubs**

**JAPANESE SPRAEA** (*Spiraea japonica*). *Control:* (2); (3), (7), (10), or (11).

**PRIVET** (all *Ligustrum* species). *Control:* (1); (7) or (10); or trim off all flowers. Do not cut back or mow.

**BURNING BUSH, WINGED EUONYMUS, WINGED WAHOO** (*Euonymus alatus*), identified by wide, corky wings on the branches. [There is another species called burning bush, *E. atropurpureus*, which is indigenous to the Appalachians, and a piedmont euonymus called strawberry bush (*E. americanus*).] *Control:* (1); (7) or (10); or trim off all flowers.

**JAPANESE BARBERRY** (*Berberis thunbergii*), red and green varieties. *Control:* (1); (7) or (10); or trim off all flowers.

**RECOMMENDED NATIVE SHRUBS:** Spicebush (*Lindera benzoin*), which is covered with tiny yellow flowers in March, is our most common native shrub. It needs rich soil, as does strawberry bush (*Euonymus americanus*). Maple-leaf viburnum (*Viburnum acerifolium*) is suited to dry shade and thinner soil, while the arrowwoods (*Viburnum dentatum, V. recognitum, V. nudum*) grow in moist soil. Wild hydrangea (*Hydrangea arborescens*), parent of some cultivated varieties, is a somewhat vining shrub. Highbush blueberry (*Vaccinium corymbosum*, the parent of cultivated blueberries) and lowbush blueberry (*V. vacillans*) need very acidic soil. They tolerate shade but fruit best in sun. Both turn red in fall.

**INVASIVE, NON-NATIVE VINES**

All of these vines shade out the shrubs and young trees of the forest understory, eventually killing them, and changing the open structure of the forest into a dense tangle. DO NOT PLANT NEXT TO OPEN SPACE.

**KUDZU** (*Pueraria lobata*), the vine that smothered the South, is now spreading through the Northeast and Midwest. It has large lobed leaves in groups of three, thick stems, flowers that resemble wisteria, and hairy, bean-like seedpods in fall. It grows extremely rapidly both above and below ground, and can pull down trees. *Control:* Small patches may be eliminated by repeated weeding (1), mowing (2), or grazing; established infestations can only be controlled with herbicide (10) or (11) - expect re-growth, but wait a full year and re-treat in the third year. Herbicide is most effective in early fall. Controlled burning (4) of the dead plants the following spring allows native vegetation to return.

**JAPANESE HONEYSUCKLE** (*Lonicera japonica*), including Hall's honeysuckle, has gold-and-white flowers with a heavenly scent and sweet nectar in June. This is probably the familiar honeysuckle of your childhood. It is a rampant grower that spirals around trees, often strangling them. *Control:* (1); (3); (10); (11) in fall or early spring when native vegetation is dormant. Plan to re-treat repeatedly.

**WISTERIA, CHINESE AND JAPANESE** (*Wisteria sinensis, W. floribunda*) both become heavy, woody vines that can pull down a large tree. *Control:* (1); cut back and deadhead ornamental plants (2); (10).
ORIENTAL BITTERSWEET (Celastrus orbiculatus) has almost completely displaced American bittersweet (C. scandens). The Asian plant has its flowers and bright orange seed capsules in clusters all along the stem, while the native species bears them only at the branch tips. 

Control: (1); keep ornamental plants cut back, remove all fruits as soon as they open, and bag or burn fruits; to eradicate use Garlon 3a (10).

PORCELAIN BERRY (Ampelopsis brevipedunculata) has small, hard fruits in a loose, flat cluster that turn from white to yellow, lilac, green, and finally a beautiful turquoise blue. 

Control: (1) before fruits appear; keep ornamental plants cut back, and bag or burn fruits before they ripen; to eradicate use Garlon 3a (10).

ENGLISH IVY (Hedera helix) grows up trees and can eventually pull them down. It spreads along the ground and occasionally by fruits. 

