



Chapter 4

Maryland's Key Wildlife Habitats





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Introduction

The 2025 State Wildlife Action Plan (SWAP or Plan) identifies nearly one thousand animal and plant species as Species of Greatest Conservation Need (SGCN) (Chapter 3). This includes federally and state-listed Threatened or Endangered species, rare species, endemic species, declining species, and responsibility species for which Maryland harbors a significant portion of the overall population. The distribution and abundance of SGCN and other Maryland flora and fauna are directly related to the condition, extent, and location of their habitats.

Some groups of species, such as migratory birds, can be found in a wide variety of habitats depending on the time of year, climatic conditions, and quality of habitat. Other species are less adaptive and are restricted to one or relatively few habitats. This especially holds true for plants, which cannot migrate to other areas or habitats as most animals can. These specific habitats often exhibit restricted distribution in Maryland. This distribution is influenced by the diversity of Maryland’s six major physiographic provinces: Lower Coastal Plain, Upper Coastal Plain, Piedmont, Blue Ridge, Ridge and Valley, and Appalachian Plateau (Chapter 2, Figure 2.1). Maryland’s latitude also supports an overlap of habitat ranges; it harbors species that typically occur in more northern latitudes as well as those that occupy the southeastern United States. Aquatic habitats similarly exhibit a wide range, from saline Atlantic Ocean and Coastal Bays, to brackish Chesapeake Bay estuary, to freshwater streams and rivers. While this greatly adds to Maryland’s ecological diversity, it also influences the somewhat limited distribution of certain wildlife species and their habitats (Lawrence 1984; Lawrence & Gross 1984; Fergus 2003). Because of the strong tie between species and habitats, it is critical to identify habitats that support SGCN in order to conserve them. For purposes of the 2025 SWAP revision, habitats that support SGCN are referred to as Key Wildlife Habitats (KWHs).

Furthermore, conservation of uncommon and rare habitats can serve as protective umbrellas for conserving lesser-known species. There are thousands of understudied, poorly understood, and/or new species in Maryland whose needs and habitat associations biologists do not yet understand. This is reflected in Maryland’s new State Assessment Priority Species (SAPS) list (Appendix 3b). Though we do not yet know enough about these species to associate them with specific KWHs, the identification and protection of vulnerable habitats mean these lesser-known species are protected by proxy.

This chapter focuses on Maryland’s KWHs. It begins with a definition of KWHs, lists the KWHs for the 2025 SWAP revision, provides reasoning for their selection, and ends with detailed descriptions of every KWH. The best available current information regarding the description, condition, and distribution of KWHs (directly addressing **Element #2**) is provided and then associated with SGCN found in those habitats (addressing **Element #1**). Each KWH also lists county distributions, examples of public lands to visit, and associated state rare natural communities. For KWH–species associations, species are referenced by common name, although for certain groups wherein common names are not widely agreed upon—most notably plants—as well as some insect species, scientific names are included as well. For a complete list of SGCN scientific names and KWH associations, please see Appendix 3a.



What are Key Wildlife Habitats?

In general, the term “habitat” describes the physical and biological environment that provides the necessary food, shelter, and other needs of a particular organism. Key Wildlife Habitats (KWHs) are no different in concept, with the exception that many species dependent upon those habitats are SGCN. While SGCN may occupy many habitats, the ones attributed as “key” for a species are considered important for the presence and persistence of that species in Maryland. Likewise, KWHs serve as critical foundations and support networks not only for SGCN but for all species in Maryland. Together, KWHs represent a patchwork mosaic of habitats in which the spectrum of Maryland’s natural diversity can be understood, identified, and mapped.

Because vegetation typically reflects biological and ecological patterns across the landscape, most terrestrial KWHs are structured as ecological cover types based primarily on vegetation. They are organized into a simple classification scheme which is scalable, allowing for compatibility with other ecological classifications. At the local level, this classification scheme is closely related to [the natural community classification](#) used by the Maryland Department of Natural Resources (MD DNR) Natural Heritage Program (NHP). This classification is a relatively fine-scale classification system that uses an ecologically based hierarchy and grouping of vegetation associations from the U.S. National Vegetation System (Federal Geographic Data Committee 2008) as the foundation.

Natural communities can be defined as “recurring assemblages of plants and animals found in particular physical environments” (MD DNR 2026a). Restricted or vulnerable associations that support the unique assemblages of plant and animal species are referred to as “rare natural communities.” A natural community may be considered rare for a number of reasons: it might represent a habitat on the northern or southern extent of its range, be particularly sensitive to anthropogenic threats, or be especially vulnerable to a rapidly changing climate. MD DNR NHP tracks rare natural communities—as well as rare plant and animal species—throughout the state.

Many KWHs have a direct ecological relationship with and are equivalent to certain levels in the Maryland natural community classification (e.g., Basic Mesic Forest, Shale Barren). Others may represent habitats slightly broader in scope that are the result of collapsing several natural community types into one KWH. Still others may not relate to any natural community types; anthropogenic or artificial habitats, not being “natural,” have no associated natural communities. Many aquatic habitats are also not associated with any natural communities, as Maryland’s classification system focuses mainly on terrestrial and wetland habitats. For a list of which (terrestrial) KWHs are associated with which natural communities, please see Appendix 4b.

This relationship to finer-scaled classifications may be useful in driving local land management decisions or identifying rare natural communities, although it is not practical in facilitating regional approaches to wildlife conservation. For the previous SWAP revision a decade ago, Maryland therefore based its KWHs on NatureServe’s ecological systems, which in turn formed the basic classification scale of the [Northeastern Terrestrial Wildlife Habitat Classification System \(NETWHCS\)](#) (Gawler 2008) and the [Northeastern Aquatic Habitat Classification System \(NEAHCS\)](#) (Olivero & Anderson 2008). Many of these KWHs were kept relatively intact for the 2025 SWAP revision. Major changes include the consolidation of similar KWHs, the addition of three new KWHs, and the overhaul of bay and ocean KWHs. For a complete list of KWH



changes in 2025, see Appendix 4a. Updated cross-references to compare Maryland’s KWHs to NETWHCS and NEAHCS can be found in Appendices 4c and 4d, respectively. For further explanation of NETWHCS and NEAHCS, please refer to the equivalent of this chapter in Maryland’s 2015 SWAP revision (MD DNR 2016a).

The three new KWHs in 2025—Urban and Suburban Environment, Small Coastal Plain Island, and Artificial Barren—were added in order to emphasize the importance of human-created or human-impacted habitats for particular groups of SGCN. Urban and Suburban Environments, for example, can serve as important stopover habitat for migratory bird populations. Maryland’s rapidly disappearing Small Coastal Plain Islands are some of the only breeding grounds left for Maryland’s colonial waterbird SGCN. Artificial Barrens encompass unvegetated, uncapped, and undeveloped gravel and sand pits that support insect SGCN. These species historically relied upon natural barrens, but with the decline of that habitat type in Maryland, they now rely upon human-made habitats as well.

Bay and ocean KWHs have been simplified based on Maryland’s three major saline or brackish bodies of water: the Chesapeake Bay, Coastal Bays, and Atlantic Ocean. During the 2025 SWAP revision process, reviewers found the previous SWAP’s splitting of estuarine and marine habitat features to be conceptually confusing. These three new KWHs are easier to conceptualize, geographically distinct, and allow for clearer SGCN–KWH associations. The bay and ocean KWHs from the 2015 SWAP revision have been consolidated into these new descriptions. The Small Coastal Plain Island KWH is also considered a bay or ocean habitat.

A total of 57 KWHs have been identified for the 2025 SWAP revision (Table 4.1). Together they represent a diverse portfolio of ecological systems, each bound by similar physiography, geology, hydrology, climate, soil composition, flora, or other significant characteristics.

Table 4.1 Maryland's 57 Key Wildlife Habitats

KEY WILDLIFE HABITAT	PHYS. PROVINCE OF OCCURRENCE					
Upland Habitats	AP	RV	BR	PD	UCP	LCP
High Elevation Ridge Forest	X					
Hemlock-Northern Hardwood Forest	X	X	X	X		
Cove Forest	X	X	X			
Montane-Piedmont Oak-Pine Forest	X	X	X	X		
Oak-Hickory Forest	X	X	X	X		
<i>*Managed Montane Conifer Forest</i>	X					
Mesic Mixed Hardwood Forest		X	X	X	X	X
Coastal Plain Oak-Pine Forest					X	X
Maritime Forest and Shrubland						X
Serpentine Barren				X		
Shale Barren		X				
Acidic Glade and Barren	X	X	X	X		
Basic Glade and Barren		X	X	X		
<i>*Artificial Barrens</i>					X	X
Cliff, Talus, and Rock Outcrop	X	X	X	X		
Coastal Bluff					X	X
Coastal Beach					X	X
Maritime Dune and Grassland						X



Wetland Habitats	AP	RV	BR	PD	UCP	LCP
Montane-Piedmont Floodplain	X	X	X	X		
Coastal Plain Floodplain					X	X
Montane Acidic Fen	X					
Montane-Piedmont Seepage Swamp	X	X	X			
Piedmont Seepage Wetland				X		
Piedmont Upland Depression Swamp				X		
Coastal Plain Flatwood and Depression Swamp					X	X
Coastal Plain Seepage Swamp					X	X
Coastal Plain Seepage Acidic Fen					X	X
Delmarva Bay						X
Maritime Swamp						X
Vernal Pool	X	X	X	X	X	X
Spring	X	X	X	X	X	
Tidal Forest					X	X
Tidal Freshwater Marsh and Shrubland					X	X
Tidal Brackish Marsh and Shrubland					X	X
Tidal Salt Marsh and Shrubland					X	X
Intertidal Mudflat and Sand Flat					X	X
<i>*Artificial Impoundment and Artificial Wetland</i>	X	X	X	X	X	X
Aquatic Habitats	AP	RV	BR	PD	UCP	LCP
Coldwater Stream	X	X	X	X		
Limestone Stream		X	X			
Highland Stream	X	X	X			
Piedmont Stream				X		
Coastal Plain Stream					X	X
Blackwater Stream					X	X
Highland River	X	X	X			
Piedmont River				X		
Coastal Plain River					X	X
Chesapeake Bay					X	X
Coastal Bays						X
Atlantic Ocean						X
Small Coastal Plain Island					X	X
Subterranean Habitats	AP	RV	BR	PD	UCP	LCP
Cave and Karst	X	X	X	X		
<i>*Artificial Structure: Mine and Tunnel</i>	X	X	X	X		
Other Habitats	AP	RV	BR	PD	UCP	LCP
<i>*Managed Successional Forest</i>	X	X	X	X	X	X
<i>*Managed Grassland</i>	X	X	X	X	X	X
<i>*Roadside and Utility Right-of-Way</i>	X	X	X	X	X	X
<i>*Artificial Structure: Buildings and Other Structures</i>	X	X	X	X	X	X
<i>*Urban and Suburban Environment</i>	X	X	X	X	X	X

Key: AP = Appalachian Plateau; RV = Ridge and Valley; BR = Blue Ridge; PD = Piedmont; UCP = Upper Coastal Plain and LCP = Lower Coastal Plain

**Habitat* = Human-made Key Wildlife Habitat



Key Wildlife Habitat Classification

Maryland’s KWHs are nested within a hierarchical classification system split into five broad divisions: 1) Upland Habitats, 2) Wetland Habitats, 3) Aquatic Habitats, 4) Subterranean Habitats, and 5) Other Habitats (see Table 4.1). These upper-level divisions are generally thought of as systems (*sensu* Cowardin et al. 1979) and are based primarily on gross hydrologic regime. For purposes of organization and for grouping threats and actions (Appendix 6b), four of the five divisions are further divided into finer groups based on similarities of hydrology (e.g., Tidal Wetlands), physiognomic structure (e.g., Forests), geomorphology (e.g., Coastal Beaches and Dunes), or other characteristics. For a full list of KWHs and their associated groupings, please see Appendix 4a.

Upland habitats are all terrestrial, non-wetland habitats that typically have dry to mesic well-drained soils. The 18 different upland habitats are divided into three groups: the forest group; the glade, barren, and cliff group; and the coastal beach and dune group. Unlike in the 2015 SWAP revision, the 2025 SWAP revision includes some anthropogenic habitats in this broad habitat group; Managed Montane Conifer Forest was added to the forest group and Artificial Barren to the glades, barrens, and cliff group. This is because these KWHs have similar properties regardless of whether they are natural or human made.

Wetland habitats are often the interface between upland and aquatic habitats. They include all non-tidal and tidal wetland habitats dominated by woody plants, herbaceous emergent plants, and floating aquatic plants. These 19 wetland habitats are divided into four groups: the floodplain wetland group, the groundwater wetland group, the tidal wetland group, and the artificial wetland group. The artificial wetland group contains only one KWH—Artificial Impoundment and Artificial Wetland—which was added to this group in the 2025 SWAP revision for the same reasons articulated above.

Aquatic habitats represent Maryland’s streams, rivers, and large marine and estuarine water bodies. The 13 different aquatic habitats are further divided into two groups: the stream and river group, and the bay and ocean group. The Small Coastal Plain Island KWH is included in the bay and ocean group because of where these islands are found (i.e., in the Coastal Bays and Chesapeake Bay).

Regarding the stream and river group—though there is not necessarily a clear, widely accepted definition that distinguishes streams from rivers—there are some key differences between the stream and river KWHs that are important to consider. Streams are typically smaller than rivers, with narrower channel width, lower water volume, and lower flow. Streams tend to function as tributaries to other streams or rivers, whereas rivers drain into larger water bodies such as estuaries or oceans. Streams also tend to support lower species richness than rivers and are dominated by species evolved to tolerate instability in flow and habitat conditions. Conversely, rivers support higher species richness and are dominated by species adapted to more stable habitat conditions, typically with larger body size and different functional feeding traits than headwater stream species. Food chains differ as well: stream food chains are usually dominated by inputs from terrestrial sources (i.e., plant material such as leaves and woody debris), whereas river food chains rely upon aquatic food sources such as phytoplankton and aquatic vegetation.



Subterranean habitats include cave habitats and significant associated karst features. The Artificial Structure: Mine and Tunnel KWH was also added to this group for the 2025 SWAP revision for the same reasons articulated in the upland and wetland habitat summaries above.

Finally, the fifth broad habitat category is entitled “other habitats.” These are certain human-made habitats that resemble and provide some function as natural wildlife habitats because of their structure, hydrology, vegetative composition, or other characteristics. This category includes habitats created as unintended outcomes as well as habitats that are specifically designed and built to serve as wildlife habitat, such as warm season grass plantings. The five “other” habitats are further divided into two groups: Working Lands and (Sub)urban. It is also worth noting that Managed Montane Conifer Forest, Artificial Impoundment and Artificial Wetland, and Artificial Structure: Mine and Tunnel were in this habitat category in the 2015 SWAP revision; Artificial Barren would have been as well, were it not a new KWH in 2025.

Although these five KWHs (as well as the four additional anthropogenic habitats marked with an asterisk in Table 4.1) have microclimates or other features that render them as important surrogate habitats for SGCN, their importance for maintaining wildlife populations varies on a case-by-case basis from suitable habitat to critical. For example, chimney swifts (*Chaetura pelagica*) lost the majority of their original nesting and roosting habitat long ago, as colonizing Europeans and growing populations vastly reduced the number of large, hollow trees. The primary habitats remaining are structures (i.e., chimneys) created and maintained by people. On the other hand, it is important to remember that not every building will support SGCN or provide a benefit equivalent to natural habitats. Maryland does not necessarily advocate for more of these artificial habitats; rather, in the absence of natural habitat equivalents, instances of these KWHs that serve as important SGCN habitat should be kept as they are and minimally disturbed.

In certain cases, artificial or human-made habitat can benefit humans, wildlife, and the ecosystem at large. This is possible through careful design and stewardship, based largely on the knowledge and practices of the indigenous peoples of Maryland. One example of this is the increasingly popular “food forest” phenomenon, which can provide food for people, food for animals, and habitat for a variety of native species. A case study is included below to highlight this practice and the benefits it brings to Maryland’s people, plants, and animals,

Case Study: Food Forests and Indigenous-Based Knowledge

The woods and wildlife go hand in hand. Our forests, from leaf litter to the treetops, can provide a home and a meal for many species.

Forest stewardship involves managing those woodlands for improved health of the trees, shrubs, and land overall. Depending on landowner objectives, it can also mean building a higher quality habitat for our wildlife by boosting overall plant diversity to provide food sources at varying points of the season. Whether it’s a Wildlife Management Area or a forest stand on private property, MD DNR’s Wildlife and Heritage Service (WHS) and Forest Service (MFS) are always looking to maximize the benefits of our woods and all the resources the forest provides for animals and people alike.



What indigenous communities understood—the original stewards of this land before the word “stewardship” existed—was that our forests are also food stores and a pharmacy for our very own species. Agroforestry, the science of integrating trees and shrubs into agricultural settings, views our landscape through this multifunctional layered lens.

In recent years, there has been a tremendous increase in knowledge exchange within the world of agroforestry, resulting in several best practices, one which has been thoroughly embraced in municipalities and public spaces: food forests. Although these are more built systems by human design versus the more symbiotic ancestral relationship of Native Americans and our forests prior to European settlement, the species that are involved in this practice are inspired by and rooted in indigenous knowledge and the first “foragers” of the land. From American persimmon (*Diospyros virginiana*) to pawpaw (*Asimina triloba*) to hazelnut (*Corylus americana*), there are layers of untapped potential in our landscape that our native wildlife knew and thrived with well before we were here. The following paragraphs describe the “edible understory” of Maryland’s food forests as well the benefits they provide to Maryland’s people and wildlife.

We’ll begin at the top of the food forest canopy with the persimmon tree. Late season blooms and the fruit that follows on persimmon provide a well-timed meal for pollinators and wildlife. Persimmons also serve as the larval home for one of our state’s largest and most beautiful moth species, the luna moth. The pileated woodpecker, the largest woodpecker in the United States, is known to feast on the fruit as it lingers on the stem late into the season before dropping to the forest floor. Northern bobwhite (*Colinus virginianus*)—a gamebird we are actively working to restore habitat for, as well as an SGCN—are also known to include persimmon on their avian menu.



Francis Smith, MD DNR, with a persimmon tree at White Marsh Park Edible Trail (Joe Zimmermann, MD DNR)

Though persimmon can stand the tallest in a food forest, the “Indiana banana” or pawpaw rises above all in terms of popularity and is the most well-known of this tree and shrub bunch. Our largest native tree fruit is food for a wide variety of native species, including wild turkey, black bear, Virginia opossum, and various fox species. As a shaded edge, bottomland species that can frequent wooded corridors along waterways, pawpaw are also utilized by beavers, who are known to eat its bark. The infamous “hillbilly mango” is also a larval host for a specialist insect species, the zebra swallowtail, that relies solely on this understory treat to begin its life journey.

Another food forest native that can sometimes be found on the shaded edges of our landscapes is the serviceberry, two species of which are SGCN. There is no higher value tree among our feathered friends, with over 30 bird species being supported by this plant. This includes many declining migratory and gamebird species that need habitat and food sources now more than



ever, many of which are also SGCN: ruffed grouse (*Bonasa umbellus*), northern bobwhite, wood thrush (*Hylocichla mustelina*), scarlet tanager (*Piranga olivacea*), and veery (*Catharus fuscescens*), among others. Serviceberry’s early-season white blooms provide nectar to many of our native bees as well, which are also under threat and in increasing need of habitat. Mason, mining, cuckoo, and bumblebees all dine on the “shadbush” flowers, so called because, when in bloom, these flowers signaled to indigenous peoples that the shad fish were running, and it was time to go fishing.



Wild American plum (*Prunus americana*)
(Joe Zimmermann, MD DNR)

The Prunus family supports more caterpillar species (400+) than any other trees in Maryland, other than our mighty oaks. Wild American plum (*Prunus americana*) is one of those family members that can be a jam-jelly fruit and potentially more adult crop of a cocktail flavor additive among our agroforestry natives. Maryland’s gamebird gang of turkey, grouse, and quail are all quite comfortable in the thickets of a spreading American plum patch, as they can provide both food and safe cover from predators. Native bees, wasps, and mammals may also rely on this fruit as it lingers late into the season.

Hazelnut is a shrub that adds desirable stratification to any native forest stand. It is another multi-stem home for gamebirds that can huddle beneath it for shelter. Additionally, hazelnut supports two of Maryland’s most unique insects: the aforementioned luna moth,

which uses hazelnut as a larval home, and the alien-looking walking stick. The walking stick has been known to eat the leaves of hazelnut, although one must look closely to spot this invertebrate in action. Like the pawpaw, beavers also enjoy munching on the bark of this native nut shrub. Not to be outdone, gray squirrels will also devour a hazelnut bush when it is in production and leave nothing but scattered shells in their wake.

Mother Nature’s cold medicine, the elderberry, both helps human health and has immense value to our wildlife cohabitants. One of the most important contributions this sprawling shrub can provide is hollow-stem habitat for native mason and mining bees. The largest native moth in the U.S., the cecropia moth, also begins its life in larval stages hosted by elderberry. Similar to serviceberry, there are at least 20 bird species that will dine among the elders, including the rose-breasted grosbeak, kinglet species, and the always-popular eastern bluebird. On the same shaded, moist edges of woodlands as the pawpaw, elderberry can also provide respite and cover for ruffed grouse and ring-necked pheasant.

A bit closer to the forest floor is the little-known native shrub, the black chokeberry (*Aronia melanocarpa*), more often referred to by its lovelier-sounding Latin name, Aronia. Multiple larval forms of insects call this shrub home, including the coral hairstreak and bluish spring moth. Beyond serving as habitat for these insects, the numerous flowers of black chokeberry are a nectar source for one of the most sought-after, high-speed migratory species, the hummingbird.



Though its fruit can seem too tart to humans, when food supply is low heading into winter months, cedar waxwing and other winter migrants can nibble on this native fruit. The iconic Delmarva fox squirrel's (*Sciurus niger cinereus*) habitat is often cited as overlapping black chokeberry, as it was known to be a part of this Endangered-turned-recovered species' diet.

Last—though certainly not least—is highbush blueberry (*Vaccinium corymbosum*). Maryland is home to both lowbush and highbush blueberry, but with its larger berries, the highbush is often the favored choice of humans and wildlife alike. The brown elfin butterfly larval form is supported by blueberry, and honeybees, bumblebees, and mining bees can be found buzzing around its flowers. As with the other listed berries, from towhees to tanagers, this plant's berries are a favorite of dozens of bird species. Veery, a long-distance migrant, has experienced population declines and is even more so benefitted by this well-known berry species. Just about every mammal in Maryland is also quite fond of a blueberry understory.



Veery (*Catharus fuscescens*) (Dan Sudia, USFWS)

What is most exciting about the planting of all of these species and food forests is that, even if humans cannot keep these systems in perfectly straight, aesthetically pleasing rows—and if we cannot harvest fruits and nuts in time—then these areas simply become multi-layered, multifunctional buffets and homes for an endless number of species.

In a broader sense, the resulting stratification and diversification of our native understory through this approach only helps to build a more resilient woodland system in the face of increasing cases of weather whiplash, as climate change and other factors cause quick changes from flash flood-level precipitation to bone-dry conditions, seesaw temperature swings, and more. A well-designed food forest can provide more sustainable systems for our lands and wildlife for generations to come.

Key Wildlife Habitat Classification: Regional Context

The Northeast Association of Fish and Wildlife Agencies (NEAFWA) encourages all northeast states to standardize their habitat types in order to promote streamlined collaboration between states. Chapter 2 of the Northeast Regional Conservation Synthesis for 2025 State Wildlife Action Plans (TCI & NEFWDTC 2023) lists 24 regional habitat types for states to use. While Maryland does not use this classification, all 57 KWHs have been cross referenced with the 24 regional habitat types to better facilitate cross-state collaboration. Each KWH description includes which regional habitat type it matches. For a comprehensive list of Maryland KWHs and regional habitat types, see Appendix 4a.



Structural Conditions of Key Wildlife Habitats

The relationship of SGCN to KWHs is a complex one in which a combination of environmental conditions must exist in order to provide the necessities of life that allow a species to survive and reproduce. Healthy and viable wildlife populations seek out and use particular habitat types (e.g., cover types), structural conditions (e.g., stand attributes), and habitat elements (i.e., finer-scaled site-specific attributes). Together, these conditions form the core of the wildlife habitat concept and are used here to illustrate the multidimensional relationships of wildlife and habitat.

The structural condition of a KWH is a vital component of a species' overall habitat. Structural conditions for vegetated upland and wetland habitats are known to vary through time in a predictable way as they follow plant successional series in a given habitat. These series, also known as seral stages, are the temporal phases of plant community development towards its climax and are classified based on age, structure of plant species, and evidence of natural or human-caused disturbance. All seral stages serve a purpose and are important to maintain in the landscape. Forests in particular support a wide variety of species depending on the structural condition or seral stage present at a given time. Furthermore, the forested habitat types represented at either end of this development are some of the most vulnerable yet important habitat types in Maryland.



Old growth forest
(Ed Thompson, MD DNR)

Old growth forests are considered the latest stage of a forest community's development. They are extremely important for a wide diversity of SGCN and are the rarest of forest seral stages in Maryland. The structural complexity that is characteristic of older forests with multiaged tree strata and significant standing dead and down trees provides greater niche and functional potential for unique biological diversity in forested systems, which is why this seral stage is so important for SGCN. Old growth forests historically occurred throughout Maryland, representing a broad range of forest types. Today, only scattered remnants remain in the state and elsewhere in the northeastern United States. These remnant patches were most likely left behind on sites that were not easily accessible for logging or where surveying errors led to uncertainty about forest ownership (McCarthy 1995). This rarity—not only in Maryland, but the majority of the U.S.—is the reason for highlighting this seral stage, in the hopes that more forest acreage in varying forest types will be allowed to reach old growth status. In a human-dominated environment, this is only possible through sound forest stewardship on both public and private lands.

One way that old growth forest status can be achieved is through Maryland's Wildlands Preservation System, the state equivalent to the federal Wilderness Preservation System. By designating certain state-owned properties as Wildlands, the state protects stretches of important habitat from all activities except passive recreation (e.g., hiking, fishing) (MD DNR 2026b). Due to this moratorium on timber harvest and associated activities, forests that receive this



designation are therefore allowed to reach old growth status with minimal disturbance. One example of this can be found at Dans Mountain Wildlife Management Area (WMA), which includes the largest contiguous state-owned forest in Maryland (MD DNR 2026c). In 2015, 4,047 acres of its total 9,783 acreage were given the Wildland designation (MD DNR 2016b). This means that, although little of the WMA is currently considered old growth, many more acres of forest will be allowed to reach old growth status in the future.

In 2007, MD DNR led an effort to map and characterize extant old growth forest on public lands throughout the state (MD DNR 2007). Although these estimates are nearly twenty years old, there has not been such a comprehensive inventory of Maryland's old growth forest in the years since. As such, for certain KWH descriptions in this chapter, estimates of old growth forest on state lands are included based on this inventory effort.

Natural processes such as fire, floods, storm damage, tree aging, and beaver activity can re-set the clock on a mature forest community to an earlier seral stage on a large or small scale, providing suitable habitat for a different set of species until the forest once again reaches maturity. Human activities can also create changes in natural forest communities that mimic the impacts of natural disturbances to some extent. These processes and activities can bring about the other end of a forest community's development: early successional forest habitat. Early successional forests are upland areas dominated by shrubs and small trees (< 8 m tall) and include recently logged forests, succeeding non-forested land, temporary natural forest openings, shrub-dominated natural communities, and forest edges. The Managed Successional Forest KWH is the best example of this habitat type in the 2025 SWAP revision.

Early successional forests are critical to many bird, small mammal, and reptile SGCN that rely on this sometimes human-made habitat type in place of what was once more abundant, natural shrubland habitat. This habitat type is particularly at risk of redevelopment and is sensitive to suppression of natural disturbances (e.g., fire and beaver activity), as its existence relies upon these sorts of disturbances. Land and habitat managers often use management tools like prescribed fire to mimic natural disturbances in an effort to restore or maintain early successional habitats.

Beyond using these two habitat types as examples of different structural conditions for the same overarching habitat group, these habitat types were chosen in order to highlight the importance of applying different management techniques to different habitats. The main need of old growth forests is to be preserved and protected; the main needs of early successional forests, on the other hand, are to allow for (and sometimes reestablish) disturbance events and support a network of always-changing forested habitat. This Plan looks to balance more "traditional" conservation techniques (i.e., preservation and protection) with the reality that some SGCN and habitats rely upon a changing, diverse landscape, and applies both approaches where and when appropriate.

Mapping Maryland's Key Wildlife Habitats

Once the list of KWHs was compiled, the need for geographic information system (GIS) map data addressing the distribution of the habitats was determined. The current scientific inventory and geospatial databases were not sufficient to produce accurate distribution maps for all of the SGCN, their associated KWHs, or vegetative associations identified during the SWAP update process. Since coarse-level habitat information and accurate habitat distribution models are



critical as a range indicator for some of the SGCN lacking adequate distribution and abundance data, the field inventories and analyses required to create these products remain a priority.

Distribution maps of Maryland's KWHs are included in this chapter, within each habitat section, for 54 of the 57 habitats. Although some location information is available, insufficient Maryland data exist to create meaningful distribution maps for three habitats: Managed Successional Forest, Roadside and Utility Right-of-Way, and Artificial Structure: Buildings and Other Structures. For the remainder, GIS data layers were reviewed and compiled for the purpose of generating a graphical representation of the general distribution of the KWHs at a statewide scale. Because of this scale, many of the smaller habitat patches have been buffered to increase their visibility on the map, especially for habitats that are not densely distributed. However, the smallest patches may still be too small to be seen at this scale; some KWHs, such as Spring and Small Coastal Plain Island, are displayed as points rather than as polygons as a way to handle this issue. Many maps represent known and potential habitat, especially those of the more common and widely distributed habitats. Many, if not most, of the KWH maps used the same data sources and GIS layers as were used in the 2015 SWAP.

These maps were compiled using numerous existing data sources, such as U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory data; U.S. Geological Survey (USGS) National Hydrography Dataset, National Land Cover Data and Geographic Names Information System; U.S. Department of Agriculture (USDA) Soil Conservation Service generalized soils data; Federal Emergency Management Agency (FEMA) Q3 Floodplain data; MD Department of Planning's (MDP) Land Use/Land Cover data; University of Maryland Center for Environmental Science (UMCES) Appalachian Lab deep mines dataset; MD DNR Maryland Biological Stream Survey (MBSS) and Versar Inc. streams data (MBSS100k); and other MD DNR data developed by various sources, including Maryland Geological Survey (MGS), MD DNR Resource Assessment Service (RAS), and MD DNR Natural Heritage Program (NHP). The Northeast Terrestrial Habitat Map, developed by The Nature Conservancy (2011), was also a major source of data. Data sources for each map are listed in the accompanying caption.

The accuracy of MD DNR's KWH GIS data layers varies greatly, ranging from field-verified locations to predictive models, and many will need additional ground-truthing and other quality control measures and refinements before they should be considered accurate enough to use for most other purposes, especially at a local level. Even the maps that display known point location data are to some extent incomplete; therefore, these maps only should be viewed as generalized range maps, rather than depicting the full and complete distribution of habitats.

In addition to displaying the general location of KWHs in Maryland, these maps can be used as a tool to help direct distribution and abundance surveys of SGCN and associated vegetative communities within these habitats. The maps may also support the development of conservation strategies for specific KWHs on state and private lands designed to benefit all wildlife. Further mapping of "ecological landscapes" and natural communities will identify and delineate land areas with similar topography, bedrock type, soils, surface hydrology, vegetation, and land use. This will allow improved analyses and prediction of the distribution of species and habitats of greatest conservation need within their ecological context and provide an important tool to assist in the conservation of unique habitats within the framework of natural biological systems.



Upland Habitats

Forests

High Elevation Ridge Forest

Region(s): Western

Habitat Group: Forests

NEAFWA: High Elevation Forests

The High Elevation Ridge Forest Key Wildlife Habitat is characterized by rocky forests and woodlands that developed on Maryland’s highest mountain ridges at or above 2,500 feet, such as those found on Backbone, Big Savage, Negro, Meadow, and Dans Mountains. The ecological communities within this habitat represent the uppermost elevational limits of oak-heath forests found throughout the western



Jason Harrison, MD DNR

Piedmont and mountain regions, occupying some of the most inhospitable habitats in Maryland, situated on very exposed sites that are frequently subjected to high winds throughout the year and ice storms during the winter months. Trees are often stunted, have wind-pruned branches, and generally have a much different appearance than trees downslope at lower elevations.

Overall species diversity is low, with chestnut oak (*Quercus montana*) most prominent in the canopy. Other canopy species may include northern red oak (*Quercus rubra*), white oak (*Quercus alba*), pitch pine (*Pinus rigida*), eastern white pine (*Pinus strobus*), bear oak (*Quercus ilicifolia*), sweet birch (*Betula lenta*), yellow birch (*Betula alleghaniensis*), black cherry (*Prunus serotina*), and occasionally red spruce (*Picea rubens*). Shrubs may include thickets of young bear oak, mountain laurel (*Kalmia latifolia*), blueberries (*Vaccinium* spp.), and black huckleberry (*Gaylussacia baccata*). Depending on the density of shrub cover, the herbaceous layer has sparse to moderate cover, and common species include Pennsylvania sedge (*Carex pensylvanica*), spotted wintergreen (*Chimaphila maculata*), false toadflax (*Comandra umbellata*), pink lady’s slipper (*Cypripedium acaule*), poverty oatgrass (*Danthonia spicata*), trailing arbutus (*Epigaea repens*), rattlesnake-weed (*Hieracium venosum*), Indian cucumber (*Medeola virginiana*), ghost pipe (*Monotropa uniflora*), and bracken fern (*Pteridium aquilinum*).

These habitats are prone to spongy moth infestations, which can cause significant tree mortality in oak-dominated forests. Prior to the chestnut blight of the 1940s, American chestnut (*Castanea dentata*) was a major component of this habitat. In 2007, the Maryland Department of Natural Resources identified approximately 220 acres of High Elevation Ridge Forests as old growth forests on state lands (MD DNR 2007).

County Distribution: Allegany, Garrett

Places to Visit: Potomac-Garrett State Forest, Savage River State Forest, Dans Mountain Wildlife Management Area



State Rare Natural Communities: Lower New England High Slope Chestnut Oak Forest

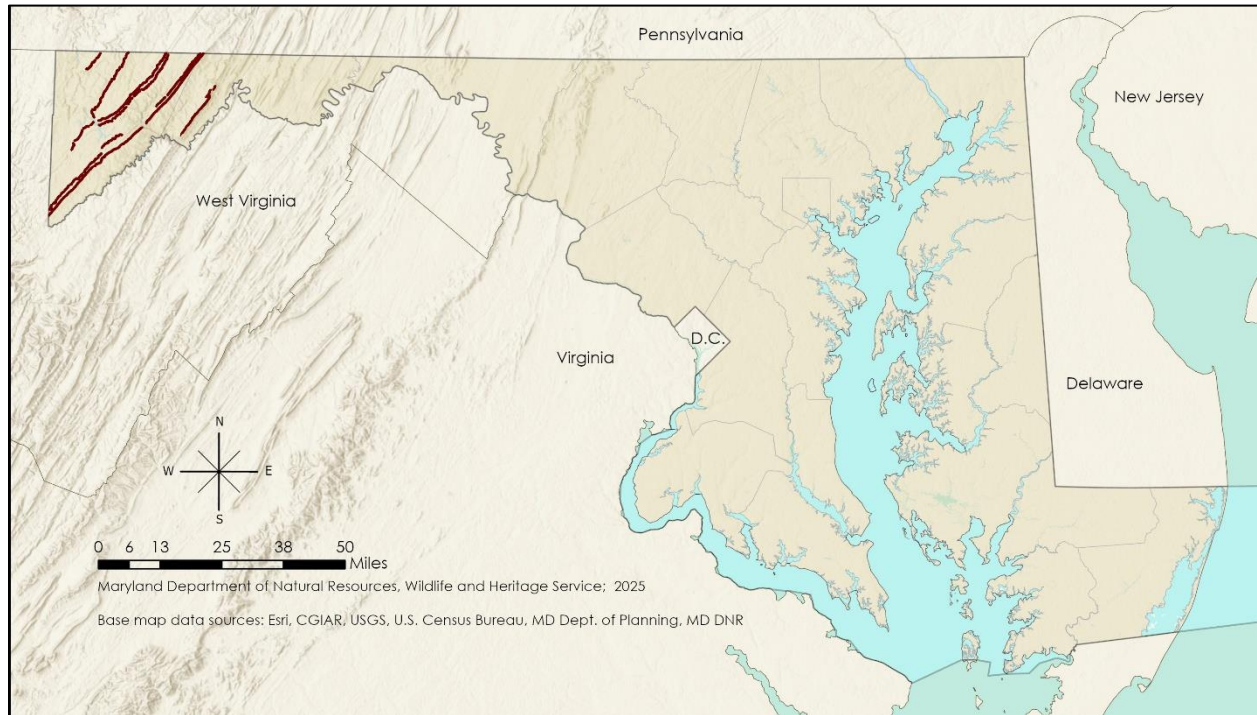


Figure 4.1 Location of High Elevation Ridge Forests in Maryland. Source: MD DNR.

Species of Greatest Conservation Need Associated with High Elevation Ridge Forests:

Birds

Acadian flycatcher
Black-and-white warbler
Black-throated blue warbler
Black-throated green warbler
Broad-winged hawk
Brown creeper
Canada warbler
Dark-eyed junco
Eastern whip-poor-will
Golden eagle
Golden-winged warbler
Magnolia warbler
Mourning warbler
Ovenbird
Ruffed grouse
Scarlet tanager
Winter wren
Wood thrush
Worm-eating warbler

Reptiles

Copperhead
Eastern box turtle
Timber rattlesnake

Amphibians

Jefferson salamander
Wehrle's salamander

Mammals

Allegheny woodrat
Appalachian cottontail
Bobcat
Eastern red bat
Eastern small-footed bat
Eastern spotted skunk
Hoary bat
Indiana bat
Least weasel
Little brown bat
Long-tailed shrew
Northern long-eared bat
Silver-haired bat

Mammals (continued)

Smoky shrew
Tricolored bat

Invertebrates (Snails)

Angular disc snail

Insects (Lepidoptera)

Barred angle moth (*Macaria subcessaria*)
Gray comma

Insects (Coleoptera)

Common claybank tiger beetle
Cow path tiger beetle
Northern barrens tiger beetle
Splendid tiger beetle

Plants

Climbing fumitory (*Adlumia fungosa*)
Giant-seed goosefoot (*Chenopodium simplex*)
Beaked dodder (*Cuscuta rostrata*)
Mountain woodfern (*Dryopteris campyloptera*)



Hemlock-Northern Hardwood Forest

Region(s): Central, Western

Habitat Group: Forests

NEAFWA: Forests & Woodlands

The Hemlock-Northern Hardwood Forest Key Wildlife Habitat is characterized by cool, mesic forests of low mountain slopes and valleys in Maryland. These forests are most abundant at higher elevations on the Appalachian Plateau but also occur in pockets along north-facing mountain slopes of the Ridge and Valley and Blue Ridge, with disjunct and isolated stands that occur in portions of the Piedmont and coastal plain regions that represent relict stands of a once more widespread forest of the late Pleistocene age. As the post-glacial climate warmed, these forests retreated to higher elevations within the state.



Jason Harrison, MD DNR

The composition of Hemlock-Northern Hardwood Forests in Maryland varies with site conditions and was heavily influenced by destructive fires and extensive logging of eastern hemlock (*Tsuga canadensis*), red spruce (*Picea rubens*), white pine (*Pinus strobus*), and hardwoods in the early 1900s. Approximately 400 acres of Hemlock-Northern Hardwood Forests have been identified as old growth on state lands in western Maryland (MD DNR 2007). Today's stands are typically dominated by northern hardwoods such as sugar maple (*Acer saccharum*), American beech (*Fagus grandifolia*), black cherry (*Prunus serotina*), and yellow birch (*Betula alleghaniensis*), with mixtures of eastern hemlock. Other tree associates may include northern red oak (*Quercus rubra*), white oak (*Quercus alba*), white pine, sweet birch (*Betula lenta*), red spruce, white ash (*Fraxinus americana*), basswood (*Tilia americana*), and red maple (*Acer rubrum*). The understory of Hemlock-Northern Hardwood Forests may include species such as striped maple (*Acer pensylvanicum*), witch-hazel (*Hamamelis virginiana*), maple-leaf viburnum (*Viburnum acerifolium*), and dense patches of great laurel (*Rhododendron maximum*) and mountain laurel (*Kalmia latifolia*). It is not uncommon to discover the herbaceous layers in some stands entirely dominated by patches of hay-scented fern (*Dennstaedtia punctilobula*) or New York fern (*Amauropelta noveboracensis*). Other characteristic herbs include Indian cucumber-root (*Medeola virginiana*), whorled aster (*Oclemena acuminata*), Canada mayflower (*Maianthemum canadense*), bellworts (*Uvularia* spp.), violets (*Viola* spp.), and wood ferns (*Dryopteris* spp.).

Forests where eastern hemlock is an important canopy component are threatened by the hemlock woolly adelgid, a non-native and destructive insect from Asia that infests hemlock trees, ultimately resulting in mortality.

County Distribution: Allegany, Baltimore, Caroline, Carroll, Cecil, Frederick, Garrett, Harford, Howard, Kent, Montgomery, Talbot, Washington

Places to Visit: Savage River State Forest, Swallows Falls State Park



State Rare Natural Communities: Eastern Hemlock-Hardwood Forest, Northern Hardwood Forest

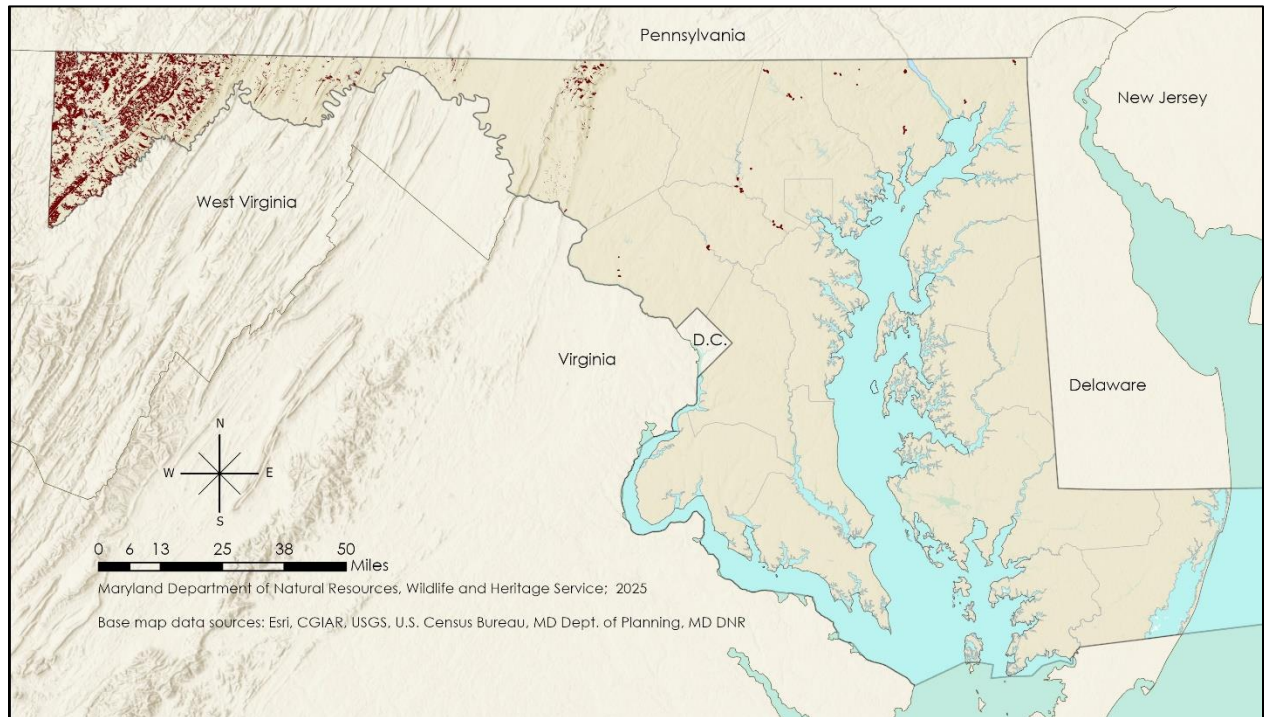


Figure 4.2 Location of Hemlock-Northern Hardwood Forests in Maryland. Sources: MD DNR and Delaware Department of Natural Resources and Environmental Control.

Species of Greatest Conservation Need Associated with Hemlock-Northern Hardwood Forests:

Birds

Acadian flycatcher
American goshawk
American redstart
American woodcock
Bald eagle
Black-and-white warbler
Black-throated blue warbler
Black-throated green warbler
Blackburnian warbler
Broad-winged hawk
Brown creeper
Canada warbler
Dark-eyed junco
Eastern whip-poor-will
Golden eagle
Golden-crowned kinglet
Golden-winged warbler
Hooded warbler
Kentucky warbler
Least flycatcher

Reptiles

Copperhead
Eastern box turtle
Smooth greensnake
Timber rattlesnake
Wood turtle

Amphibians

Green salamander
Jefferson salamander
Mountain chorus frog
Valley and Ridge salamander
Wehrle's salamander

Mammals

Allegheny woodrat
American mink
Appalachian cottontail
Bobcat
Eastern red bat
Eastern small-footed bat

Insects (Lepidoptera)

Barred angle moth (*Macaria subcessaria*)
Comstock's sawfly moth
Gray comma
West Virginia white

Insects (Coleoptera)

Common claybank tiger beetle
Cow path tiger beetle
Northern barrens tiger beetle
Splendid tiger beetle

Plants

Filmy angelica (*Angelica triquinata*)
Lanceleaf grapefern (*Botrychium angustisegmentum*)
Bunchberry (*Chamaepericlymenum canadense*)
Purple clematis (*Clematis occidentalis*)



Magnolia warbler
Mourning warbler
Northern parula
Northern saw-whet owl
Ovenbird
Pine siskin
Red-breasted nuthatch
Ruffed grouse
Scarlet tanager
Sharp-shinned hawk
Swainson's thrush
Veery
Winter wren
Wood thrush
Worm-eating warbler

Eastern spotted skunk
Gray fox
Hoary bat
Indiana bat
Least weasel
Little brown bat
Long-tailed shrew
Northern long-eared bat
Silver-haired bat
Smoky shrew
Southern bog lemming
Southern pygmy shrew
Southern rock vole
Southern water shrew
Tricolored bat

Invertebrates (Snails)

Angular disc snail
Spruce knob threetooth

Harned's clintonia (*Clintonia
alleghaniensis*)
Clinton lily (*Clintonia borealis*)
Goldthread (*Coptis trifolia*)
Long-bract green orchis
(*Dactylorhiza viridis*)
American fly-honeysuckle (*Lonicera
canadensis*)
Bog clubmoss (*Lycopodiella
inundata*)
Kidneyleaf twayblade (*Neottia
smallii*)
Purple oat (*Schizachne purpurascens*)
Rosy twisted-stalk (*Streptopus
lanceolatus*)
Canada yew (*Taxus canadensis*)
Large-flower bellwort (*Uvularia
grandiflora*)



Cove Forest

Region(s): Western

Habitat Group: Forests

NEAFWA: Forests & Woodlands

The Cove Forest Key Wildlife Habitat (KWH) is characterized by diverse, mesic forests of mountain slopes occupying sheltered landforms such as coves, ravines, and concave lower slopes, which provide shade protection from high winds, creating very moist soil conditions. Both rich and acidic Cove Forests are represented in this KWH and differentiated by soil fertility, species richness, and species composition.



Edward Thompson, MD DNR

Rich Cove Forests contain deep, nutrient-rich, moderately alkaline, fertile soils weathered from a variety of substrates that have higher levels of calcium, magnesium, and manganese, yielding some of the highest diversity of plant communities in the state, often supporting very diverse and lush herbaceous layers. However, greater soil nutrient availability also makes rich cove forests highly susceptible to invasion by non-native plant species. Forest canopies are most commonly dominated by combinations of sugar maple (*Acer saccharum*), basswood (*Tilia americana*), white ash (*Fraxinus americana*), white oak (*Quercus alba*), and northern red oak (*Quercus rubra*). Other characteristic tree species include cucumber magnolia (*Magnolia acuminata*), shagbark hickory (*Carya ovata*), butternut (*Juglans cinerea*), tulip poplar (*Liriodendron tulipifera*), witch-hazel (*Hamamelis virginiana*), eastern hop-hornbeam (*Ostrya virginiana*), striped maple (*Acer pensylvanicum*), and sweet birch (*Betula lenta*). The herbaceous layer typically includes species such as Jack-in-the-pulpit (*Arisaema triphyllum*), white snakeroot (*Ageratina altissima*), aniseroot (*Osmorhiza longistylis*), wood nettle (*Laportea canadensis*), enchanter's nightshade (*Circaea lutetiana* ssp. *canadensis*), Virginia waterleaf (*Hydrophyllum virginianum*), wild ginger (*Asarum canadense*), American ginseng (*Panax quinquefolius*), wild columbine (*Aquilegia canadensis*), yellow mandarin (*Prosartes lanuginosa*), blue cohosh (*Caulophyllum thalictroides*), foamflower (*Tiarella cordifolia*), wood ferns (*Dryopteris* spp.), trilliums (*Trillium* spp.), and bellworts (*Uvularia* spp.).

Acidic Cove Forests occur on substrates underlain by acidic bedrock such as sandstone or quartzite. A mixture of eastern hemlock (*Tsuga canadensis*), white pine (*Pinus strobus*), and hardwoods such as yellow birch, northern red oak, white oak, and dense patches of great laurel (*Rhododendron maximum*) or mountain laurel (*Kalmia latifolia*) distinguish these forests from rich Cove Forests. Other characteristic woody species include witch-hazel, spicebush (*Lindera benzoin*), wild hydrangea (*Hydrangea arborescens*), and maple-leaf viburnum (*Viburnum acerifolium*). Herbaceous species are limited by dense shade and poor soils and are much sparser and less diverse than in rich cove forests. The herbaceous layer includes species suited to acidic soils, such as white wood aster (*Eurybia divaricata*), Christmas fern (*Polystichum acrostichoides*), hay-scented fern (*Dennstaedtia punctilobula*), wild yam (*Dioscorea* spp.),



Canada mayflower (*Maianthemum canadense*), rattlesnake fern (*Botrychium virginianum*), and Solomon’s plume (*Maianthemum racemosum* ssp. *racemosum*).

The Cove Forest KWH is often transitional and adjacent to the Hemlock-Northern Hardwood Forest KWH. Approximately 500 acres of Cove Forest have been identified as old growth forests on state lands (MD DNR 2007). Cove Forests range-wide are threatened by logging and the invasion of shade-tolerant non-native weeds such as garlic mustard (*Alliaria petiolata*). Furthermore, cove forests are threatened by two non-native insect species. Acidic Cove Forests, where eastern hemlock is an important canopy species, are threatened by the hemlock woolly adelgid, a non-native and destructive insect from Asia. Rich cove forests are threatened by mortality of white ash caused by emerald ash borer, also native to Asia.

County Distribution: Allegany, Frederick, Garrett, Washington

Places to Visit: Savage River State Forest, Potomac-Garrett State Forest

State Rare Natural Communities: Acidic Cove Forest, Rich Cove Forest

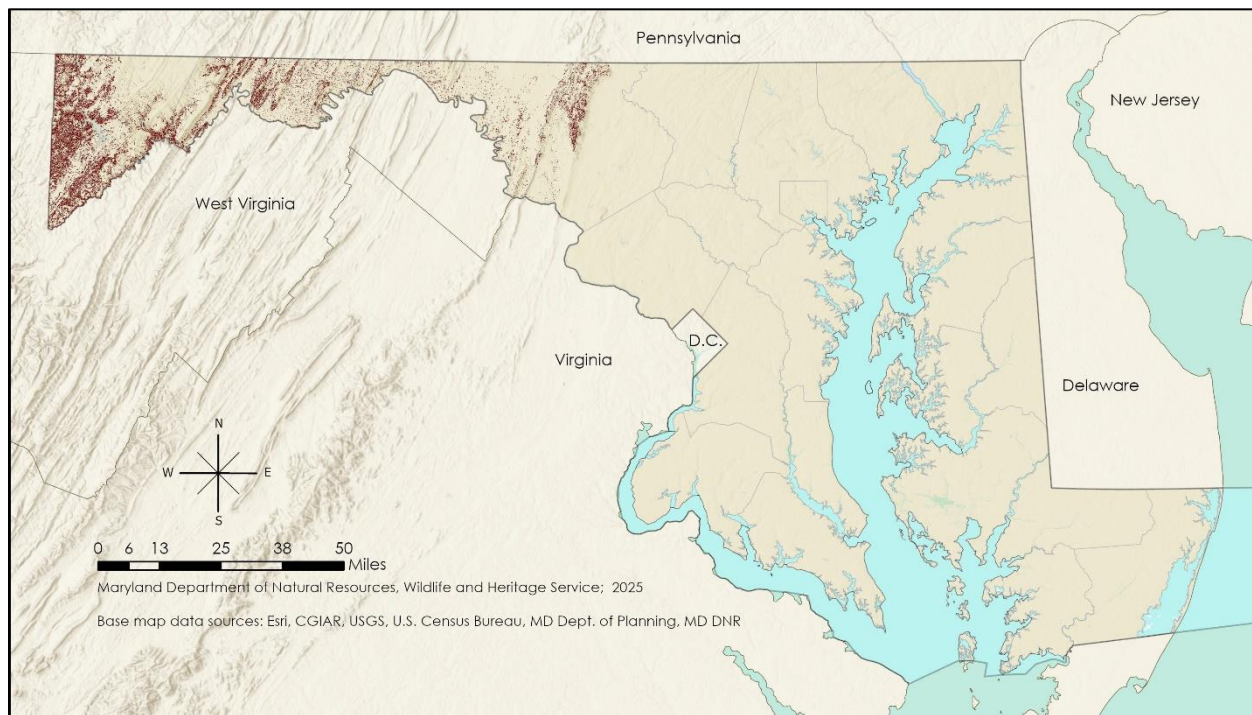


Figure 4.3 Location of Cove Forests in Maryland. Sources: MD DNR and Nature Serve’s Terrestrial Ecological Systems of the U.S.

Species of Greatest Conservation Need Associated with Cove Forests:

Birds

Acadian flycatcher
American redstart
American woodcock
Baltimore oriole

Mammals

Allegheny woodrat
American mink
Appalachian cottontail
Bobcat

Amphibians

Green salamander
Jefferson salamander
Mountain chorus frog
Upland chorus frog



Black-and-white warbler
Black-throated blue warbler
Black-throated green warbler
Blackburnian warbler
Blue-winged warbler
Broad-winged hawk
Brown creeper
Canada warbler
Cerulean warbler
Dark-eyed junco
Eastern whip-poor-will
Golden eagle
Golden-winged warbler
Hooded warbler
Kentucky warbler
Least flycatcher
Northern parula
Northern saw-whet owl
Ovenbird
Prairie warbler
Ruffed grouse
Scarlet tanager
Sharp-shinned hawk
Veery
Winter wren
Wood thrush
Worm-eating warbler
Yellow-throated vireo

Eastern red bat
Eastern small-footed bat
Eastern spotted skunk
Gray fox
Hoary bat
Indiana bat
Least weasel
Little brown bat
Long-tailed shrew
Northern long-eared bat
Silver-haired bat
Smoky shrew
Southern bog lemming
Southern pygmy shrew
Southern water shrew
Tricolored bat

Reptiles

Copperhead
Eastern box turtle
Timber rattlesnake
Wood turtle

Valley and Ridge salamander
Wehrle's salamander

Insects (Lepidoptera)

Barred angle moth (*Macaria subcessaria*)
Comstock's swallow moth
Gray comma
West Virginia white

Plants

American bugbane (*Actaea podocarpa*)
Fraser's sedge (*Carex fraseriana*)
Northern oak fern (*Gymnocarpium dryopteris*)
Drooping bluegrass (*Poa saltuensis*)



Montane-Piedmont Oak-Pine Forest

Region(s): Central, Western

Habitat Group: Forests

NEAFWA: Forests & Woodlands

The Montane-Piedmont Oak-Pine Forest Key Wildlife Habitat (KWH) consists of dry-mesic oak and oak-pine dominated forests of low (< 2,500 feet) mountain slopes, ridge crests, and rolling Piedmont hills. This KWH develops over a variety of acidic substrates, including shale and sandstone in the mountains and metamorphic and igneous rocks in the Piedmont. These forests commonly include chestnut oak (*Quercus montana*), white oak (*Quercus alba*), scarlet oak (*Quercus coccinea*), bear oak (*Quercus ilicifolia*), black oak (*Quercus velutina*), black gum (*Nyssa sylvatica*), and white pine (*Pinus strobus*) in variable mixtures, although some stands may be entirely dominated by chestnut oak. Occasionally, stands may support abundant white pine, which may be more common in forests following logging or fire exclusion, while others may have Virginia pine (*Pinus virginiana*) and successional hardwoods such as red maple (*Acer rubrum*) present, indicative of past disturbances. Tall shrubs of mountain laurel (*Kalmia latifolia*), wild azalea (*Rhododendron periclymenoides*), and maple-leaf viburnum (*Viburnum acerifolium*) are typical as are dense patches of low heaths such as early lowbush blueberry (*Vaccinium pallidum*), black huckleberry (*Gaylussacia baccata*), and deerberry (*Vaccinium stamineum*). The herbaceous layer of these forests is generally sparse but may include poverty oatgrass (*Danthonia spicata*), wavy hairgrass (*Deschampsia flexuosa* var. *flexuosa*), and Pennsylvania sedge (*Carex pensylvanica*). In 2007, the Maryland Department of Natural Resources identified about 730 acres of Montane-Piedmont Oak-Pine Forest as old growth forests on state lands (MD DNR 2007).



Mark Hall, MD DNR

County Distribution: Allegany, Baltimore, Carroll, Cecil, Frederick, Garrett, Harford, Howard, Montgomery, Washington

Places to Visit: Green Ridge State Forest, Savage River State Forest, South Mountain State Park, Dans Mountain Wildlife Management Area



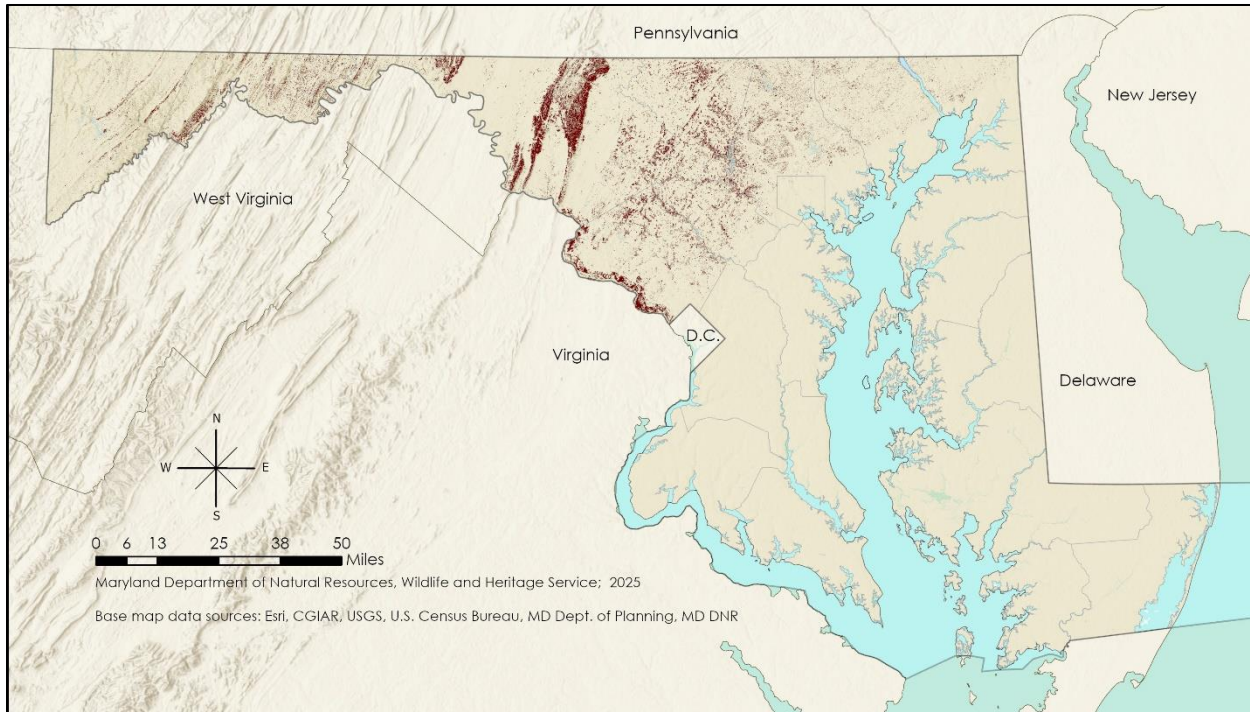


Figure 4.4 Location of Montane-Piedmont Oak-Pine Forests in Maryland. Source: NatureServe’s Terrestrial Ecological Systems of the U.S.

Species of Greatest Conservation Need Associated with Montane-Piedmont Oak-Pine Forests:

Birds

Acadian flycatcher
American woodcock
Bald eagle
Baltimore oriole
Black-and-white warbler
Black-billed cuckoo
Broad-winged hawk
Brown creeper
Eastern whip-poor-will
Golden eagle
Golden-winged warbler
Northern bobwhite
Northern saw-whet owl
Ovenbird
Prairie warbler
Ruffed grouse
Scarlet tanager
Sharp-shinned hawk
Wood thrush
Worm-eating warbler
Yellow-breasted chat
Yellow-throated vireo

Mammals

Allegheny woodrat
American mink
Appalachian cottontail
Bobcat
Eastern red bat
Eastern small-footed bat
Eastern spotted skunk
Gray fox
Hoary bat
Indiana bat
Least weasel
Little brown bat
Northern long-eared bat
Silver-haired bat
Tricolored bat
Amphibians
Jefferson salamander
Mountain chorus frog
Upland chorus frog
Valley and Ridge salamander

Insects (Coleoptera)

Cow path tiger beetle
Northern barrens tiger beetle
Splendid tiger beetle

Insects (Hymenoptera)

A leafcutter bee (*Paranthidium jugatorium*)
Azalea mining bee (*Andrena cornelli*)
Half-black bumble bee (*Bombus vagans*)
Rusty-patch bumble bee (*Bombus affinis*)
Texas mason bee (*Osmia texana*)
Yellowbanded bumble bee (*Bombus terricola*)

Plants

Hairy woodmint (*Blephilia hirsuta*)
Summer sedge (*Carex aestivalis*)
Blue Ridge sedge (*Carex lucorum*)
Ravenel’s witchgrass (*Dichanthelium ravenelii*)
Hairy lettuce (*Lactuca hirsuta*)



Reptiles

Copperhead
Eastern box turtle
Mountain earthsnake
Northern coal skink
Red cornsnake
Six-lined racerunner
Smooth greensnake
Timber rattlesnake
Wood turtle

Insects (Lepidoptera)

Cobweb skipper
Edwards' hairstreak
Frosted elfin
Indian skipper
Leonard's skipper
Melsheimer's sack-bearer
Northern metalmark
Northern oak hairstreak
Olympia marble
Pepper and salt skipper
Silvery blue

Sweet pinesap (*Monotropsis odorata*)
Black-fruit mountain-ricegrass (*Patis
racemosa*)
Virginia mountainmint (*Pycnanthemum
virginianum*)
Roundleaf dogwood (*Swida rugosa*)
Drummond's aster (*Symphyotrichum
drummondii*)



Oak-Hickory Forest

Region(s): Central, Western

Habitat Group: Forests

NEAFWA: Forests & Woodlands

The Oak-Hickory Forest Key Wildlife Habitat (KWH) is the most common forest type in the Piedmont and mountain regions of Maryland, historically covering thousands of acres throughout the Piedmont, Ridge and Valley, Blue Ridge, and Appalachian Plateau. They occupy a wide variety of low- to mid-elevation upland settings with variable soil moisture and fertility. Soils are predominantly acidic and nutrient-poor, but localized areas of basic (e.g., metabasalt, amphibolite, and gabbro) support a higher diversity of plants and are considered rare natural communities in the state. Soil moisture is dependent upon local site conditions but can vary from mesic on low to midslopes to dry on upper slopes, ridge crests and, occasionally, bedrock terraces along rivers.



Richard Wiegand, MD DNR

Characteristic of this KWH is a well-developed, closed canopy of oaks such as white oak (*Quercus alba*), northern red oak (*Quercus rubra*), scarlet oak (*Quercus coccinea*), black oak (*Quercus velutina*), and occasionally chestnut oak (*Quercus prinus*). American chestnut (*Castanea dentata*) was likely prominent in the canopy of oak-hickory forests prior to the chestnut blight of the 1940s, which essentially eliminated them from these forests. Hickory species are diagnostic and often abundant as understory trees, but may also reach into the canopy and commonly include pignut hickory (*Carya glabra*), mockernut hickory (*Carya alba*), red hickory (*Carya ovalis*), shagbark hickory (*Carya ovata*), and bitternut hickory (*Carya cordiformis*). White ash (*Fraxinus americana*), eastern hop-hornbeam (*Ostrya virginiana*), common hackberry (*Celtis occidentalis*), and eastern redbud (*Cercis canadensis*) are characteristic of stands over basic substrates. With a long history of human habitation, logging, and agricultural conversion, many stands today are early to mid-successional and may be dominated by tulip poplar (*Liriodendron tulipifera*), sugar maple (*Acer saccharum*), white pine (*Pinus strobus*), and Virginia pine (*Pinus virginiana*). Only 100 acres of Oak-Hickory Forest were identified by the Maryland Department of Natural Resources as old growth on state lands (MD DNR 2007).

The understory of Oak-Hickory Forests is also variable and correlated with soil nutrient and moisture availability, grading from dense patches of deciduous shrubs on dry, acidic sites to lush herbaceous layers—sometimes with exceptionally high species diversity—on more mesic or nutrient-enriched sites. Forests with more acidic soils have understories that are typically shrub-dominated by ericads, including early lowbush blueberry (*Vaccinium pallidum*) and deerberry (*Vaccinium stamineum*), and scattered individuals of maple-leaf viburnum (*Viburnum acerifolium*), witch-hazel (*Hamamelis virginiana*), and flowering dogwood (*Cornus florida*). Historically, flowering dogwood was probably much more abundant, but today's stands are



vulnerable to dogwood anthracnose, a fungal pathogen responsible for high mortality in dogwoods. On more enriched sites, the shrub layer is more open, with ericads and other shrubs having only patchy cover and less importance within the community.

The herbaceous layer grades from patchy with low diversity on acidic sites to dense with high diversity in stands over basic substrates. Native plants of basic Oak-Hickory Forests may include cut-leaf toothwort (*Cardamine concatenata*), spring-beauty (*Claytonia* spp.), rue-anemone (*Thalictrum thalictroides*), white wood aster (*Eurybia divaricata*), bottlebrush grass (*Elymus hystrix* var. *hystrix*), blue-stemmed goldenrod (*Solidago caesia*), elm-leaf goldenrod (*Solidago ulmifolia* var. *ulmifolia*), and Bosc’s panic grass (*Dichanthelium boscii*). Native plants of acidic Oak-Hickory Forests generally include species such as Indian cucumber-root (*Medeola virginiana*), Solomon’s-seal (*Polygonatum biflorum*), rattlesnake-weed (*Hieracium venosum*), plantain-leaved pussytoes (*Antennaria plantaginifolia*), Pennsylvania sedge (*Carex pensylvanica*), and poverty oatgrass (*Danthonia spicata*). Unfortunately, excessive deer browse in these habitats has resulted in poor tree regeneration, and in some cases, invasion of non-native weeds such as garlic mustard (*Alliaria petiolata*) and Japanese honeysuckle (*Lonicera japonica*).

County Distribution: Allegany, Baltimore, Carroll, Cecil, Frederick, Garrett, Harford, Howard, Montgomery, Washington

Places to Visit: Green Ridge State Forest, Monocacy Natural Resource Management Area, Patapsco Valley State Park, C&O Canal National Historical Park

State Rare Natural Community: Basic Oak-Hickory Forest

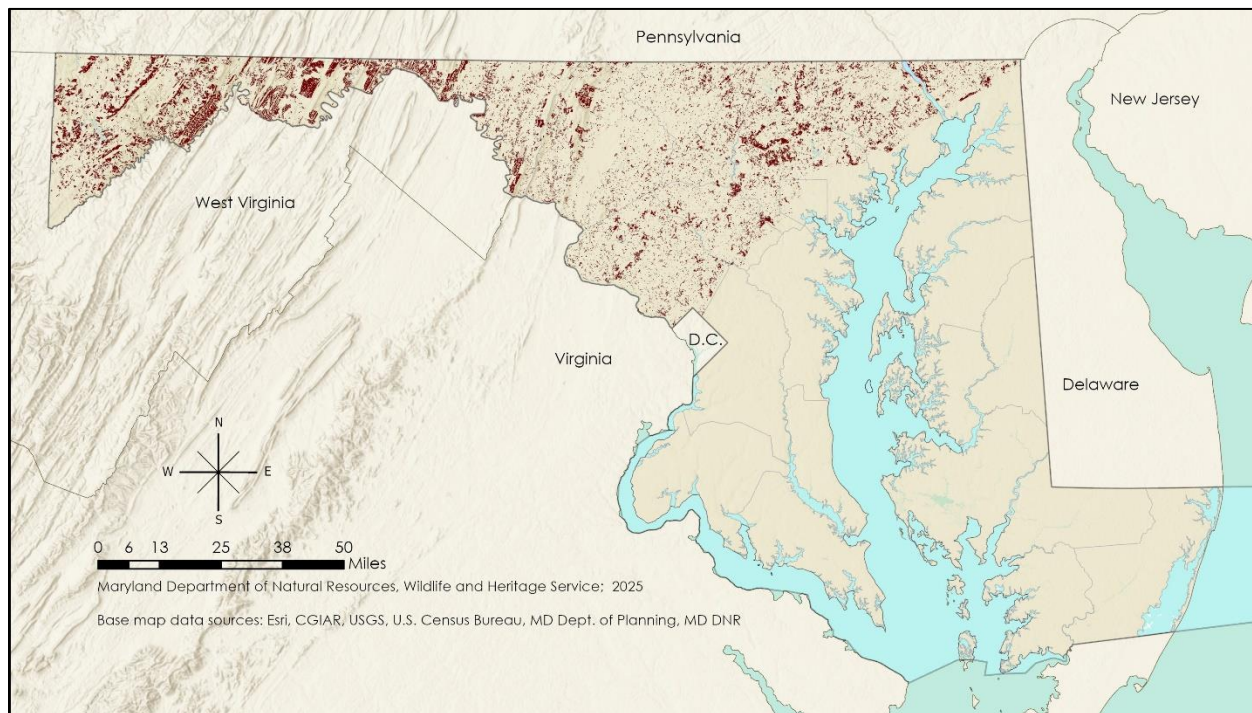


Figure 4.5 Location of Oak-Hickory Forests in Maryland. Source: The Nature Conservancy’s (TNC) Northeastern Terrestrial Wildlife Habitat Classification System (NETWHCS).



Species of Greatest Conservation Need Associated with Oak-Hickory Forests:

Birds

Acadian flycatcher
American redstart
American woodcock
Bald eagle
Baltimore oriole
Black-and-white warbler
Black-billed cuckoo
Black-throated blue warbler
Black-throated green warbler
Blackburnian warbler
Blue-winged warbler
Broad-winged hawk
Brown creeper
Canada warbler
Cerulean warbler
Dark-eyed junco
Eastern whip-poor-will
Golden eagle
Golden-winged warbler
Hooded warbler
Kentucky warbler
Least flycatcher
Mourning warbler
Northern bobwhite
Northern parula
Ovenbird
Prairie warbler
Ruffed grouse
Scarlet tanager
Sharp-shinned hawk
Veery
Wood thrush
Worm-eating warbler
Yellow-breasted chat
Yellow-throated vireo

Mammals

Allegheny woodrat
American mink
Bobcat
Eastern red bat
Eastern small-footed bat
Eastern spotted skunk
Gray fox
Hoary bat
Indiana bat
Least weasel
Little brown bat
Northern long-eared bat
Silver-haired bat
Smoky shrew
Southeastern shrew
Southern bog lemming
Southern pygmy shrew
Tricolored bat

Amphibians

Green salamander
Jefferson salamander
Mountain chorus frog
Upland chorus frog
Valley and Ridge salamander

Reptiles

Copperhead
Eastern box turtle
Eastern kingsnake
Eastern mud turtle
Red cornsnake
Smooth greensnake
Spotted turtle
Timber rattlesnake
Wood turtle

Insects (Lepidoptera)

Barred angle moth (*Macaria subcessaria*)
Franck's sphinx
Gray comma
Northern oak hairstreak
Pepper and salt skipper

Insects (Hymenoptera)

A leafcutter bee (*Paranthidium jugatorium*)
Cranesbill miner bee (*Andrena distans*)
Half-black bumble bee (*Bombus vagans*)
Rusty-patch bumble bee (*Bombus affinis*)
Texas mason bee (*Osmia texana*)
Yellowbanded bumble bee (*Bombus terricola*)

Plants

Fly-poison (*Amianthium muscitoxicum*)
American chestnut (*Castanea dentata*)
Devil's-bit (*Chamaelirium luteum*)
Green adder's-mouth orchid (*Malaxis unifolia*)
Sourwood (*Oxydendrum arboreum*)
Bashful bulrush (*Trichophorum planifolium*)



Managed Montane Conifer Forest

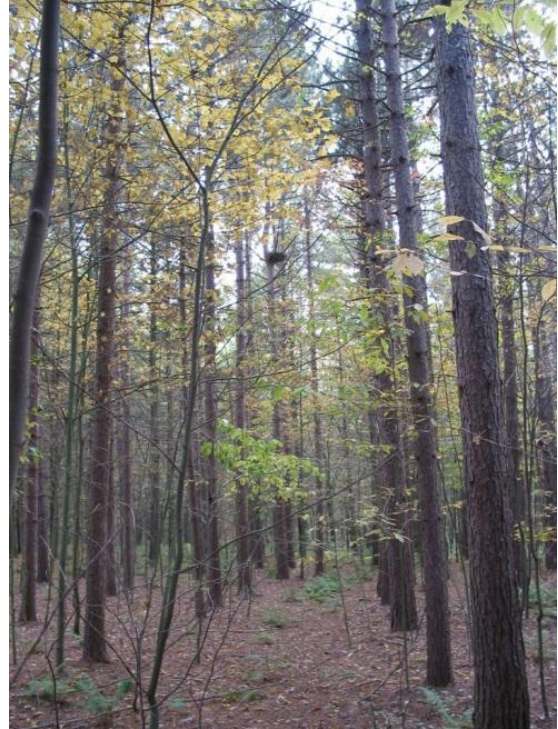
Region(s): Western

Habitat Group: Forests

NEAFWA: Agriculture: Plantations/Orchards

Additional Notes: An artificial or human-made habitat

This habitat consists of pure or nearly pure conifer stands that have been planted, usually as monocultures. Many contain non-native conifers (e.g., Norway spruce [*Picea abies*], black spruce [*Picea glauca*], Scotch pine [*Pinus sylvestris*]), but some include native species such as eastern white pine (*Pinus strobus*). Numerous conifer forest stands in western Maryland were established during the 1930s by Civilian Conservation Corps work crews. Today, these plantings can still be found on DNR lands (e.g., Savage River State Forest, New Germany State Park) and elsewhere as dense, heavily shaded, mature conifer stands. In a region where most natural forests dominated by northern conifers were eliminated by nineteenth and early twentieth century logging, montane conifer plantations provide surrogate nesting habitat for some sub-boreal and boreal bird species of conservation need that reach the southern periphery of their breeding range in the central and southern Appalachians. Species such as red-breasted nuthatch (*Sitta canadensis*) and golden-crowned kinglet (*Regulus satrapa*) can be found in other forested habitats, such as Hemlock-Northern Hardwood Forests, but the density and age of conifers in these stands provide optimal conditions for species with northern affinities.



Dave Brinker, MD DNR

County Distribution: Allegany, Garrett



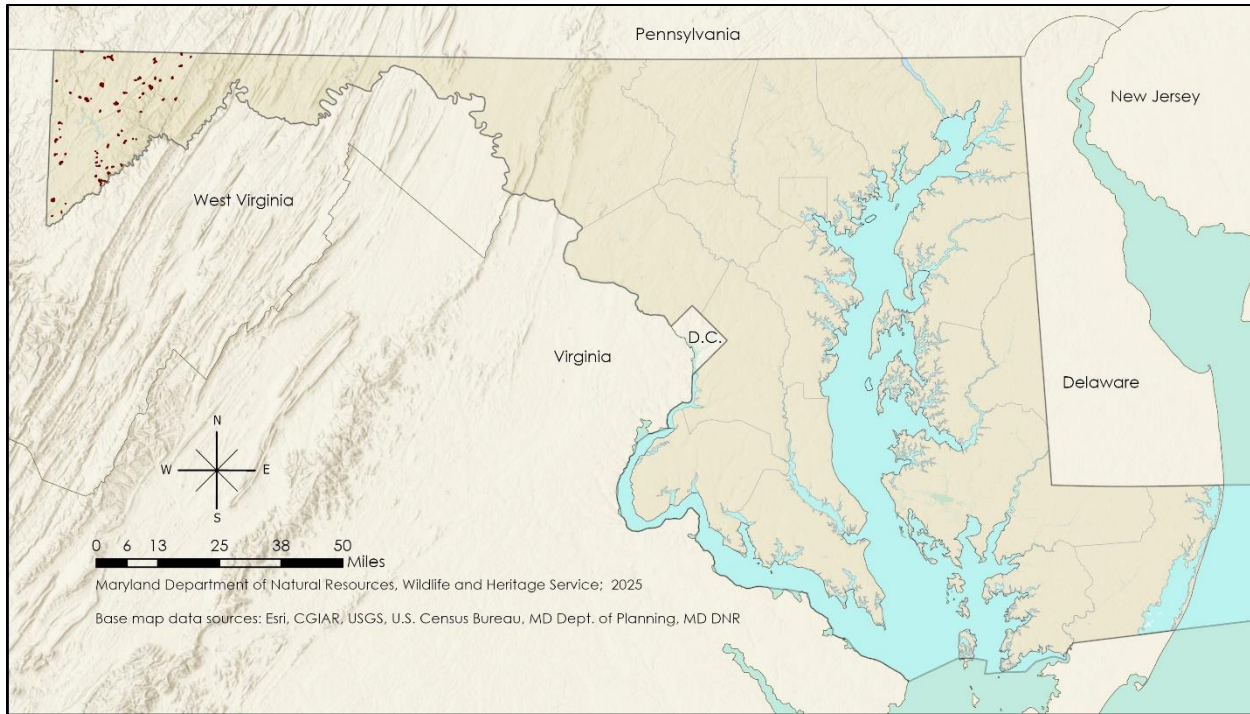


Figure 4.6 Location of Managed Montane Conifer Forests in Maryland. Source: MD DNR.

Species of Greatest Conservation Need Associated with Managed Montane Conifer Forests:

Birds

American goshawk
Black-throated green warbler
Blackburnian warbler
Golden-crowned kinglet
Long-eared owl
Magnolia warbler
Pine siskin
Red-breasted nuthatch
Sharp-shinned hawk



Mesic Mixed Hardwood Forest**Region(s):** Central, Eastern, Southern**Habitat Group:** Forests**NEAFWA:** Forests & Woodlands

The revised Mesic Mixed Hardwood Forest Key Wildlife Habitat (KWH) combines the Basic Mesic Forest and Mesic Mixed Hardwood Forest KWHs from the 2015 State Wildlife Action Plan revision. This KWH occurs across the Coastal Plain, Piedmont, and lower elevations of the Blue Ridge and Ridge and Valley regions. These forests occur in landscape positions with greater moisture availability, such as north and east-facing slopes, ravines, lower slopes, undulating uplands, and flatwoods or occasionally upon high floodplain terraces that are well-drained. Soils develop from various substrates, which may vary from calcareous substrates such as limestone, calcareous shales, or greenstone material and mafic substrates that, when weathered, produce basic soils high in calcium and magnesium to those that are more acidic, derived from parent material such as sandstone of low to moderate fertility.



Jason Harrison, MD DNR

While these forests may differ in the substrate from which they develop, they often have similar dominant species composition characterized by mixed and often diverse canopies. Characteristic canopy dominants include tulip poplar (*Liriodendron tulipifera*), American beech (*Fagus grandifolia*), black walnut (*Juglans nigra*), northern red oak (*Quercus rubra*), white oak (*Quercus alba*), pignut hickory (*Carya glabra*), and eastern hop-hornbeam (*Ostrya virginiana*). Stands with more enriched soils and substrates often have chinkapin oak (*Quercus muhlenbergii*), bitternut hickory (*Carya cordiformis*), white ash (*Fraxinus americana*), eastern redbud (*Cercis canadensis* var. *canadensis*), and sugar maple (*Acer saccharum*) as canopy and subcanopy associates. On more nutrient-rich sites, the characteristic shrub species often include pawpaw (*Asimina triloba*), and spicebush (*Lindera benzoin*), with flowering dogwood (*Cornus florida*) as a common associate on more acidic substrates. The understories of these forests are dominated by moisture-demanding species but vary from low total cover and diversity on nutrient-poor sites to lush and dense with high species diversity on more enriched substrates. On less enriched sites, ferns such as Christmas fern (*Polystichum acrostichoides*) and New York fern (*Amauropelta noveboracensis*) may be locally abundant in patches with other herbaceous associates, including pink lady's slipper (*Cypripedium acaule*), false Solomon's-seal (*Maianthemum racemosum*), perfoliate bellwort (*Uvularia perfoliata*), Indian cucumber-root (*Medeola virginiana*), crane fly orchid (*Tipularia discolor*), and spotted wintergreen (*Chimaphila maculata*). On more enriched sites, herbaceous layers are typically more lush and dense with numerous species of forbs such as wild ginger (*Asarum canadense*), Virginia waterleaf (*Hydrophyllum virginianum*), touch-me-not (*Impatiens* sp.), sweet cicely (*Osmorhiza* sp.),



mayapple (*Podophyllum peltatum*), black cohosh (*Caulophyllum thalictroides*), and twinleaf (*Jeffersonia diphylla*).

County Distribution: Anne Arundel, Baltimore, Calvert, Caroline, Carroll, Cecil, Charles, Dorchester, Frederick, Harford, Howard, Kent, Montgomery, Prince George’s, Somerset, Queen Anne’s, St. Mary’s, Talbot, Wicomico, Worcester

Places to Visit: Mattawoman NEA, Wye Island Natural Resources Management Area-Schoolhouse Woods, Patuxent Research Refuge

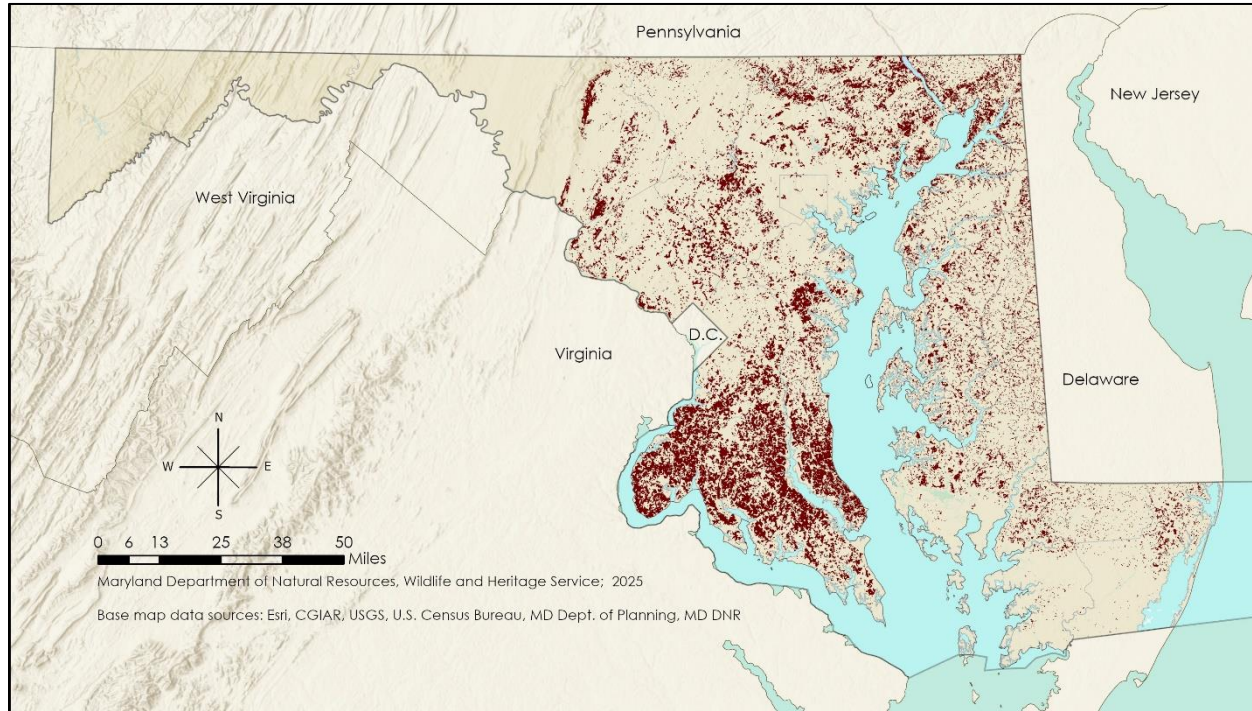


Figure 4.7 Location of Mesic Mixed Hardwood Forests in Maryland. Source: MD DNR.