Control: Clip off flowers or fruits if any are seen (2), and (1) pull any seedlings. To eradicate ivy climbing trees, cut stems as high above ground as you can reach, then pull down and paint lower portion of stems and foliage with Garlon 3a (10), taking care not to wet the tree bark. Ground cover: pull up as much as you can, dig out the roots as well as you can, and repeat until it no longer re-sprouts; or treat re-growth with Garlon 3a.

WINTERCREEPER (Euonymus fortunei). Control: Same as for English Ivy, but Garlon is not effective; glyphosate mixed with extra sticker-spreader may be.

VINCA, PERIWINKLE (Vinca minor). Control: With persistence, you can dig out vinca (1); plan to remove re-growth. If digging is not feasible, cut to the ground and treat re-growth with glyphosate (11).

RECOMMENDED NATIVE ORNAMENTAL VINES: American bittersweet (Celastrus scandens), which bears flowers and seed capsules only at the branch tips, has been almost completely displaced by the Asian species. To preserve it, give it preference, except where its exotic counterpart is present, because the two hybridize. Trumpet honeysuckle (Lonicera sempervirens), a semi-evergreen twining shrub with tubular red flowers attractive to hummingbirds, is uncommon but indigenous to the piedmont. Native wisteria (Wisteria frutescens), much less aggressive than the introduced ones, can be grown from Maryland south. Trumpet vine (Campsis radicans) has dramatic flowers attractive to hummingbirds, and Virginia creeper (Parthenocissus quinquefolia) has spectacular red fall foliage, but be aware that both are aggressive growers. Native grapes (Vitis spp.) provide an enormous amount of food for birds but are aggressive and not ornamental. For non-vining ground covers, see below.

INVASIVE NON-VINING GROUND COVERS

CROWN VETCH (Coronilla varia) has striking pink flowers. Its bare woody stems are unattractive in winter. Often planted along highways, its seeds spread invasively.

Control: (1); (10) or (11).

CREEPING BUGLEWEED (Ajuga reptans) MINTS, including SPEARMINT (Mentha spicata), GROUND IVY, GILL-OVER-THE-GROUND, CREEPING CHARLIE (Glechoma hederacea), HENBIT (Lamium amplexicaule), and PURPLE DEAD NETTLE (L. purpureum), spread by wind-borne seed as well as by runners. They grow in sun and shade and are common lawn weeds that have spread to woods and wetlands. Recognize mints by square stems and a minty smell when crushed.

PLANT CULINARY AND ORNAMENTAL MINTS IN CONTAINERS; PREVENT FROM SPREADING OUT DRAINAGE HOLES OR OVER THE TOP.

Control: (1) (difficult); (2); (6); (11).
INDIAN STRAWBERRY (*Duchesnea indica*). From India, this shade-tolerant ground cover spreads by fruit and runners. 

*Control:* (1), taking care to remove each crown; (6).

**RECOMMENDED NATIVE GROUND COVERS:** Evergreen: Golden ragwort (*Senecio aureus*) and green-and-gold (*Chrysogonum virginianum*) have showy yellow flowers in spring and grow in moist shade. Wild stonecrop (*Sedum ternatum*) has lacy white flowers; it grows in thin, rocky soil in light shade. Moss phlox (*Phlox subulata*), the familiar landscape plant, has a looser form in the wild, and usually has white flowers; it tolerates very poor soil but needs good drainage. Semi-evergreen: Allegheny spurge (*Pachysandra procumbens*) is indigenous to the mountains but will grow here. It looks much like its Japanese cousin. Deciduous: Wild ginger (*Asarum canadense*) has kidney-shaped leaves that seem to sparkle in spring. Not a culinary plant, its roots do have a gingery scent. It needs moist shade.

**RUNNING BAMBOOS** (many species and genera; *Phyllostachys*, *Bambusa*, and *Pseudosasa* are the most destructive). Many bamboos send runners great distances, under pavement and edging. Once established, they form impenetrable thickets that are almost impossible to eradicate. PLANT BAMBOOS ONLY IN CONTAINERS, NEVER IN OPEN SOIL. PREVENT FROM SPREADING OUT DRAINAGE HOLES.

*Control:* (1) - an enormous job; (10) or (11).