Species of Greatest Conservation Need Associated with Mesic Mixed Hardwood Forests:

<u>Birds</u>	<u>Mammals</u>	<u>Plants</u>
Acadian flycatcher	Allegheny woodrat	Woodland agrimony (<i>Agrimonia striata</i>)
American redstart	American mink	Hitchcock's sedge (<i>Carex hitchcockiana</i>)
American woodcock	Bobcat	Spring coralroot (<i>Corallorhiza wisteriana</i>)
Bald eagle	Delmarva fox squirrel	Small white lady's-slipper (<i>Cypripedium candidum</i>)
Baltimore oriole	Eastern red bat	Eastern leatherwood (<i>Dirca palustris</i>)
Bicknell's thrush	Eastern small-footed bat	Goldie's fern (<i>Dryopteris goldieana</i>)
Black-and-white warbler	Gray fox	Angular-fruit milkvine (<i>Gonolobus suberosus</i> var. <i>suberosus</i>)
Black-billed cuckoo	Hoary bat	
Blue-winged warbler	Indiana bat	
Broad-winged hawk	Little brown bat	
Brown creeper	Northern long-eared bat	
Cerulean warbler	Silver-haired bat	
Chuck-will's-widow	Smoky shrew	



Eastern whip-poor-will
Great blue heron
Great egret
Hooded warbler
Kentucky warbler
Northern bobwhite
Northern parula
Ovenbird
Prairie warbler
Scarlet tanager
Sharp-shinned hawk
Veery
Wood thrush
Worm-eating warbler
Yellow-breasted chat
Yellow-throated vireo

Reptiles

Bog turtle
Copperhead
Eastern box turtle
Eastern kingsnake
Eastern milksnake
Eastern mud turtle
Eastern ribbonsnake
Northern mole kingsnake
Scarletsnake
Spotted turtle
Striped mud turtle
Timber rattlesnake
Wood turtle

Invertebrates (Snails)

Cherrystone drop

Southeastern shrew
Southern bog lemming
Southern pygmy shrew
Tricolored bat

Amphibians

Barking treefrog
Carpenter frog
Eastern narrow-mouthed toad
Eastern tiger salamander
Jefferson salamander
Upland chorus frog

Insects (Diptera)

Painted wood fly (*Blera pictipes*)

Insects (Hymenoptera)

A cuckoo bee (*Nomada seneciophila*)
A leafcutter bee (*Paranthidium jugatorium*)
Cranesbill miner bee (*Andrena distans*)
Golden Alexanders miner bee (*Andrena ziziae*)
Half-black bumble bee (*Bombus vagans*)
Rusty-patch bumble bee (*Bombus affinis*)
Texas mason bee (*Osmia texana*)
Yellowbanded bumble bee (*Bombus terricola*)

Insects (Lepidoptera)

Northern oak hairstreak

Virginia heartleaf (*Hexastylis virginica*)
Glade fern (*Homalosorus pycnocarpus*)
Golden-seal (*Hydrastis canadensis*)
Large-leaf waterleaf (*Hydrophyllum macrophyllum*)
Upland dwarf iris (*Iris verna* var. *smalliana*)
Butternut (*Juglans cinerea*)
American ginseng (*Panax quinquefolius*)
Swamp lousewort (*Pedicularis lanceolata*)
Shumard oak (*Quercus shumardii*)
Willow aster (*Symphyotrichum praealtum*)
Purple meadow-parsnip (*Thaspium trifoliatum*)
Nodding trillium (*Trillium flexipes*)
Virginia least trillium (*Trillium pusillum* var. *virginianum*)
Yellowleaf tinker's-weed (*Triosteum angustifolium*)
Nodding pogonia (*Triphora trianthophoros*)



Coastal Plain Oak-Pine Forest

Region(s): Central, Eastern, Southern

Habitat Group: Forests

NEAFWA: Forests & Woodlands

The revised Coastal Plain Oak-Pine Forest Key Wildlife Habitat (KWH) combines the Coastal Plain Pitch Pine Forest and Coastal Plain Oak-Pine Forest KWHs from the 2015 State Wildlife Action Plan revision. The Coastal Plain Oak-Pine Forest KWH is characterized by dry, often fire-prone forests and woodlands of Maryland's inner and outer Coastal Plain. This forest type's range extends from north in Cecil County, inland to scattered locations in Prince George's County and south throughout the Delmarva Peninsula and east to the intercoastal zone. Several different natural communities are represented in this KWH and are largely differentiated by landscape setting, substrate, and soil moisture, which can range from extremely dry to dry-mesic and acidic to alkaline. This KWH is associated with deep, sandy loams and sandy clay-loams with soils that are typically very acidic and have exceedingly low base cation and base saturation levels, indicative of a low capacity to retain essential plant nutrients. Landscape settings include flat-to-gently rolling uplands, steep ravine slopes, north-facing bluffs, terraces, ancient inland dunes, and ridges, as well as calcareous river-fronting bluffs.



Jason Harrison, MD DNR

In Maryland, some of these forests are considered to be a southern extension of the New Jersey Pine Barrens and many components of the flora found in this region of Maryland also suggest a phytogeographical relationship to natural communities of those barrens. These forests are fire-dependent ecosystems, and pitch pine (*Pinus rigida*), the dominant tree species, and many associated species within this ecosystem exhibit fire adaptations that allow them to establish, persist and/or regenerate in burned areas. Though mean fire return intervals in portions of the New Jersey Pine Barrens occurred at much higher frequencies because of drier fuels and higher evaporation rates, fire intervals in Maryland's pitch pine forest likely occurred every 40–60 years. It is believed by many that this fire return interval would allow pitch pine to persist while also allowing for continued oak regeneration.

Tree canopies are variable with mixed oak-pine composition and often related to the environmental setting as well as fire history and interval. Characteristic species include scarlet oak (*Quercus coccinea*), southern red oak (*Quercus falcata*), white oak (*Quercus alba*), black oak (*Quercus velutina*), blackjack oak (*Quercus marilandica*), chestnut oak (*Quercus montana*), black gum (*Nyssa sylvatica*), and sassafras (*Sassafras albidum*). Virginia pine (*Pinus virginiana*), red maple (*Acer rubrum*), and sweetgum (*Liquidambar styraciflua*) are considered successional in this KWH and often indicate disturbance such as logging or agricultural conversion. American beech (*Fagus grandifolia*) may also be prominent on submesic sites such as steep ravine slopes or north-facing bluffs. Inflammable shrubs of dangleberry (*Gaylussacia frondosa*), black



huckleberry (*Gaylussacia baccata*), early lowbush blueberry (*Vaccinium pallidum*), black highbush blueberry (*Vaccinium fuscatum*), and deerberry (*Vaccinium stamineum*) can be abundant, sometimes forming a continuous layer. Herbs are noticeably sparse throughout the deeply leaf-littered forest floor and may include pink lady's slipper (*Cypripedium acaule*), Indian-pipe (*Monotropa uniflora*), spotted wintergreen (*Chimaphila maculata*), and partridge-berry (*Mitchella repens*).

Two rare natural communities occur as smaller inclusions within this KWH: (1) Inland Sand Dune and Ridge Woodlands and (2) Coastal Plain Dry Calcareous Forests and Woodlands, which are structurally more open and have a more unique and variable floristic composition.

Inland Sand Dune and Ridge Woodlands developed during the late Pleistocene age when strong northwest prevailing winds transported sand across the Coastal Plain, eventually developing into prominent dunes and ridges flanking the east sides of rivers such as the Choptank, Nanticoke, Wicomico, and Pocomoke. The Inland Sand Dune and Ridge Woodland community includes more prominence of dune and dry site-associated species such as blackjack oak (*Quercus marilandica*), post oak (*Quercus stellata*), water oak (*Quercus nigra*), shortleaf pine (*Pinus echinata*), and sand hickory (*Carya pallida*). Ericaceous shrubs typically form an uneven understory with mixtures of late lowbush blueberry (*Vaccinium pallidum*), black huckleberry (*Gaylussacia baccata*), dangleberry (*Gaylussacia frondosa*), and deerberry (*Vaccinium stamineum*). The herbaceous layer is characterized by dry-site graminoids such as Pennsylvania sedge (*Carex pensylvanica*), shaved sedge (*Carex tonsa* var. *tonsa*), black edge sedge (*Carex nigromarginata*), whitetinge sedge (*Carex albicans*), or little bluestem (*Schizachyrium scoparium*), and forbs and ferns such as yellow wild indigo (*Baptisia tinctoria*), pink lady's slipper (*Cypripedium acaule*), spotted wintergreen (*Chimaphila maculata*), pipsissewa (*Chimaphila umbellata*), butterfly pea (*Clitoria mariana*), variable panicgrass (*Dichanthelium commutatum*), ipecac spurge (*Euphorbia ipecacuanhae*), teaberry (*Gaultheria procumbens*), and bracken fern (*Pteridium aquilinum*). Inland dunes and ridges are considered rare natural communities in Maryland because they exhibit a unique flora adapted to these harsh and dry environments and serve as habitat for specialist beetles, bees, ants, and butterflies, and moths. Many historical stands have been replaced or degraded by development, agriculture, and commercial forestlands.

Coastal Plain Dry Calcareous Forest and Woodlands occur as small, wooded patches of river-fronting bluffs and slopes that have developed over either Tertiary-aged shell deposits or Native American oyster shell middens. Through the process of weathering, these substrates create a substrate composed of dry sandy, alkaline soil with abundant calcium and corresponding unique flora. Canopy dominants include chinkapin oak (*Quercus muhlenbergii*), white ash (*Fraxinus americana*), hackberry (*Celtis occidentalis*), eastern hop-hornbeam (*Ostrya virginiana*), and eastern redbud (*Cercis canadensis*). Unlike most communities in this KWH, the understory and herbaceous layers are diverse and may include species such as blackhaw (*Viburnum rufidulum*), Robin's plantain (*Erigeron pulchellus* var. *pulchellus*), Bosc's panic grass (*Dichanthelium boscii*), tickweed, white snakeroot (*Ageratina altissima*), columbine (*Aquilegia canadensis*), and slender wild rye (*Elymus villosus*). Examples of this community have been documented along the Chesapeake Bay and river-fronting slopes and bluffs of the Chester, Sassafras, Wye, Great Bohemia, Transquaking, and Piscataway River tributaries.



County Distribution: Anne Arundel, Baltimore, Calvert, Caroline, Cecil, Charles, Dorchester, Harford, Kent, Prince George’s, Queen Anne’s, Somerset, St. Mary’s, Talbot, Wicomico, Worcester

Places to Visit: Idylwild Wildlife Management Area, Pocomoke State Forest, Elk Neck State Forest, Patuxent Research Refuge

State Rare Natural Communities: Coastal Plain Pine-Oak Woodland, Inland Sand Dune and Ridge Woodland, Coastal Plain Dry Calcareous Forest and Woodland

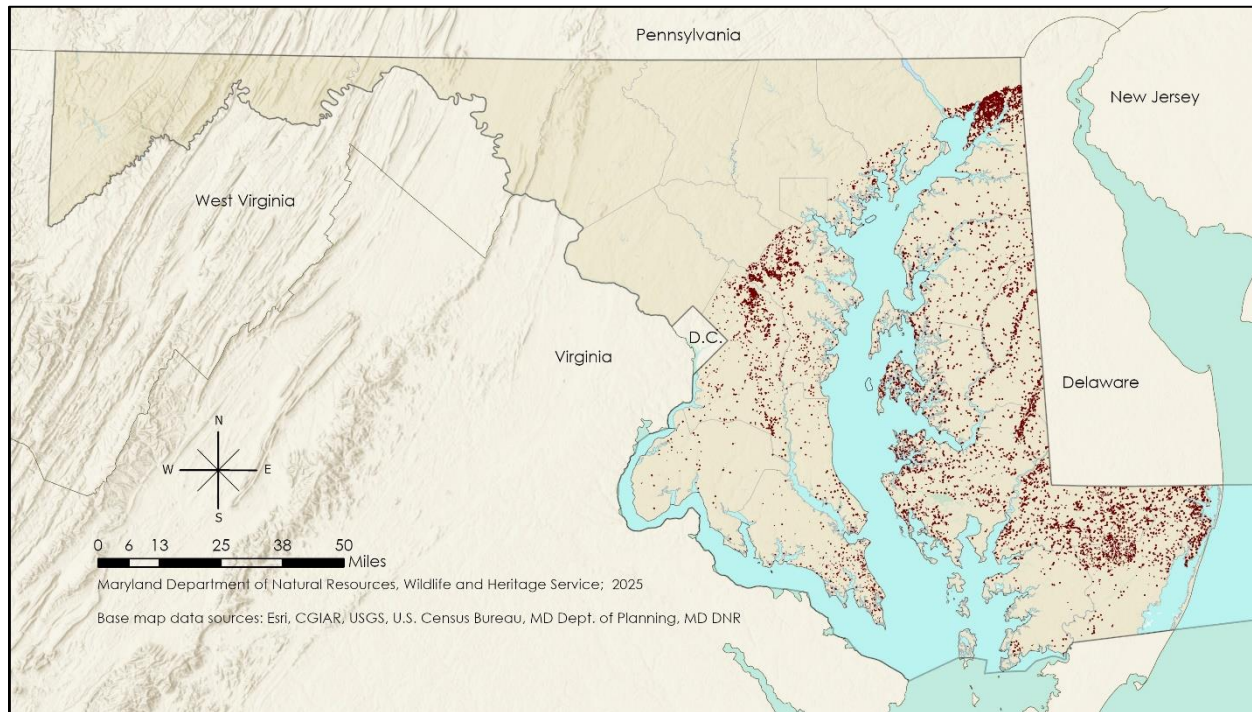


Figure 4.8 Location of Coastal Plain Oak-Pine Forests in Maryland. Sources: MD DNR, Nature Serve’s Terrestrial Ecological Systems of the U.S., and USFWS.

Species of Greatest Conservation Need Associated with Coastal Plain Oak-Pine Forests:

<u>Birds</u>	<u>Insects (Hymenoptera)</u>	<u>Insects (Hemiptera)</u>
Acadian flycatcher	A cuckoo bee (<i>Nomada rubicunda</i>)	Riley's 13-year cicada (<i>Magicalcica tredecim</i>)
American woodcock	A dieunomia bee (<i>Dieunomia nevadensis</i>)	
Baltimore oriole	A leafcutter bee (<i>Coelioxys immaculatus</i>)	
Bicknell's thrush	A long-horned bee (<i>Epimelissodes comptus</i>)	
Black-and-white warbler	A mason bee (<i>Osmia chalybea</i>)	
Black-billed cuckoo	A miner bee (<i>Perdita boltoniae</i>)	
Broad-winged hawk	A miner bee (<i>Perdita bradleyi</i>)	
Chuck-will's-widow		
Common nighthawk		
Eastern whip-poor-will		
Northern bobwhite		
		<u>Plants</u>
		Threadleaf gerardia (<i>Agalinis setacea</i>)
		Single-head pussytoes (<i>Antennaria solitaria</i>)
		Woolly three-awn (<i>Aristida lanosa</i>)
		Leopard's-bane (<i>Arnica acaulis</i>)
		Coastal butterfly pea (<i>Centrosema virginianum</i>)



Ovenbird
Prairie warbler
Scarlet tanager
Sharp-shinned hawk
Wood thrush
Worm-eating warbler
Yellow-breasted chat

Mammals

American mink
Bobcat
Delmarva fox squirrel
Eastern red bat
Hoary bat
Least shrew
Little brown bat
Silver-haired bat
Tricolored bat

Amphibians

Carpenter frog
Eastern narrow-mouthed toad
Eastern tiger salamander

Reptiles

Copperhead
Eastern box turtle
Eastern kingsnake
Eastern milksnake
Eastern mud turtle
Northern mole kingsnake
Red cornsnake
Scarletsnake
Six-lined racerunner
Spotted turtle
Striped mud turtle

Insects (Coleoptera)

A tenebrionid beetle (*Helops cisteloides*)
A tenebrionid beetle (*Schoenicus puberulus*)
Eastern pinebarrens tiger beetle

Insects (Diptera)

Painted wood fly (*Blera pictipes*)

A mining bee (*Andrena fulvipennis*)
A mining bee (*Protandrena abdominalis*)
A sweat bee (*Lasioglossum arantium*)
A sweat bee (*Lasioglossum nymphaeae*)
A sweat bee (*Lasioglossum raleighense*)
A sweat bee (*Lasioglossum floridanum*)
A sweat bee (*Lasioglossum sopinci*)
A sweat bee (*Sphecodes brachycephalus*)
Howard's cuckoo nomad bee (*Epeolus howardi*)
Nude plasterer bee (*Colletes nudus*)
Pearly-banded bee (*Nomia maneei*)
Puny cuckoo nomad bee (*Epeolus pusillus*)
Summer miner bee (*Protandrena aestivalis*)
Sunflower sweat bee (*Dieunomia heteropoda*)
Two-spotted miner bee (*Andrena accepta*)

Insects (Lepidoptera)

Bold-based zale moth (*Zale lunifera*)
Cobweb skipper
Eastern cactus-boring moth
Fringed dart moth
Frosted elfin
Great purple hairstreak
King's hairstreak
Ornate bella moth (*Utetheisa ornatrix*)
Pine barrens fungus moth (*Chytonix sensilis*)
Pine barrens zanclognatha
The record keeper moth (*Feltia manifesta*)

Many-flowered umbrella-sedge (*Cyperus lancastricensis*)
Plukenet's flatsedge (*Cyperus plukenetii*)
Rough flatsedge (*Cyperus retrofractus*)
Fernald's tick-trefoil (*Desmodium fernaldii*)
Stiff tick-trefoil (*Desmodium obtusum*)
Pineland tick-trefoil (*Desmodium strictum*)
Hairy needle-leaved witchgrass (*Dichanthelium filirimum*)
Few-flowered witchgrass (*Dichanthelium oligosanthes* var. *oligosanthes*)
Tobaccoweed (*Elephantopus tomentosus*)
Box huckleberry (*Gaylussacia brachycera*)
Golden heather (*Hudsonia ericoides*)
Potato dwarf-dandelion (*Krigia dandelion*)
Scaly gayfeather (*Liatris squarrosa*)
Sandplain flax (*Linum intercursum*)
Sundial lupine (*Lupinus perennis*)
Carolina anglepod (*Matelea carolinensis*)
Hairy snoutbean (*Rhynchosia tomentosa*)
Globe beakrush (*Rhynchospora globularis*)
Carolina sandwort (*Sabulina caroliniana*)
Sandyland blue-eyed grass (*Sisyrinchium arenicola*)
Showy goldenrod (*Solidago speciosa*)
Late goldenrod (*Solidago tarda*)
Long-bristle Indian grass (*Sorghastrum elliottii*)
Rough dropseed (*Sporobolus clandestinus*)
Eastern silvery aster (*Symphotrichum concolor*)
Spiked hoary-pea (*Tephrosia spicata*)
Chapman's redtop (*Tridens chapmanii*)



Case Study: Safeguarding Plukenet's Flatsedge (*Cyperus plukenetii*) via Inland Dune Woodland Restoration

Plukenet's flatsedge (*Cyperus plukenetii*) is a delicate native of the sun-drenched longleaf pine sandhills and thin, sandy soils of the Eastern United States. Once thought to be a ghost of Maryland's botanical past, this rare plant went unseen in our state for 80 years. Before its recent return, the only evidence of its existence in Maryland was a handful of pressed specimens collected between 1887 and 1939.

The tide turned in 2019 and 2021 when tiny, fragile populations were rediscovered in Wicomico and Worcester Counties. These "lost" colonies were struggling to survive in small, isolated fragments of habitat—one under a suburban powerline and another in an old sand mine. With only a dozen or so plants remaining at these sites, biologists knew they had to act fast to save the species from permanent extinction in Maryland.

To give the flatsedge a second chance, seeds were carefully collected and transported to the Mount Cuba Center, a leader in native plant conservation. There, horticultural experts successfully germinated and grew a "rescue" population. These healthy young plants provided the foundation for a restoration effort within a large, protected inland dune woodland—a habitat perfectly suited for their needs.

Today, the flatsedge is thriving in its new home. This habitat is managed with prescribed fire, a process that clears away competing brush and creates the open, sandy conditions the species loves. By protecting these unique inland dunes and utilizing modern conservation science, we are ensuring that this rare piece of Maryland's natural heritage isn't just a memory, but a living part of our landscape.



*Jason Harrison, MD DNR, with plukenet's flatsedge (*Cyperus plukenetii*) in its new home (Chris Frye, MD DNR)*

Signs of Success

Growing Numbers: From a tiny group of founders, the population has expanded to over 64 plants as of 2024.

Natural Growth: For the first time in decades, we are seeing "recruitment"—new seedlings sprouting naturally on their own!

Official Protection: In recognition of its rarity and the ongoing need for conservation, plukenet's flatsedge was officially listed as an Endangered Species in Maryland in 2025.



Maritime Forest and Shrubland

Region(s): Eastern

Habitat Group: Forests

NEAFWA: Forests & Woodlands; Shrublands

The Maritime Forest and Shrubland Key Wildlife Habitat includes forests, woodlands, and shrublands with structure and composition influenced by proximity to marine environments. In Maryland, they are best developed in sheltered dune systems, flats of barrier islands, upper edges of salt marshes, and, less commonly, on rocky headlands of the Atlantic Coast and islands of the lower Chesapeake Bay. The distribution, structure and species composition of these habitats are largely controlled by marine influences such as salt spray and deep sand deposits, transitioning from open to dense shrub-scrub vegetation near the coastline to open forests and woodlands further inland. Soil moisture and drainage also play a critical role in shaping these habitats.



Peter Stango, MD DNR



Jason Harrison, MD DNR

Open forests and woodlands of stunted loblolly pine (*Pinus taeda*) may develop on older, more stable, back dunes, away from the primary dune, where the effects of salt spray are minimized. Forests and woodlands that develop in this zone are primarily dominated by loblolly pine with mixtures of black cherry (*Prunus serotina*), water oak (*Quercus nigra*), sassafras (*Sassafras albidum*), southern red oak (*Quercus falcata*), willow oak (*Quercus phellos*), red maple (*Acer rubrum*), and American holly (*Ilex opaca* var. *opaca*), with bayberry (*Morella* spp.) and muscadine grape (*Vitis rotundifolia*) common in the understory.

Shrublands or “scrub” vegetation, defined as dense, intermixed growth of shrubs and stunted trees, develop on inland edges of back dunes and leeward dune slopes where they are moderately protected from ocean salt spray. Vegetation typically includes stunted trees and low-growing, dwarfed shrub species such as sand heather (*Hudsonia tomentosa*), bayberry, and high-tide bush (*Baccharis halimifolia*). Vines are often abundant and include poison ivy (*Toxicodendron radicans*), muscadine grape, Virginia creeper (*Parthenocissus quinquefolia*), and common greenbrier (*Smilax rotundifolia*). Herbaceous species are sparse; however, frequent canopy gaps support many species from adjacent maritime grassland communities, such as beach panic grass (*Panicum amarum* ssp. *amarulum*) and slender spikegrass (*Chasmanthium laxum*).

These habitats are threatened by coastal development and by natural and anthropogenic disturbances that destroy the protective primary dune system. Because these habitats have a restricted geographic range (Delaware to North Carolina) and narrow habitat requirements, all



natural communities within Maritime Forests and Shrublands are considered globally uncommon to rare.

County Distribution: Dorchester, Somerset, Wicomico, Worcester

Places to Visit: Assateague Island National Seashore

State Rare Natural Communities: Maritime Forest, Maritime Dune Scrub, Maritime Dune Woodland

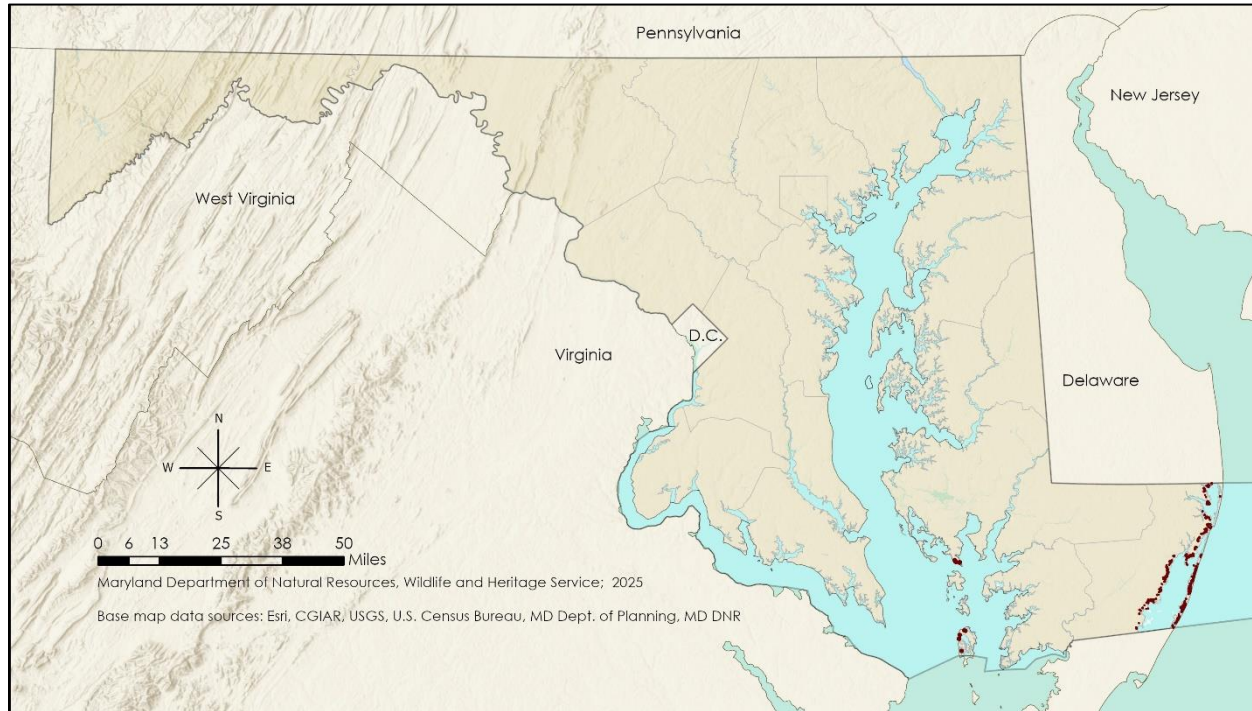


Figure 4.9 Location of Maritime Forests and Shrublands in Maryland. Sources: MD DNR, NETWHCS, and USFWS.

Species of Greatest Conservation Need Associated with Maritime Forests and Shrublands:

Birds

American woodcock
Bald eagle
Black-crowned night heron
Boat-tailed grackle
Chuck-will's-widow
Common nighthawk
Glossy ibis
Great blue heron
Great egret
Little blue heron
Long-eared owl

Birds (continued)

Northern bobwhite
Northern saw-whet owl
Ovenbird
Prairie warbler
Red-cockaded woodpecker
Snowy egret
Tricolored heron
Worm-eating warbler
Yellow-breasted chat
Yellow-crowned night heron

Mammals

Delmarva fox squirrel
Eastern red bat
Hoary bat
Least shrew
Silver-haired bat
Tricolored bat

Plants

Coastal water-hyssop (*Bacopa monnieri*)
Carolina fimbry (*Fimbristylis caroliniana*)
Coast bedstraw (*Galium hispidulum*)



Glades, Barrens, and Cliffs

Serpentine Barren

Region(s): Central

Habitat Group: Glades/Barrens/Cliffs

NEAFWA: Glades, Barrens & Savannas

The Serpentine Barren Key Wildlife Habitat forms on shallow soils over ultramafic bedrock of serpentine, which occurs in a discontinuous band east of the Appalachian Mountains from Canada to Alabama, with the largest known occurrences in the Piedmont of southeastern Pennsylvania and northern Maryland. One of the four remaining serpentine areas in Maryland, the Soldiers Delight Natural Area near Baltimore, is the largest in eastern North America, encompassing nearly 2,000 acres of woodlands and grassland savannas, and is among the most species-rich in the world.



Mark Hall, MD DNR

In folklore, the name "serpentine" is attributed to the high magnesium mineral content, which gives the resemblance to a mottled greenish-brown snake native to similar geologic settings in northern Italy. As much as one-third of the bedrock may be composed of magnesium silicate with associated high iron, cobalt, nickel, and chromite content. The soils that develop are normally acidic near the surface, though less so in deeper layers, dry, nutrient-poor, and toxic to plants not specially adapted to the unusual chemistry. High levels of magnesium in the soil typically inhibit plants' ability to take in soil nutrients, especially calcium, and because they are shallow and low in organic material and clay, they do not retain water or nutrients well.

The plant communities associated with them are structurally a mosaic of sparse woodlands, shrublands, and grass savannas, with higher woody species cover associated with deeper soils. Most of these habitats are kept from succeeding to closed forests by periodic fire, drought stress, soil factors, and unstable substrates. As wind and water erode the soil, non-acidic layers are exposed, creating a varied habitat for plants. Plants characteristic of serpentine barrens include little bluestem (*Schizachyrium scoparium*) and Indian grass (*Sorghastrum nutans*), which are typically herbaceous dominants, with associated species including serpentine aster (*Aster depauperatus*), few-flowered nutrush (*Scleria pauciflora*), field chickweed (*Cerastium arvense* var. *villosum*), field goldenrod (*Solidago nemoralis*), Small's ragwort (*Packera anonyma*), round-seed panic grass (*Dichanthelium sphaerocarpon*), lyre-leaved rock cress (*Arabis lyrata*), and roundleaf fameflower (*Phemeranthus teretifolius*). Woodlands bordering grassland savannas consist of blackjack oak (*Quercus marilandica*) and post oak (*Quercus stellata*) but are commonly invaded by species such as common greenbrier (*Smilax rotundifolia*), eastern red cedar (*Juniperus virginiana*), and Virginia pine (*Pinus virginiana*) when fire suppressed.

County Distribution: Baltimore, Cecil, Harford, Montgomery

Places to Visit: Soldiers Delight Natural Area, Lake Roland Park



State Rare Natural Community: Serpentine Barren

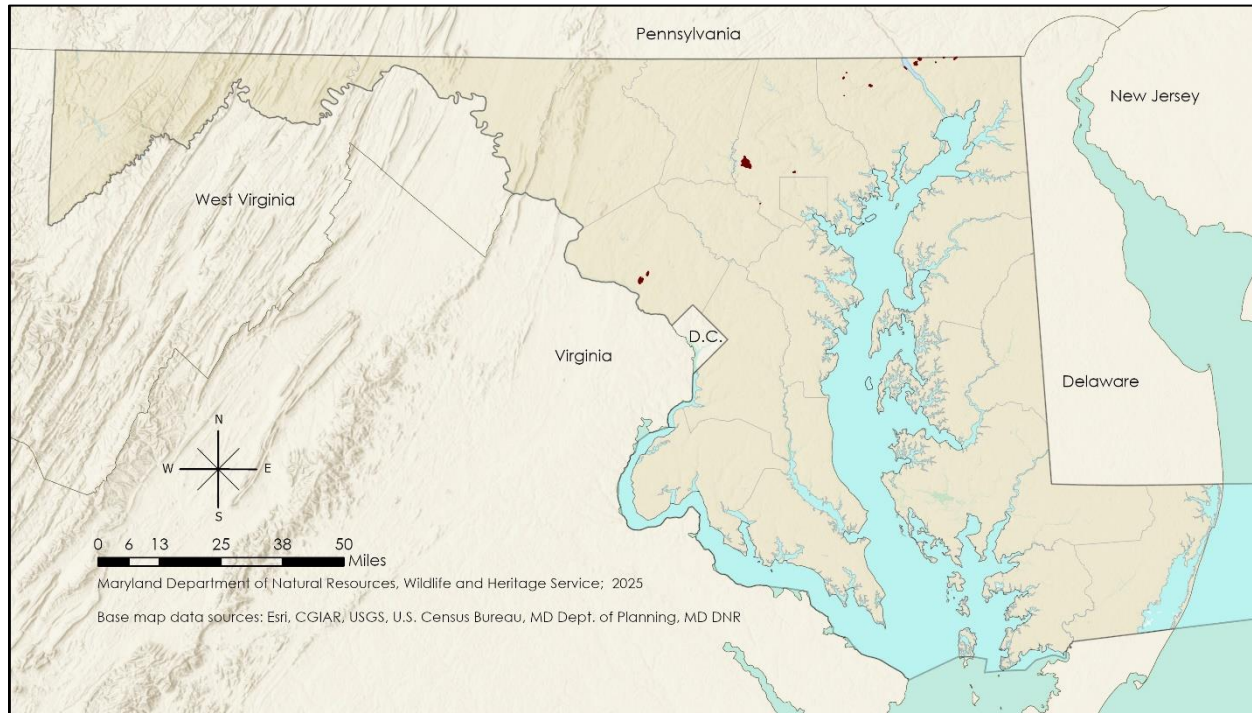


Figure 4.10 Location of Serpentine Barrens in Maryland. Source: MD DNR.

Species of Greatest Conservation Need Associated with Serpentine Barrens:

<u>Birds</u>	<u>Insects (Lepidoptera)</u>	<u>Plants (continued)</u>
Eastern whip-poor-will	Bold-based zale moth (<i>Zale lunifera</i>)	Plains frostweed (<i>Crocianthemum bicknellii</i>)
Ovenbird	Cobweb skipper	Tufted hairgrass (<i>Deschampsia cespitosa</i>)
Prairie warbler	Edwards' hairstreak	Scribner's witchgrass (<i>Dichanthelium oligosanthos</i> var. <i>scribnerianum</i>)
	Franck's sphinx	Vanilla grass (<i>Hierochloa odorata</i>)
	Indian skipper	Prairie blazing star (<i>Liatris spicata</i>)
<u>Mammals</u>	Joyful holomelina moth	Grooved yellow flax (<i>Linum sulcatum</i>)
Bobcat	Leonard's skipper	Roundleaf fameflower (<i>Phemeranthus teretifolius</i>)
Eastern red bat	Northern oak hairstreak	Dwarf prairie willow (<i>Salix occidentalis</i>)
Gray fox	Pepper and salt skipper	Muehlenberg's nutrush (<i>Scleria muehlenbergii</i>)
Hoary bat	Unexpected cynia moth	Northern dropseed (<i>Sporobolus heterolepis</i>)
Least shrew		Serpentine aster (<i>Symphyotrichum depauperatum</i>)
Little brown bat	<u>Plants</u>	
Silver-haired bat	Blue Ridge false foxglove (<i>Agalinis decemloba</i>)	
Tricolored bat	Porcupine sedge (<i>Carex hystericina</i>)	
<u>Insects (Coleoptera)</u>	Inland sedge (<i>Carex interior</i>)	
Cow path tiger beetle	Mead's sedge (<i>Carex meadii</i>)	
Splendid tiger beetle	Richardson's sedge (<i>Carex richardsonii</i>)	
<u>Insects (Hemiptera)</u>	Octoraro creek chickweed (<i>Cerastium velutinum</i> var. <i>villosissimum</i>)	
Eastern sedge barrens leafhopper		



Shale Barren

Region(s): Western

Habitat Group: Glades/Barrens/Cliffs

NEAFWA: Glades, Barrens & Savannas

The Shale Barren Key Wildlife Habitat consists of sparse woodlands with scattered herbaceous openings on rock outcrops of acidic and calcareous shales in the Ridge and Valley physiographic province of Maryland. They are best developed on steep, dry slopes with south to west-facing exposures, where surface temperatures are seasonally extremely high. In addition, shales are highly friable and many steep slopes contain loose and unstable channery derived from the continual undercutting of bedrock by streams. This mechanical erosion from constant downslope movement of loose fissile shale—combined with very little soil development, very low soil moisture, rapid water drainage, lack of shading vegetation, and longer daily/annual exposure to the sun (due to south and west aspects)—results in harsh growing conditions and drought stress where only species well adapted to these drought stresses can thrive in such habitats.



Jason Harrison, MD DNR

The vegetation structure is predominantly a mix of open shrubland with dwarfed trees and less frequently open woodlands composed of stunted chestnut oak (*Quercus montana*), Virginia pine (*Pinus virginiana*), eastern red cedar (*Juniperus virginiana*), and pignut hickory (*Carya glabra*). Other characteristic trees include white ash (*Fraxinus americana*), post oak (*Quercus stellata*), black oak (*Quercus velutina*), northern red oak (*Quercus rubra*), Table Mountain pine (*Pinus pungens*), white pine (*Pinus strobus*), and shagbark hickory (*Carya ovata*). Shrubs common to shale barrens include shadbush (*Amelanchier* spp.), black huckleberry (*Gaylussacia baccata*), deerberry (*Vaccinium stamineum*), and bear oak (*Quercus ilicifolia*). Herbaceous openings are sparsely vegetated and often scattered within a woodland matrix. Such openings contain many endemic or near-endemic Shale Barren species such as shale-barren pussytoes (*Antennaria virginica*), shale-barren ragwort (*Packera antennariifolia*), shale-barren evening primrose (*Oenothera argillicola*), low bindweed (*Calystegia spithamea*), and Kate's mountain-clover (*Trifolium virginicum*). Other characteristic species include Pennsylvania sedge (*Carex pensylvanica*), tufted hairgrass (*Deschampsia flexuosa*), common dittany (*Cunila origanoides*), rattlesnake-weed (*Hieracium venosum*), poverty oatgrass (*Danthonia spicata*), little bluestem (*Schizachyrium scoparium*), moss-pink (*Phlox subulata*), bird's-foot violet (*Viola pedata*), and reindeer lichens (*Cladonia* spp.).

County Distribution: Allegany, Washington

Places to Visit: Green Ridge State Forest

State Rare Natural Community: Shale Barren



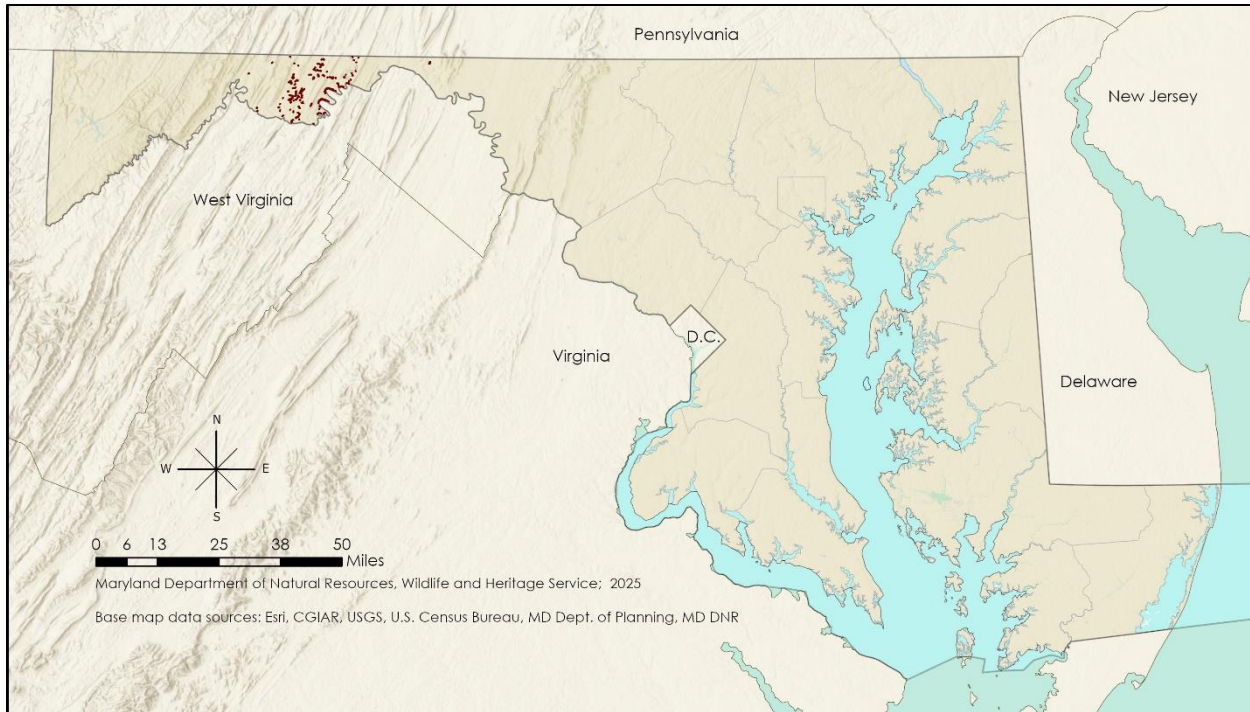


Figure 4.11 Location of Shale Barrens in Maryland. Source: MD DNR.

Species of Greatest Conservation Need Associated with Shale Barrens:

Birds

Eastern whip-poor-will
Ovenbird
Prairie warbler
Ruffed grouse

Amphibians

Valley and Ridge salamander

Reptiles

Copperhead
Northern coal skink
Red cornsnake
Six-lined racerunner
Timber rattlesnake

Insects (Coleoptera)

Cow path tiger beetle
Splendid tiger beetle

Insects (Hymenoptera)

Felt's mason bee (*Osmia felti*)

Mammals

Allegheny woodrat
Appalachian cottontail
Bobcat
Eastern red bat
Eastern small-footed bat
Gray fox
Hoary bat
Indiana bat
Least shrew
Little brown bat
Northern long-eared bat
Silver-haired bat
Tricolored bat

Insects (Lepidoptera)

Cobweb skipper
Franck's sphinx
Indian skipper
Leonard's skipper
Northern metalmark
Northern oak hairstreak
Olympia marble
Pepper and salt skipper
Silvery blue

Plants

Toothed tick-trefoil
(*Desmodium cuspidatum*)
Stiff-hair sunflower
(*Helianthus hirsutus*)
Smooth sunflower (*Helianthus laevigatus*)
Allegheny plum (*Prunus alleghaniensis*)
Vasey's goldenrod (*Solidago vaseyi*)
Common snowberry
(*Symphoricarpos albus*)
Mountain parsley (*Taenidia montana*)
Kate's Mountain clover
(*Trifolium virginicum*)
Rusty woodsia (*Woodsia ilvensis*)



Acidic Glade and Barren

Region(s): Central, Western

Habitat Group: Glades/Barrens/Cliffs

NEAFWA: Glades, Barrens & Savannas

The Acidic Glade and Barren Key Wildlife Habitat is defined as natural clearings within a forested or wooded area consisting of exposed bedrock outcrops and sloping pavements over acidic substrates. They occur only in the Piedmont and mountainous regions of Maryland. Piedmont examples are typically associated with small rock outcrops and bouldery slopes of schist, granite, or quartzite. Those occurring in the mountain region of the Appalachian Plateau are known as Sandstone Glades, which are considered rare in Maryland, are associated with Pottsville sandstone, and are most prominent at 2,700–2,800 feet. In contrast, examples of those in the Ridge and Valley region occur at lower elevations of 800–1,000 feet over Oriskany sandstone. The vegetation of these habitats is variable depending on the region, but most can be generally characterized as a mosaic of stunted woodlands with scrubby thickets, scattered herbaceous plants, and considerable exposed bedrock. Plant growth is typically confined to crevices or depressions where organic material has accumulated over time. Acidic Glades and Barrens exhibit very harsh, drought-prone growing conditions resulting from negligible soil development, low moisture retention, rapid runoff, and sun exposure.



Chris Frye, MD DNR

The dominant vegetation is characterized by woody scrub usually consisting of scattered, stunted trees of chestnut oak (*Quercus montana*), bear oak (*Quercus ilicifolia*), black gum (*Nyssa sylvatica*), pitch pine (*Pinus rigida*), Table Mountain pine (*Pinus pungens*), and sweet birch (*Betula lenta*), and shrub thickets of black huckleberry (*Gaylussacia baccata*), early lowbush blueberry (*Vaccinium pallidum*), late low blueberry (*Vaccinium angustifolium*), mountain laurel (*Kalmia latifolia*), and catbrier (*Smilax glauca*). Openings in the woody scrub are interspersed with patches of herbaceous species within crevices and moisture pockets, often supporting a mixture of graminoids and forbs such as wintergreen (*Gaultheria procumbens*), little bluestem (*Schizachyrium scoparium*), broomsedge (*Andropogon virginicus*), Pennsylvania sedge (*Carex pensylvanica*), and oatgrasses (*Danthonia* spp.). Reindeer lichens (*Cladonia* spp.) may be especially abundant.

County Distribution: Allegany, Baltimore, Carroll, Cecil, Frederick, Garrett, Harford, Howard, Montgomery, Washington

Places to Visit: Cunningham Falls State Park, Dans Mountain Wildlife Management Area, Savage River State Forest, South Mountain State Park, Green Ridge State Forest

State Rare Natural Communities: Sandstone Glade



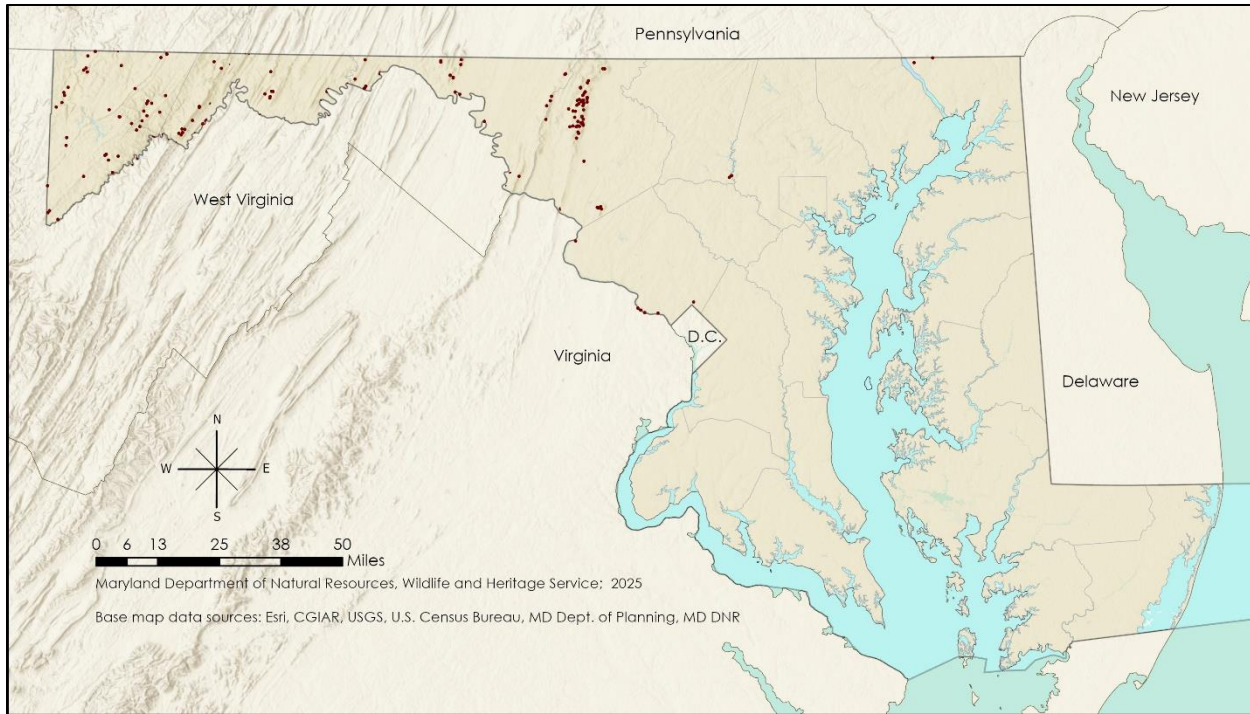


Figure 4.12 Location of Acidic Glades and Barrens in Maryland. Source: MD DNR, Terrestrial Ecological Systems of the United States.

Species of Greatest Conservation Need Associated with Acidic Glades and Barrens:

Birds

Eastern whip-poor-will
Ovenbird
Prairie warbler
Ruffed grouse

Reptiles

Copperhead
Smooth greensnake
Timber rattlesnake

Insects (Coleoptera)

Common claybank tiger beetle
Cow path tiger beetle
Northern barrens tiger beetle
Splendid tiger beetle

Insects (Hymenoptera)

Felt's mason bee (*Osmia felti*)

Mammals

Allegheny woodrat
Appalachian cottontail
Bobcat
Eastern red bat
Eastern small-footed bat
Eastern spotted skunk
Gray fox
Hoary bat
Indiana bat
Least shrew

Little brown bat
Northern long-eared bat
Silver-haired bat
Tricolored bat

Insects (Lepidoptera)

Bold-based zale moth (*Zale lunifera*)
Edwards' hairstreak
Frosted elfin
Indian skipper
Melsheimer's sack-bearer

Plants

Roundleaf serviceberry
(*Amelanchier sanguinea*)
Running serviceberry
(*Amelanchier spicata*)
Bristly sarsaparilla (*Aralia hispida*)
Canadian milkvetch
(*Astragalus canadensis*)
Ozark milkvetch (*Astragalus distortus*)
Houghton's umbrella-sedge
(*Cyperus houghtonii*)
Wild bleedinghearts (*Dicentra eximia*)
Striped gentian (*Gentiana villosa*)
Slender-leaved bluets
(*Houstonia tenuifolia*)
Racemed milkwort (*Senega polygama*)
Narrowleaf bluecurls
(*Trichostema setaceum*)



Basic Glade and Barren

Region(s): Central, Western

Habitat Group: Glades/Barrens/Cliffs

NEAFWA: Glades, Barrens & Savannas

The Basic Glade and Barren Key Wildlife Habitat consists of natural clearings within forested or wooded ecological communities that form on exposed bedrock outcrops and sloping pavements of limestone and mafic (i.e., greenstone, amphibolite, diabase, gabbro) geologic formations in the western Piedmont and mountains of Maryland.

These habitats usually occupy small outcrops and steep talus slopes with very thin patches of shallow, dry soils that accumulate in cracks and depressions ranging from moderately acidic to alkaline, but are extremely base-rich and fertile. Vegetation composition and structure are strongly influenced by drought stress due to the lack of moisture retention and exposure within these substrates, resulting in a patchy mosaic of woodlands interspersed with open grassy glades.



Jason Harrison, MD DNR

Ecological communities that occur on substrates derived from limestone are more alkaline and characterized by stunted, open woodlands of variable composition, which may include chinkapin oak (*Quercus muhlenbergii*), white ash (*Fraxinus americana*), eastern red cedar (*Juniperus virginiana*), common hackberry (*Celtis occidentalis*), eastern hop-hornbeam (*Ostrya virginiana*), with pasture rose (*Rosa carolina* var. *carolina*), northern prickly-ash (*Zanthoxylum americanum*), and fragrant sumac (*Rhus aromatica*) as characteristic shrub species. The herbaceous layer, patchy and typically restricted to pockets of thin soil that develop in cracks and depressions, consists of a mix of forbs and graminoids, including side-oats grama (*Bouteloua curtipendula* var. *curtipendula*), bottlebrush grass (*Elymus hystrix* var. *hystrix*), mountain oatgrass (*Danthonia compressa*), woodland sunflower (*Helianthus divaricatus*), hoary puccoon (*Lithospermum canescens*), and flowering spurge (*Euphorbia corollata*). While similar in vegetation structure and dynamics, glades and barrens that formed on mafic substrates are also base-rich, but tend to be more acidic, resulting in similar species composition, but with prominence of species such as chestnut oak (*Quercus montana*) and Virginia pine (*Pinus virginiana*) within the canopy.

Not only are these small-patch habitats globally rare, but the mineral-rich, open substrates of these habitats create conditions that make them prone to invasion by non-native plant species.

County Distribution: Allegany, Baltimore, Carroll, Frederick, Garrett, Montgomery, Washington

Places to Visit: C&O Canal National Historical Park, Roundtop Hill Natural Area, Catoctin Mountain Park



State Rare Natural Communities: Limestone Glade, Basic Outcrop Barren

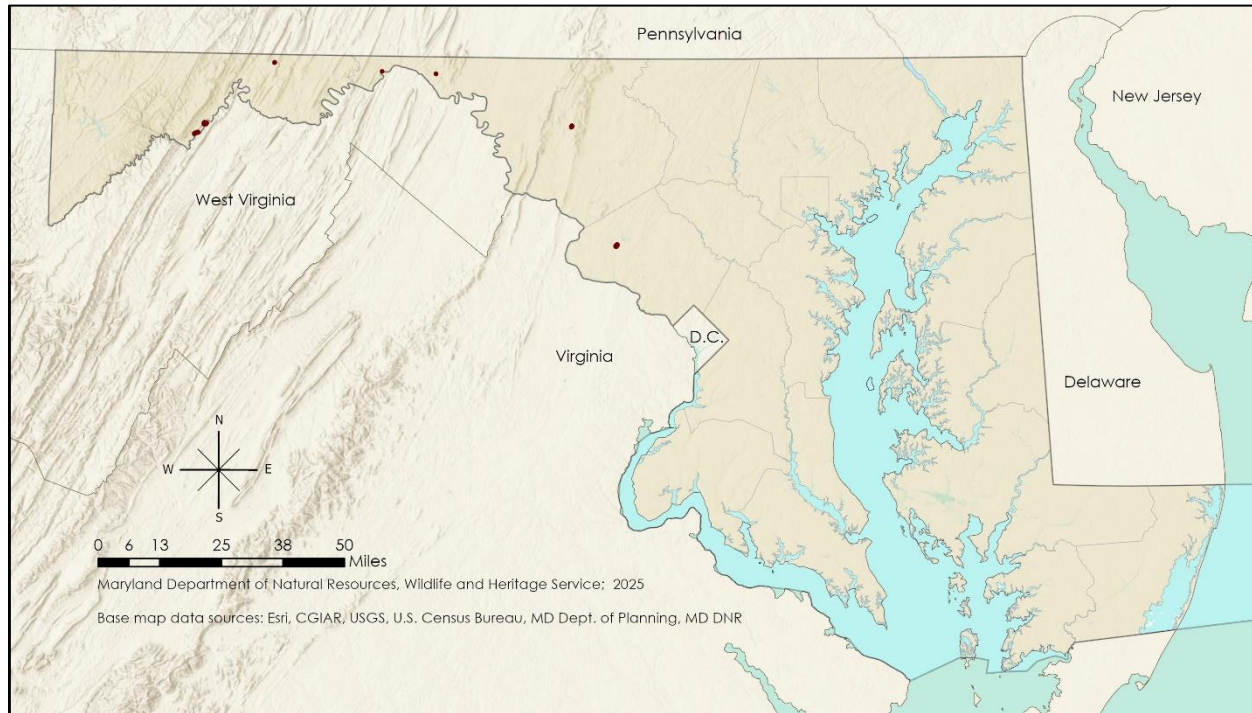


Figure 4.13 Location of Basic Glades and Barrens in Maryland. Source: MD DNR.

Species of Greatest Conservation Need Associated with Basic Glades and Barrens:

Birds

Eastern whip-poor-will
Ovenbird
Prairie warbler

Mammals

Allegheny woodrat
Bobcat
Eastern red bat
Eastern small-footed bat
Gray fox
Hoary bat
Indiana bat
Least shrew
Little brown bat
Northern long-eared bat
Silver-haired bat
Tricolored bat

Reptiles

Copperhead
Smooth greensnake
Timber rattlesnake

Plants

Hairy rockcress (*Arabis adpressipilis*)
Spreading rockcress (*Arabis patens*)
Side-oats grama (*Bouteloua curtipendula*)
Long-stalked sedge (*Carex pedunculata*)
Flat-spiked sedge (*Carex planispicata*)
Standley's goosefoot (*Chenopodium standleyanum*)
Low bindweed (*Convolvulus spithamea*)
Tall larkspur (*Delphinium exaltatum*)
Cream tick-trefoil (*Desmodium ochroleucum*)
Ringed witchgrass (*Dichanthelium annulum*)
Warty spurge (*Euphorbia spathulata*)
Crested coralroot (*Hexalectris spicata*)
Hairy false gromwell (*Lithospermum parviflorum*)
Climbing milkweed (*Matelea obliqua*)
Three-flower melicgrass (*Melica nitens*)
White-grained mountain-ricegrass (*Oryzopsis asperifolia*)
Wiry witchgrass (*Panicum flexile*)
American feverfew (*Parthenium integrifolium*)
Pale beardtongue (*Penstemon pallidus*)
Smooth phlox (*Phlox glaberrima*)
Downy phlox (*Phlox pilosa*)
Torrey's mountainmint (*Pycnanthemum torreyi*)



Invertebrates (Snails)

Cherrystone drop

Early buttercup (*Ranunculus fascicularis*)
Pursh's wild petunia (*Ruellia purshiana*)
Shale barren skullcap (*Scutellaria leonardii*)
Seneca snakeroot (*Senega officinalis*)
Prairie goldenrod (*Solidago rigida*)
Yellow nodding ladies' tresses (*Spiranthes ochroleuca*)
Northern white-cedar (*Thuja occidentalis*)
Snow trillium (*Trillium nivale*)
Goosefoot cornsalad (*Valerianella chenopodiifolia*)
Broadleaf bunchflower (*Veratrum hybridum*)
Northern prickly-ash (*Zanthoxylum americanum*)



Artificial Barren (Sand and Gravel Mines)

Region(s): Southern

Habitat Group: Glades/Barrens/Cliffs

NEAFWA: Developed Areas

Additional Notes: An artificial or human-made habitat

The Artificial Barren is a Key Wildlife Habitat characterized by human-created, sparsely vegetated areas dominated by exposed mineral soils (i.e., sand and gravel) resulting from surface mining. Maryland contains nearly 300 operating surface mines and many more inactive or reclaimed sites, most located in southern Maryland. These artificial barrens serve as surrogates for early successional and



*Sam Droege, USGS, at an abandoned sand mine
(Will Parson, Chesapeake Bay Program)*

open habitats that were created by large grazing mammals (e.g., woodland bison, elk) and by indigenous peoples such as the Piscataway Indian Nation through thousands of years of fire hunting and other types of human-caused disturbances (Mayre 1920, 1955). Inactive sand mines support a variety of Species of Greatest Conservation Need, particularly invertebrates that depend on bare or sparsely vegetated soils. Ground-nesting bees and wasps, tiger beetles, and other insects rely on these conditions for nesting, foraging, thermoregulation, and larval development. Studies indicate that inactive sand and gravel mines in Maryland support high levels of rare bee diversity (Droege et al. 2009; Seitz et al. 2019).

Maryland currently requires that inactive sand mines be capped with topsoil and vegetated, although seed mixes are not regulated. While well-intentioned, this approach can reduce habitat value for sand-specialist species and other invertebrates that rely on open ground. Instead, reclamation should aim to create a mosaic of ground cover, leaving some areas exposed and uncapped. Native flowering plants should be established to provide pollen and nectar. Active sand mines should also reserve stripped areas for barren-dependent taxa and include pollinator buffer strips to support adjacent populations.

County Distribution: Anne Arundel, Baltimore, Calvert, Caroline, Cecil, Charles, Dorchester, Harford, Kent, Prince George's, Queen Anne's, Somerset, St. Mary's, Talbot, Wicomico, Worcester



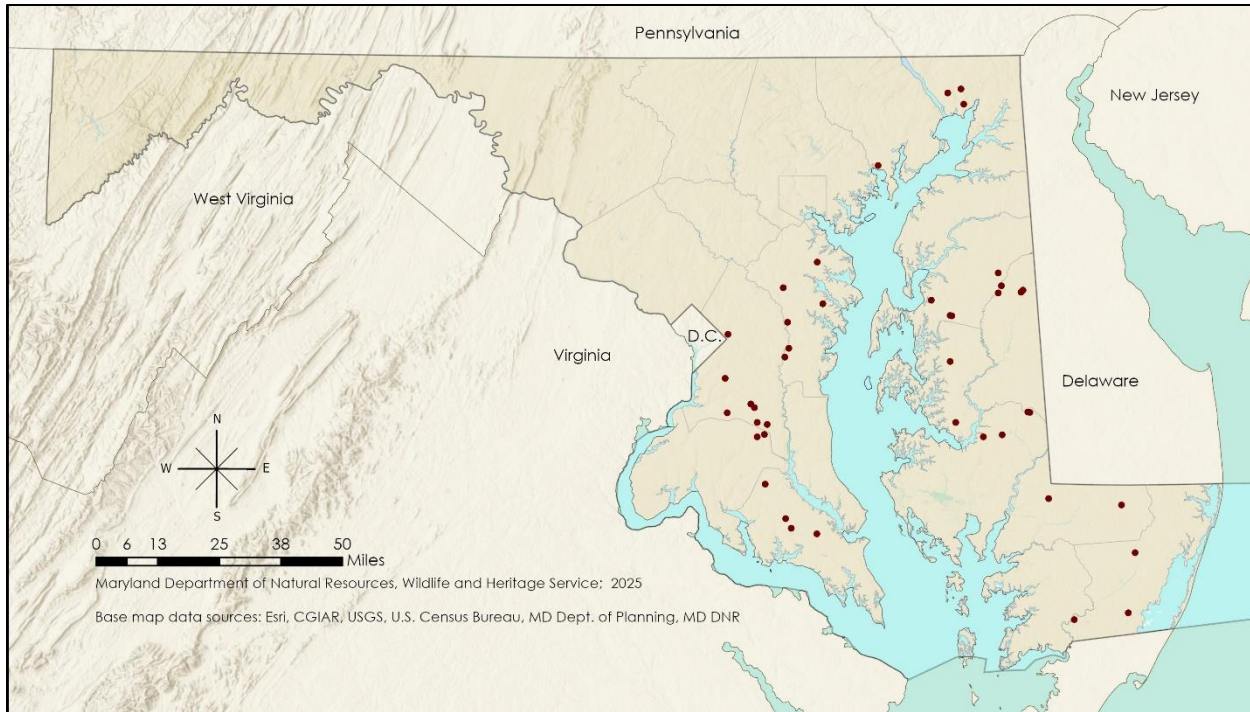


Figure 4.14 Location of Artificial Barrens (Sand and Gravel Mines) in Maryland. Sources: MD DNR and Sam Droege (USGS).

Species of Greatest Conservation Need Associated with Artificial Barrens (Sand and Gravel Mines):

Insects (Hymenoptera)

- A dieunomia bee (*Dieunomia nevadensis*)
- A leafcutter bee (*Coelioxys immaculatus*)
- A long-horned bee (*Epimelissodes comptus*)
- A mason bee (*Osmia chalybea*)
- A miner bee (*Perdita bradleyi*)
- A mining bee (*Andrena fulvipennis*)
- A sweat bee (*Lasioglossum sopinci*)
- American plasterer bee (*Colletes americanus*)
- Puny cuckoo nomad bee (*Epeolus pusillus*)
- Summer miner bee (*Protandrena aestivalis*)
- Sunflower sweat bee (*Dieunomia heteropoda*)
- Two-spotted miner bee (*Andrena accepta*)



Cliff, Talus, and Rock Outcrop

Region(s): Central, Western

Habitat Group: Glades/Barrens/Cliffs

NEAFWA: Cliffs & Talus

The Cliff, Talus, and Rock Outcrop Key Wildlife Habitat includes rock outcrops, vertical or near-vertical cliffs, and talus slopes. The differences between cliffs and rock outcrops are subtle: cliffs are generally considered tall, sheer vertical walls of rock or soil, while outcrops consist of steep to vertical, exposed rock formations with well-developed fissures and crevices. Talus consists of large, dry, lichen-dominated boulderfields with little or no vascular vegetation, formed of the accumulation of rock fragments eroded from the cliffs and rock outcrops above. Cliff, Talus, and Rock Outcrop habitats are most numerous and prominent in the Appalachian Plateau and Ridge and Valley physiographic regions, although significant examples also occur in the Piedmont. On the Appalachian Plateau, this habitat is typified by extensive (in places, > 0.5 km long) Pottsville sandstone outcrops along the upper slopes and ridges (600-1,000 m) of the state's highest mountains. This includes Dans, Big Savage, Meadow, and Backbone Mountains. In the Ridge and Valley, large sandstone ridgetop outcrops also occur in the Tuscarora Formation on Haystack, Wills, and Evitts Mountains, and in the Bear Pond Mountains; the Purslane Formation on Sideling Hill and Town Hill; and in the Oriskany Formation on numerous ridges such as Fort Hill, Roundtop Hill and Warrior Mountain. Further east between Hagerstown and Frederick, the Weverton Quartzite Formation forms major outcrops along the crests of South and Catoclin Mountains.



Jason Harrison, MD DNR

Many of these outcrops include massive cliff and boulder faces with numerous deep fissures. The outcrop base is often surrounded by extensive, open talus that grades into the Boulderfield Forests and Woodlands natural community. Cool, windswept conditions along with frequent ice storms and heavy snows greatly limit soil development and thus, the type and extent of plant communities present. Vegetation in and around outcrops also varies depending on the physiographic region, elevation, slope, aspect, geological formation, and other factors. On the steepest, most exposed sections, vegetation is absent except for mosses, and patches of lichens growing on rock surfaces. On less exposed areas, scattered, sometimes dense patches of shrubs such as mountain laurel (*Kalmia latifolia*), great rhododendron (*Rhododendron maximum*), huckleberries (*Gaylussacia* spp.), and blueberries (*Vaccinium* spp.), as well as occasional stunted trees of chestnut oak (*Quercus montana*), pitch pine (*Pinus rigida*), American mountain ash (*Sorbus americana*), Table Mountain pine (*Pinus pungens*), or eastern hemlock (*Tsuga canadensis*) can be found growing there. The surrounding vegetation, which influences the types of outcrop fauna present, can range from High Elevation Ridge Forests and Hemlock-Northern Hardwood Forests to Montane-Piedmont Oak-Pine Forests. Prior to the introduction of chestnut blight in the early-mid 1900s, American chestnut (*Castanea dentata*) was a frequent to dominant tree species in many of the forests surrounding ridgetop outcrops.



At lower elevations in the western mountain region of Maryland, large outcrops and cliffs also occur along many of the larger streams and rivers. One example exists in Garrett County, where Pottsville sandstone outcrops overlook sections of the Youghiogheny River and North Branch of the Potomac River. There are also a variety of formations of outcrops in the Piedmont region along the main branch of the Potomac River, including one of the more notable examples on the Weverton Quartzite Formation, which exhibits tall, sheer cliffs near Harpers Ferry and Point of Rocks. This Key Wildlife Habitat also includes the less common shale and limestone outcrops and ledges that occur along the Potomac in Allegany, Washington, and Frederick counties. Cliffs and Rock Outcrops are much less common in the Piedmont region, and most are small; the largest occur along the Susquehanna River, on Sugarloaf Mountain, and in the Great Falls region of the Potomac River.

County Distribution: Allegany, Baltimore, Carroll, Cecil, Frederick, Garrett, Harford, Howard, Montgomery, Washington

Places to Visit: Catoctin Mountain Park, C&O Canal National Historical Park, Rocks State Park, South Mountain State Park

State Rare Natural Communities: Basic Cliff, Boulderfield Forest and Woodland

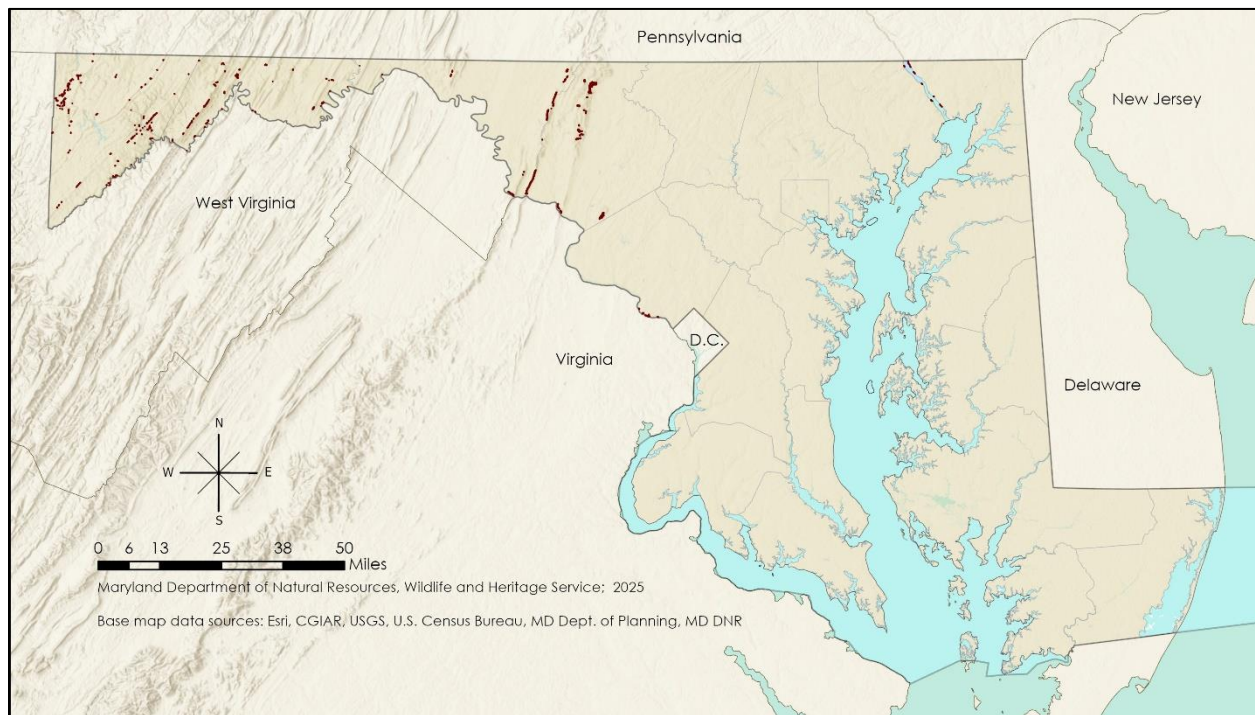


Figure 4.15 Location of Cliffs, Talus, and Rock Outcrops in Maryland. Sources: MD DNR and NETWHCS.



Species of Greatest Conservation Need Associated with Cliffs, Talus, and Rock Outcrops:

Birds

American peregrine falcon
Dark-eyed junco
Golden eagle
Winter wren

Amphibians

Green salamander
Wehrle's salamander

Reptiles

Copperhead
Red cornsnake
Six-lined racerunner
Smooth greensnake
Timber rattlesnake

Insects (Coleoptera)

Common claybank tiger beetle
Cow path tiger beetle
Northern barrens tiger beetle
Splendid tiger beetle

Insects (Hymenoptera)

A cellophane bee (*Colletes aestivalis*)

Mammals

Allegheny woodrat
Appalachian cottontail
Bobcat
Eastern small-footed bat
Eastern spotted skunk
Gray fox
Indiana bat
Least weasel
Little brown bat
Long-tailed shrew
Northern long-eared bat
Silver-haired bat
Smoky shrew
Tricolored bat

Plants

Running shadbush (*Amelanchier humilis*)
Nantucket shadbush (*Amelanchier nantucketensis*)
Western hairy rockcress (*Arabis pycnocarpa*)
Bearberry (*Arctostaphylos uva-ursi*)
Bradley's spleenwort (*Asplenium bradleyi*)

Plants (continued)

Lobed spleenwort (*Asplenium pinnatifidum*)
Black-stem spleenwort (*Asplenium resiliens*)
Missouri rockcress (*Borodinia missouriensis*)
American harebell (*Campanula rotundifolia*)
Ebony sedge (*Carex eburnea*)
Northern bedstraw (*Galium boreale*)
Appalachian sandwort (*Geocarpon glabrum*)
Highland rush (*Oreojuncus trifidus*)
Canby's mountain-lover (*Paxistima canbyi*)
Smooth cliffbrake (*Pellaea glabella*)
Northern beechfern (*Phegopteris connectilis*)
Michaux's stitchwort (*Sabulina michauxii*)
Cliff stonecrop (*Sedum glaucophyllum*)
Racemose goldenrod (*Solidago racemosa*)



Coastal Bluff

Region(s): Eastern, Southern

Habitat Group: Glades/Barrens/Cliffs

NEAFWA: Cliffs & Talus; Shorelines

The Coastal Bluff Key Wildlife Habitat is defined as a steep shoreline slope formed in loose sediments of clay, sand, and gravel, often just above the high tide line. By comparison, cliffs or slopes in bedrock (ledge) surfaces are not classified as bluffs and are not subject to significant erosion over a century or more. In addition, beaches and dunes do not form bluffs, except along the seaward dune edge as a result of erosion.



Jared Parks, Eastern Shore Land Conservancy

On the Coastal Plain, this habitat type is limited to tall (5-40 m), steep to vertical bluffs of Miocene origin along the shorelines of the mid- and upper Chesapeake Bay and large tidal rivers, examples of which include Calvert Cliffs on the Chesapeake Bay and Grove Point at the mouth of the Sassafras River.

Vegetation is usually absent to sparse due to naturally high erosion rates resulting from a combination of shoreline wave action, groundwater percolation, and the weathering effects of wind and precipitation, especially during major storm events (e.g., hurricanes, nor'easters). A sparse early successional community may become temporarily established on less steep or exposed bluff faces. Vegetation composition varies, but small trees such as black locust (*Robinia pseudoacacia*) and sassafras (*Sassafras albidum*) are among the more frequent tree species present, and mixtures of native and non-native woody and herbaceous species may be found in variable composition and abundance, including staghorn sumac (*Rhus typhina*), multiflora rose (*Rosa multiflora*), common pokeweed (*Phytolacca americana*), Japanese honeysuckle (*Lonicera japonica*), yellow foxtail (*Setaria pumila*), and wild potato-vine (*Ipomoea pandurata*). Smaller (3-8 m tall) bluffs also occur along large inland rivers, such as the Potomac and the Monocacy. In some cases, sand and gravel mining operations create bluff-like conditions around the edges or in the open pits that provide primary habitat for certain Species of Greatest Conservation Need, including bank swallows (*Riparia riparia*).

County Distribution: Anne Arundel, Baltimore, Calvert, Cecil, Charles, Frederick*, Harford, Kent, Montgomery*, Prince George's, Queen Anne's, St. Mary's, Talbot
(*This Key Wildlife Habitat accommodates "disjunct" and isolated areas that occur in portions of the Piedmont.)

Places to Visit: Calvert Cliffs State Park, Sassafras Natural Resources Management Area



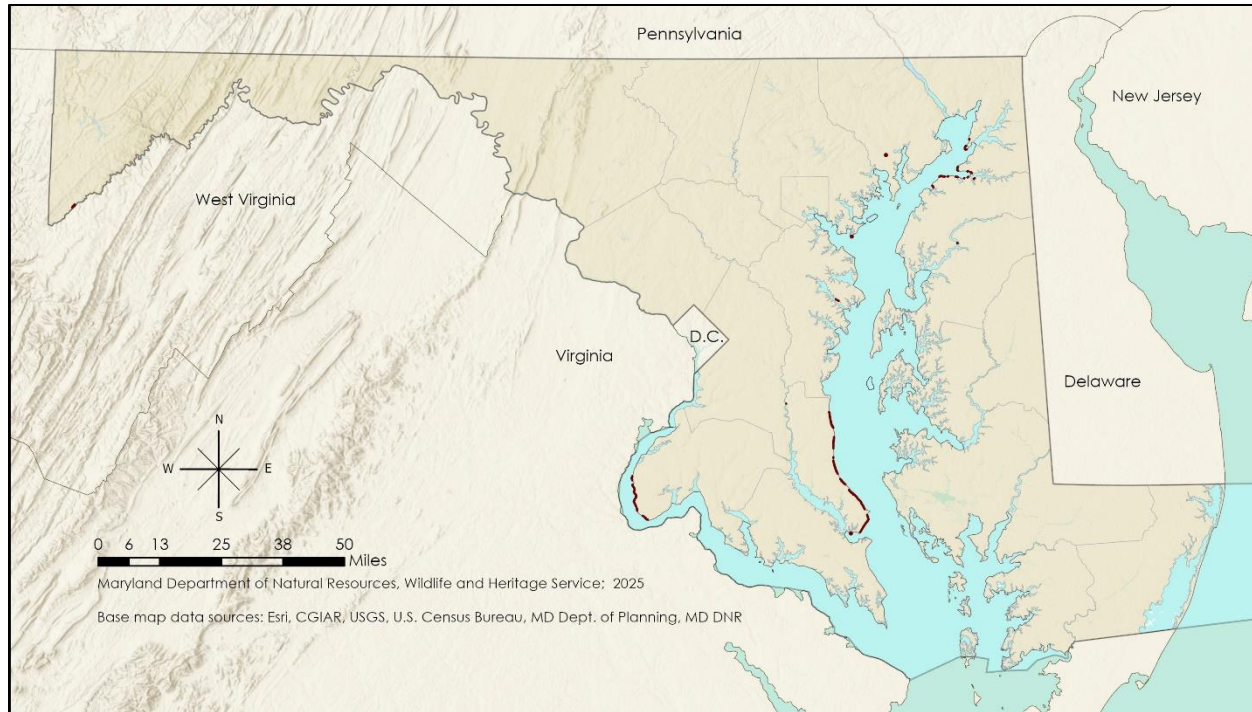


Figure 4.16 Location of Coastal Bluffs in Maryland. Source: MD DNR.

Species of Greatest Conservation Need Associated with Coastal Bluffs:

Birds

Bank swallow

Insects (Coleoptera)

Eastern beach tiger beetle

Puritan tiger beetle



Coastal Beaches and Dunes

Coastal Beach

Region(s): Eastern, Southern

Habitat Group: Coastal Beaches/Dunes

NEAFWA: Beaches & Dunes

The Coastal Beach Key Wildlife Habitat is represented by ocean shores and flats behind breached foredunes of the Atlantic coast, as well as along some of the shoreline habitat of the Coastal Bays, Chesapeake Bay, and lower reaches of major rivers. Situated between the mean high tide limit and foredunes, Coastal Beaches along the Atlantic Ocean are subjected to extreme conditions associated with marine environments, such as salt spray, high winds, flooding, and shifting sands. These habitats are generally kept moist due to constant salt spray and rainwater. Substrates are composed of unconsolidated sands and shells, which are constantly being shifted by winds and floods of storm surges and spring high tides.



MD DNR

This dynamic disturbance regime severely limits vegetation establishment to salt-tolerant species, with composition that can change dramatically from year to year, which often includes succulent annuals such as American sea rocket (*Cakile edentula*), seaside sandmat (*Chamaesyce polygonifolia*), sea chickweed (*Honckenya peploides*), and glassworts (*Salicornia* spp.). In addition, broad overwash flats may develop behind primary dunes when breaching occurs during storm surges. Dune construction along the Atlantic coast has greatly reduced the extent of these habitats by increasing oceanside beach erosion and eliminating the natural disturbance regime that creates and maintains overwash flats. Beaches of shorelines away from the ocean are subject to many of the same conditions, except for a minimized or insignificant amount of salt spray, depending on their location. These beaches are also frequently reduced to small, isolated areas. Certain erosion control structures, such as bulkheads and placement of riprap revetments along shorelines, have greatly reduced the extent of this habitat by disrupting natural erosion and longshore or littoral drift of sand.

County Distribution: Anne Arundel, Baltimore, Calvert, Caroline, Cecil, Charles, Dorchester, Harford, Kent, Prince George's, Queen Anne's, Talbot, Somerset, St. Mary's, Wicomico, Worcester

Places to Visit: Assateague Island National Seashore, Calvert Cliffs State Park, Flag Ponds Nature Park



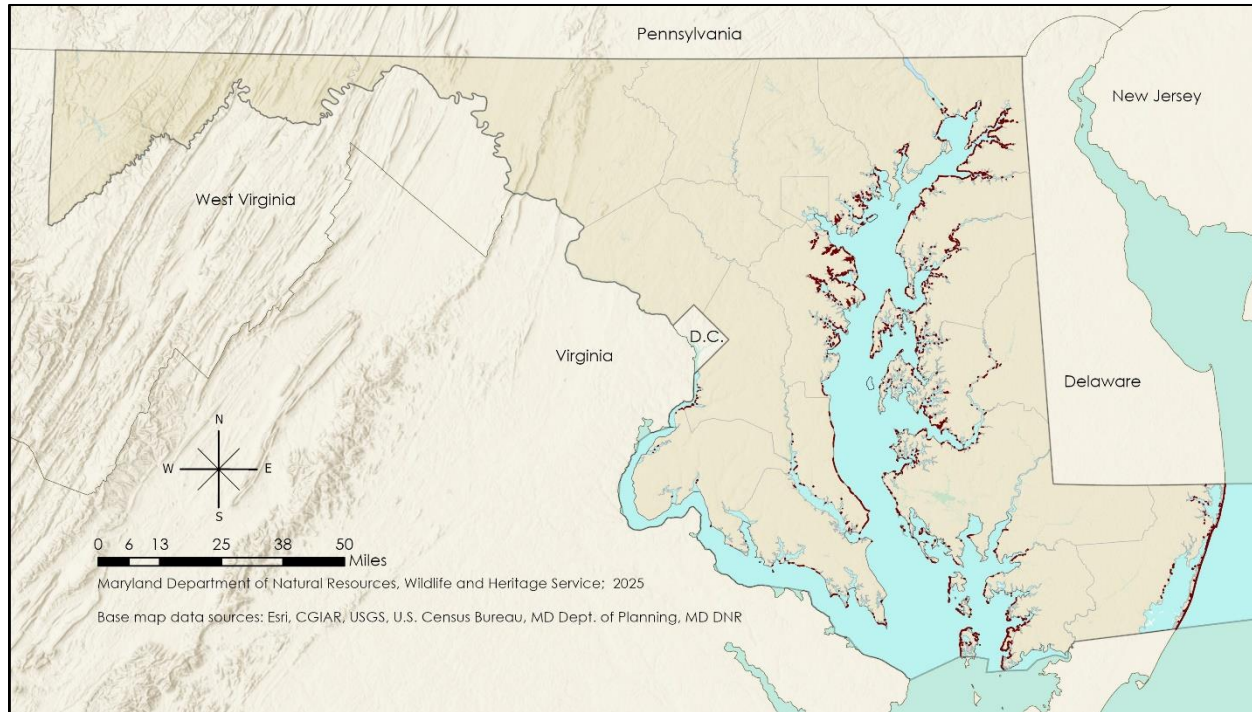


Figure 4.17 Location of Coastal Beaches in Maryland. Sources: MD DNR, NPS, and USGS.

Species of Greatest Conservation Need Associated with Coastal Beaches:

Birds

American oystercatcher
Black skimmer
Black-bellied plover
Brant
Brown pelican
Common tern
Dunlin
Forster's tern
Greater yellowlegs
Gull-billed tern
Ipswich sparrow
Laughing gull
Least tern
Lesser yellowlegs
Piping plover
Roseate tern
Royal tern
Ruddy turnstone
Rufa red knot
Sanderling
Sandwich tern
Semipalmated sandpiper
Spotted sandpiper
Whimbrel

Birds (continued)

Willet
Wilson's plover

Reptiles

Loggerhead sea turtle
Diamond-backed terrapin
Six-lined racerunner

Insects (Coleoptera)

Eastern beach tiger beetle
Ghost tiger beetle
White tiger beetle

Insects (Hymenoptera)

A cellophane bee (*Colletes speculariferus*)
A mason bee (*Osmia chalybea*)
A mining bee (*Andrena braccata*)
A sweat bee (*Lasioglossum nymphale*)
American plasterer bee (*Colletes americanus*)
George Eickwort's sweat bee (*Lasioglossum georgeickworti*)
Puny cuckoo nomad bee (*Epeolus pusillus*)

Insects (Lepidoptera)

Brown flower moth
Coastal graphic moth (*Drasteria graphica*)
Eastern cactus-boring moth
Fringed dart moth
Merry melipotis moth
Sand wainscot moth
Seaside goldenrod stem borer

Plants

Seabeach amaranth (*Amaranthus pumilus*)
Seabeach orach (*Atriplex mucronata*)
Seabeach sedge (*Carex silicea*)
Common clammyweed (*Polanisia dodecandra*)
Seabeach knotweed (*Polygonum glaucum*)
Beach plum (*Prunus maritima*)
Narrowleaf willow (*Salix interior*)
Puerto Rico sea-purslane (*Sesuvium maritimum*)



Maritime Dune and Grassland

Region(s): Eastern

Habitat Group: Coastal Beaches/Dunes

NEAFWA: Beaches & Dunes;
Grasslands

The Maritime Dune and Grassland Key Wildlife Habitat is characterized by dune systems along the Atlantic Ocean. These habitats are dominated by grasses and dwarf shrubs well adapted to extreme gradients of soil moisture and salt spray. Sand movement is also an important factor in shaping dune communities.

Active dunes, where sand movement is greatest, tend to support grasses such as American beachgrass (*Ammophila breviligulata*), beach panic grass (*Panicum amarum* ssp. *amarulum*), and bitter seabeach grass (*Panicum amarum* ssp. *amarum*), whereas stabilized dunes support low-growing shrubs such as beach heather (*Hudsonia tomentosa*). Steep, ocean-fronting dunes are usually colonized by linear, nearly monospecific stands of American beachgrass. The crest and back slopes of primary dunes have a slightly more diverse plant assemblage that may include sea oats (*Chasmanthium latifolium*), bitter seabeach grass, seaside goldenrod (*Solidago sempervirens*), seaside spurge (*Euphorbia polygonifolia*), and dune sandbur (*Cenchrus tribuloides*).



Jason Harrison, MD DNR

A series of smaller secondary dunes spread inland from the primary dune. These dunes are somewhat protected from salt spray and often dominated by beach panic grass. Small, seasonally flooded grasslands in low swales between secondary dunes are commonly referred to as interdunal swales, characterized by perched water tables and shallow seasonal flooding by rainfall. Although they are predominantly freshwater wetlands, periodic saltwater intrusion may occur in some swales during storm surges. Fluctuations in water levels and salinity vary between swales and greatly influence species composition. As water levels draw down late in the growing season, interdunal swales support a variety of grasses, sedges, rushes, and forbs. Maritime dune systems are threatened by development and coastal erosion.

County Distribution: Worcester

Places to Visit: Assateague Island National Seashore

State Rare Natural Communities: Maritime Dune Grassland, Interdunal Swale



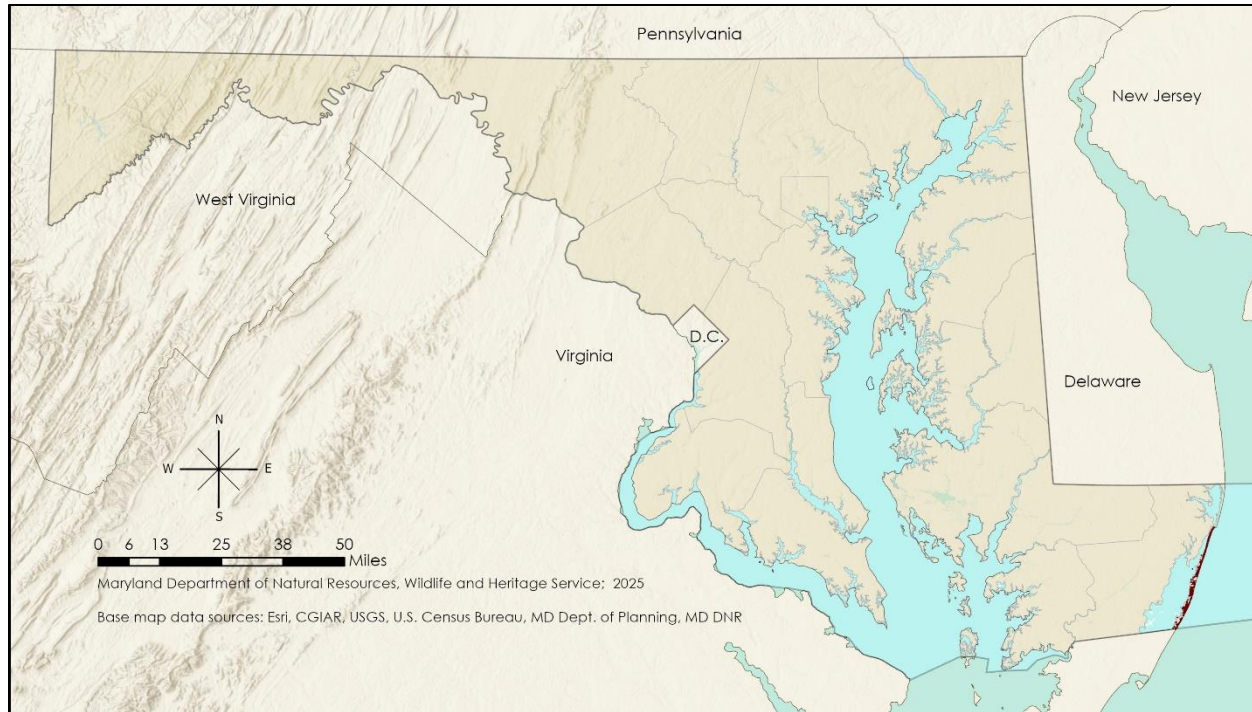


Figure 4.18 Location of Maritime Dunes and Grasslands in Maryland. Sources: MD DNR and NPS.