**RECOMMENDED ALTERNATIVES TO BAMBOO:** Giant cane (*Arundinaria gigantea*), a well-behaved native bamboo, is indigenous to damp woods and swamps on the coastal plain. Elsewhere, use native grasses (see below) or shrubs (see above).

**INVASIVE WETLAND PLANTS**

A number of ornamental plants once recommended for water gardens or moist garden soil have spread to our riverbanks, floodplains, and wetlands. They are extremely difficult to eradicate once established - up to 10 years of repeated treatment may be needed to remove purple loosestrife or *Phragmites*. These plants propagate by seed and by fleshy root parts that break off easily. Both are spread by water, feet (human, animal, bird), and tires, including those of mowers. They are also found in dredge spoil, fill dirt, and compost. It is not clear whether seeds may be transported by wind. Do not plant exotic water garden plants unless they are not hardy, and never dump plants from fish tanks or water gardens into toilets, storm drains, lakes, or streams.

**COMMON REED** (*Phragmites australis*, formerly *P. communis*) looks like a tall ornamental grass with lovely plumes, usually white or tan. Although the species is indigenous, a particularly aggressive strain, probably introduced or a hybrid, has escaped from natural controls and taken over many formerly diverse wetlands. It is also seen in roadside ditches.

*Control:* (10) or (11), using Rodeo when the plant is flowering. If possible, follow up with a controlled burn of the dead plants, to allow native plants to return. **DO NOT DIG PHRAGMITES - THE ROOTS WILL BREAK, RE-SPROUT, AND SPREAD.** If herbicide cannot be used, cut annually in late July to reduce spread.

**GIANT REED** (*Arundo donax*) chokes waterways from Virginia south. It can grow 20' tall.

*Control:* Same as for Phragmites or mow several times a season.

**JAPANESE KNOTWEED, MEXICAN BAMBOO** (*Polygonum cuspidatum*) can grow in shade. The stems have knotty joints, reminiscent of bamboo. It grows 6-10' tall and has large pointed oval or triangular leaves.
**Control:** Cut at least 3 times each growing season and/or treat with Rodeo (10) or (11). In gardens, heavy mulch or dense shade may kill it.

**PURPLE LOOSESTRIFE** (*Lythrum salicaria, L. virgatum*), a handsome garden plant, has tall spikes of magenta flowers over a long bloom season. Often marketed as sterile, it is at best self-sterile, i.e., it can be pollinated by plants you may not be aware of, growing nearby. A single plant can produce up to a million seeds. Like *Phragmites*, it chokes out all competitors and has taken over millions of acres of wetland in the US.

*Control:* Initial infestations may be hand-pulled (1) before flowering (DO NOT DIG). Bag and burn or send to the landfill. Otherwise, use Rodeo (10) or (11) when plants begin to bloom (they continue to flower while setting seed). Expect to re-treat for several years until the seed bank is exhausted.

**LESSER CELANDINE, CELANDINE BUTTERCUP** (*Ranunculus ficaria*) has spread from gardens to carpet our floodplains with small yellow flowers in spring. It comes up in winter, giving it a head start over most native spring wildflowers.

*Control:* It is not yet known whether digging is effective - the small reproductive corms break off very easily. Try digging (1) before the plants flower. Otherwise, use Rodeo (10 or 11), preferably in February to protect native plants, frogs, and salamanders, which become active in March.

**RECOMMENDED NATIVE WETLAND PLANTS FOR WATER GARDENS:** Turtlehead (*Chelone glabra*), lizard's tail (*Saururus cernuus*), cardinal flower (*Lobelia cardinalis*), New York ironweed (*Vernonia noveboracencis*), blue flag (*Iris versicolor*), Virginia bluebells (*Mertensia virginica*), wild blue phlox (*Phlox divaricata*), arrowhead (*Sagittaria latifolia*), pickerelweed (*Pontederia cordata*). Also use native reeds, rushes, and sedges.

**INVASIVE ORNAMENTAL GRASSES**

Often promoted as native plants, most ornamental grasses come from outside our region. Once established, they are extremely tenacious. They are now spreading into our meadows. So far, **PAMPAS GRASS** (*Cortaderia selloana* and *C. jubata*), **JAPANESE SILVER GRASS** (*Miscanthus sinensis*), and **REED CANARY GRASS** (*Phalaris arundinacea*) have been the most invasive. Those with heavy seeds are less likely to spread.

*Control:* (1); (2); or (11), using additional sticker-spreader.

**RECOMMENDED NATIVE GRASSES:** Native grasses usually grow in small clumps, in a mix of several species. Tall ones include Indian grass (*Sorghastrum nutans*), big bluestem (*Andropogon gerardii*), purple top (*Triodia flava*), and, on the coastal plain, switch grass (*Panicum virgatum*). Small to medium grasses include little bluestem (*Schizachyrium scoparium*), bottlebrush (*Hystrix patula*), and wild oats (*Uniola latifolia*). Native grasses provide nest sites for meadow birds, as well as food, cover, and shelter for a wide variety of animals. In the garden, they offer textural contrast, and fall and winter interest.

**THE MOST INVASIVE NON-NATIVE WEEDS**

**GARLIC MUSTARD** (*Alliaria petiolata, A. officinalis*), a white-flowered biennial with rough, scalloped leaves (kidney-, heart- or arrow-shaped), recognizable by the smell of garlic and taste of mustard when its leaves are crushed. (The odor fades by fall.)

*Control:* Pull before it flowers in spring (1), removing crown and roots. Tamp down soil afterwards. Once it has flowered, cut (2), being careful not to scatter seed, then bag and burn or send to the landfill. (11) may be appropriate in some settings.
**JAPANESE or VIETNAMESE STILT GRASS, EULALIA** (*Microstegium vimineum*) can be identified by its lime-green color and a line of silvery hairs down the middle of the 2-3" long blade. It tolerates sun or dense shade and quickly invades areas left bare or disturbed by tilling or flooding. An annual grass, it builds up a large seed bank in the soil.

*Control:* Easily pulled in early to mid-summer (1) - be sure to pull before it goes to seed. If seeds have formed, bag and burn or send to landfill. Mowing weekly or when it has just begun to flower may prevent it from setting seed (3). Use glyphosate (11) or herbicidal soap (less effective) on large infestations. Follow up with (5) in spring.

**MILE-A-MINUTE VINE, DEVIL'S TAIL TEARTHUMB** (*Polygonum perfoliatum*), a rapidly growing annual vine with triangular leaves, barbed stems, and turquoise berries in August that are spread by birds. It quickly covers and shades out herbaceous plants.

*Control:* same as for stilt grass.

**JAPANESE PERILLA, BEEFSTEAK PLANT** (*Perilla frutescens*). Sold as a salad plant, this member of the mint family is extremely invasive by wind-borne seeds. Recognize it by the odd odor, supposedly like raw beef, when you rub it.

*Control:* (1); (2); (10) or (11).

**SPOTTED KNAPWEED** (*Centaurea maculosa*), a biennial with thistle-like flowers.

**CANADA THISTLE, BULL THISTLE** (*Cirsium arvense, C. Vulgare*). Exotic thistles are far more common than native ones. If you cannot identify the species, it is probably better to remove it.

*Control:* Do NOT pull (1) unless the plant is young and the ground is very soft - the tap root will break off and produce several new plants. Wear sturdy gloves. (2); (6); (10) or (11).

**CONTROL MEASURES**

(1) PULL seedlings and small or shallow-rooted plants when soil is moist. DIG out larger plants, including the root systems. Use a spading fork or weed wrench for trees or shrubs.

(2) To prevent spread of seeds of desirable ornamental plants, CUT OFF SPENT FLOWERS ("DEADHEAD") or cut off seeds or fruits before they ripen. Bag, and burn or send to the landfill.

(3) MOW or CUT BACK at least 3 times a season to deplete plants' store of nutrients, reduce seed formation, and kill or minimize spread of plants. If necessary, repeat each year.

(4) CONTROLLED BURNING during the spring, repeated over several years, allows native vegetation to compete more effectively with the exotic. This may require a permit. Spot treatment with glyphosate in late fall can be used to make this method more effective.