Species of Greatest Conservation Need Associated with Maritime Dunes and Grasslands:

Birds

American oystercatcher
Black skimmer
Boat-tailed grackle
Common nighthawk
Common tern
Forster's tern
Greater yellowlegs
Gull-billed tern
Ipswich sparrow
Laughing gull
Least tern
Lesser yellowlegs
Northern bobwhite
Northern harrier
Piping plover
Roseate tern
Royal tern
Sandwich tern
Short-eared owl
Whimbrel
Willet
Wilson's plover

Mammals

Eastern red bat
Hoary bat
Silver-haired bat
Tricolored bat

Reptiles

Diamond-backed terrapin

Insects (Hymenoptera)

A cellophane bee (*Colletes speculiferus*)
A mason bee (*Osmia chalybea*)
A mining bee (*Andrena braccata*)
A sweat bee (*Lasioglossum nymphae*)
American plasterer bee (*Colletes americanus*)
George Eickwort's sweat bee (*Lasioglossum georgeickworti*)
Puny cuckoo nomad bee (*Epeolus pusillus*)

Insects (Coleoptera)

Bethany Beach firefly
Ghost tiger beetle
White tiger beetle

Insects (Lepidoptera)

Brown flower moth
Coastal graphic moth (*Drasteria graphica*)
Eastern cactus-boring moth
Fringed dart moth
Merry melipotis moth
Sand wainscot moth
Seaside goldenrod stem borer

Plants

Umbrella flats flatsedge (*Cyperus diandrus*)
Sea chickweed (*Honckenya peploides*)



Wetland Habitats

Floodplain Wetlands

Montane-Piedmont Floodplain

Region(s): Western, Central

Habitat Group: Floodplain Wetlands

NEAFWA: Riparian & Floodplains

The Montane-Piedmont Floodplain Key Wildlife Habitat encompasses a wide variety of floodplain habitats along small streams and large river systems in the Piedmont and mountain regions of Maryland. These habitats are very diverse and dynamic, creating a mosaic of forests, woodlands, shrublands and herbaceous ecological communities where species distribution, composition and structure are influenced by geology, soil properties, and flooding regimes. Beaver herbivory and dam-building can also dynamically alter floodplain connection in small and medium sized systems.



Richard Wiegand, MD DNR

Distinct alluvial landforms are usually present at varying scales along larger rivers along shoreline areas and islands, especially in high-gradient rocky sections and along flood-deposited sand and gravel bars, levees, terraces, old oxbows, and sloughs. These support stunted, flood-scoured woodlands, herbaceous wet meadows, and riverside prairies. Such areas are frequently dominated by dense, nearly pure stands of small (2-8 m tall) sycamore (*Platanus occidentalis*), box elder (*Acer negundo*), river birch (*Betula nigra*), and green ash (*Fraxinus pennsylvanica*) trees with smaller inclusions of graminoid vegetation often dominated by little bluestem (*Andropogon gerardii*) and switchgrass (*Panicum virgatum*). Temporarily and intermittently flooded bottomland forests are prominent along many of the rivers with canopies composed of species including sycamore, silver maple (*Acer saccharinum*), black walnut (*Juglans nigra*), river birch, box elder, pawpaw (*Asimina triloba*), and American elm (*Ulmus americana*).

Frequently embedded within floodplain forests are floodwater pools and seasonally flooded backswamps and sloughs dominated by red maple (*Acer rubrum*), silver maple, sweetgum (*Liquidambar styraciflua*), and hydrophytic oaks such as pin oak (*Quercus palustris*) and swamp white oak (*Quercus bicolor*). These backwater areas usually exhibit distinctive hummock-and-hollow microtopography with maximum flood depths of 50-70 cm. along smaller, higher gradient streams, where the floodplain is narrower and alluvial landforms develop at much smaller scales, mesophytic species may occur. Commonly encountered is a mixture of bottomland and mesophytic species, which include tulip poplar (*Liriodendron tulipifera*), sugar maple (*Acer saccharum*), basswood (*Tilia americana*), American beech (*Fagus grandifolia*), and white pine (*Pinus strobus*). At higher elevations, eastern hemlock (*Tsuga canadensis*), black cherry (*Prunus serotina*), yellow birch (*Betula alleghaniensis*), and dense thickets of great laurel (*Rhododendron maximum*) can be prominent.



County Distribution: Allegany, Baltimore, Carroll, Cecil, Frederick, Garrett, Harford, Howard, Montgomery, Washington

Places to Visit: C&O National Historical Park, Gunpowder Falls State Park, Patapsco Valley State Park, Susquehanna State Park, Sideling Hill Wildlife Management Area

State Rare Natural Communities: River Scour Woodland, Riverside Prairie, Riverside Outcrop Barren



Figure 4.19 Location of Montane-Piedmont Floodplains in Maryland. Sources: MD DNR and FEMA.

Species of Greatest Conservation Need Associated with Montane-Piedmont Floodplains:

<u>Birds</u>	<u>Insects (Coleoptera)</u>	<u>Plants</u>
Acadian flycatcher	An ash seed weevil (<i>Lignynodes bischoffi</i>)	Blue monkshood (<i>Aconitum uncinatum</i>)
Alder flycatcher	An ash seed weevil (<i>Lignynodes fraxini</i>)	Earleaf false foxglove (<i>Agalinis auriculata</i>)
American black duck	An ash seed weevil (<i>Lignynodes helvolus</i>)	Lake-cress (<i>Armoracia lacustris</i>)
American redstart	An ash seed weevil (<i>Lignynodes horridulus</i>)	Blue wild indigo (<i>Baptisia australis</i>)
American woodcock		Susquehanna doll's-daisy (<i>Boltonia asteroides</i> var. <i>asteroides</i>)
Bald eagle		Broad-glumed brome (<i>Bromus latiglumis</i>)
Baltimore oriole	Appalachian tiger beetle	Carey's sedge (<i>Carex careyana</i>)
Bank swallow	Charlie Brown's flea beetle (<i>Capraita sexmaculata</i>)	Davis' sedge (<i>Carex davisii</i>)
Black-and-white warbler	Eastern ash bark beetle (<i>Hylesinus aculeatus</i>)	Cypress-knee sedge (<i>Carex decomposita</i>)
Black-billed cuckoo		
Black-crowned night heron		
Black-throated blue warbler		
Black-throated green warbler		
Blackburnian warbler		



Blue-winged warbler	Encircled borer (<i>Agilus subcinctus</i>)	Hairy-fruited sedge (<i>Carex trichocarpa</i>)
Broad-winged hawk	Potomac firefly	Big shellbark hickory (<i>Carya laciniosa</i>)
Brown creeper		Tall tickseed (<i>Coreopsis tripteris</i>)
Canada warbler	<u>Insects (Diptera)</u>	Flatsedge (<i>Cyperus hystrixinus</i>)
Cerulean warbler	Ash bullet gall midge (<i>Dasineura pellex</i>)	Flat-stem spikerush (<i>Eleocharis compressa</i> var. <i>compressa</i>)
Golden-crowned kinglet	Swollen ash gall midge (<i>Dasineura tumidosae</i>)	Matted spikerush (<i>Eleocharis intermedia</i>)
Golden-winged warbler		Braun's robin's-plantain (<i>Erigeron pulchellus</i> var. <i>brauniae</i>)
Great blue heron	<u>Insects (Hemiptera)</u>	White trout lily (<i>Erythronium albidum</i>)
Great egret	Fringetree lace bug (<i>Leptocypha mutica</i>)	Harperella (<i>Harperella nodosa</i>)
Greater yellowlegs		Sweet-scented Indian plantain (<i>Hasteola suaveolens</i>)
Hooded warbler	<u>Insects (Hymenoptera)</u>	McDowell's sunflower (<i>Helianthus occidentalis</i>)
Kentucky warbler	A carpenter ant (<i>Colobopsis mississippiensis</i>)	Few-flowered tick-trefoil (<i>Hylodesmum pauciflorum</i>)
Lesser yellowlegs	A cuckoo bee (<i>Nomada seneciophila</i>)	Eastern bloodleaf (<i>Iresine rhizomatosa</i>)
Louisiana waterthrush	An andrenid bee (<i>Andrena lamelliterga</i>)	Dwarf crested iris (<i>Iris cristata</i>)
Magnolia warbler	An andrenid bee (<i>Andrena phaceliae</i>)	Pipevine (<i>Isotrema macrophyllum</i>)
Northern parula	Azalea mining bee (<i>Andrena cornelli</i>)	American gromwell (<i>Lithospermum latifolium</i>)
Ovenbird	Blackheaded ash sawfly (<i>Tethida barda</i>)	Virginia false gromwell (<i>Lithospermum virginianum</i>)
Prothonotary warbler	Fringed loosestrife oil-collecting bee (<i>Macropis ciliata</i>)	Winged loosestrife (<i>Lythrum alatum</i>)
Ruffed grouse	Golden Alexanders miner bee (<i>Andrena ziziae</i>)	Starflower Solomon's-plume (<i>Maianthemum stellatum</i>)
Rusty blackbird	Mustard miner bee (<i>Andrena arabis</i>)	Ostrich fern (<i>Matteuccia struthiopteris</i>)
Scarlet tanager	Trout lily miner bee (<i>Andrena erythronii</i>)	Purple mecardonia (<i>Mecardonia acuminata</i>)
Spotted sandpiper	Waterleaf mining bee (<i>Andrena geranii</i>)	Hair-awn muhly (<i>Muhlenbergia capillaris</i>)
Veery		Whorled water-milfoil (<i>Myriophyllum verticillatum</i>)
Willow flycatcher	<u>Insects (Lepidoptera)</u>	Glade mallow (<i>Napaea dioica</i>)
Winter wren	A grass miner moth (<i>Ethmia maceliosiella</i>)	Yellow nailwort (<i>Paronychia virginica</i>)
Wood thrush	Angel moth	Horse-tail paspalum (<i>Paspalum fluitans</i>)
Worm-eating warbler	Ash borer moth (<i>Podosesia syringae</i>)	Coville's phacelia (<i>Phacelia covillei</i>)
Yellow warbler	Ash leaf cone roller moth (<i>Caloptilia fraxinella</i>)	Fowl bluegrass (<i>Poa palustris</i>)
Yellow-breasted chat	Ash sphinx (<i>Manduca jasmineearum</i>)	Large-leaved pondweed (<i>Potamogeton amplifolius</i>)
Yellow-crowned night heron		
Yellow-throated vireo		
<u>Mammals</u>		
American mink		
Bobcat		
Eastern red bat		
Hoary bat		
Indiana bat		
Least shrew		
Least weasel		
Little brown bat		
Northern long-eared bat		
Silver-haired bat		
Southeastern shrew		
Southern bog lemming		
Southern pygmy shrew		
Southern water shrew		
Tricolored bat		



Amphibians

Jefferson salamander
Longtail salamander
Mountain dusky salamander
Seal salamander
Upland chorus frog
Valley and Ridge salamander

Reptiles

Bog turtle
Copperhead
Eastern box turtle
Eastern mud turtle
Eastern ribbonsnake
Eastern spiny softshell
Northern map turtle
Smooth greensnake
Spotted turtle
Timber rattlesnake
Wood turtle

Invertebrates (Mites)

Ash flower gall mite (*Aceria fraxiniflora*)
Ash key gall mite (*Aceria fraxinivora*)
Ash leaf gall mite (*Aceria fraxini*)

Ash tip borer moth (*Papaipema furcata*)

Atlantis fritillary
Baltimore checkerspot
Banded ash clearwing moth (*Podosesia aureocincta*)
Black dash
Braun's ash bark-mining moth (*Marmara fraxinicola*)
Franck's sphinx
Great ash sphinx (*Sphinx chersis*)
Grote's swallow moth
Harris's checkerspot
Inkblot palpita moth (*Palpita illibalis*)
Long dash
Northern oak hairstreak
Pepper and salt skipper
Purple plagodis moth (*Plagodis kuetzingi*)
Silver-bordered fritillary
Splendid palpita moth (*Palpita magniferalis*)
Tuscarora emerald
West Virginia white
Zeller's grass miner moth (*Ethmia zelleriella*)

Insects (Odonata)

Beaverpond baskettail
Black-tipped darner
Canada darner
Green-striped darner
Ski-tailed emerald

Illinois pondweed (*Potamogeton illinoensis*)

Bur oak (*Quercus macrocarpa*)
Wild black currant (*Ribes americanum*)
Virginia mallow (*Ripariosida hermaphrodita*)
Smooth rose (*Rosa blanda*)
Hairy wild petunia (*Ruellia humilis*)
Limestone wild petunia (*Ruellia strepens*)
Tall dock (*Rumex altissimus*)
Blunt-lobe grapefern (*Sceptridium oneidense*)
Little-head nutrush (*Scleria oligantha*)
Hooded skullcap (*Scutellaria galericulata*)
Veined skullcap (*Scutellaria nervosa*)
Rock skullcap (*Scutellaria saxatilis*)
Snowy campion (*Silene nivea*)
Rock goldenrod (*Solidago rupestris*)
Smooth false buttonweed (*Spermacoce glabra*)
Valerian (*Valeriana pauciflora*)
Rock grape (*Vitis rupestris*)



Coastal Plain Floodplain

Region(s): Central, Eastern, Southern

Habitat Group: Floodplain Wetlands

NEAFWA: Riparian & Floodplains

The Coastal Plain Floodplain Key Wildlife Habitat is characterized by a variety of flooded habitats that border Coastal Plain streams and rivers. These floodplain habitats are influenced by temporary or seasonal overbank flooding, groundwater seepage, and beaver activity. The vegetation of Coastal Plain Floodplains is both structurally and compositionally diverse, and often occurs as a mosaic of forests, woodlands, shrublands, and herbaceous communities. Species composition varies widely with stream order, soil type, and flooding regime.

Floodplain forests of small intermittent streams and braided streams may support combinations of sycamore (*Platanus occidentalis*), green ash (*Fraxinus pennsylvanica*), red maple (*Acer rubrum*), sweetgum (*Liquidambar styraciflua*), black gum (*Nyssa sylvatica*), river birch (*Betula nigra*), swamp chestnut oak (*Quercus michauxii*), and willow oak (*Quercus phellos*). Diverse understories are often present and characterized by mixtures of subcanopy and shrub species including American hornbeam (*Carpinus caroliniana*), pawpaw (*Asimina triloba*), American elm (*Ulmus americana*), American holly (*Ilex opaca* var. *opaca*), spicebush (*Lindera benzoin*), Jack-in-the-pulpit (*Arisaema triphyllum*), false nettle (*Boehmeria cylindrica*), poison ivy (*Toxicodendron radicans*), Virginia creeper (*Parthenocissus quinquefolia*), stout wood reedgrass (*Cinna arundinacea*), and various sedges. Similarly, floodplain forests of larger Coastal Plain Rivers with well-drained terraces or natural levees not subject to regular flooding will often support species such as tulip poplar (*Liriodendron tulipifera*), beech (*Fagus grandifolia*), and box elder (*Acer negundo*).

Semi-permanent to permanently flooded areas of this habitat may support swamps dominated by green ash, red maple, and plants tolerant of fluctuating water levels such as lizard's-tail (*Saururus cernuus*). Bald cypress (*Taxodium distichum*) and Atlantic white cedar (*Chamaecyparis thyoides*) swamps are rare natural communities that are also associated with poorly drained settings in regularly flooded floodplains, both of which are associated with slow-moving Blackwater Streams such as those in the Pocomoke and Nanticoke River watersheds.

Floodplain pools, beaver ponds, and other open water habitats are also characteristic of Coastal Plain Floodplains. These habitats are subjected to irregular disturbances that change water levels, such as the breaching of beaver dams and storm events. These habitats are highly variable in size, structure, and species composition. They often support a variety of floating aquatic, emergent, and woody vegetation. Species common to these habitats include white water-lily (*Nymphaea odorata*), spatterdock (*Nuphar advena*), pondweeds (*Potamogeton* spp.), duckweeds (*Lemna* spp.), bladderworts (*Utricularia* spp.), rice cutgrass (*Leersia oryzoides*), common



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woodrush (*Luzula multiflora*), knotweeds (*Polygonum* spp.), pickerelweed (*Pontederia cordata*), arrow-arum (*Peltandra virginica*), three-way sedge (*Dulichium arundinaceum*), broad-leaved cattail (*Typha latifolia*), American bur-reed (*Sparganium americanum*), swamp loosestrife (*Decodon verticillatus*), and common buttonbush (*Cephalanthus occidentalis*).

County Distribution: Anne Arundel, Baltimore, Calvert, Caroline, Cecil, Charles, Dorchester, Kent, Prince George’s, Queen Anne’s, St. Mary’s, Somerset, Talbot, Wicomico, Worcester

Places to Visit: Merkle Wildlife Sanctuary, Idylwild Wildlife Management Area, Pocomoke State Forest

State Rare Natural Communities: Bald Cypress - Gum Swamp, Atlantic White Cedar Swamp

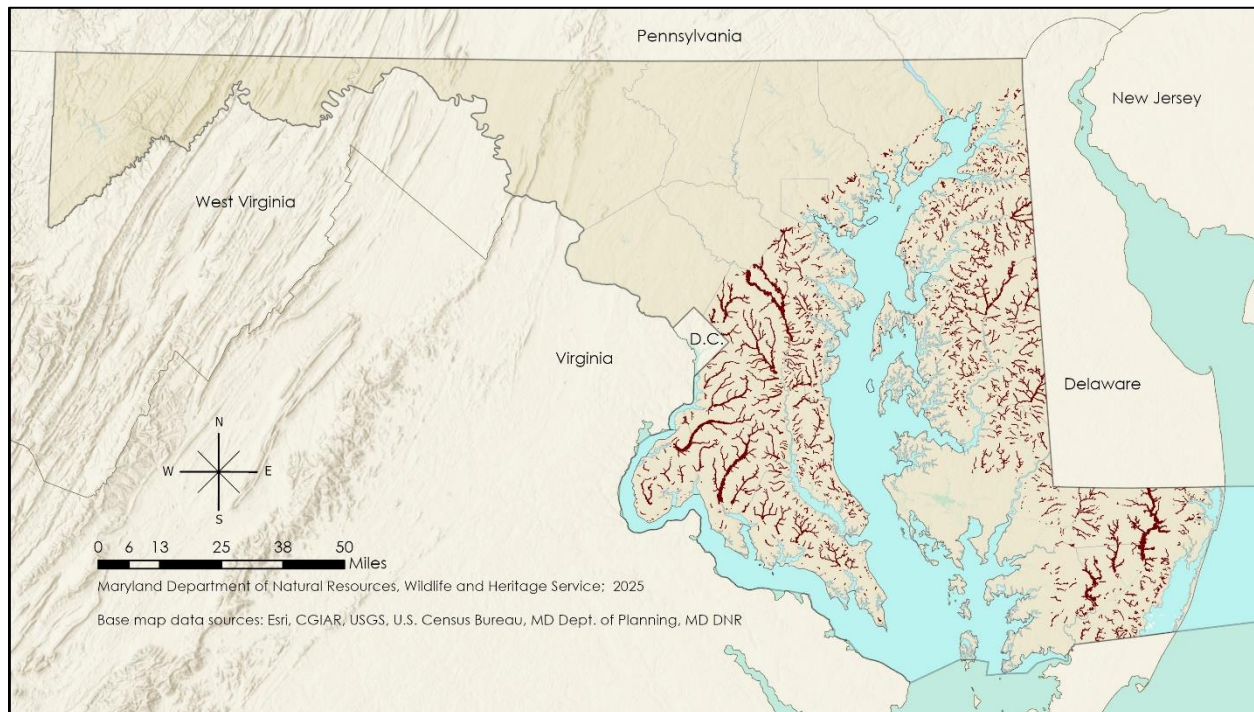


Figure 4.20 Location of Coastal Plain Floodplains in Maryland. Sources: MD DNR and FEMA.

Species of Greatest Conservation Need Associated with Coastal Plain Floodplains:

<u>Birds</u>	<u>Invertebrates (Mites)</u>	<u>Insects (Odonata)</u>
Acadian flycatcher	Ash flower gall mite (<i>Aceria fraxiniflora</i>)	Elfin skimmer
American black duck	Ash key gall mite (<i>Aceria fraxinivora</i>)	Fine-lined emerald
American redstart	Ash leaf gall mite (<i>Aceria fraxini</i>)	
American woodcock		<u>Insects (Diptera)</u>
Bald eagle		Ash bullet gall midge (<i>Dasineura pellex</i>)
Baltimore oriole		Painted wood fly (<i>Blera pictipes</i>)
Bank swallow		Swollen ash gall midge (<i>Dasineura tumidosae</i>)
Bicknell's thrush	<u>Insects (Coleoptera)</u>	
Black-and-white warbler	An ash seed weevil (<i>Lignyodes bischoffi</i>)	
Black-billed cuckoo		



Black-crowned night heron
 Blue-winged warbler
 Broad-winged hawk
 Brown creeper
 Chuck-will's-widow
 Great blue heron
 Great egret
 Greater yellowlegs
 Hooded warbler
 Kentucky warbler
 Lesser yellowlegs
 Louisiana waterthrush
 Nashville warbler
 Northern parula
 Ovenbird
 Prothonotary warbler
 Rusty blackbird
 Scarlet tanager
 Sedge wren
 Spotted sandpiper
 Swainson's warbler
 Veery
 Willow flycatcher
 Winter wren
 Wood thrush
 Worm-eating warbler
 Yellow warbler
 Yellow-breasted chat
 Yellow-crowned night heron
 Yellow-throated vireo

Mammals

American mink
 Bobcat
 Delmarva fox squirrel
 Eastern red bat
 Hoary bat
 Silver-haired bat
 Southeastern shrew
 Southern bog lemming
 Southern pygmy shrew
 Tricolored bat

Amphibians

Eastern narrow-mouthed toad
 Eastern spadefoot
 Mud salamander

Reptiles

An ash seed weevil (*Lignyodes fraxini*)
 An ash seed weevil (*Lignyodes helvolus*)
 An ash seed weevil (*Lignyodes horridulus*)
 Charlie Brown's flea beetle (*Capraita sexmaculata*)
 Eastern ash bark beetle (*Hylesinus aculeatus*)
 Encircled borer (*Agrius subcinctus*)
 Mysterious lantern firefly

Insects (Hemiptera)

Fringetree lace bug (*Leptoypha mutica*)
 Riley's 13-year cicada (*Magicicada tredecim*)

Insects (Lepidoptera)

A twirler moth (*Coleotechnites variella*)
 An owlet moth (*Meropleon titan*)
 Angel moth
 Ash borer moth (*Podosesia syringae*)
 Ash leaf cone roller moth (*Caloptilia fraxinella*)
 Ash sphinx (*Manduca jasmineearum*)
 Ash tip borer moth (*Papaipema furcata*)
 Bald cypress coneworm moth
 Baltimore checkerspot
 Banded ash clearwing moth (*Podosesia aureocincta*)
 Bronze copper
 Cypress emerald moth
 Cypress looper (*Iridopsis pergracilis*)
 Cypress pinion (*Lithophane abita*)
 Cypress sphinx moth (*Isoparce cupressi*)
 Distinguished cypress owlet moth
 Franck's sphinx

Insects (Hymenoptera)

A carpenter ant (*Colobopsis mississippiensis*)
 A cuckoo bee (*Nomada seneciophila*)
 An andrenid bee (*Andrena lamelliterga*)
 An andrenid bee (*Andrena phaceliae*)
 Azalea mining bee (*Andrena cornelli*)
 Blackheaded ash sawfly (*Tethida barda*)
 Fringed loosestrife oil-collecting bee (*Macropis ciliata*)
 Golden Alexanders miner bee (*Andrena ziziae*)
 Mustard miner bee (*Andrena arabis*)
 Trout lily miner bee (*Andrena erythronii*)
 Waterleaf mining bee (*Andrena geranii*)

Plants

Sharpscale sedge (*Carex oxylepis*)
 Smartweed dodder (*Cuscuta polygonorum*)
 Dwarf bulrush (*Cyperus subsquarrosus*)
 Creeping burhead (*Echinodorus cordifolius*)
 Deciduous holly (*Ilex decidua*)
 Slender blueflag (*Iris prismatica*)
 American frog's-bit (*Limnobia spongia*)
 Primrose-willow (*Ludwigia decurrens*)
 Small-flower baby-blue-eyes (*Nemophila aphylla*)
 Marsh fleabane (*Pluchea camphorata*)
 Leafy pondweed (*Potamogeton foliosus*)
 Water-plantain spearwort (*Ranunculus ambigens*)
 Yellow water-crowfoot (*Ranunculus flabellaris*)
 Mississippi buttercup (*Ranunculus laxicaulis*)
 Northeastern white water-crowfoot (*Ranunculus trichophyllus*)
 Water bulrush (*Schoenoplectus subterminalis*)



Copperhead	Gray cypress looper (<i>Cutina</i>	Gritty hedge-nettle (<i>Stachys aspera</i>)
Eastern box turtle	<i>albopunctella</i>)	Hyssopleaf hedge-nettle (<i>Stachys</i>
Eastern kingsnake	Great ash sphinx (<i>Sphinx</i>	<i>hyssopifolia</i>)
Eastern milksnake	<i>chersis</i>)	Lowland loosestrife (<i>Steironema</i>
Eastern mud turtle	Great purple hairstreak	<i>hybridum</i>)
Eastern ribbonsnake	Grote's sallow moth	Climbing dogbane (<i>Thyrsanthella</i>
Northern map turtle	Inkblot palpita moth (<i>Palpita</i>	<i>difformis</i>)
Northern mole kingsnake	<i>illibalis</i>)	Salad violet (<i>Viola esculenta</i>)
Plain-bellied watersnake	King's hairstreak	Atamasco lily (<i>Zephyranthes</i>
Rainbow snake	Mulberry wing	<i>atamasca</i>)
Spotted turtle	Palamedes swallowtail	
Striped mud turtle	Purple plagodis moth (<i>Plagodis</i>	
	<i>kuetzingi</i>)	
	Splendid palpita moth (<i>Palpita</i>	
	<i>magniferalis</i>)	



Groundwater Wetlands

Montane Acidic Fen

Region(s): Western

Habitat Group: Groundwater Wetlands

NEAFWA: Non-tidal Wetlands

The Montane Acidic Fen (Montane Bog and Fen in the 2015 State Wildlife Action Plan revision) Key Wildlife Habitat is represented by open acidic seepage wetlands supporting a patchwork of saturated shrub and herbaceous vegetation. These acidic peatlands are more commonly found in boreal and subboreal regions of central and eastern Canada and the northeast and north-central United States. However, in the central Appalachian Mountains, these habitats exist as small, isolated occurrences at high elevations, where climates are cold enough to allow the rate of peat accumulation to exceed its decomposition, which is a diagnostic characteristic of this habitat. While the term “bog” is often used for these habitats, it is a technical misnomer, and in strict usage applies only to peatlands that are rainwater-fed (i.e., ombrotrophic). In Maryland, fens are groundwater-fed (i.e., minerotrophic) peatlands that remain saturated for all or nearly all of the growing season and may have standing water seasonally. They are best developed on seepage slopes, along headwater streams, oxbows of streams, margins of beaver ponds, established millponds, and sandpits. Soils vary from mineral to deep peat, are extremely acidic, nutrient poor, and often support a variety of *Sphagnum* mosses. Beaver herbivory and flooding related to dam building exert additional spatiotemporal effects on vegetative regimes within wetland complexes.



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Fens on the Appalachian Plateau are uncommon habitats that often occur in openings on seepage slopes and along streams, creating a mosaic of different vegetation cover types depending on hydrology and position within the fen. The margins of fens, which are perched slightly higher than the central depressional features, are slightly drier with forest and woodland cover composed of red spruce (*Picea rubens*), eastern hemlock (*Tsuga canadensis*), white pine (*Pinus strobus*), American larch (*Larix laricina*), red maple (*Acer rubrum*), and black gum (*Nyssa sylvatica*), which grade inwards forming openings of shrub-herbaceous vegetation within the lower, more inundated depressional features. The openings contain a diverse flora often including Virginia cotton-grass (*Eriophorum virginicum*), rose pogonia (*Pogonia ophioglossoides*), round-leaf sundew (*Drosera rotundifolia* var. *rotundifolia*), cranberry (*Vaccinium* spp.), and a variety of ferns, rushes, and sedges. Dense mats of *Sphagnum* and haircap mosses are also characteristic of many Montane Fens. The abundance of shrubs is variable throughout sites and can range from scattered to dense impenetrable thickets. Common species include speckled alder (*Alnus incana* ssp. *rugosa*), narrow-leaved meadowsweet (*Spiraea alba*), mountain holly (*Ilex montana*), and black chokeberry (*Aronia melanocarpa*), although wetlands that have experienced disturbance may be dominated by brookside alder (*Alnus serrulata*) or silky dogwood (*Cornus amomum*).



County Distribution: Allegany, Garrett

Places to Visit: Mt. Nebo Wildlife Management Area, Cranesville Swamp (The Nature Conservancy), Finzel Swamp (The Nature Conservancy)

State Rare Natural Community: Montane Peatland



Figure 4.21 Location of Montane Acidic Fens in Maryland. Sources: MD DNR and USFWS.

Species of Greatest Conservation Need Associated with Montane Acidic Fens:

Birds

Acadian flycatcher
Alder flycatcher
American bittern
American black duck
American redstart
American woodcock
Baltimore oriole
Black-and-white warbler
Black-throated blue warbler
Black-throated green warbler
Blackburnian warbler
Blue-winged warbler
Brown creeper
Canada warbler
Dark-eyed junco
Golden-crowned kinglet

Reptiles

Copperhead
Eastern box turtle
Mountain earthsnake
Northern coal skink
Smooth greensnake
Spotted turtle
Timber rattlesnake

Invertebrates (Mites)

Ash flower gall mite (*Aceria fraxiniflora*)
Ash key gall mite (*Aceria fraxinivora*)
Ash leaf gall mite (*Aceria fraxini*)

Invertebrates (Snails)

Spruce knob threetooth

Insects (Hymenoptera)

A carpenter ant (*Colobopsis mississippiensis*)
Blackheaded ash sawfly (*Tethida barda*)

Insects (Coleoptera)

An ash seed weevil (*Lignyodes bischoffi*)
An ash seed weevil (*Lignyodes fraxini*)
An ash seed weevil (*Lignyodes helvolus*)
An ash seed weevil (*Lignyodes horridulus*)
Charlie Brown's flea beetle (*Capraita sexmaculata*)



Golden-winged warbler
 Hooded warbler
 Kentucky warbler
 Lesser yellowlegs
 Louisiana waterthrush
 Magnolia warbler
 Northern harrier
 Northern parula
 Northern saw-whet owl
 Northern waterthrush
 Olive-sided flycatcher
 Ovenbird
 Pine siskin
 Red-breasted nuthatch
 Ruffed grouse
 Rusty blackbird
 Scarlet tanager
 Sora
 Spotted sandpiper
 Swainson's thrush
 Swamp sparrow
 Veery
 Willow flycatcher
 Winter wren
 Wood thrush
 Worm-eating warbler
 Yellow warbler

Amphibians

Mountain chorus frog
 Upland chorus frog

Mammals

American mink
 Bobcat
 Eastern red bat
 Hoary bat
 Indiana bat
 Least shrew
 Little brown bat
 Northern long-eared bat
 Silver-haired bat
 Smoky shrew
 Southern bog lemming
 Southern pygmy shrew
 Southern water shrew
 Tricolored bat

Striped whitelip

Insects (Diptera)

Ash bullet gall midge (*Dasineura pellex*)
 Swollen ash gall midge (*Dasineura tumidosae*)

Insects (Lepidoptera)

Angel moth
 Ash borer moth (*Podosesia syringae*)
 Ash leaf cone roller moth (*Caloptilia fraxinella*)
 Ash sphinx (*Manduca jasmineearum*)
 Ash tip borer moth (*Papaipema furcata*)
 Atlantis fritillary
 Baltimore checkerspot
 Banded ash clearwing moth (*Podosesia aureocincta*)
 Black dash
 Bog copper
 Franck's sphinx
 Great ash sphinx (*Sphinx chersis*)
 Grote's sawfly moth
 Harris's checkerspot
 Hoary elfin
 Inkblot palpita moth (*Palpita illibalis*)
 Long dash
 Purple plagodis moth (*Plagodis kuetzingi*)
 Silver-bordered fritillary
 Splendid palpita moth (*Palpita magniferalis*)
 Tuscarora emerald
 Two-spotted skipper
 West Virginia white

Insects (Odonata)

American emerald
 Beaverpond baskettail
 Black-tipped darner
 Canada darner
 Crimson-ringed whiteface
 Frosted whiteface
 Green-striped darner
 Hudsonian whiteface
 Northern bluet
 Rainbow bluet
 Ski-tailed emerald
 Spatterdock darner

Eastern ash bark beetle
 (*Hylesinus aculeatus*)
 Encircled borer (*Agilus subcinctus*)

Plants

Balsam fir (*Abies balsamea*)
 Wild calla (*Calla palustris*)
 Buxbaum's sedge (*Carex buxbaumii*)
 Lesser panicled sedge (*Carex diandra*)
 Lake-bank sedge (*Carex lacustris*)
 Slender sedge (*Carex lasiocarpa*)
 Necklace sedge (*Carex projecta*)
 Tuckerman's sedge (*Carex tuckermanii*)
 Inflated sedge (*Carex vesicaria*)
 Slender cottongrass (*Eriophorum gracile*)
 Creeping snowberry (*Gaultheria hispidula*)
 Yellow avens (*Geum aleppicum*)
 American mannagrass (*Glyceria grandis*)
 Jointed rush (*Juncus articulatus*)
 Narrow-panicle rush (*Juncus tweedyi*)
 American larch (*Larix laricina*)
 Bog buckbean (*Menyanthes trifoliata*)
 Grove sandwort (*Moehringia lateriflora*)
 Bog Jacob's ladder (*Polemonium vanbruntiae*)
 Alderleaf buckthorn (*Rhamnus alnifolia*)
 Torrey's bulrush (*Schoenoplectus torreyi*)
 Fernald's mannagrass
 (*Torreyochloa pallida* var. *fernaldii*)
 Horned bladderwort (*Utricularia cornuta*)
 Small cranberry (*Vaccinium oxycoccos*)
 Nannyberry (*Viburnum lentago*)



Montane-Piedmont Seepage Swamp**Region(s):** Central, Western**Habitat Group:** Groundwater Wetlands**NEAFWA:** Non-tidal Wetlands

The revised Montane-Piedmont Seepage Swamp Key Wildlife Habitat (KWH) combines the Montane-Piedmont Acidic Seepage Swamp and Montane-Piedmont Basic Seepage Swamp KWHs from the 2015 State Wildlife Action Plan revision. This KWH occurs in the Piedmont and mountain regions on gently sloping small stream headwaters, large spring seeps, ravine bottoms, toeslopes, and lateral areas in ravines and stream bottoms where groundwater emerges at the base of slopes. Seepage swamps develop where groundwater is forced to the surface along an impermeable clay or rock layer due to hydrostatic pressure resulting from gravity or artesian flow, which frequently results in a diffuse drainage pattern of braided channels and rivulets that typically remain saturated throughout the year due to perennial groundwater seepage. The substrates are often composed of bouldery, cobbly, and gravelly alluvium, and soils vary based on the geologic formations from which they are derived. Throughout their range, substrates most frequently develop from the weathering of nutrient-poor, acidic sandstone and quartzite and less frequently on base-rich granite, calcareous shale, and limestone in the Catoclin Mountains within the Blue Ridge ecoregion and Allegheny Plateau.



Richard Orr



Jason Harrison, MD DNR

Montane-Piedmont Seepage Swamps are structurally defined as closed canopy forests to woodlands with small openings of dense shrubs and herbs typical in areas of windfall or beaver activity. Floristic composition is variable depending on site conditions and soil chemistry. Canopy trees commonly include red maple (*Acer rubrum*), tulip poplar (*Liriodendron tulipifera*), black gum (*Nyssa sylvatica*), yellow birch (*Betula alleghaniensis*), red spruce (*Picea rubens*), and eastern hemlock (*Tsuga canadensis*) at higher elevations, with black and white ash (*Fraxinus nigra*, *F. americana*) occurring on sites with more alkaline substrates. The understory is variable and ranges from patches of open to dense shrub thickets to lush herbaceous cover of graminoids, ferns and forbs. Shrubs vary depending on the region and elevation, but common species may include winterberry (*Ilex verticillata*), swamp azalea (*Rhododendron viscosum*), highbush blueberry (*Vaccinium*



corymbosum), great-laurel (*Rhododendron maximum*), mountain laurel (*Kalmia latifolia*), speckled alder (*Alnus incana* spp. *rugosa*), common elderberry (*Sambucus nigra* ssp. *canadensis*), spicebush (*Lindera benzoin*), and southern arrow-wood (*Viburnum dentatum*). Ground conditions and herbaceous vegetation cover and structure are often influenced by hummock and hollow microtopography, where hummocks often support woody species and the depressional hollows support herbaceous vegetation.

Between acidic and alkaline sites, there can also be considerable differences in species richness and composition. Common dominant species include skunk cabbage (*Symplocarpus foetidus*), American false-hellebore (*Veratrum viride*), cinnamon fern (*Osmunda cinnamomea*), royal fern (*Osmunda spectabilis*), and bristly-stalked sedge (*Carex leptalea*), any or all of which may produce dense herbaceous cover on both acidic and alkaline sites. However, species richness can be considerably higher on alkaline sites and may also include more nutrient-demanding species such as marsh-marigold (*Caltha palustris*), brome-sedge (*Carex bromoides*), smooth-sheathed sedge (*Carex laevivaginata*), springs clearweed (*Pilea fontana*), bog bluegrass (*Poa paludigena*), bristly buttercup (*Ranunculus hispidus* var. *caricetorum*), swamp saxifrage (*Saxifraga pennsylvanica*), and nodding trillium (*Trillium cernuum*) among others. These communities also lack the more abundant *Sphagnum* mosses that characterize acidic groundwater wetlands.

County Distribution: Allegany, Baltimore, Carroll, Cecil, Frederick, Garrett, Harford, Howard, Montgomery, Washington

Places to Visit: Catoctin Mountain Park, Gunpowder Falls State Park, Patapsco Valley State Park, Cranesville Swamp (The Nature Conservancy), Finzel Swamp (The Nature Conservancy), Mt. Nebo Wildlife Management Area, Savage River State Forest, Sugarloaf Mountain

State Rare Natural Communities: Montane-Piedmont Basic Seepage Swamp, High Elevation Seepage Swamp, Montane-Piedmont Acidic Seepage Swamp



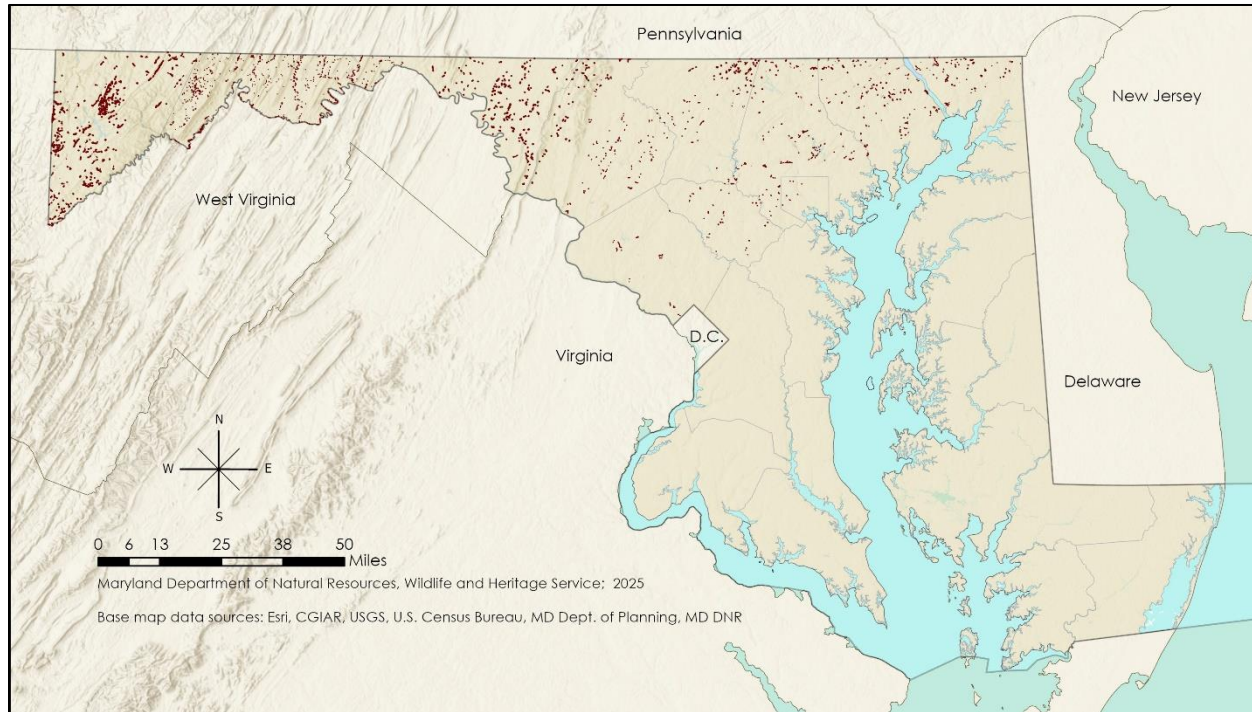


Figure 4.22 Location of Montane-Piedmont Seepage Swamps in Maryland. Sources: MD DNR, NETWHCS, Terrestrial Ecological System for the U.S., and USFWS.