(5) Use a CORN-BASED PRE-EMERGENCE HERBICIDE on annual weeds. This product is also an organic fertilizer, i.e., it can stimulate growth of existing plants, including weeds, so it is appropriate for lawns and gardens but may not be appropriate in woodlands.

(6) In lawns, SPOT TREAT with BROAD-LEAF WEEDKILLER. Good lawn-care practices (test soil; use lime and fertilizer only when soil test shows a need; mow high and frequently; leave clippings on lawn) reduce weed infestations.

(7) CUT DOWN the tree. Grind out the stump, or clip off re-growth.
(8) **GIRDLE** tree: cut through the bark and growing layer (cambium) all around the trunk, about 6” above the ground. Girdling is most effective in spring when the sap is rising, and from middle to late summer when the tree is sending down food to the roots. Clip off re-growth.

(9) **HACK & SQUIRT**: Hack a hole (several holes in larger trees) downward into the growing layer, and squirt in glyphosate (or triclopyr if recommended in text above). Follow label directions for Injection and Frill Applications. This is most effective from middle to late summer. Clip off any re-growth or paint with glyphosate.

(10) **CUT DOWN, and PAINT THE CUT STEM OR STUMP WITH GLYPHOSATE** (or triclopyr if specified above). Follow label directions for Cut Stump Application. Clip off re-growth or paint with glyphosate. See Note on Herbicides.

(11) **PAINT** foliage with GLYPHOSATE herbicide (see Note on Herbicides). Use an envelope dauber (small sponge-topped bottle), following label directions for "wiper" method. Add a drop of food color for visibility. Or use a foam spray. Avoid dripping on non-target plants, because glyphosate kills most plants except moss. If it rolls off waxy or grass-like foliage, use additional sticker-spreader. Deciduous trees, shrubs, and perennials move nutrients down to the roots in late summer. Glyphosate is particularly effective at this time and when flowering plants are in bloom. Several invasive exotics retain their foliage after native plants have lost theirs, and resume growth earlier in spring than most natives. This allows you to treat them without harming the natives. However, the plant must be growing for the herbicide to work, and more may be needed in cold weather because growth is slower.

**NOTE ON HERBICIDES**: MNPS strongly recommends non-chemical methods of control wherever feasible. However, for large infestations, and for a few plants specified above, non-chemical methods are inadequate. Applied carefully to avoid non-target plants, glyphosate is the least environmentally damaging herbicide in most cases. Roundup contains a stronger concentration of glyphosate than Kleen-Up. Both contain a petroleum-based sticker-spreader. Rodeo, the glyphosate formulation for wetlands, does not contain any sticker-spreader and thus is safer for the environment. The smallest size of Rodeo available is one quart of concentrate, obtainable from farm supply stores for about $60 in 1999. Add food coloring for visibility, and a soap-based sticker such as Cide-Kick. For small applications, another choice is Roundup Sure Shot Foam, easier to see and control than liquid Roundup. Glyphosate is ineffective on some plants; for these, triclopyr (Garlon), a stump and brush killer, may be indicated. When using herbicides, read the entire label and observe all precautions listed, including proper disposal. If in doubt, call your state Extension Service.


*Maryland Native Plant Society, P. O. Box 4877; Silver Spring, MD 20914, E-Mail: mnps@geocities.com*
### INVASIVE EXOTIC PLANTS THAT THREATEN NATIVE SPECIES AND NATURAL HABITATS IN MARYLAND