Species of Greatest Conservation Need Associated with Montane-Piedmont Seepage Swamps:

<u>Birds</u>	<u>Invertebrates (Mites)</u>	<u>Insects (Coleoptera)</u>
Acadian flycatcher	Ash flower gall mite (<i>Aceria fraxiniflora</i>)	An ash seed weevil (<i>Lignyodes bischoffi</i>)
American redstart	Ash key gall mite (<i>Aceria fraxinivora</i>)	An ash seed weevil (<i>Lignyodes fraxini</i>)
American woodcock	Ash leaf gall mite (<i>Aceria fraxini</i>)	An ash seed weevil (<i>Lignyodes helvolus</i>)
Baltimore oriole		An ash seed weevil (<i>Lignyodes horridulus</i>)
Black-and-white warbler		Charlie Brown's flea beetle (<i>Capraita sexmaculata</i>)
Black-billed cuckoo		Eastern ash bark beetle (<i>Hylesinus aculeatus</i>)
Black-throated blue warbler		Encircled borer (<i>Agrilus subcinctus</i>)
Black-throated green warbler	<u>Insects (Diptera)</u>	
Blackburnian warbler	Ash bullet gall midge (<i>Dasineura pellex</i>)	
Blue-winged warbler	Swollen ash gall midge (<i>Dasineura tumidosae</i>)	
Canada warbler		
Dark-eyed junco	<u>Insects (Hymenoptera)</u>	
Golden-winged warbler	A carpenter ant (<i>Colobopsis mississippiensis</i>)	
Hooded warbler	Azalea mining bee (<i>Andrena cornelli</i>)	
Kentucky warbler	Blackheaded ash sawfly (<i>Tethida barda</i>)	
Louisiana waterthrush		<u>Plants</u>
Magnolia warbler		Cloud sedge (<i>Carex haydenii</i>)
Northern parula		Scarlet Indian-paintbrush (<i>Castilleja coccinea</i>)
Northern waterthrush		Early coralroot (<i>Corallorhiza trifida</i>)
Ovenbird		Downy willowherb (<i>Epilobium densum</i>)
Prothonotary warbler		
Ruffed grouse		



Scarlet tanager	<u>Insects (Lepidoptera)</u>	Linear-leaf willowherb (<i>Epilobium leptophyllum</i>)
Veery	Angel moth	Woodland horsetail (<i>Equisetum sylvaticum</i>)
Willow flycatcher	Ash borer moth (<i>Podosesia syringae</i>)	Glade spurge (<i>Euphorbia purpurea</i>)
Winter wren	Ash leaf cone roller moth (<i>Caloptilia fraxinella</i>)	Queen-of-the-prairie (<i>Filipendula rubra</i>)
Wood thrush	Ash sphinx (<i>Manduca jasmineearum</i>)	Fringe-top bottle gentian (<i>Gentiana andrewsii</i>)
Yellow warbler	Ash tip borer moth (<i>Papaipema furcata</i>)	Loesel's twayblade (<i>Liparis loeselii</i>)
<u>Mammals</u>	Baltimore checkerspot	Yellow fringed orchid (<i>Platanthera ciliaris</i>)
American mink	Banded ash clearwing moth (<i>Podosesia aureocincta</i>)	Pale green orchid (<i>Platanthera flava</i>)
Bobcat	Black dash	Large purple fringed orchid (<i>Platanthera grandiflora</i>)
Eastern red bat	Great ash sphinx (<i>Sphinx chersis</i>)	Purple fringeless orchid (<i>Platanthera peramoena</i>)
Hoary bat	Grote's swallow moth	Small purple fringed orchid (<i>Platanthera psycodes</i>)
Indiana bat	Indian skipper	Shriver's frilly orchid (<i>Platanthera shriveri</i>)
Least shrew	Inkblot palpita moth (<i>Palpita illibalis</i>)	Eastern featherbells (<i>Stenanthium gramineum</i>)
Little brown bat	Long dash	
Northern long-eared bat	Purple plagodis moth (<i>Plagodis kuetzingi</i>)	
Silver-haired bat	Splendid palpita moth (<i>Palpita magniferalis</i>)	
Southern bog lemming	Tuscarora emerald	
Southern rock vole		
Tricolored bat		
<u>Amphibians</u>	<u>Insects (Odonata)</u>	
Mountain chorus frog	Seepage dancer	
Red salamander		
Spring salamander		
Upland chorus frog		
<u>Reptiles</u>		
Eastern box turtle		
Eastern ribbonsnake		
Queensnake		
Smooth greensnake		
Spotted turtle		



Piedmont Seepage Wetland**Region(s):** Central**Habitat Group:** Groundwater Wetlands**NEAFWA:** Non-tidal Wetlands

The Piedmont Seepage Wetland Key Wildlife Habitat encompasses open, graminoid-dominated meadows and shrub swamps scattered throughout low stream valleys of the Piedmont. They are common features at the toeslopes of rolling hills and margins of floodplains where groundwater seepage can be found throughout much of the year. The water table is usually at or near the surface throughout much of the growing season, causing most habitats to remain saturated, but conditions may vary yearly from site to site. The substrates of Piedmont Seepage Wetlands are primarily comprised of mineral soils with mucky, organic layers at the surface.



Bonnie Ott

The vegetation structure varies from graminoid-dominated meadows of tussock sedge (*Carex stricta*), common rush (*Juncus effusus*), stout wood reedgrass (*Cinna arundinacea*), and rice cutgrass (*Leersia oryzoides*) to a patchwork of shrub swamps dominated by alder (*Alnus* spp.), meadowsweet (*Spiraea* spp.), southern arrow-wood (*Viburnum dentatum*), buttonbush (*Cephalanthus occidentalis*), spicebush (*Lindera benzoin*), swamp rose (*Rosa palustris*), and black willow (*Salix nigra*). Other common species include jewelweeds (*Impatiens* spp.), skunk cabbage (*Symplocarpus foetidus*), sensitive fern (*Onoclea sensibilis*), wood reedgrass, woolgrass (*Scirpus cyperinus*), Joe pye-weed (*Eutrochium dubium*), American golden saxifrage (*Chrysosplenium americanum*), sallow sedge (*Carex lurida*), knotweeds (*Polygonum* spp.), and marsh fern (*Thelypteris palustris* var. *pubescens*). In addition, purple loosestrife (*Lythrum salicaria*), common reed (*Phragmites australis* spp. *australis*), Japanese stiltgrass (*Microstegium vimineum*), and reed canarygrass (*Phalaris arundinacea*) are frequently reported non-native invasive plants in these habitats. Though trees are relatively unimportant in these habitats, woody plant succession of red maple (*Acer rubrum*) is a common problem that usually indicates a cessation of grazing or other forms of natural disturbance.

County Distribution: Baltimore, Carroll, Cecil, Frederick, Harford, Howard, Montgomery**Places to Visit:** Rocks State Park, Eden Mill Nature Center, Gunpowder Falls State Park, Little Bennett Regional Park**State Rare Natural Community:** Montane-Piedmont Wet Meadow/Fen

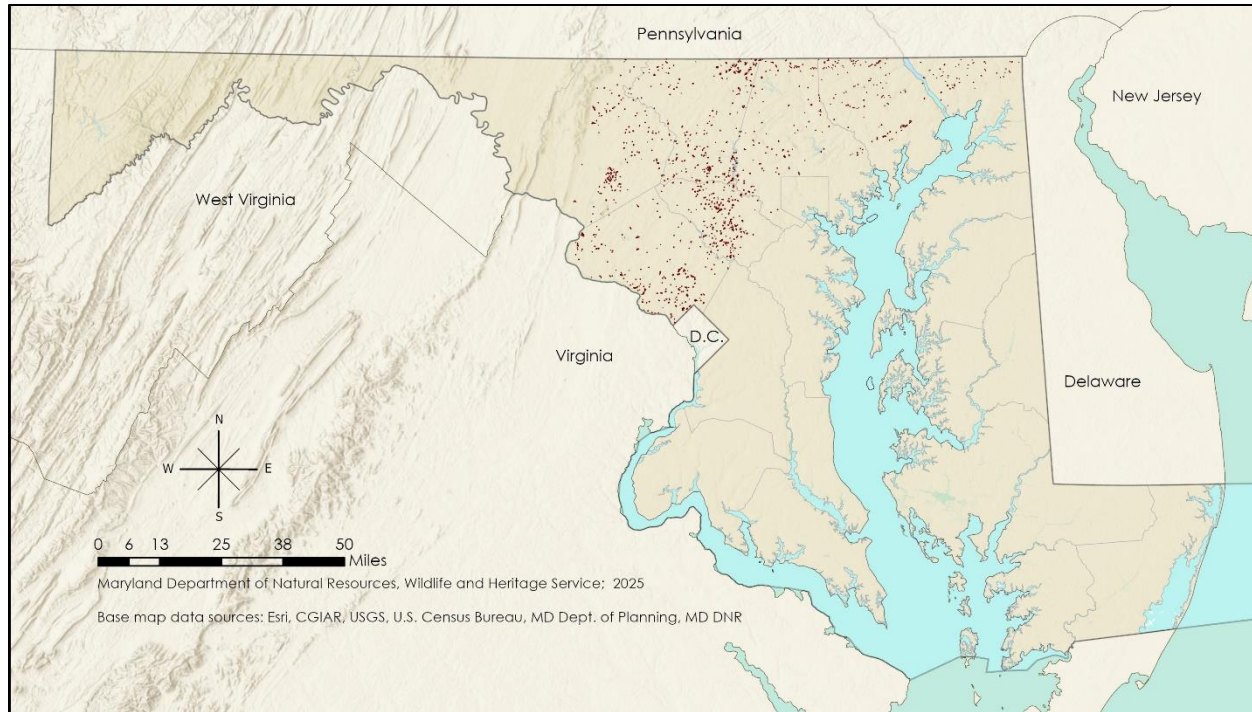


Figure 4.23 Location of Piedmont Seepage Wetlands in Maryland. Sources: MD DNR and NETWHCS.

Species of Greatest Conservation Need Associated with Piedmont Seepage Wetlands:

Birds

Acadian flycatcher
American redstart
American woodcock
Baltimore oriole
Blue-winged warbler
Swamp sparrow
Willow flycatcher
Yellow warbler

Mammals

American mink
Bobcat
Eastern red bat
Hoary bat
Indiana bat
Least shrew
Little brown bat
Northern long-eared bat
Silver-haired bat
Southeastern shrew
Southern bog lemming
Southern pygmy shrew
Tricolored bat

Insects (Diptera)

Ash bullet gall midge (*Dasineura pellex*)
Swollen ash gall midge (*Dasineura tumidosae*)

Insects (Hymenoptera)

A carpenter ant (*Colobopsis mississippiensis*)
Blackheaded ash sawfly (*Tethida barda*)
Fringed loosestrife oil-collecting bee (*Macropis ciliata*)

Insects (Lepidoptera)

Angel moth
Ash borer moth (*Podosesia syringae*)
Ash leaf cone roller moth (*Caloptilia fraxinella*)
Ash sphinx (*Manduca jasmineearum*)
Ash tip borer moth (*Papaipema furcata*)
Baltimore checkerspot

Insects (Coleoptera)

An ash seed weevil (*Lignyodes bischoffi*)
An ash seed weevil (*Lignyodes fraxini*)
An ash seed weevil (*Lignyodes helvolus*)
An ash seed weevil (*Lignyodes horridulus*)
Charlie Brown's flea beetle (*Capraita sexmaculata*)
Eastern ash bark beetle (*Hylesinus aculeatus*)
Encircled borer (*Agilus subcinctus*)

Plants

Low rough aster (*Eurybia radula*)
Fringed gentian (*Gentianopsis crinita*)
Swamp pink (*Helonias bullata*)
Whorled mountainmint (*Pycnanthemum verticillatum*)
Long-stalked crowfoot (*Ranunculus hederaceus*)
Canada burnet



Amphibians

Longtail salamander
Red salamander
Upland chorus frog

Reptiles

Bog turtle
Eastern box turtle
Eastern ribbonsnake
Queensnake
Spotted turtle

Invertebrates (Mites)

Ash flower gall mite (*Aceria
fraxiniflora*)
Ash key gall mite (*Aceria
fraxinivora*)
Ash leaf gall mite (*Aceria
fraxini*)

Banded ash clearwing moth
(*Podosesia aureocincta*)

Black dash
Bronze copper
Great ash sphinx
(*Sphinx chersis*)
Grote's sallow moth
Inkblot palpita moth
(*Palpita illibalis*)
Long dash
Purple plagodis moth
(*Plagodis kuetzingi*)
Splendid palpita moth
(*Palpita magniferalis*)

Insects (Odonata)

Seepage dancer

(*Sanguisorba canadensis*)

Shining ladies'-tresses
(*Spiranthes lucida*)
Epling's hedge-nettle
(*Stachys eplingii*)
Trailing stitchwort (*Stellaria alsine*)
Pinebarrens death-camas
(*Stenanthium leimanthoides*)
Marsh speedwell
(*Veronica scutellata*)



Piedmont Upland Depression Swamp

Region(s): Central

Habitat Group: Groundwater Wetlands

NEAFWA: Non-tidal Wetlands

The Piedmont Upland Depression Swamp Key Wildlife Habitat includes seasonally flooded, non-floodplain forested wetlands that form in shallow basins and other depressions, often underlain by shallow bedrock or clay hardpans that impede soil drainage, that result in small patch wetlands formed by perched groundwater. This results in standing water throughout the early part of the growing season, followed by a period of drawdown. The hydroperiods are variable between these swamps and largely depend on rainfall and drought cycles.



Jason Harrison, MD DNR

The forested canopy structure ranges from open to closed and is primarily oak-dominated, with other hardwoods less frequent. Common tree species include willow oak (*Quercus phellos*), pin oak (*Quercus palustris*), swamp chestnut oak (*Quercus michauxii*), swamp white oak (*Quercus bicolor*), green ash (*Fraxinus pennsylvanica*), red maple (*Acer rubrum*), sweetgum (*Liquidambar styraciflua*), and black gum (*Nyssa sylvatica*). Shrubs and vines are variable in the understory between sites, but common species often include sweet pepperbush (*Clethra alnifolia*), spicebush (*Lindera benzoin*), common winterberry (*Ilex verticillata*), highbush blueberry (*Vaccinium corymbosum*), and frequently an abundance of common greenbrier (*Smilax rotundifolia*). The herbaceous layer varies from open to sparse and may include species of ferns, sedges, manna-grasses, and rushes. Slightly elevated hummocks of *Sphagnum* mosses frequently form large patches. Piedmont Upland Depression Swamps are isolated wetlands that occur as fine-scale inclusions within upland forests. They are considered rare both globally and within Maryland and are subject to major disturbances including logging, draining, and development.

County Distribution: Baltimore, Carroll, Cecil, Frederick, Harford, Howard, Montgomery

Places to Visit: C&O Canal National Historical Park, Hoyles Mill Conservation Park

State Rare Natural Community: Upland Depression Swamp



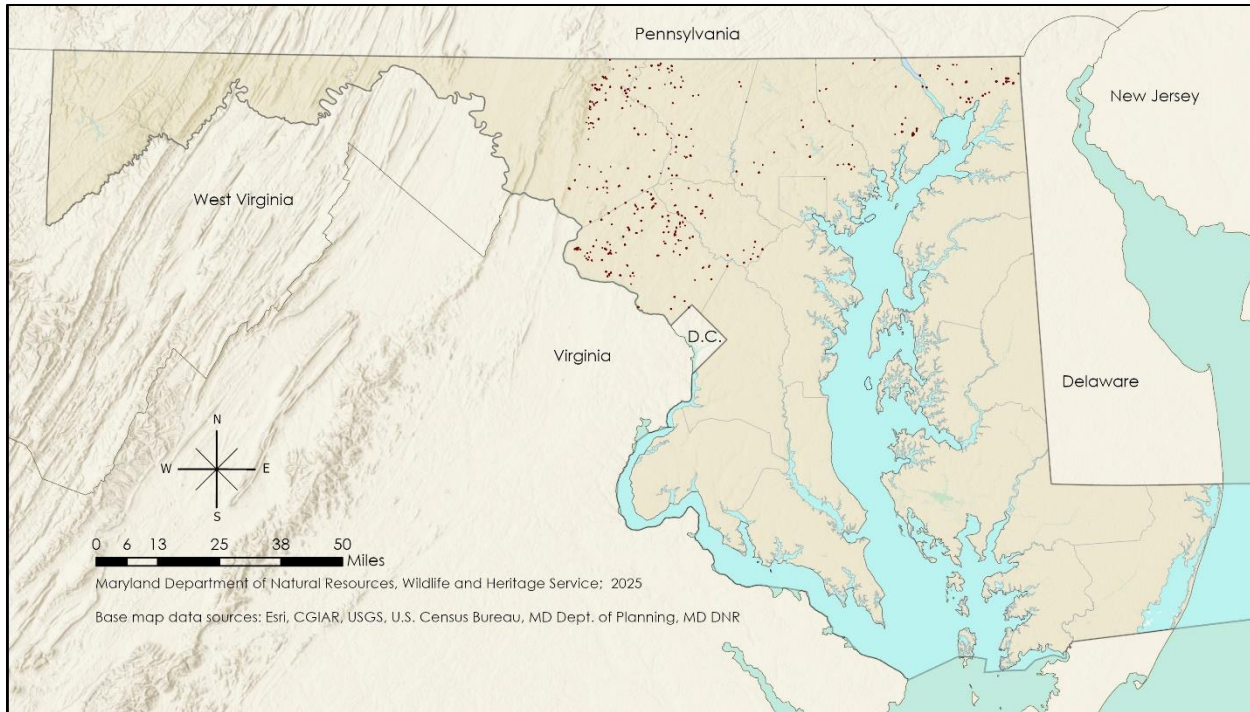


Figure 4.24 Location of Piedmont Upland Depression Swamps in Maryland. Source: MD DNR.

Species of Greatest Conservation Need Associated with Piedmont Upland Depression Swamps:

Birds

Acadian flycatcher
American redstart
American woodcock
Baltimore oriole
Black-and-white warbler
Black-billed cuckoo
Blue-winged warbler
Hooded warbler
Kentucky warbler
Louisiana waterthrush
Northern parula
Ovenbird
Prothonotary warbler
Red-cockaded woodpecker
Scarlet tanager

Birds (continued)

Veery
Willow flycatcher
Wood thrush
Worm-eating warbler
Yellow warbler
Yellow-breasted chat
Yellow-throated vireo

Amphibians

Eastern spadefoot
Upland chorus frog

Reptiles

Eastern ribbonsnake
Queensnake
Spotted turtle

Mammals

American mink
Bobcat
Eastern red bat
Hoary bat
Indiana bat
Least shrew
Little brown bat
Northern long-eared bat
Silver-haired bat
Southeastern shrew
Southern bog lemming
Southern pygmy shrew
Tricolored bat



Coastal Plain Flatwood and Depression Swamp

Region(s): Central, Eastern, Southern
Habitat Group: Groundwater Wetlands
NEAFWA: Non-tidal Wetlands

The Coastal Plain Flatwood and Depression Swamp Key Wildlife Habitat (KWH) includes non-alluvial, seasonally flooded flatwoods and depressions of the Coastal Plain. These habitats develop on flat terraces and shallow depressions with seasonally perched water tables. This results in standing water throughout the early part of the growing season, followed by a period of drawdown. Hydroperiods are variable between swamps and largely dependent on rainfall and drought cycles.



Scott Smith, MD DNR

The forest canopy structure of flatwoods and depression swamps ranges from open to closed, with compositions ranging from hardwood-dominated to mixtures of hardwoods and conifers. Swamps dominated by oak species such as willow oak (*Quercus phellos*), pin oak (*Quercus palustris*), swamp chestnut oak (*Quercus michauxii*), and cherrybark oak (*Quercus pagoda*) were historically the prevalent and representative ecological communities within these sites pre-European settlement. These are generally considered as higher quality habitat in contrast to much of today's remaining stands dominated by successional hardwoods such as red maple (*Acer rubrum*), sweetgum (*Liquidambar styraciflua*), black gum (*Nyssa sylvatica*), and American holly (*Ilex opaca* var. *opaca*), with loblolly pine (*Pinus taeda*) as a prominent component of many flatwoods on the lower Coastal Plain. Other species commonly encountered in these habitats include green ash (*Fraxinus pennsylvanica*), overcup oak (*Quercus lyrata*), and swamp tupelo (*Nyssa biflora*). State rare natural communities within this KWH include depressions with mixtures of Atlantic white cedar (*Chamaecyparis thyoides*), swamp tupelo, pond pine (*Pinus serotina*), and sweetbay magnolia (*Magnolia virginiana*). In the understory, shrubs and vines are common but variable, often including an abundance of common greenbrier (*Smilax rotundifolia*). The herbaceous layer is often sparse and may include species of sedges, manna-grasses, and rushes. Slightly elevated hummocks of *Sphagnum* mosses frequently form large patches. Coastal Plain Flatwoods and Depression Swamps have been greatly reduced in Maryland through ditching, draining, logging, and conversion to agriculture and pine plantations.

County Distribution: Anne Arundel, Baltimore, Calvert, Caroline, Cecil, Charles, Dorchester, Harford, Kent, Prince George's, Queen Anne's, Somerset, St. Mary's, Talbot, Wicomico, Worcester

Places to Visit: Blackwater National Wildlife Refuge, LeCompte Wildlife Management Area, Third Haven Woods (The Nature Conservancy)

State Rare Natural Communities: Coastal Plain Non-Riverine Hardwood Swamps, Atlantic White Cedar Swamp, Upland Depression Swamp



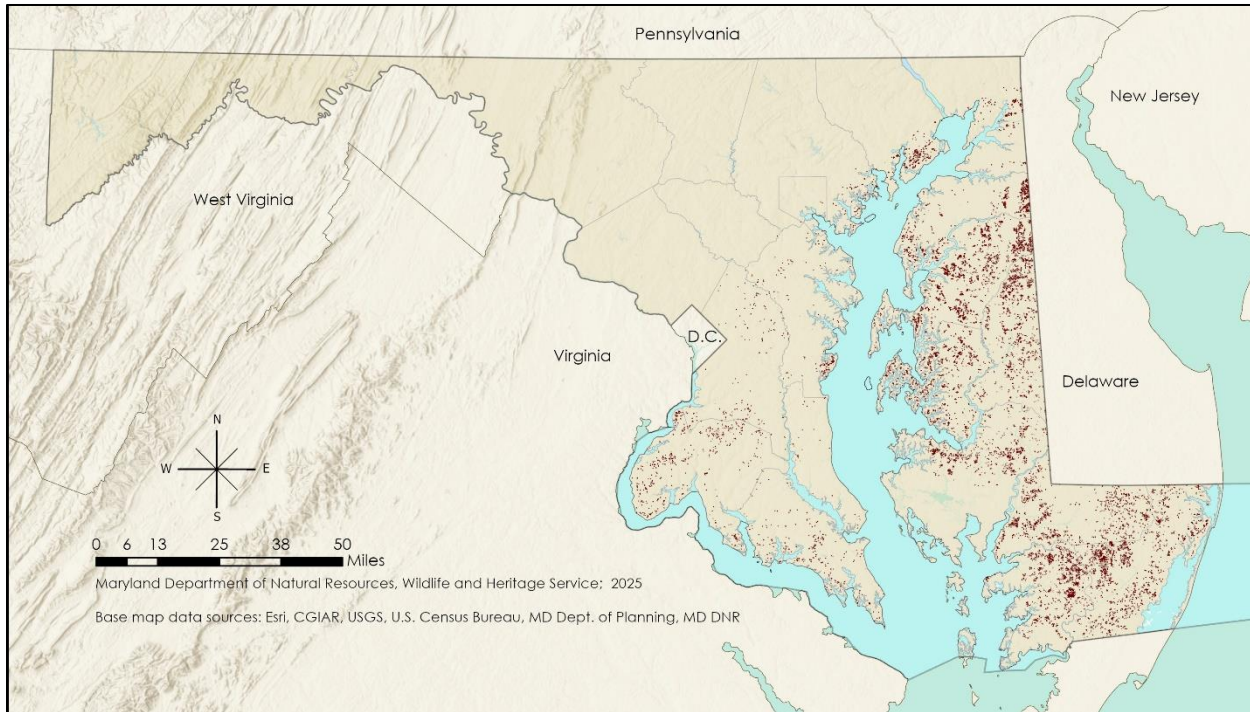


Figure 4.25 Location of Coastal Plain Flatwoods and Depression Swamps in Maryland. Source: MD DNR.

Species of Greatest Conservation Need Associated with Coastal Plain Flatwoods and Depression Swamps:

Birds

Acadian flycatcher
American redstart
American woodcock
Baltimore oriole
Bicknell's thrush
Black-and-white warbler
Black-billed cuckoo
Broad-winged hawk
Chuck-will's-widow
Eastern whip-poor-will
Great blue heron
Great egret
Hooded warbler
Kentucky warbler
Louisiana waterthrush
Northern bobwhite
Northern parula
Ovenbird
Prothonotary warbler
Scarlet tanager
Wood thrush
Worm-eating warbler

Mammals

American mink
Bobcat
Delmarva fox squirrel
Eastern red bat
Hoary bat
Silver-haired bat
Southeastern shrew
Southern bog lemming
Southern pygmy shrew
Tricolored bat

Amphibians

Barking treefrog
Carpenter frog
Eastern narrow-mouthed toad
Eastern spadefoot
Eastern tiger salamander

Reptiles

Eastern box turtle
Eastern kingsnake
Eastern milksnake

Insects (Coleoptera)

Mysterious lantern firefly

Insects (Diptera)

Painted wood fly (*Blera pictipes*)

Insects (Lepidoptera)

An owl moth (*Meroplon titan*)

Plants

Eastern straw sedge (*Carex straminea*)
Three-angle spikerush (*Eleocharis tricostrata*)
Short's hedge-hyssop (*Gratiola viscidula*)
Catchfly cutgrass (*Leersia lenticularis*)
Star duckweed (*Lemna trisulca*)
Climbing fern (*Lygodium palmatum*)
Little floatingheart (*Nymphoides cordata*)



Yellow warbler
Yellow-breasted chat
Yellow-throated vireo

Eastern mud turtle
Eastern ribbonsnake
Northern mole kingsnake
Plain-bellied watersnake
Queensnake
Rainbow snake
Scarletsnake
Striped mud turtle

Small-headed beakrush
(*Rhynchospora microcephala*)
Cymose beakrush (*Rhynchospora
recognita*)
Torrey's beakrush (*Rhynchospora
torreyana*)



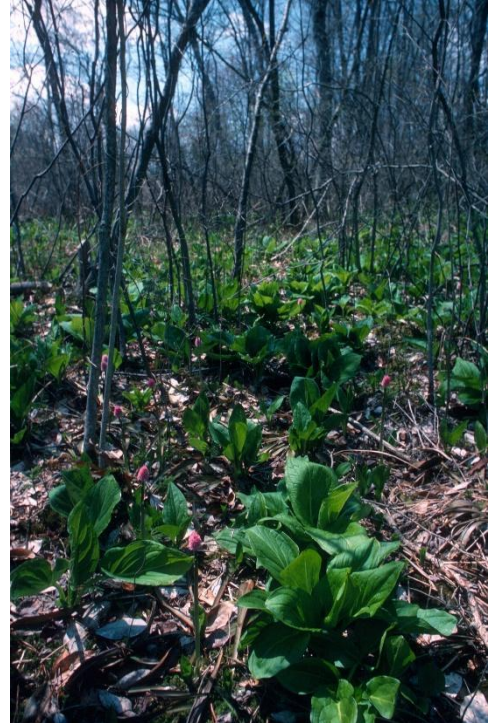
Coastal Plain Seepage Swamp

Region(s): Central, Eastern, Southern

Habitat Group: Groundwater Wetlands

NEAFWA: Non-tidal Wetlands

Coastal Plain Seepage Swamp Key Wildlife Habitat is characterized by gently sloping forests of small stream headwaters, ravine bottoms, and toeslopes where groundwater seepage is discharged at ground surface and carried away as stream flow. Groundwater seepage is typically perennial and characterized by diffuse drainage and braided channels with sand, gravel, or peaty substrates. Typically, soils in most swamps are moderately to strongly acidic and nutrient-poor, with the exception of basic seepage swamps, which may develop in ravines that have downcut into Tertiary-aged shell marl deposits.



Richard Wiegand, MD DNR

Coastal Plain Seepage Swamps are associated with mostly-closed to semi-open canopies of red maple (*Acer rubrum*), black gum (*Nyssa sylvatica*), tulip poplar (*Liriodendron tulipifera*), sweetbay magnolia (*Magnolia virginiana*), green ash (*Fraxinus pennsylvanica*), white ash (*Fraxinus americana*), and pitch pine (*Pinus rigida*). Shrub and herbaceous layers are characteristically dense and can be quite diverse, composed of a variety of deciduous shrubs, ferns and herbs. The shrub layer may include winterberry (*Ilex verticillata*), sweet pepperbush (*Clethra alnifolia*), swamp azalea (*Rhododendron viscosum*), spicebush (*Lindera benzoin*), possum-haw viburnum (*Viburnum nudum*), highbush blueberry (*Vaccinium corymbosum*), and vines of poison ivy (*Toxicodendron radicans*), greenbrier (*Smilax* spp.), and Virginia creeper (*Parthenocissus quinquefolia*). The herbaceous layer is often characterized by dense patches of skunk cabbage (*Symplocarpus foetidus*) and colonies of ferns such as cinnamon fern (*Osmunda cinnamomea*), marsh fern (*Thelypteris palustris* var. *pubescens*), royal fern (*Osmunda spectabilis*), New York fern (*Amauropelta noveboracensis*), and netted chain fern (*Woodwardia areolata*). Common herbs include jewelweeds (*Impatiens* spp.), small green wood orchid (*Platanthera clavellata*), Virginia bugleweed (*Lycopus virginicus*), Jack-in-the-pulpit (*Arisaema triphyllum*), false nettle (*Boehmeria cylindrica*), and numerous sedges. Non-vascular species are often important components of these communities, where hummocks of peat mosses can be quite abundant and diagnostic to Coastal Plain Seepage Swamps of acidic substrates. Coastal Plain Seepage Swamps are naturally small-patched habitats vulnerable to hydrological disturbances, beaver activity, logging, and surface runoff.

County Distribution: Anne Arundel, Baltimore, Calvert, Caroline, Cecil, Charles, Dorchester, Harford, Kent, Prince George's, Queen Anne's, Somerset, St. Mary's, Talbot, Wicomico, Worcester

Places to Visit: Elk Neck State Forest, Tuckahoe State Park, Pocomoke State Forest



State Rare Natural Community: Coastal Plain-Piedmont Acidic Seepage Swamp

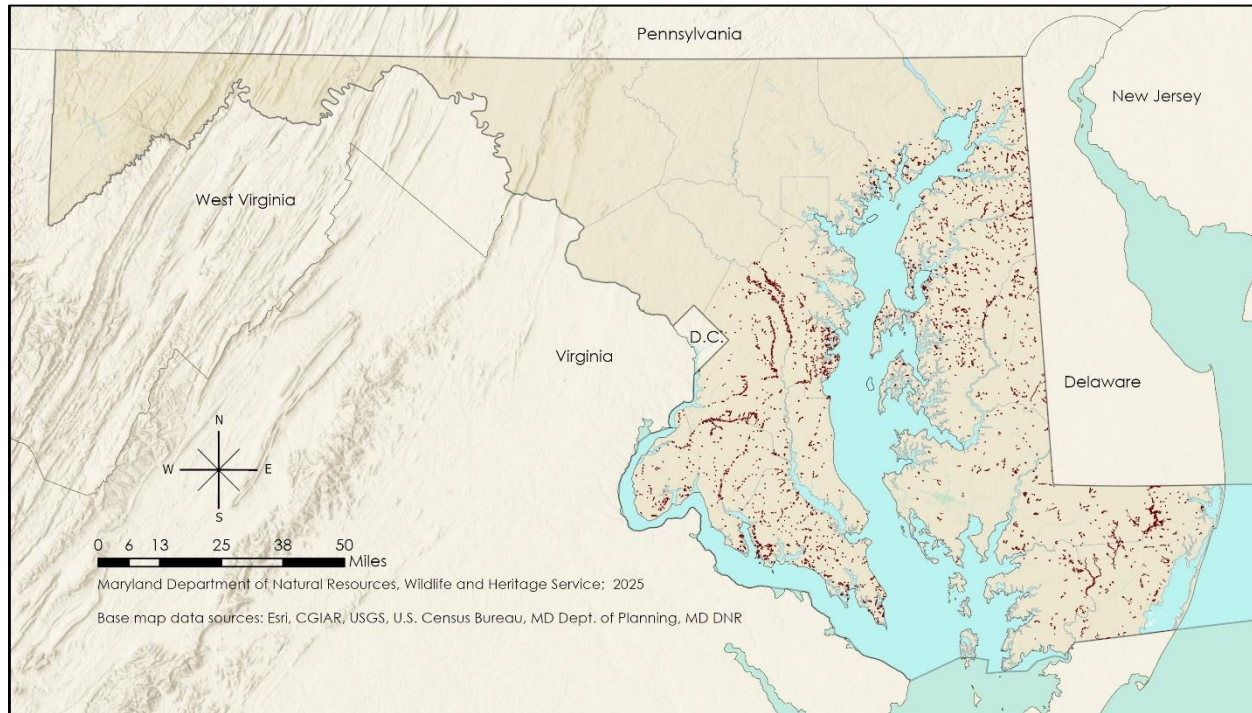


Figure 4.26 Location of Coastal Plain Seepage Swamps in Maryland. Sources: MD DNR and USFWS.

Species of Greatest Conservation Need Associated with Coastal Plain Seepage Swamps:

Birds

Acadian flycatcher
American redstart
American woodcock
Baltimore oriole
Black-and-white warbler
Black-billed cuckoo
Hooded warbler
Kentucky warbler
Louisiana waterthrush
Northern parula
Ovenbird
Prothonotary warbler
Scarlet tanager
Wood thrush
Yellow warbler

Amphibians

Carpenter frog
Mud salamander
Red salamander

Reptiles

Mammals

American mink
Bobcat
Eastern red bat
Hoary bat
Silver-haired bat
Southeastern shrew
Southern bog lemming
Southern pygmy shrew
Tricolored bat

Insects (Coleoptera)

Mysterious lantern firefly

Insects (Lepidoptera)

An owl moth (*Meroplex titan*)
Bronze copper
Mulberry wing

Insects (Odonata)

Elfin skimmer
Fine-lined emerald
Little blue dragonlet

Insects (Hymenoptera)

Azalea mining bee (*Andrena cornelli*)
Fringed loosestrife oil-collecting bee
(*Macropis ciliata*)

Plants

Red turtlehead (*Chelone obliqua*)
Bulb-bearing water-hemlock (*Cicuta bulbifera*)
Bog fern (*Coryphopteris simulata*)
Clinton's woodfern (*Dryopteris clintoniana*)
Dwarf huckleberry (*Gaylussacia dumosa*)
New Jersey rush (*Juncus caesariensis*)
Sessile-leaf bugleweed (*Lycopus amplexans*)
Water loosestrife (*Lysimachia thyrsiflora*)
Evergreen bayberry (*Morella carolinensis*)
Carolina clubmoss (*Pseudolycopodiella caroliniana*)



Eastern box turtle
Eastern kingsnake
Eastern mud turtle
Eastern ribbonsnake
Queensnake
Rainbow snake
Spotted turtle
Striped mud turtle

Seepage dancer
Treetop emerald

Long-stalk greenbrier (*Smilax
pseudochina*)
Red bay (*Tamala palustris*)



Coastal Plain Seepage Acidic Fen**Region(s):** Central, Eastern, Southern**Habitat Group:** Groundwater Wetlands**NEAFWA:** Non-tidal Wetlands

The Coastal Plain Seepage Acidic Fen (Coastal Plain Seepage Bog and Fen in the 2015 State Wildlife Action Plan revision) Key Wildlife Habitat occurs as rare, small patches of shrub and herbaceous vegetation typically associated with seepage toeslopes, swales, small stream bottoms and headwaters, and the margins of long-established millponds and sandpits of the upper and lower coastal plain of Maryland. They typically develop at the base of sand and gravel terraces near streams where groundwater seepage is abundant and forced to the surface by an impermeable clay lens or aquiclude. The soils and substrates are usually peaty or sandy, very acidic, infertile, sometimes with large cobbles abundantly exposed at the surface, and often covered by dense mats of mosses (*Sphagnum* spp.) that support a unique flora. The term "bog," widely used in the southeastern United States as a descriptor for open, acidic seepage wetlands, is often applied to these wetlands, but is a technical misnomer, since not all of these habitats are true peatlands and none is an ombrotrophic system (i.e., fed by rainwater).



Wesley Knapp, MD DNR

These fens exist in a variety of open settings, and many are relics of older, larger systems. Many natural examples have been destroyed by hydrologic alterations (e.g., ditching, draining, and impoundment construction), beaver activity, and a long history of fire suppression across the landscape. Remaining sites that support fen vegetation persist in artificially maintained habitats such as millponds, powerline rights-of-way, and sandpits where woody plant succession is usually controlled.

The vegetation is heterogeneous and irregular, forming a mosaic of shrub and graminoid-dominated patches. Most commonly, these small openings are found along the margins of slow-moving streams, millponds, and abandoned sandpits. They often support shrubs such as brookside alder (*Alnus serrulata*), leatherleaf (*Chamaedaphne calyculata*), sweet pepperbush (*Clethra alnifolia*), swamp loosestrife (*Lysimachia terrestris*), sweetbay magnolia (*Magnolia virginiana*), swamp azalea (*Rhododendron viscosum*), swamp dewberry (*Rubus hispidus*), poison sumac (*Toxicodendron vernix*), Virginia marsh St. John's-wort (*Triadenum virginicum*), northern highbush blueberry (*Vaccinium corymbosum*), large cranberry (*Vaccinium macrocarpon*), and possum-haw viburnum (*Viburnum nudum*). Hummocks of *Sphagnum* mosses are characteristic and usually support species such as giant cane (*Arundinaria gigantea*), beggarticks (*Bidens* spp.), northern pitcherplant (*Sarracenia purpurea*), white beak-sedge (*Rhynchospora alba*), cinnamon fern (*Osmunda cinnamomea*), rose pogonia (*Pogonia ophioglossoides*), three-way sedge



(*Dulichium arundinaceum*), broadleaf arrowhead (*Sagittaria latifolia*), St. John’s-worts (*Hypericum* spp.), and Virginia meadow-beauty (*Rhexia virginica*). Orchids, sundews (*Drosera* spp.), bladderworts (*Utricularia* spp.), and yellow-eyed-grasses (*Xyris* spp.) are also common. Tree species composition and cover are variable between sites, occasionally important to the community composition, and where present, may form sparse to open canopies of short-statured species that may include black gum (*Nyssa sylvatica*), sweetbay magnolia, and red maple (*Acer rubrum*).

County Distribution: Anne Arundel, Calvert, Caroline, Cecil, Charles, Dorchester, Prince George’s, Somerset, Wicomico, Worcester

Places to Visit: Suitland Bog

State Rare Natural Community: Coastal Plain-Piedmont Acidic Seepage Fen

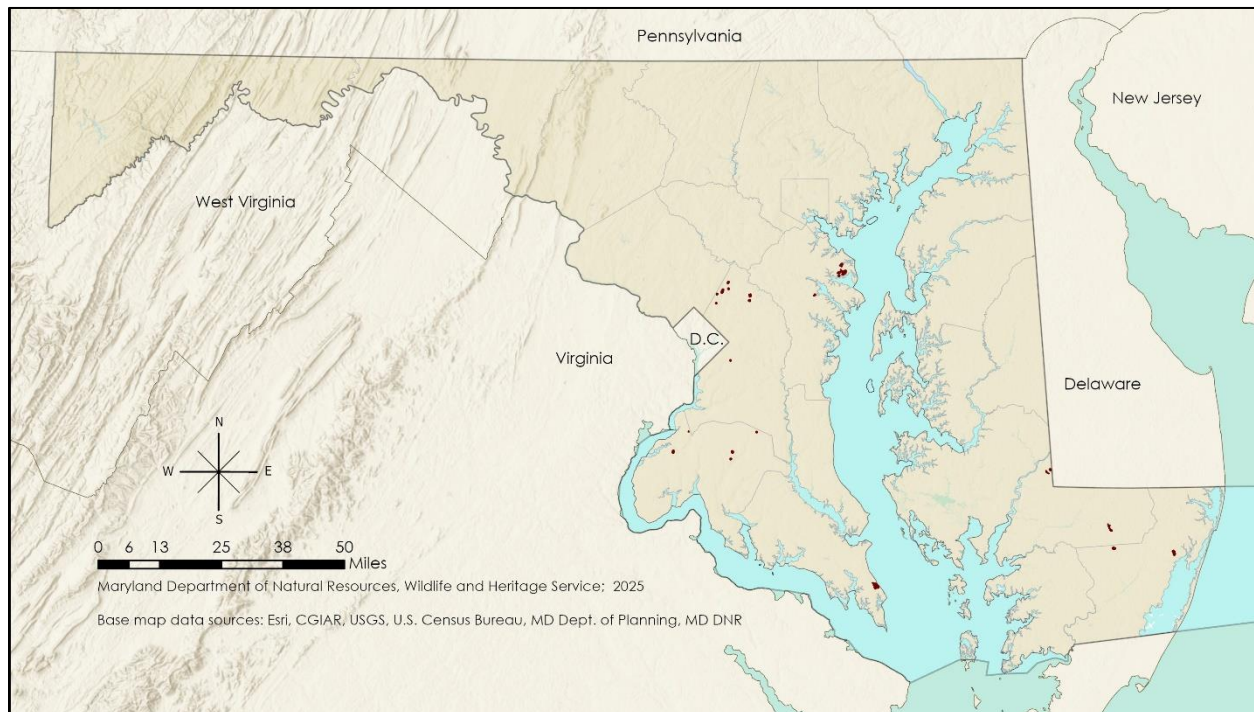


Figure 4.27 Location of Coastal Plain Seepage Acidic Fens in Maryland. Sources: MD DNR and USFWS.

Species of Greatest Conservation Need Associated with Coastal Plain Seepage Acidic Fens:

<u>Birds</u>	<u>Insects (Aquatic Orders)</u>	<u>Plants (continued)</u>
Acadian flycatcher	Variable needlety	Leatherleaf (<i>Chamaedaphne calyculata</i>)
American redstart		Spreading pogonia (<i>Cleisteslopsis divaricata</i>)
American woodcock	<u>Insects (Diptera)</u>	Tall swamp witchgrass (<i>Dichanthelium scabriusculum</i>)
Baltimore oriole	Pitcher plant midge (<i>Metriocnemus knabi</i>)	White-margin panicgrass (<i>Dichanthelium tenue</i>)
Kentucky warbler	Pitcher plant mosquito (<i>Wyeomyia smithii</i>)	
Prothonotary warbler		
Swamp sparrow		
Yellow warbler		



<u>Mammals</u> American mink Bobcat Eastern red bat Hoary bat Silver-haired bat Southeastern shrew Southern bog lemming Southern pygmy shrew Tricolored bat	Pitcher plant flesh fly <i>(Fletcherimyia fletcheri)</i> <u>Insects (Lepidoptera)</u> An owl moth <i>(Meroplen titan)</i> Epauletted pitcher plant moth <i>(Exyra fax)</i>	Dwarf sundew <i>(Drosera brevifolia)</i> Pink sundew <i>(Drosera capillaris)</i> Horsetail spikerush <i>(Eleocharis equisetoides)</i> Seven-angle pipewort <i>(Eriocaulon aquaticum)</i> Flattened pipewort <i>(Eriocaulon compressum)</i> Ten-angle pipewort <i>(Eriocaulon decangulare)</i>
<u>Amphibians</u> Carpenter frog Mud salamander Red salamander	<u>Insects (Odonata)</u> Atlantic bluet Black-tipped darner Burgundy bluet Elfin skimmer Fine-lined emerald Pale bluet Seepage dancer Southern sprite Sphagnum sprite Treetop emerald White corporal	White-bracted boneset <i>(Eupatorium leucolepis)</i> Elliott's rush <i>(Juncus elliottii)</i> Long's rush <i>(Juncus longii)</i> Brown-fruit rush <i>(Juncus pelocarpus)</i> Kidneyleaf grass-of-parnassus <i>(Parnassia asarifolia)</i> White fringed orchid <i>(Platanthera blephariglottis)</i> Crossleaf milkwort <i>(Polygala cruciata)</i> Short-beaked baldrush <i>(Rhynchospora nitens)</i>
<u>Reptiles</u> Eastern box turtle Eastern kingsnake Eastern ribbonsnake Queensnake Rainbow snake Spotted turtle	<u>Plants</u> Red milkweed <i>(Asclepias rubra)</i> Eastern doll's-daisy <i>(Boltonia asteroides var. glastifolia)</i> Tuberous grass-pink <i>(Calopogon tuberosus)</i> Coastal sedge <i>(Carex exilis)</i> Southern waxy sedge <i>(Carex glaucescens)</i>	Northern pitcherplant <i>(Sarracenia purpurea)</i> Slender nutrush <i>(Scleria minor)</i> Low nutrush <i>(Scleria verticillata)</i> Flatleaf bladderwort <i>(Utricularia intermedia)</i>
<u>Invertebrates (Mites)</u> Pitcher plant mite <i>(Sarraceniopus gibsoni)</i>		



Delmarva Bay**Region(s):** Eastern**Habitat Group:** Groundwater Wetlands**NEAFWA:** Non-tidal Wetlands

The Delmarva Bay Key Wildlife Habitat is characterized by a shallow, seasonally flooded depression wetland on Maryland’s lower Coastal Plain. Research suggests this habitat developed from ancient interdunal depressions approximately 16,000 years ago when the climate of the Coastal Plain was very cold and windy and supported an extensive sand dune ecosystem. The majority of Delmarva Bays have been shaped by these wind and erosional processes into circular depressions up to one meter in depth with prominent sand rims. A perched water table and seasonal fluctuations in groundwater recharge and precipitation cause these wetlands to be irregularly flooded or seasonally inundated. During very dry seasons, surface water may be absent or limited to the deepest point within the bay. Likewise, during very wet years when rainfall is abundant, bays may retain water throughout the entire growing season. Depth and duration of seasonal inundation are apparently the most important factors influencing plant communities and the degree to which woody species become established. Dry-season fires in adjacent uplands may spread into bays and may be another factor limiting the invasion of woody species, although fire frequencies throughout the region have been much reduced in recent decades.