The listings below have the common name followed by the **scientific name**

#### HERBACEOUS

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creeping Bugleweed</td>
<td><em>Ajuga reptans</em></td>
</tr>
<tr>
<td>Garlic Mustard</td>
<td><em>Alliaria petiolata</em> (<em>A. officinalis)</em></td>
</tr>
<tr>
<td>Field Garlic</td>
<td><em>Allium vineale</em></td>
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<tr>
<td>a grass</td>
<td><em>Arthraxon hispidus</em></td>
</tr>
<tr>
<td>Long-bracted Beggar-ticks</td>
<td><em>Bidens polylepis</em></td>
</tr>
<tr>
<td>Barren Brome Grass</td>
<td><em>Bromus sterilis</em></td>
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<tr>
<td>Spotted Knapweed</td>
<td><em>Centaurea maculosa</em></td>
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<tr>
<td>Canada Thistle</td>
<td><em>Cirsium arvense</em></td>
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<tr>
<td>Bull Thistle</td>
<td><em>Cirsium vulgare</em></td>
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<tr>
<td>Crown-vetch</td>
<td><em>Coronilla varia</em></td>
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<tr>
<td>Teasel</td>
<td><em>Dipsacus sylvestris</em></td>
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<tr>
<td>Indian Strawberry</td>
<td><em>Duchesnea indica</em></td>
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<tr>
<td>Tall Fescue, K31 Fescue</td>
<td><em>Festuca elatior</em> (<em>F. arundinacea)</em></td>
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<tr>
<td>Gill-over-the-ground, Ground Ivy</td>
<td><em>Glechoma hederacea</em></td>
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<tr>
<td>Common Daylily</td>
<td><em>Hemerocallis fulva</em></td>
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<tr>
<td>Hydrilla</td>
<td><em>Hydrilla verticillata</em></td>
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<tr>
<td>European Yellow Iris, Water Flag</td>
<td><em>Iris pseudacorus</em></td>
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<tr>
<td>Henbit</td>
<td><em>Lamium amplexicaule</em></td>
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<tr>
<td>Purple Dead Nettle</td>
<td><em>Lamium purpureum</em></td>
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<tr>
<td>Sericea Lespedeza</td>
<td><em>Lespedeza cuneata</em></td>
</tr>
<tr>
<td>Creeping Lilyturf</td>
<td><em>Liriope spicata</em></td>
</tr>
<tr>
<td>Moneywort</td>
<td><em>Lysimachia nummularia</em></td>
</tr>
<tr>
<td>Purple Loosestrife</td>
<td><em>Lythrum salicaria</em></td>
</tr>
<tr>
<td>a grass</td>
<td><em>Microstegium vimineum</em> (<em>Eulalia viminea)</em></td>
</tr>
<tr>
<td>Eulalia, an ornamental grass</td>
<td><em>Miscanthus sinensis</em></td>
</tr>
<tr>
<td>Giant Chickweed</td>
<td><em>Myosoton aquaticum</em> (<em>Stellaria aquatica)</em></td>
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<tr>
<td>Parrot's Feather</td>
<td><em>Myriophyllum brasiliense</em></td>
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<tr>
<td>Star of Bethlehem</td>
<td><em>Ornithogalum nutans</em></td>
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<tr>
<td>Nodding Star of Bethlehem</td>
<td><em>Ornithogalum umbellatum</em></td>
</tr>
<tr>
<td>Beefsteak Mint</td>
<td><em>Perilla frutescens</em></td>
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<tr>
<td>Reed Canary Grass</td>
<td><em>Phalaris arundinacea</em></td>
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<tr>
<td>Common Reed</td>
<td><em>Phragmites australis</em> (<em>P. communis)</em></td>
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<tr>
<td>An arum, resembles Green Dragon</td>
<td><em>Pinellia ternata</em></td>
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<tr>
<td>Japanese Knotweed</td>
<td><em>Polygonum cuspidatum</em></td>
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<tr>
<td>Giant Knotweed</td>
<td><em>Polygonum sachalinense</em></td>
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<tr>
<td>Lesser Celandine</td>
<td><em>Ranunculus ficaria</em></td>
</tr>
<tr>
<td>Johnson Grass</td>
<td><em>Sorghum halepense</em></td>
</tr>
</tbody>
</table>
### VINES

| Porcelain Berry \(^1\) Ampelopsis brevipedunculata \(^1\) |
|---|---|
| Oriental Bittersweet \(^1\) Celastrus orbiculatus \(^1\) |
| Yam-leaved Clematis \(^1\) Clematis terniflora \(^1\) (C. dioscoreifolia) |
| Cinnamon Vine \(^1\) Dioscorea oppositifolia \(^1\) (D. batatas) |
| Climbing Euonymus, Wintercreeper Euonymus fortunei |
| English Ivy \(^2\) Hedera helix \(^2\) |