Richard Wiegand, MD DNR

The vegetation of Delmarva Bays is closely linked to its hydrologic regime. As water level draws down or recedes during the growing season, plant communities typically develop concentric rings from the outer edge towards the center or deepest point in the bay. Outer rings of a bay may include shrubs of buttonbush (*Cephalanthus occidentalis*), fetterbush (*Leucothoe racemosa*), swamp loosestrife (*Lysimachia terrestris*), and sweet pepperbush (*Clethra alnifolia*), or nearly pure stands of Walter’s sedge (*Carex striata*), maidencane (*Panicum hemitomon*), and Virginia chain fern (*Anchistea virginica*). Interior portions of bays may include species such as Eaton’s witchgrass (*Dichanthelium spretum*), warty panicgrass (*Panicum verrucosum*), and Virginia meadow-beauty (*Rhexia virginica*). Many of these species grade into the “draw down pocket” or lowest portion of a bay, which is the last to dry out during the growing season. Common to this zone are slender fimbry (*Fimbristylis autumnalis*) and flood tolerant shrubs like buttonbush. Many plants and animals considered rare in Maryland are known to occur in Delmarva Bays.

County Distribution: Caroline, Dorchester, Kent, Queen Anne’s, Somerset, Talbot, Wicomico, Worcester

State Rare Natural Community: Delmarva Bay



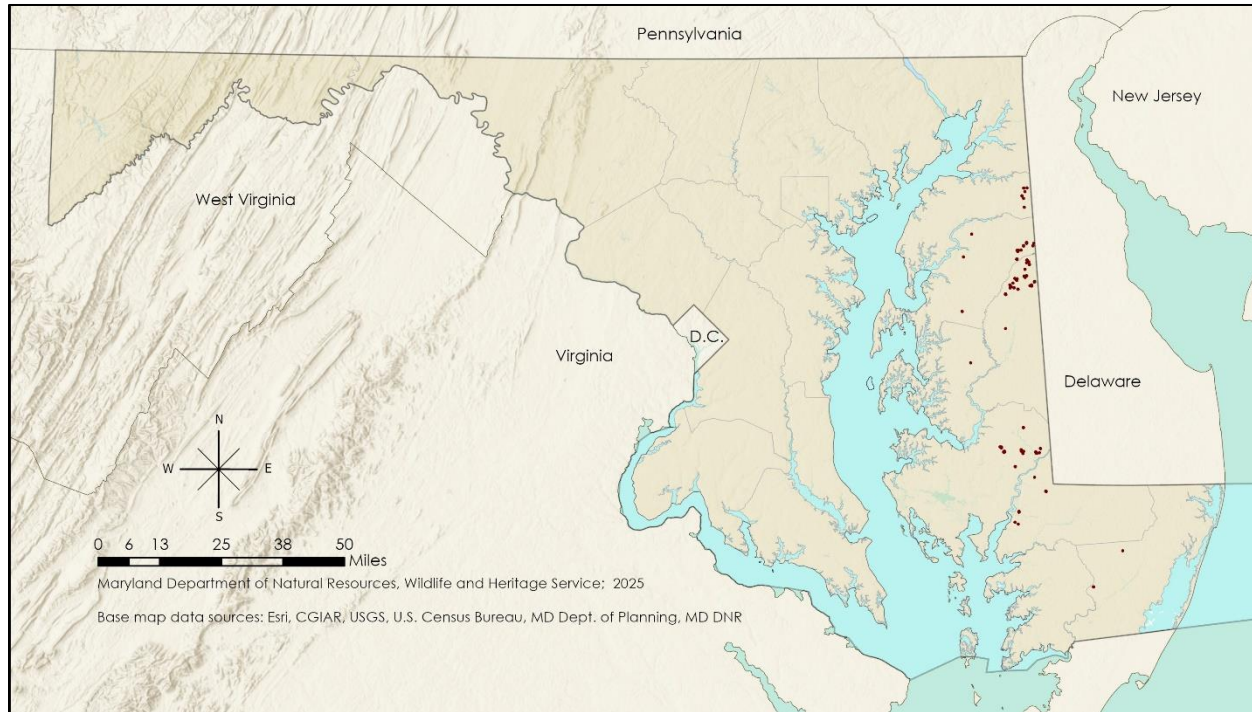


Figure 4.28 Location of Delmarva Bays in Maryland. Sources: MD DNR and USFWS.

Species of Greatest Conservation Need Associated with Delmarva Bays:

Birds

American woodcock
Baltimore oriole
Yellow warbler

Mammals

American mink
Bobcat
Eastern red bat
Hoary bat
Silver-haired bat
Southern bog lemming
Tricolored bat

Amphibians

Barking treefrog
Carpenter frog
Eastern tiger salamander

Reptiles

Eastern box turtle
Eastern kingsnake
Eastern ribbonsnake
Spotted turtle

Plants

Rose coreopsis (*Coreopsis rosea*)
Wright's witchgrass
(*Dichanthelium wrightianum*)
Black-fruit spikerush (*Eleocharis melanocarpa*)
Robbins' spikerush (*Eleocharis robbinsii*)
Harper's fimbriatylis (*Fimbristylis perpusilla*)
Sharp-scaled mannagrass (*Glyceria acutiflora*)
Featherfoil (*Hottonia inflata*)
Creeping St. John's-wort
(*Hypericum adpressum*)
Coppery St. John's-wort
(*Hypericum denticulatum*)
Red root (*Lachnanthes caroliniana*)
Club-head cutgrass (*Leersia hexandra*)
Pondspice (*Litsea aestivalis*)
Canby's lobelia (*Lobelia canbyi*)
Wrinkled joingrass (*Mnesithea rugosa*)

Plants (continued)

Capitate beakrush (*Rhynchospora cephalantha*)
Drowned hornrush (*Rhynchospora inundata*)
Mid-Atlantic beakrush (*Rhynchospora mesoatlantica*)
Long-beaked baldrush (*Rhynchospora scirpoides*)
Slender marsh pink (*Sabatia campanulata*)
Two-formed pink (*Sabatia difformis*)
Engelmann's arrowhead (*Sagittaria engelmanniana*)
Sessile-fruit arrowhead (*Sagittaria rigida*)
Reticulated nutrush (*Scleria reticularis*)
One-flower sclerolepis (*Sclerolepis uniflora*)
Canby's dropwort (*Tiedemannia canbyi*)
Swollen bladderwort (*Utricularia inflata*)
Purple bladderwort (*Utricularia purpurea*)



Insects (Coleoptera)

A dytiscid beetle
(*Hopierius planatus*)
Seth Forest water
scavenger beetle

Torrey's dropseed (*Muhlenbergia
torreyana*)
Big floatingheart (*Nymphoides
aquatica*)
Walter's paspalum (*Paspalum
dissectum*)

Northeastern bladderwort (*Utricularia
resupinata*)
Fibrous bladderwort (*Utricularia
striata*)
Fringed yellow-eyed-grass (*Xyris
fimbriata*)
Small's yellow-eyed-grass (*Xyris
smalliana*)

Insects (Odonata)

Fine-lined emerald



Maritime Swamp

Region(s): Eastern

Habitat Group: Groundwater Wetlands

NEAFWA: Non-tidal Wetlands

The Maritime Swamp Key Wildlife Habitat encompasses saturated and seasonally flooded swamps and shrublands of barrier islands along the Atlantic Coast, and low-lying flats behind tidal marshes just inland from estuarine zones. The structure of these swamps may vary from shrubland to woodland to forest because of differing stand ages as well as the amount of exposure to harsh maritime conditions, such as salt spray and wind pruning. Shrub swamps of back-dune hollows and inlet heads are frequent on barrier islands where perched water tables and seasonal flooding characterize the hydrology. Though primarily freshwater, these shrub swamps may periodically be subjected to higher salinity levels as a result of storm surges from hurricanes and other storm events. Small-scale structural variability is also common within these wetlands, with hummocks (i.e., elevated mounds created by vegetation growth and the decomposition of organic matter) and hollows (i.e., the low-lying, often saturated depressions between them) creating an undulating landscape.



Jason Harrison, MD DNR

The species composition is variable from stand to stand, but southern bayberry (*Morella cerifera*), black highbush blueberry (*Vaccinium fuscum*), poison ivy (*Toxicodendron radicans*), royal fern (*Osmunda spectabilis*), whorled water-pennywort (*Hydrocotyle verticillata*), and marsh fern (*Thelypteris palustris* var. *pubescens*) are common. Saturated and seasonally flooded forests typically develop in protected swales between dunes and flats behind tidal marshes. Red maple (*Acer rubrum*), sweetgum (*Liquidambar styraciflua*), black gum (*Nyssa sylvatica*), willow (*Salix* spp.), swamp tupelo (*Nyssa biflora*), and sweetbay magnolia (*Magnolia virginiana*) are common trees. The shrub layers are often dense with southern bayberry, black highbush blueberry, poison ivy, and greenbrier (*Smilax* spp.). Back-dune depressions of barrier islands and low-lying flats bordering tidal marsh of estuaries further inland are characterized by a dominance of loblolly pine (*Pinus taeda*) and a saturated hydrology. These fringing pine forests are nearly level and may contain areas of standing water. Some common associates include southern bayberry, greenbrier, cinnamon fern (*Osmunda cinnamomea*), royal fern, switchgrass (*Panicum virgatum*), and whorled marsh-pennywort. In Maryland, Maritime Swamps are of conservation significance because of a limited distribution along the Atlantic Coast and a high vulnerability to coastal development, sea-level rise, and stochastic storm events.

County Distribution: Dorchester, Somerset, Wicomico, Worcester

Places to Visit: Assateague Island National Seashore, Blackwater National Wildlife Refuge

State Rare Natural Communities: Maritime Swamp



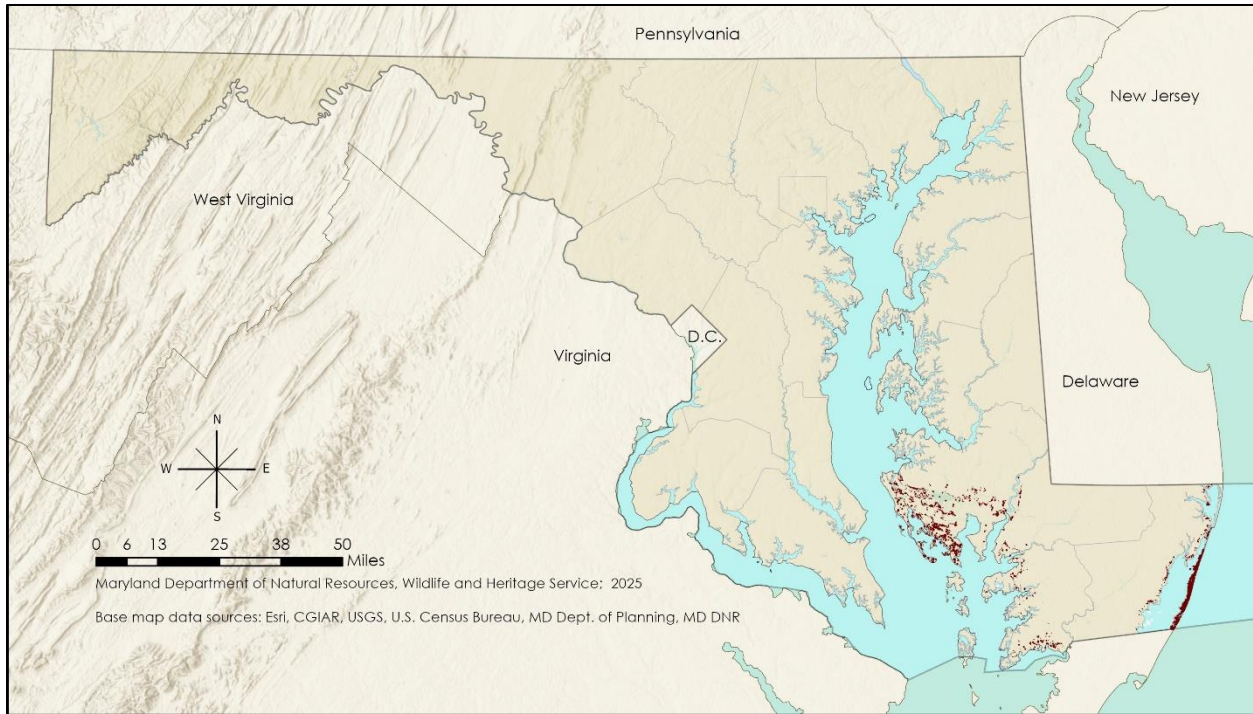


Figure 4.29 Location of Maritime Swamps in Maryland. Sources: MD DNR, NETWHCS, and USFWS.

Species of Greatest Conservation Need Associated with Maritime Swamps:

Birds

American black duck
American woodcock
Black-crowned night heron
Glossy ibis
Great blue heron
Great egret
Little blue heron
Northern bobwhite
Snowy egret
Tricolored heron
Yellow warbler
Yellow-crowned night heron

Insects (Lepidoptera)

Palamedes swallowtail

Mammals

American mink
Bobcat
Eastern red bat
Hoary bat
Silver-haired bat
Tricolored bat

Amphibians

Carpenter frog

Reptiles

Eastern box turtle
Eastern ribbonsnake
Plain-bellied watersnake
Spotted turtle



Vernal Pool

Region(s): All

Habitat Group: Groundwater Wetlands

NEAFWA: Non-tidal Wetlands

The Vernal Pool Key Wildlife Habitat is defined as small (~0.1-2 ha), non-tidal palustrine forested wetlands formed within a well-defined, discrete basin lacking a permanent, above-ground outlet. The basin overlies an impermeable soil or rock layer that impedes drainage, such as a clay hardpan, creating a perched water table. As the water table rises in fall and winter, the basin fills, forming a shallow pool. By spring, the pool typically reaches maximum depth (~0.5-2.5 m) following snowmelt and the onset of spring rains. By mid to late summer, the pool usually dries up completely, although some surface water may persist in relatively deep basins, especially in years with above-average precipitation. Important abiotic features of Vernal Pools are a lack of hydrologic input and periodic seasonal drying, which prevent fish populations from becoming established. However, many species have evolved to use these ephemeral wetlands, some of which are obligate Vernal Pool species, so-called because they require a Vernal Pool to complete all or part of their life cycle. This is especially true for amphibians, as Vernal Pools provide critical fish-free breeding habitat for many amphibious species.



James McCann, MD DNR

Vernal Pools occur throughout the state, most often as scattered, isolated habitats. They are most numerous on the Lower Coastal Plain, especially on the mid to upper Eastern Shore, and uncommon west of the Fall Line. They are typically situated in low areas or depressions in a forest, but they can also occur in floodplain forests as isolated floodwaters, among backwaters of old beaver impoundments, old sinkholes, or as perched spring- or seep-fed basins along mountain slope benches, or at the base of slopes. Vernal Pools may also persist in open areas such as agricultural fields, pastures, clearcuts, and suburban areas, though usually in a degraded ecological state.

Because Vernal Pools occur throughout the state in a variety of forest types and settings, the vegetation in and around these habitats varies considerably, but exhibits similar physical features and structure. The substrate of basins typically consists of dense mats of submerged leaf litter and scattered, coarse woody debris, and tends to have a semi-open to closed forest canopy around them, the degree of closure generally decreasing with increasing pool size. Herbaceous vegetation is usually absent to sparse in and around the basin, although small mossy patches frequently occur along the basin edge. Shrub cover along the shoreline or in small patches within the basin is variable, with some pools having dense shrub cover along basin margins, especially on the Coastal Plain, but may be lacking entirely or sparse in others.

County Distribution: Statewide

Places to Visit: Seth Demonstration Forest



State Rare Natural Community: Vernal Pool

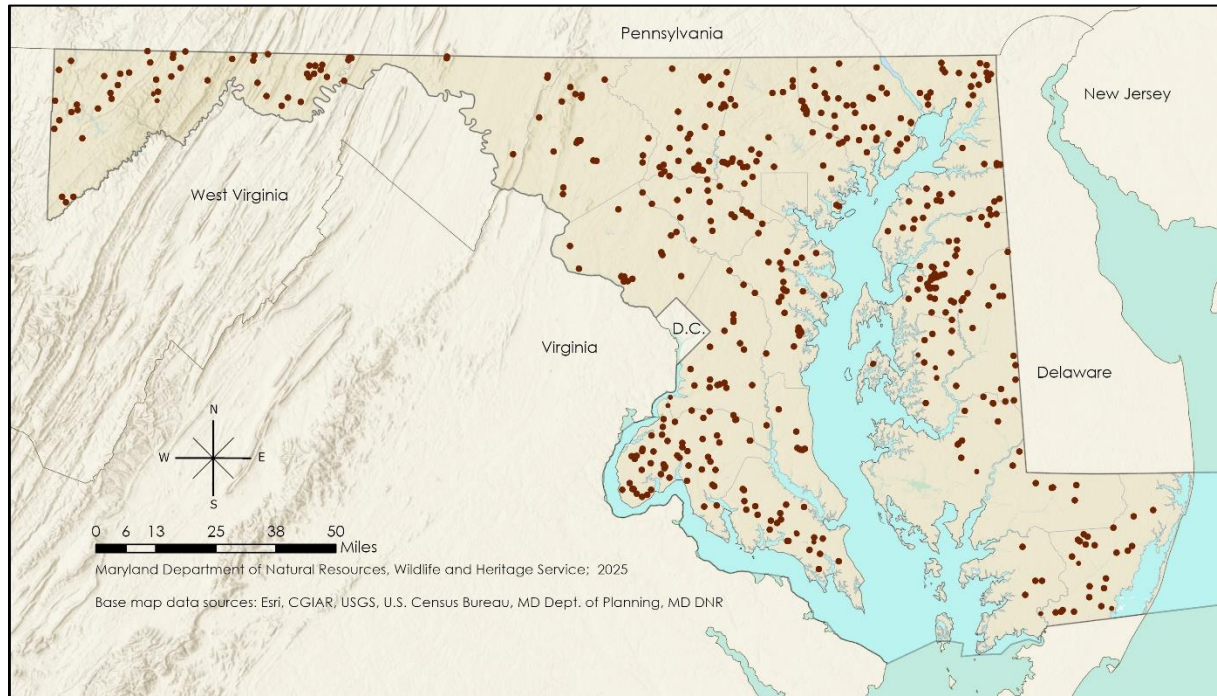


Figure 4.30 Location of Vernal Pools in Maryland. Source: MD DNR.

Species of Greatest Conservation Need Associated with Vernal Pools:

Mammals

American mink
 Eastern red bat
 Eastern small-footed bat
 Hoary bat
 Indiana bat
 Little brown bat
 Northern long-eared bat
 Silver-haired bat
 Tricolored bat

Insects (Coleoptera)

A dytiscid beetle (*Hopierius planatus*)
 Seth Forest water scavenger beetle

Insects (Odonata)

Little blue dragonlet

Amphibians

Carpenter frog
 Eastern narrow-mouthed toad
 Eastern spadefoot
 Eastern tiger salamander
 Jefferson salamander
 Mountain chorus frog
 Upland chorus frog

Reptiles

Eastern box turtle
 Eastern kingsnake
 Eastern ribbonsnake
 Rainbow snake
 Spotted turtle

Plants

Northeastern bulrush (*Scirpus
 ancistrochaetus*)



Spring

Region(s): Western, Central, Southern

Habitat Group: Groundwater Wetlands

NEAFWA: Non-tidal Wetlands

The Spring Key Wildlife Habitat (KWH) is a concentrated discharge of groundwater at a small (usually $< 1 \text{ m}^2$), distinct site or opening in the ground. Springs emit groundwater due to hydrostatic pressure resulting from gravity or artesian flow, although other physical forces may play a role (e.g., buoyant effect of dissolved gases). Springs are uncommon, typically isolated features, primarily occurring west of the Fall Line. They provide critical habitat for highly rare salamanders, aquatic snails, crayfish, subterranean invertebrates, and other invertebrates; a number of these species are endemic to spring habitats and may only occur at a single or few locations within the state. Some Springs discharge directly into streams or wetlands, playing a vital role in maintaining the ecological integrity of these habitats and associated species, including those of conservation concern (e.g., Allegheny pearl dace [*Margariscus margarita*], brook trout [*Salvelinus fontinalis*], rare dragonflies and damselflies).



MD DNR

Several types of Spring KWHs exist in Maryland, including contact, scree, and fault Springs. Perhaps the most common type is fracture or crevice springs. Here, groundwater moves downward due to gravity, flowing through fractures and crevices underneath the ground and emerging as a spring where a major fracture in a rock formation occurs at the earth's surface, usually along a ravine or swale. The flow or discharge rates of Maryland's Springs range from less than one gallon per minute to nearly 10,000 gallons per minute. Springs are similar to seeps, but have distinct discharge sites that are associated with unique aquatic and geological features, whereas seeps and seepage wetlands form at the surface as broad, diffuse zones of groundwater discharge or percolation, where groundwater naturally comes to the surface, often with associated wetlands that support distinct plant communities.

County Distribution: Allegany, Anne Arundel, Baltimore, Carroll, Cecil, Charles, Frederick, Garrett, Howard, Montgomery, Prince George's, Washington

Places to Visit: Henryton Spring, Annapolis Rock Spring



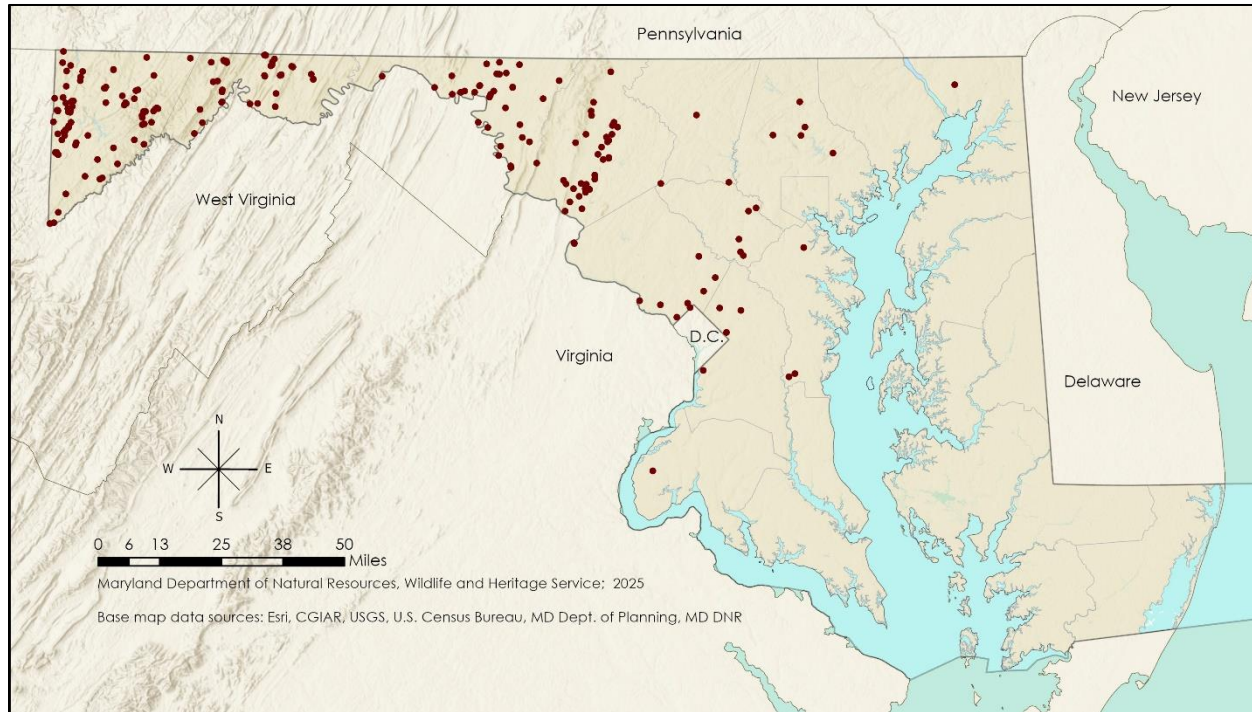


Figure 4.31 Location of Springs in Maryland. Sources: MD DNR and Geographic Names Information System (USGS).

Species of Greatest Conservation Need Associated with Springs:

Amphibians

Longtail salamander
Mountain chorus frog
Mountain dusky salamander
Mud salamander
Red salamander
Seal salamander
Spring salamander
Upland chorus frog

Reptiles

Eastern kingsnake

Insects (Aquatic Orders)

Shenandoah needelfly
Shenandoah sallfly

Invertebrates (Snails)

Appalachian springsnail
Blue Ridge springsnail

Invertebrates (Cave and Groundwater)

A cave obligate planarian (*Sphalloplana buchanani*)
A planarian (*Paraplanaria dactyligera*)
A planarian (*Procotyla typhlops*)
Allegheny spring isopod (*Caecidotea alleghenyensis*)
Biggers' cave amphipod (*Stygobromus biggersi*)
Capital Area groundwater amphipod (*Stygobromus sextarius*)
Cecil groundwater amphipod (*Stygobromus caecilius*)
Feller's groundwater amphipod (*Stygobromus felleri*)
Friendly cave amphipod (*Stygobromus amicus*)
Greenbrier cave amphipod (*Stygobromus emarginatus*)
Pizzini's cave amphipod (*Stygobromus pizzinii*)
Prettyboy groundwater amphipod (*Stygobromus paxillus*)
Price's cave isopod (*Conasellus pricei*)
Rappahannock spring amphipod (*Stygobromus foliatus*)
Refton Cave planarian (*Sphalloplana pricei*)
Rock Creek groundwater amphipod (*Stygobromus kenki*)
Shenandoah Valley cave amphipod (*Stygobromus gracilipes*)
Tidewater amphipod (*Stygobromus indentatus*)



Tidal Wetlands

Tidal Forest

Region(s): Central, Eastern, Southern

Habitat Group: Tidal Wetlands

NEAFWA: Tidal Wetlands & Flats

The Tidal Forest Key Wildlife Habitat includes a variety of tidally flooded forests that border the upper reaches of Maryland's rivers and tributaries on the Coastal Plain, developing in narrow ecotones between regularly tidally flooded areas and the upland interface. These habitats are species-rich and structurally complex with open canopies and floristically diverse lower strata. In much of our region, these freshwater habitats are composed of mixtures of hardwoods where species such as green ash (*Fraxinus pensylvanica*), water tupelo (*Nyssa aquatica*), and red maple (*Acer rubrum*) are characteristic and/or dominant. On some sites, globally and state rare communities occur, such as those within the Pocomoke and Nanticoke River watersheds, where bald cypress (*Taxodium distichum*) and Atlantic white cedar

(*Chamaecyparis thyoides*) are dominant, co-dominant, or occur as scattered individuals within these stands. Both Atlantic white cedar and bald cypress swamps are designated as rare ecological communities in Maryland as a result of various historical and current impacts, including widespread logging that occurred in the early 1900s, wetland drainage, habitat conversion, and salination from resulting sea-level rise.



Jason Harrison, MD DNR

The shrub layer in freshwater Tidal Forests is usually dense and diverse, often including species such as northern arrow-wood (*Viburnum recognitum*), winterberry (*Ilex verticillata*), silky dogwood (*Cornus amomum*), swamp azalea (*Rhododendron viscosum*), swamp rose (*Rosa palustris*), fetterbush (*Leucothoe racemosa*), and sweet pepperbush (*Clethra alnifolia*). Climbing vines are common in multiple layers and may include species such as common wild yam (*Dioscorea villosa*), poison ivy (*Toxicodendron radicans*), common greenbrier (*Smilax rotundifolia*), and Virginia creeper (*Parthenocissus quinquefolia*). Pronounced hummock-and-hollow microtopography is characteristic of tidal forests. Hollows are regularly inundated by tidal water, whereas hummocks are less frequently flooded, thus supporting the establishment of trees and numerous herbs. The exceptional species diversity and richness in these habitats can be attributed to the topography as well as flooding frequency. Regularly flooded hollows support many flood-tolerant swamp species, such as jewelweed (*Impatiens capensis*), arrow arum (*Peltandra virginica*), halberd-leaved tearthumb (*Polygonum arifolium*), lizard's-tail (*Saururus cernuus*), and sedges such as tussock sedge (*Carex stricta*). Elevated above normal high tides, hummocks provide habitat for marsh blue violet (*Viola cucullata*), water hemlock (*Cicuta maculata* var. *maculata*), greenfruit clearweed (*Pilea pumila*), false nettle (*Boehmeria*



cylindrica), and ferns such as royal fern (*Osmunda spectabilis*), cinnamon fern (*Osmunda cinnamomea*), and marsh fern (*Thelypteris palustris* var. *pubescens*).

In brackish river systems, small fringing tidal woodlands dominated by loblolly pine (*Pinus taeda*) occur along portions of tidal rivers and creeks, in narrow ecotones between high salt marshes and adjacent uplands, and as islands within extensive salt marshes. Examples of these tidal forests can be found in the lower tidewater areas of Dorchester, Wicomico, Somerset, Worcester and St. Mary's counties. These habitats are believed to be an artifact of sea-level rise and marsh subsidence, which subsequently allows for a higher frequency of tidal encroachment to the surrounding upland, pine-dominated communities. The flood tolerance of loblolly pine is relatively high, but signs of stress have become more apparent as the frequency and length of tidal inundation have increased in duration. Indicators of stress may include stunted growth, thinning crowns, and significant tree mortality. These habitats are generally species-poor, with loblolly pine often forming a monospecific canopy and southern bayberry (*Morella cerifera*) comprising the shrub layer. Indicative of brackish conditions, species diversity in the herbaceous layer is quite low and chiefly composed of vegetation tolerant of such conditions. Most frequent and dominant of these species include salt meadow cordgrass (*Spartina patens*), switchgrass (*Panicum virgatum*), and salt grass (*Distichlis spicata*).

County Distribution: Anne Arundel, Baltimore, Calvert, Caroline, Cecil, Charles, Dorchester, Harford, Kent, Prince George's, Queen Anne's, Somerset, St. Mary's, Talbot, Wicomico, Worcester

Places to Visit: Blackwater National Wildlife Refuge, Piscataway Park, Pocomoke River State Forest

State Rare Natural Communities: Tidal Bald Cypress Swamp, Tidal Hardwood Swamp



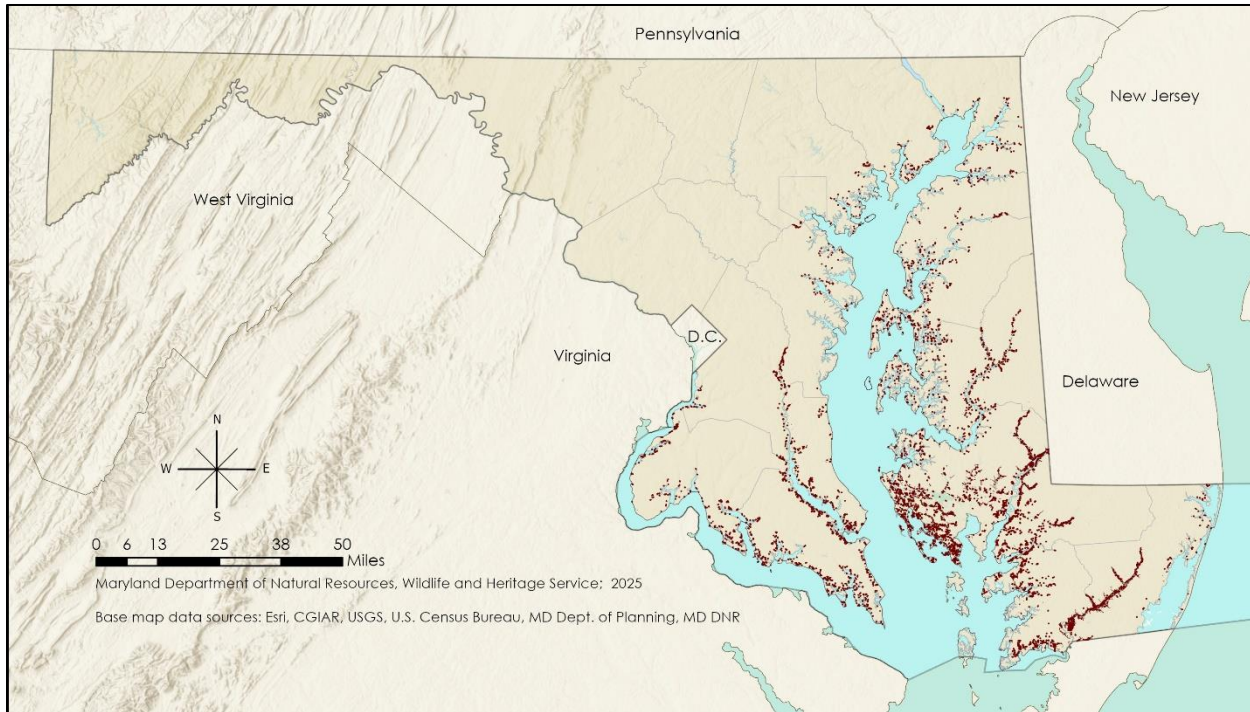


Figure 4.32 Location of Tidal Forests in Maryland. Source: MD DNR.

Species of Greatest Conservation Need Associated with Tidal Forests:

Birds

Acadian flycatcher
American redstart
American woodcock
Bald eagle
Black-and-white warbler
Black-billed cuckoo
Chuck-will's-widow
Great blue heron
Great egret
Hooded warbler
Kentucky warbler
Louisiana waterthrush
Northern parula
Ovenbird
Prairie warbler
Prothonotary warbler
Rusty blackbird
Scarlet tanager
Swainson's warbler
Wood thrush
Worm-eating warbler
Yellow-breasted chat
Yellow-throated vireo

Mammals

Bobcat
Delmarva fox squirrel
Eastern red bat
Hoary bat
Silver-haired bat
Tricolored bat

Amphibians

Carpenter frog
Eastern narrow-mouthed toad
Mud salamander

Reptiles

Eastern box turtle
Eastern kingsnake
Eastern milksnake
Eastern ribbonsnake
Northern mole kingsnake
Plain-bellied watersnake
Rainbow snake
Spotted turtle
Wood turtle

Plants

Hazel dodder (*Cuscuta coryli*)
Carolina ash (*Fraxinus caroliniana*)
Three-ribbed arrow-grass (*Triglochin striata*)

Insects (Lepidoptera)

A twirler moth (*Coleotechnites variella*)
Bronze copper
Bald cypress coneworm moth
Cypress emerald moth
Cypress looper (*Iridopsis pergracilis*)
Cypress pinion (*Lithophane abita*)
Cypress sphinx moth (*Isoparce cupressi*)
Distinguished cypress owlet moth
Gray cypress looper (*Cutina albopunctella*)
Great purple hairstreak
Mulberry wing
Palamedes swallowtail



Tidal Freshwater Marsh and Shrubland

Region(s): Central, Eastern, Southern

Habitat Group: Tidal Wetlands

NEAFWA: Tidal Wetlands & Flats

In Maryland, the Tidal Freshwater Marsh and Shrubland Key Wildlife Habitat is widely distributed along upper tidal rivers, creeks and shores of the Chesapeake Bay, which are subject to lunar tides and subsequent flooding that occurs twice daily, in zones where water is consistently fresh (salinity less than 0.5 ppt). Pulses of higher salinity are common during spring high tides and episodes of low river discharge during drought cycles. In addition, where these marshes begin the transition to saline ones, a zone of slightly brackish conditions (i.e., oligohaline) occurs where salt concentrations may range from 0.5–5 ppt.



Jason Harrison, MD DNR

The vegetation of these wetlands is very diverse and dynamic, exhibiting floristic zonation with spatial vegetation patterns that may change seasonally or yearly with variability based on location within the wetland, age, water depth, and tidal regime, with emergent herbaceous and graminoid dominated vegetation forming in the lower, permanently flooded zones, grading outwards to shrub dominated vegetation at the higher, semi-permanently to seasonally flooded margins that grade into Tidal Forests.

Typically, there are two distinct zones in the marsh: a low-elevation zone dominated by short, broad-leaf emergent herbaceous species bordering mudflats or open water, and a slightly higher-elevation area dominated by tall graminoids. Plants in the low zone may include spatterdock (*Nuphar advena*), arrow-arum (*Peltandra virginica*), and pickerelweed (*Pontederia cordata*), while higher zones often support species such as wild rice (*Zizania aquatica* var. *aquatic*), jewelweeds (*Impatiens* spp.), sweetflag (*Acorus calamus*), dotted smartweed (*Polygonum punctatum*), rice cutgrass (*Leersia oryzoides*), arrowleaf tearthumb (*Polygonum sagittatum*), halberdleaf tearthumb (*Polygonum arifolium*), and beggar-ticks (*Bidens* spp.). This zonation can be attributed to flooding depth, duration, and frequency. Oligohaline marshes frequently support the latter species in addition to species tolerant of brackish conditions, such as water-hemp pigweed (*Amaranthus cannabinus*), eastern-rose mallow (*Hibiscus moscheutos* ssp. *moscheutos*), seashore mallow (*Kosteletzkya virginica*), saltmarsh bulrush (*Schoenoplectus robustus*), and extensive stands of big cordgrass (*Spartina cynosuroides*) and narrow-leaved cattail (*Typha angustifolia*). Tidal freshwater shrublands commonly form small, linear patches on floodplains between tidal emergent marshes and Tidal Forests.

Discrete shrub-dominated vegetation occurs within the drier transitional areas of freshwater tidal marshes and adjacent uplands. The vegetation of these shrub wetlands is very diverse and typically contains species characteristic of both tidal marshes and tidal forests. Common shrubs are such as brookside alder (*Alnus serrulata*), winterberry (*Ilex verticillata*), swamp rose (*Rosa*



palustris), northern arrow-wood (*Viburnum recognitum*), southern bayberry (*Morella cerifera*), and silky dogwood (*Cornus amomum*). Pronounced hummock and hollow microtopography is characteristic and contribute to relatively high species richness, with most species confined to irregularly flooded hummocks, whereas hollows are regularly flooded and typically contain only those species tolerant of frequent inundation.

County Distribution: Anne Arundel, Baltimore, Calvert, Caroline, Cecil, Charles, Dorchester, Harford, Kent, Prince George’s, Queen Anne’s, Somerset, St. Mary’s, Talbot, Wicomico, Worcester

Places to Visit: Pocomoke State Forest

State Rare Natural Communities: Tidal Freshwater Marsh and Shrubland, Tidal Oligohaline Marsh and Shrubland

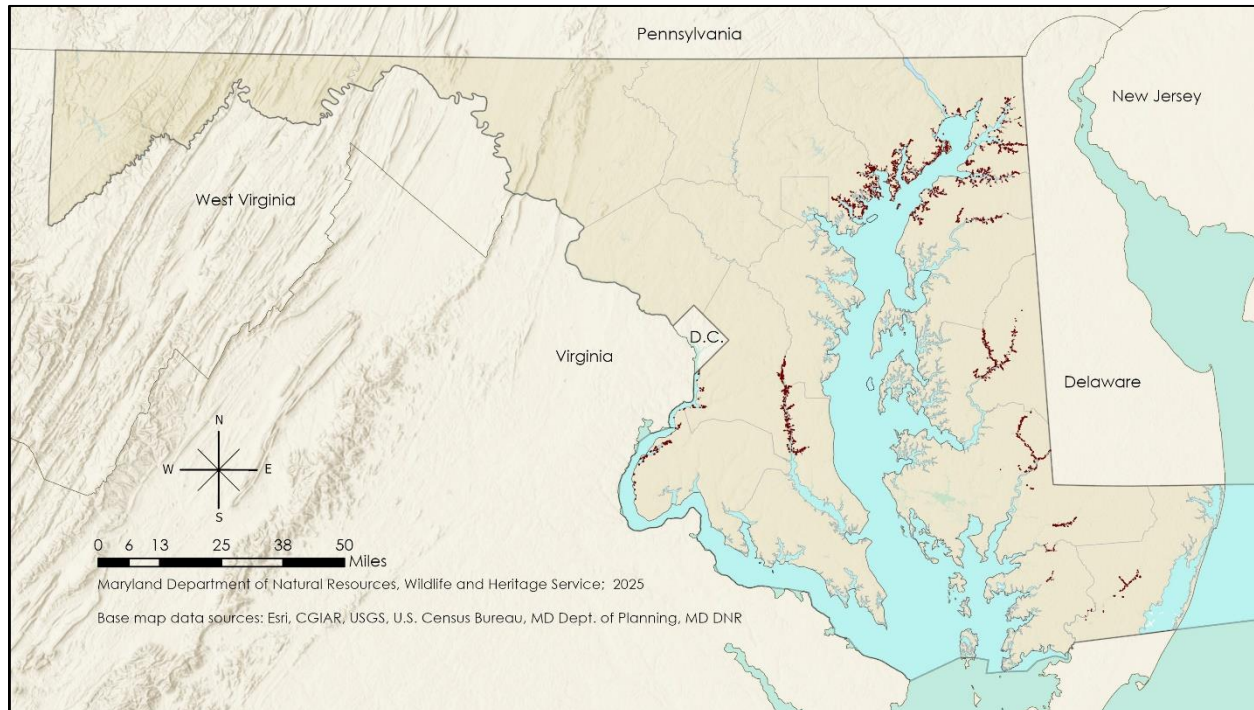


Figure 4.33 Location of Tidal Freshwater Marshes and Shrublands in Maryland. Sources: MD DNR and Nature Serve’s Terrestrial Ecological Systems of the U.S.

Species of Greatest Conservation Need Associated with Tidal Freshwater Marshes and Shrublands:

Birds

American barn owl
American bittern
American black duck
Bald eagle
Baltimore oriole
Black-crowned night heron

Mammals

American mink
Bobcat
Eastern red bat
Hoary bat
Least shrew
Silver-haired bat

Plants

Seaside alder (*Alnus maritima* ssp. *maritima*)
Switch cane (*Arundinaria tecta*)
Smooth orange milkweed (*Asclepias lanceolata*)



Blue-winged teal
Brown pelican
Coastal Plain swamp sparrow
Dunlin
Gadwall
Glossy ibis
Great blue heron
Great egret
Greater yellowlegs
King rail
Least bittern
Least tern
Lesser yellowlegs
Little blue heron
Marsh wren
Northern harrier
Pied-billed grebe
Ruddy turnstone
Rusty blackbird
Sanderling
Sedge wren
Semipalmated sandpiper
Short-eared owl
Snowy egret
Sora
Spotted sandpiper
Swamp sparrow
Tricolored heron
Yellow warbler
Yellow-crowned night heron

Tricolored bat

Reptiles

Eastern kingsnake
Eastern mud turtle
Diamond-backed terrapin
Plain-bellied watersnake
Rainbow snake
Spotted turtle
Striped mud turtle

Insects (Hymenoptera)

Pickerelweed long-horned bee
(*Melissodes apicatus*)

Insects (Lepidoptera)

An owlet moth (*Meropon titan*)
Bronze copper
Rare skipper

Insects (Odonata)

Fine-lined emerald

Saltmarsh bulrush
(*Bolboschoenus novae-angliae*)
Long's bittercress (*Cardamine longii*)
Mitchell's sedge (*Carex mitchelliana*)
Partridge pea (*Chamaecrista fasciculata* var. *macrosperma*)
Water horsetail (*Equisetum fluviatile*)
Parker's pipewort (*Eriocaulon parkeri*)
Dwarf umbrella-sedge (*Fuirena pumila*)
Vetchling peavine (*Lathyrus palustris*)
Gibbous panic-grass (*Sacciolepis striata*)
Swamp wedgescale (*Sphenopholis pensylvanica*)
Southern wild rice (*Zizaniopsis miliacea*)



Tidal Brackish Marsh and Shrubland

Region(s): Central, Eastern, Southern

Habitat Group: Tidal Wetlands

NEAFWA: Tidal Wetlands & Flats

The Tidal Brackish Marsh and Shrubland Key Wildlife Habitat (KWH) is a transitional, mesohaline wetland between tidal freshwater systems and salt marshes. It is the most abundant wetland type in Maryland, occurring along the many miles of coastal plain rivers and shores where the salinity of water ranges from 5–18 ppt. This wide transition zone is diverse, with species tolerant of both saline and freshwater conditions.