| Japanese Honeysuckle \(^1\) Lonicera japonica |
|---|---|
| Kudzu \(^2\) Pueraria lobata |
| Matrimony Vine Solanum dulcamara |
| Mile-a-minute Vine, Devil's Tearthumb \(^1\) Tracaulon (Polygonum) perfoliatum \(^1\) (an annual) |
| Periwinkle Vinca minor |
| Wisteria \(^2\) Wisteria floribunda, W. sinensis \(^2\) |

### SHRUBS

| Japanese Barberry **Berberis thunbergii** |
| Russian Olive *Elaeagnus angustifolium* |
| Autumn Olive *Elaeagnus umbellata* |
| Winged Euonymus, Winged Wahoo \(^1\) *Euonymus alatus* |
| Privet *Ligustrum spp.* |
| Bush Honeysuckles \(^1\), including *Lonicera spp.* |
| Belle Honeysuckle *Lonicera x bella* |
| Amur Honeysuckle *Lonicera maackii* |
| Morrow's Honeysuckle *Lonicera morrowii* |
| Tartarian Honeysuckle *Lonicera tatarica* |

| Bamboo - running varieties \(^2\) *Phyllostachys spp.*, *Pseudosasa japonica* |
| Common Buckthorn *Rhamnus cathartica* |
| European Buckthorn *Rhamnus frangula* |
| Multiflora Rose \(^1\) *Rosa multiflora* |
| Strawberry-raspberry, Balloonberry *Rubus illecebrus* |
| Wineberry *Rubus phoenicolasius* |
| Japanese Spiraea \(^1\) *Spiraea japonica* |
| Coralberry Symphoricarpos orbiculatus |

### TREES

| Norway Maple \(^1\) *Acer platanoides* |
| Tree of Heaven Ailanthus altissima |
| Catalpa Catalpa spp. |
| White Mulberry Morus alba |

| Empress Tree Paulownia tomentosa |
| White Spruce *Picea glauca* |
| White Poplar *Populus alba* |
| Sweet Cherry, Bird Cherry *Prunus avium* |
the most serious threats to natural areas because they are both damaging and strongly invasive

not as readily established, but once established, very persistent and damaging to native vegetation

Common Reed (Phragmites australis) is native, but is included on this list because it acts like an invasive exotic, readily invading wetlands, displacing native vegetation, and forming dense monocultures. The invasive ecotype that is considered to be a pest may actually be a vigorous hybrid derived from genetic stock from other continents, and if so, is not genetically native.

An attempt has been made to limit these lists to exotic species that pose at least some threat to natural areas, and to exclude exotic species that are primarily restricted to disturbed sites. These non-native species should not be planted in Maryland within or near natural areas because they can escape and displace native vegetation, and may disrupt natural ecosystems. Individuals or populations of these species should be removed if discovered growing in natural areas.

Please provide any comments, additions, and corrections you may have to Chris Frye at 410-260-8563 or cfrye@dnr.state.md.us.

Maryland Department of Natural Resources Wildlife and Heritage Division
Tawes State Office Building, E-1
580 Taylor Avenue
Annapolis, Maryland 21401
Appendix G:
Trail Design Standards to Minimize
Tree Root Damage

Structural Soil (Paving Over Existing and/or Future Tree Roots)

Shall consist of 2 parts sandy loam topsoil and 8 parts ½” to No. 4 lightweight aggregate thoroughly mixed by volume. Before mixing, saturate the lightweight aggregate with water. Proportion and mechanically mix the dry fines into the wet stalite until the lightweight aggregate is completely coated.

Air-Entrained Soil

Nonpaved Areas Over Existing Tree Roots: Shall consist of 6 parts sandy loam topsoil and 4 parts 3/8 to No. 8 lightweight aggregate thoroughly mixed by volume. Mechanically mix the materials to provide a uniform distribution of the components. The soil moisture content shall be such that dust will not form in the air when mixing. Do not mix if the soil is excessively moist.