Jason Harrison, MD DNR

The vegetation of this KWH is influenced by salinity, elevation, and the depth and duration of tidal flooding. Lower, more regularly flooded zones consist of species such as saltmarsh cordgrass (*Spartina alterniflora*), saltgrass (*Distichlis spicata*), glassworts (*Salicornia* spp.), narrow-leaved cattail (*Typha angustifolia*), olney threesquare (*Schoenoplectus americanus*), saltmarsh bulrush (*Schoenoplectus robustus*), and extensive stands of black needlerush (*Juncus roemerianus*), which is believed by many to have had its range expanded due to a decrease in natural fires in brackish marshes of the mid-Atlantic. Higher portions of brackish marshes may support saltmeadow cordgrass (*Spartina patens*), sea-lavender (*Limonium carolinianum*), seashore mallow (*Kosteletzkya virginica*), marsh fleabane (*Pluchea camphorata*), switchgrass (*Panicum virgatum*), and seaside goldenrod (*Solidago sempervirens*). Shrubby ecotones of southern bayberry (*Morella cerifera*), bigleaf marsh-elder (*Iva frutescens*), and high-tide bush (*Baccharis halimifolia*) are also frequent throughout the habitat.

County Distribution: Anne Arundel, Baltimore, Calvert, Caroline, Dorchester, Kent, Prince George's, Queen Anne's, Somerset, St. Mary's, Talbot, Wicomico, Worcester

Places to Visit: Blackwater National Wildlife Refuge, Eastern Neck Wildlife Refuge, Fishing Bay Wildlife Management Area



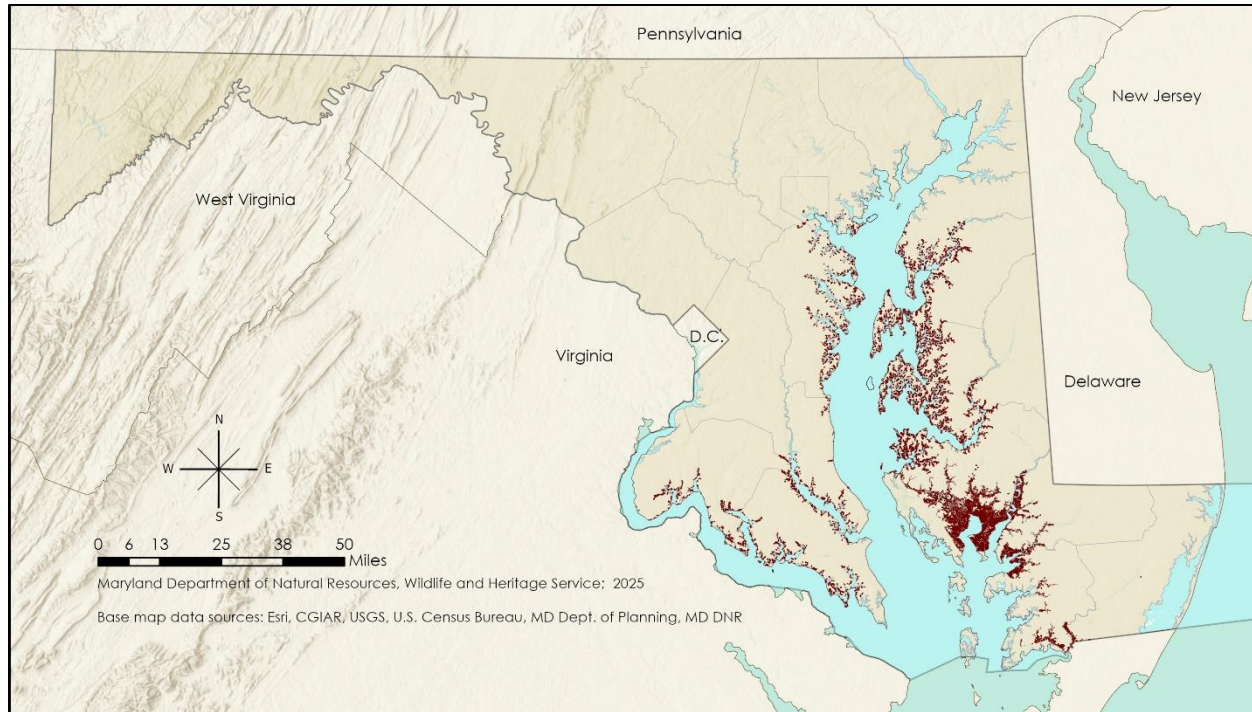


Figure 4.34 Location of Tidal Brackish Marshes and Shrublands in Maryland. Sources: MD DNR and Nature Serve’s Terrestrial Ecological Systems of the U.S.

Species of Greatest Conservation Need Associated with Tidal Brackish Marshes and Shrublands:

Mammals

American mink
Bobcat
Eastern red bat
Hoary bat
Least shrew
Silver-haired bat
Tricolored bat

Reptiles

Eastern kingsnake
Diamond-backed terrapin
Plain-bellied watersnake

Insects (Coleoptera)

Keel-necked firefly
Salt marsh firefly

Insects (Lepidoptera)

Bronze copper
Rare skipper

Birds

American barn owl
American bittern
American black duck
American peregrine falcon
Bald eagle
Black rail
Black-crowned night heron
Blue-winged teal
Boat-tailed grackle
Brown pelican
Coastal Plain swamp sparrow
Common gallinule
Common nighthawk
Dunlin
Eastern meadowlark
Gadwall
Glossy ibis
Golden eagle
Great blue heron

Birds (continued)

Great egret
Greater yellowlegs
Horned grebe
King rail
Least bittern
Least tern
Lesser yellowlegs
Little blue heron
Marsh wren
Nelson's sparrow
Northern harrier
Pied-billed grebe
Ruddy turnstone
Saltmarsh sparrow
Sanderling
Seaside sparrow
Sedge wren
Semipalmated sandpiper
Short-billed dowitcher
Short-eared owl
Snowy egret
Sora

Birds (continued)

Spotted sandpiper
Swamp sparrow
Tricolored heron
Whimbrel
Willet
Yellow warbler
Yellow-crowned night heron

Plants

Sensitive joint-vetch
(*Aeschynomene virginica*)
Koehne ammannia
(*Ammannia latifolia*)
Shoreline sedge (*Carex hyalinolepis*)



Tidal Salt Marsh and Shrubland

Region(s): Eastern, Southern

Habitat Group: Tidal Wetlands

NEAFWA: Tidal Wetlands & Flats

The Tidal Salt Marsh and Shrubland Key Wildlife Habitat includes salt meadows along the coast and lower portions of the Chesapeake Bay that form essentially flat plains of low-statured vegetation with moderate species diversity and distinct zonation between low and high salt marshes. Lower, more regularly flooded salt zones with lower salinity are often dominated by saltmarsh cordgrass

(*Spartina alterniflora*) and extensive stands of black needlerush (*Juncus roemerianus*). Shorter-statured salt marshes or salt meadows are dominated by saltgrass (*Distichlis spicata*) and saltmeadow cordgrass (*Spartina patens*) and generally occur on slightly elevated surfaces where tides may be less regular and where soils may concentrate salts. High salt marsh zones often support a diverse assemblage of plants that may include species such as camphorweed (*Pluchea* spp.), saltmarsh false-foxglove (*Agalinis maritima*), annual saltmarsh aster (*Symphyotrichum subulatum*), perennial saltmarsh aster (*Symphyotrichum tenuifolium*), sea oxeye (*Borrchia frutescens*), sea-lavender (*Limonium carolinianum*), glassworts (*Salicornia* spp.), sea pink (*Sabatia stellaris*), and narrow loosestrife (*Lythrum lineare*).



Jason Harrison, MD DNR

The salinity of tidal water is usually 18–30 ppt and flooding is less regular because of slightly elevated landscapes. Embedded in salt marshes are shallow, poorly drained depressions called “salt pannes.” Like the adjacent salt marsh, salt pannes are flooded by tidal water, but water does not drain freely into creeks or guts. After a panne has been flooded, the standing water evaporates and the salinity of the soil water greatly increases above the level of seawater, thus supporting the most salt tolerant perennials and annuals.

Salt scrub is generally species poor and composed only of plants tolerant of high salinity such as southern bayberry (*Morella cerifera*), high-tide bush (*Baccharis halimifolia*), and bigleaf marsh-elder (*Iva frutescens*). These communities are found in saline environments throughout the outer Coastal Plain. Although salt scrub does occur in tidal habitats, it more commonly occupies higher, only irregularly flooded landscape positions in a mosaic with lower, regularly flooded salt marsh. Salt scrub stands often occur in maritime environments, where they are influenced especially by high winds and salt spray.

Sea-level fens are also associated with higher landscape positions in tidal salt marsh and shrubland systems. These small seepage wetlands develop at the upland edge of salt marshes where abundant groundwater discharges at the bases of gentle slopes. The hydrology of these sites is best characterized as saturated, although shallow standing water and small, muck-filled pools are locally present at most sites. The soils are organic and extremely nutrient poor.



Because of freshwater groundwater seepage, the vegetation of these features exhibits characteristics of both inland acidic seepage bogs and oligohaline tidal marshes. Stands are generally a mosaic of open woodland, scrub, and herbaceous patches. Sea-level fens are globally rare natural communities threatened by sea-level rise, encroachment of non-native species (e.g., *Phragmites*), and excessive nutrient input via agricultural runoff.

County Distribution: Dorchester, Somerset, St. Mary's, Wicomico, Worcester

Places to Visit: Assateague Island National Seashore

State Rare Natural Community: Sea-level Fen

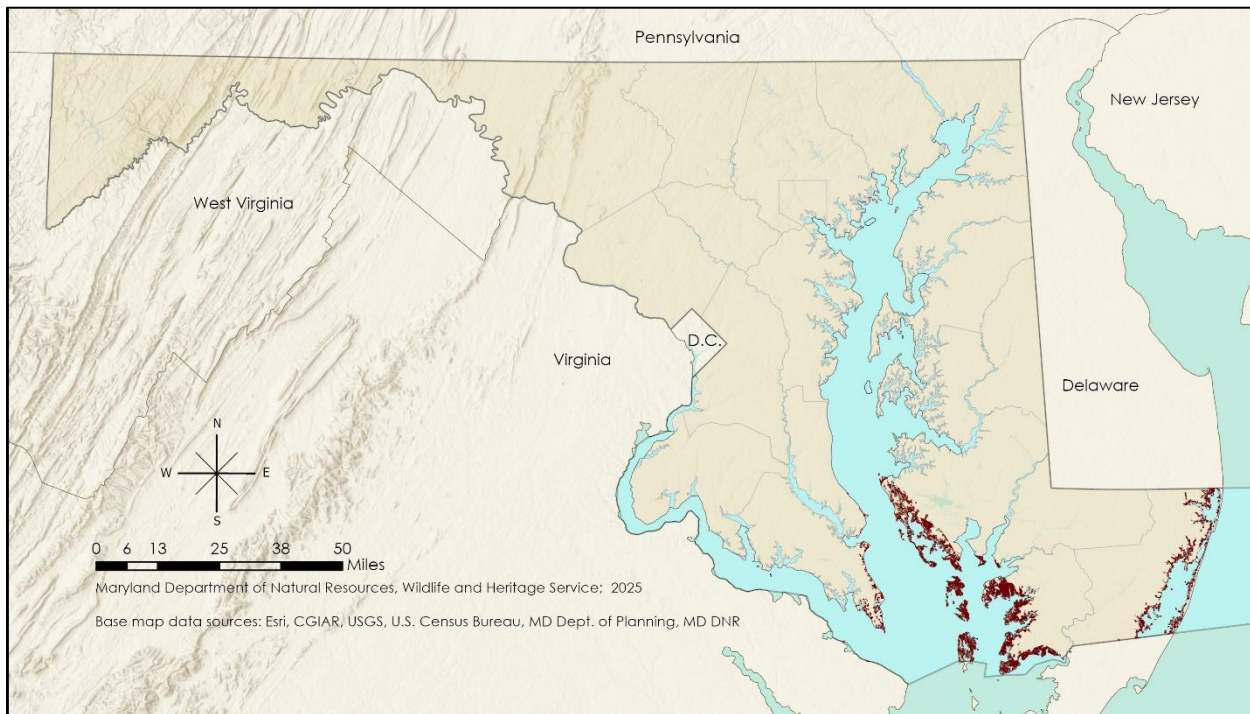


Figure 4.35 Location of Tidal Salt Marshes and Shrublands in Maryland. Sources: MD DNR and Nature Serve's Terrestrial Ecological Systems of the U.S.

Species of Greatest Conservation Need Associated with Tidal Salt Marshes and Shrublands:

Birds

American barn owl
American bittern
American black duck
American oystercatcher
American peregrine falcon
Bald eagle
Black rail
Black skimmer
Black-crowned night heron

Birds (continued)

Least bittern
Least tern
Lesser yellowlegs
Little blue heron
Marsh wren
Nelson's sparrow
Northern harrier
Pied-billed grebe
Royal tern

Mammals

American mink
Bobcat
Eastern red bat
Hoary bat
Least shrew
Little brown bat
Silver-haired bat
Tricolored bat



Blue-winged teal
Boat-tailed grackle
Brown pelican
Common gallinule
Common nighthawk
Common tern
Dunlin
Eastern meadowlark
Forster's tern
Gadwall
Glossy ibis
Golden eagle
Great blue heron
Great egret
Greater yellowlegs
Gull-billed tern
Horned grebe
Laughing gull

Ruddy turnstone
Rufa red knot
Saltmarsh sparrow
Sanderling
Sandwich tern
Seaside sparrow
Sedge wren
Semipalmated sandpiper
Short-billed dowitcher
Short-eared owl
Snowy egret
Sora
Spotted sandpiper
Tricolored heron
Whimbrel
Willet
Yellow warbler
Yellow-crowned night heron

Insects (Coleoptera)

Keel-necked firefly
Salt marsh firefly

Insects (Lepidoptera)

Rare skipper

Plants

Maryland bur-marigold (*Bidens
bidentoides*)
White spikerush (*Eleocharis
albida*)
Saltmarsh spikerush (*Eleocharis
uniglumis*)



Intertidal Mudflat and Sand Flat

Region(s): Central, Eastern, Southern

Habitat Group: Tidal Wetlands

NEAFWA: Tidal Wetlands & Flats

The Intertidal Mudflat and Sand Flat Key Wildlife Habitat (KWH) is characterized by mudflats and sand flats of embayed and riverine areas of the Coastal Plain. They are best developed in shallow, protected estuarine bays and pools, and along small tidal creeks and guts, with sand flats often occurring as tidally exposed extensions adjacent to areas of Coastal Beach KWH. The depth and frequency of tidal flooding are variable depending on the landscape setting, but most flats are exposed twice daily during low tide cycles. Additional intertidal areas are less frequently exposed during certain lunar cycles that cause extra low tides and especially during extended periods of strong winds. Though somewhat lacking in plant diversity, vascular aquatic species cover can be abundant with characteristic species such as eelgrass (*Vallisneria americana*), beaked ditch-grass (*Ruppia maritima*), horned pondweed (*Zannichellia palustris*), and sago pondweed (*Potamogeton pectinatus*). On some sites, aquatic algae can also be abundant and may frequently include species of sea-lettuce (*Ulva* spp.).



Jason Harrison, MD DNR

Mudflats are especially critical for invertebrate communities. Nutrient-rich and highly productive, Mudflats provide habitat for numerous aquatic invertebrates that form complex communities on the surface and in burrows within the soft sediment. Example species include mud snails, fiddler crabs, polychaete worms, mussels, clams, and oysters. These species serve as a significant food source for animals such as blue crabs, fish, and colonial waterbirds. The exposed Mudflats and Sand Flats also provide crucial resting areas for shorebirds, colonial waterbirds, and the diamond-backed terrapin (*Malaclemys terrapin*).

Among the stressors affecting this KWH are nutrification leading to oxygen-depleted dead zones, and land subsidence and sea-level rise leading to eventual submersion. However, drowned Mudflats may be replaced by new ones as tidal marshes become too flooded to maintain their vegetation and eventually become Mudflats..

County Distribution: Anne Arundel, Baltimore, Calvert, Caroline, Cecil, Charles, Dorchester, Harford, Kent, Prince George's, Queen Anne's, Somerset, St. Mary's, Talbot, Wicomico, Worcester

Places to Visit: Blackwater National Wildlife Refuge, Assateague Island National Seashore, Piscataway Park

State Rare Natural Community: Intertidal Shore



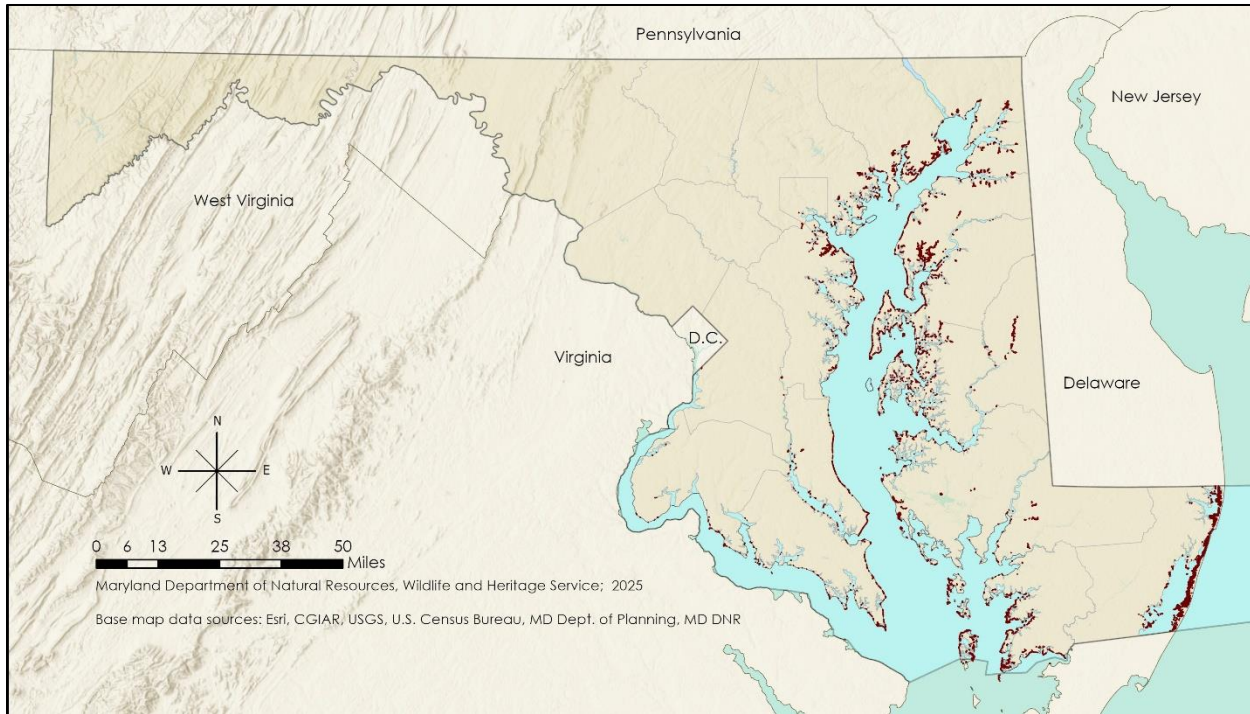


Figure 4.36 Location of Intertidal Mudflats and Sandflats in Maryland. Sources: USFWS, USGS, and MD DNR.

Species of Greatest Conservation Need Associated with Intertidal Mudflats and Sandflats:

Birds

American black duck
American oystercatcher
American peregrine falcon
Bald eagle
Black skimmer
Black-bellied plover
Black-crowned night heron
Blue-winged teal
Brant
Brown pelican
Common tern
Dunlin
Forster's tern
Gadwall
Glossy ibis
Great blue heron
Great egret
Greater yellowlegs
Gull-billed tern
Laughing gull

Birds (continued)

Least tern
Lesser yellowlegs
Little blue heron
Piping plover
Roseate tern
Royal tern
Ruddy turnstone
Rufa red knot
Sanderling
Sandwich tern
Semipalmated sandpiper
Short-billed dowitcher
Snowy egret
Sora
Spotted sandpiper
Tricolored heron
Whimbrel
Willet
Wilson's plover
Yellow-crowned night heron

Mammals

Little brown bat

Reptiles

Diamond-backed terrapin

Insects (Coleoptera)

Eastern beach tiger beetle

Plants

Water pygmyweed (*Crassula aquatica*)
Mudwort (*Limosella australis*)
Spongy arrowhead (*Sagittaria spatulata*)



Artificial Wetlands

Artificial Impoundment and Artificial Wetland

Region(s): All

Habitat Group: Artificial Wetlands

NEAFWA: Lakes & Ponds

Additional Notes: An artificial or human-made habitat

Lakes usually form naturally when water collects in basins created from geological processes, such as glacial scouring. No such geologically formed natural lakes occur in Maryland because the state lies well south of the southern extent of glaciation. While Maryland does contain some small natural, open freshwater habitats—including beaver impoundments, wetland openings (e.g., Delmarva Bays, Vernal Pools, montane bogs and fens, flooded riverine floodplain openings), and river oxbows—that provide habitat for a variety of Species of Greatest Conservation Need (SGCN), the number and overall extent of the state's natural open water areas and wetlands have been greatly reduced due to various forms of ditching, drainage, degradation, and conversion of wetlands and stream and river habitats. Beaver populations in many parts of the state have also never fully recovered from pre-1900 declines due to fur trapping pressure, and the long-term effects on aquatic ecosystems and associated wildlife have been significant.



Jason Harrison, MD DNR

Although these natural habitats are few in number, numerous man-made lakes, ponds, pools, and wetlands of varying sizes exist in Maryland. These habitats are usually the result of water diversion. In many cases, impoundments were created at the expense of natural streams and river systems or natural marshes. Unfortunately, many man-made ponds and wetlands, such as stormwater management ponds, are lacking or have somewhat limited suitability as habitat for most SGCN. In other instances, however, artificial impoundments provide critical refugia where natural aquatic habitats have been destroyed or degraded (e.g., black-banded sunfish [*Enneacanthus chaetodon*]).

In recent years, there have been increased efforts to restore or create new wetlands that mimic natural habitats more suitable to natural communities. These projects may stem from compensatory mitigation requirements for major infrastructure projects that impact forested and emergent wetlands. Several wetland creation projects were undertaken for the building of the intercounty connector over a decade ago; more recently, similar projects have been undertaken for the Purple Line light rail project, which is slated to be completed in 2027. One of these projects was the Ken-Gar Palisades Park wetland creation project, which created 1.66 acres of new wetland and enhanced 1.90 acres of existing wetland.

Large artificial impoundments in the Chesapeake Bay, such as Hart-Miller Island and Poplar Island, have been created by the U.S. Army Corps of Engineers to hold dredge spoil from



shipping channels. While dredging is ongoing, these areas provide important stopover feeding and resting habitat for migrant shorebirds. When active dredging ends, these areas dry up unless water is pumped in to maintain some areas as artificial wetlands and mudflats. The dried out open areas can become suitable for colonial nesting waterbirds, especially terns. Since these large artificial islands are designed to be permanent, the habitats they contain can be planned and designed to support SGCN, and will require regular maintenance to sustain them long-term. Smaller dredge spoil impoundments are usually created on land and are often too small and too short-lived to support SGCN for more than a few years. These areas usually become overgrown by the invasive common reed (*Phragmites australis* spp. *australis*).

County Distribution: Statewide

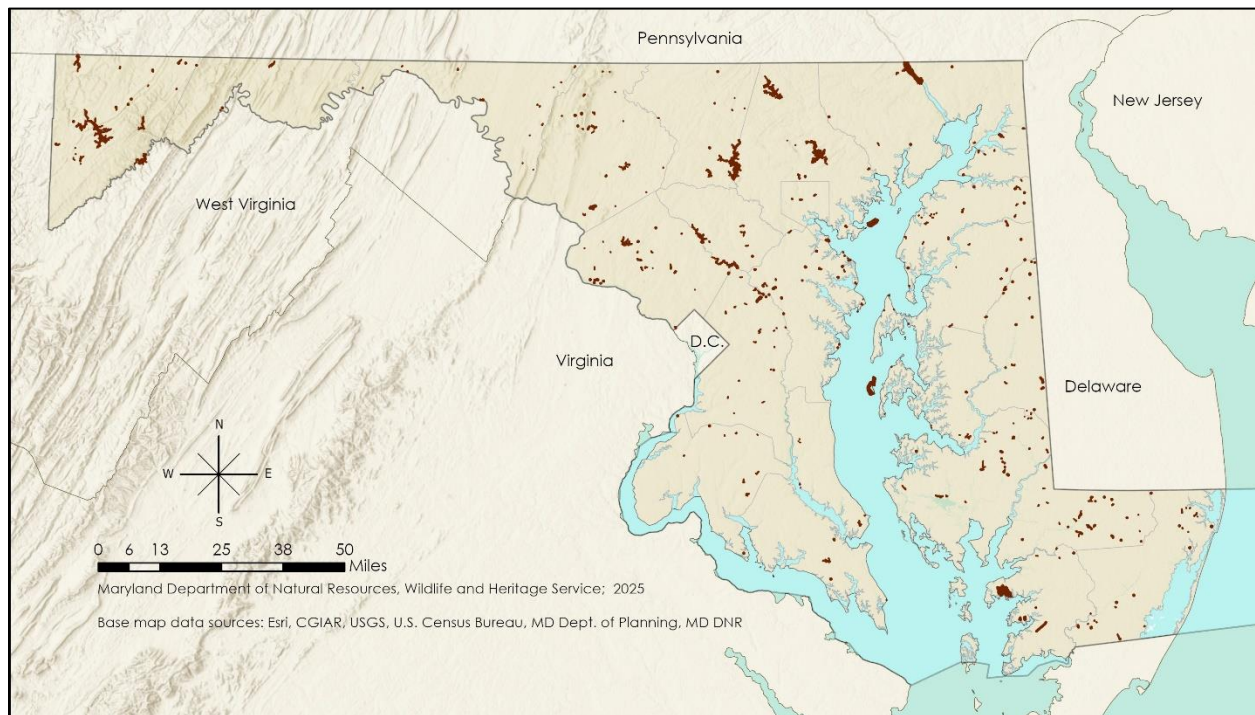


Figure 4.37 Location of Artificial Impoundments and Artificial Wetlands in Maryland. Source: MD DNR.

Species of Greatest Conservation Need Associated with Artificial Impoundments and Artificial Wetlands:

Birds

American bittern
American black duck
Bald eagle
Black rail
Black scoter
Black-bellied plover
Black-crowned night heron
Blue-winged teal
Canvasback

Birds (continued)

Rufa red knot
Sanderling
Semipalmated sandpiper
Short-billed dowitcher
Snowy egret
Sora
Spotted sandpiper
Surf scoter
Swamp sparrow

Fish

Blackbanded sunfish
Striped shiner

Invertebrates (Aquatic)

Eastern lampmussel
Northern lance
Paper pondshell

Insects (Odonata)



Common gallinule
Common goldeneye
Common loon
Dunlin
Gadwall
Glossy ibis
Golden eagle
Great blue heron
Great egret
Greater scaup
Greater yellowlegs
Gull-billed tern
Horned grebe
Least bittern
Lesser scaup
Lesser yellowlegs
Little blue heron
Long-tailed duck
Pied-billed grebe
Red phalarope
Red-necked phalarope
Redhead
Ruddy turnstone

Tricolored heron
White-winged scoter
Willet
Yellow warbler

Mammals

American mink
Eastern red bat
Hoary bat
Indiana bat
Little brown bat
Northern long-eared bat
Silver-haired bat
Tricolored bat

Amphibians

Barking treefrog
Eastern narrow-mouthed toad
Eastern tiger salamander

Reptiles

Eastern box turtle
Eastern musk turtle
Eastern spiny softshell
Diamond-backed terrapin
Queensnake
Spotted turtle

American emerald
Atlantic bluet
Black-tipped darter
Burgundy bluet
Canada darter
Elfin skimmer
Green-striped darter
Little blue dragonlet
Pale bluet
Rainbow bluet
Rapids clubtail
Spatterdock darter

Plants

Broadleaf water-milfoil
(*Myriophyllum heterophyllum*)
Flatstem pondweed
(*Potamogeton zosteriformis*)



Aquatic Habitats

Streams and Rivers

Coldwater Stream

Region(s): Central, Western

Habitat Group: Streams/Rivers

NEAFWA: Rivers & Streams

Coldwater Streams are freshwater streams that are unique in form, function, and biota. They are most common in the Appalachian Plateau and Ridge and Valley physiographic provinces, particularly in the Youghiogheny and North Branch Potomac drainages, but are also found in the Piedmont physiographic province within the Middle Potomac, Susquehanna, Gunpowder, and Patapsco drainages. These streams may support coldwater taxa such as trout and stoneflies. They are characterized by a maximum daily mean water temperature of less than 20° C and dissolved oxygen levels greater than 5 mg/L. Coldwater streams are typically found only in the headwater reaches of a watershed. Most are riffle-dominated, high gradient (>2%) streams with well-shaded riparian canopies allowing for aeration and regulation of water temperature. Fallen trees play an important role in shaping Coldwater Stream channels, creating pools and slow-water areas beneficial to aquatic species. Logs and leaf litter are also a primary source of organic matter that form the base of the food web. In certain areas, beaver activity along Coldwater Streams may represent an important form of natural disturbance and create habitat heterogeneity. Beaver impounded stream sections help reduce sediment and nutrient loads in downstream areas, create shifting mosaics of different forest successional stages, and provide habitat for a variety of wildlife Species of Greatest Conservation Need.



Richard Wiegand, MD DNR

Compared to downstream and warm water streams, aquatic biodiversity and productivity are low, with few fish and benthic macroinvertebrate species. Brook trout (*Salvelinus fontinalis*), Maryland's only native trout species, are found in these streams along with introduced brown and rainbow trout. Common nongame fish species include mottled (*Cottus bairdii*) and Blue Ridge sculpin, longnose dace, and creek chub. Stoneflies of the genera *Sweltsa* and *Tallaperla* are considered coldwater obligate taxa (i.e., found only in these habitats). Mayflies of the genera *Ephemerella*, *Epeorus*, *Stenonema*, and *Paraleptophlebia* often dominate the benthic macroinvertebrate community. In contrast to the low diversity of fish species, Coldwater Streams support the greatest diversity of aquatic and semi-aquatic salamanders in the state, including spring salamanders (*Gyrinophilus porphyriticus*), seal salamanders (*Desmognathus monticola*), and mountain dusky salamanders (*Desmognathus ochrophaeus*).

The quantity and quality of Coldwater Stream habitats have declined as a result of disturbance associated with agriculture and urban development. Although the historical extent of Coldwater Streams in Maryland is not known, these streams were likely more widespread in the past.



County Distribution: Allegany, Anne Arundel, Baltimore, Carroll, Cecil, Frederick, Garrett, Harford, Howard, Montgomery, Prince George’s, Washington

Places to Visit: Savage River State Forest, Big Run State Park, Gunpowder Falls State Park

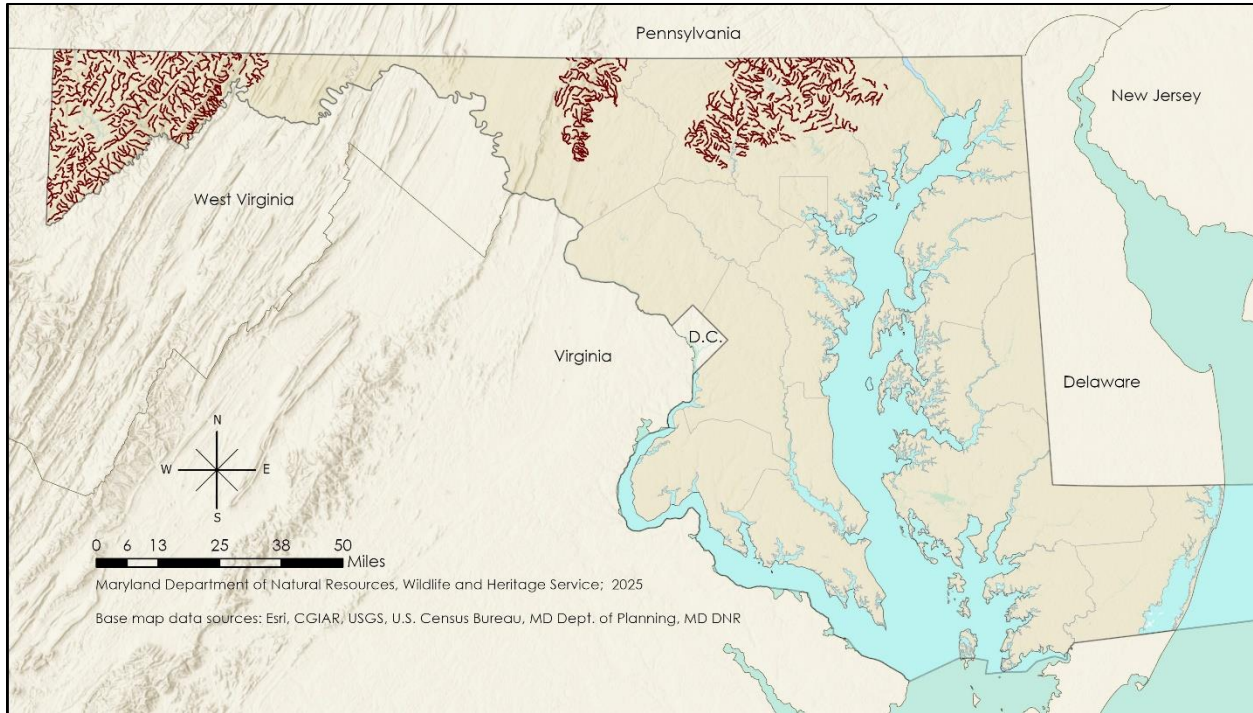


Figure 4.38 Location of Coldwater Streams in Maryland. Sources: Versar, Inc., USGS, and MD DNR.

Species of Greatest Conservation Need Associated with Coldwater Streams:

<u>Birds</u> Louisiana waterthrush	<u>Mammals</u> American mink Eastern red bat Eastern small-footed bat	<u>Insects (Aquatic Orders)</u> Dusky sallfly Lash springfly Lobed stone Pocahontas sallfly Shenandoah sallfly
<u>Amphibians</u> Eastern hellbender Longtail salamander Mountain dusky salamander Red salamander Seal salamander Spring salamander	Hoary bat Indiana bat Little brown bat Northern long-eared bat Silver-haired bat Southern water shrew Tricolored bat	<u>Insects (Odonata)</u> Harpoon clubtail Mustached clubtail Ski-tailed emerald Southern pygmy clubtail Spine-crowned clubtail Superb jewelwing Zebra clubtail
<u>Reptiles</u> Eastern ribbonsnake Queensnake Wood turtle	<u>Fish</u> Brook trout Mottled sculpin	
	<u>Invertebrates (Aquatic)</u> Rock crayfish	



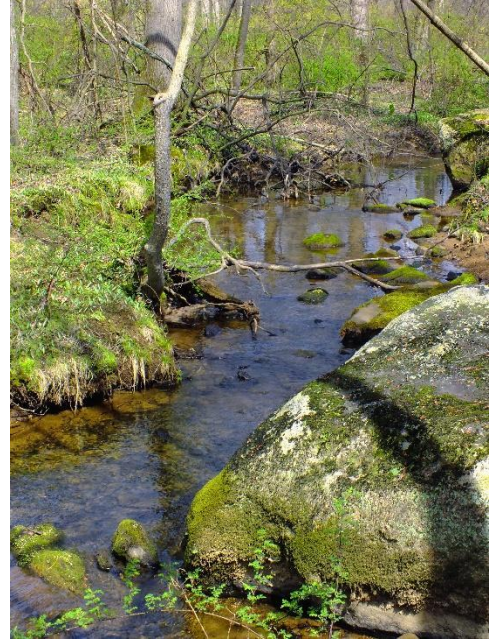
Limestone Stream

Region(s): Western

Habitat Group: Streams/Rivers

NEAFWA: Rivers & Streams

Limestone Streams are strongly influenced by the underlying geology of the Ridge and Valley physiographic province of Maryland, resulting in systems that are physically and chemically distinct from freestone (non-limestone) streams. Fractures, cracks, and channels are abundant in limestone, making springs and seeps common. This connectivity between groundwater and surface water serves to stabilize water pH and temperature. Submerged logs and tree roots are important features in Limestone Streams that shape channels and create pools and other slow-water areas beneficial to aquatic species. Logs and leaf litter form the base of the food web in these streams. Limestone Streams are also biologically unique. Plants, such as watercress (*Rorippa nasturtium-aquaticum*) and waterweed (*Elodea* spp.) are abundant, especially near spring sources and groundwater seeps. Fish and benthic macroinvertebrate communities tend to exhibit low diversity but maintain high abundance in response to the stable water chemistry. In certain areas, beaver activity along Limestone Streams may represent an important form of natural disturbance and create habitat heterogeneity. Beaver-impounded stream sections help reduce sediment and nutrient loads in downstream areas, create shifting mosaics of different forest successional stages, and provide habitat for a variety of wildlife Species of Greatest Conservation Need. Fish species common in Limestone Streams include checkered sculpin (*Cottus* n. sp.) and Allegheny pearl dace (*Margariscus margarita*). In contrast to the region's freestone streams, which are dominated by mayfly and stonefly taxa, the benthic macroinvertebrate communities of Limestone Streams tend to be dominated by crustaceans, like scuds and aquatic sow bugs.



Wikimedia Commons

The majority of Maryland's Limestone Streams are located in the Ridge and Valley physiographic province, a predominately agricultural area that is under increasing pressure from suburban development. Agricultural land-use practices have altered many of these streams by chemical and physical degradation.

County Distribution: Frederick, Washington

Places to Visit: Chesapeake and Ohio National Park at Antietam Creek, South Mountain State Park



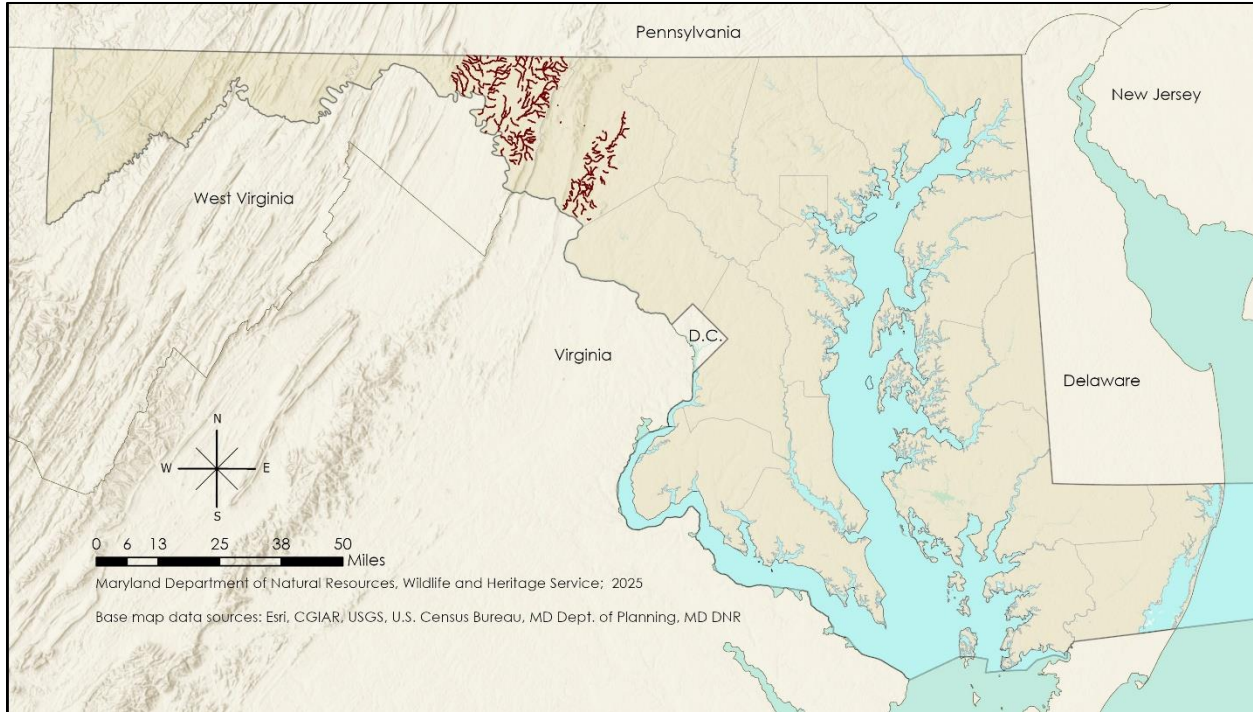


Figure 4.39 Location of Limestone Streams in Maryland. Sources: Versar, Inc., USGS, and MD DNR.

Species of Greatest Conservation Need Associated with Limestone Streams:

Birds

Louisiana waterthrush

Mammals

American mink
Eastern red bat
Eastern small-footed bat
Hoary bat
Indiana bat
Little brown bat
Northern long-eared bat
Silver-haired bat
Tricolored bat

Amphibians

Longtail salamander
Red salamander
Spring salamander

Reptiles

Eastern ribbonsnake
Queensnake
Wood turtle

Fish

Allegheny pearl dace
Checkered sculpin



Highland Stream

Region(s): Western

Habitat Group: Streams/Rivers

NEAFWA: Rivers & Streams

Highland Streams flow through several physiographic regions, including the Appalachian Plateau, Ridge and Valley, and Blue Ridge. They are typically high gradient systems (>4 %), ranging in elevation from 140 to 2,800 feet. Their substrate is dominated by gravel, cobble, and boulders interspersed with bedrock outcroppings. Many of these streams fall within the rain shadow of the



Paul Kayzak, MD DNR

Appalachians, and thus receive the lowest annual rainfall amounts in the state. Consequently, stream flow in the summer is often markedly reduced for many Highland Streams. In certain areas, beaver activity along Highland Streams may represent an important form of natural disturbance and create habitat heterogeneity. Beaver-impounded stream sections help reduce sediment and nutrient loads in downstream areas, create shifting mosaics of different forest successional stages, and provide habitat for a variety of wildlife Species of Greatest Conservation Need. Native fish species found in Highland Streams include mottled sculpin (*Cottus bairdii*), Potomac sculpin, silverjaw minnow, striped shiner (*Luxilus chrysocephalus*), and fantail darter. Stoneflies and mayflies often dominate the benthic macroinvertebrate community. Streamside trees and logs play an important role in shaping Highland Stream channels and banks, creating pools and slow-water areas beneficial to aquatic species. Logs and leaf litter are also a primary source of organic matter, forming the base of the food web in these streams.

County Distribution: Allegany, Frederick, Garrett, Washington

Places to Visit: Green Ridge State Forest



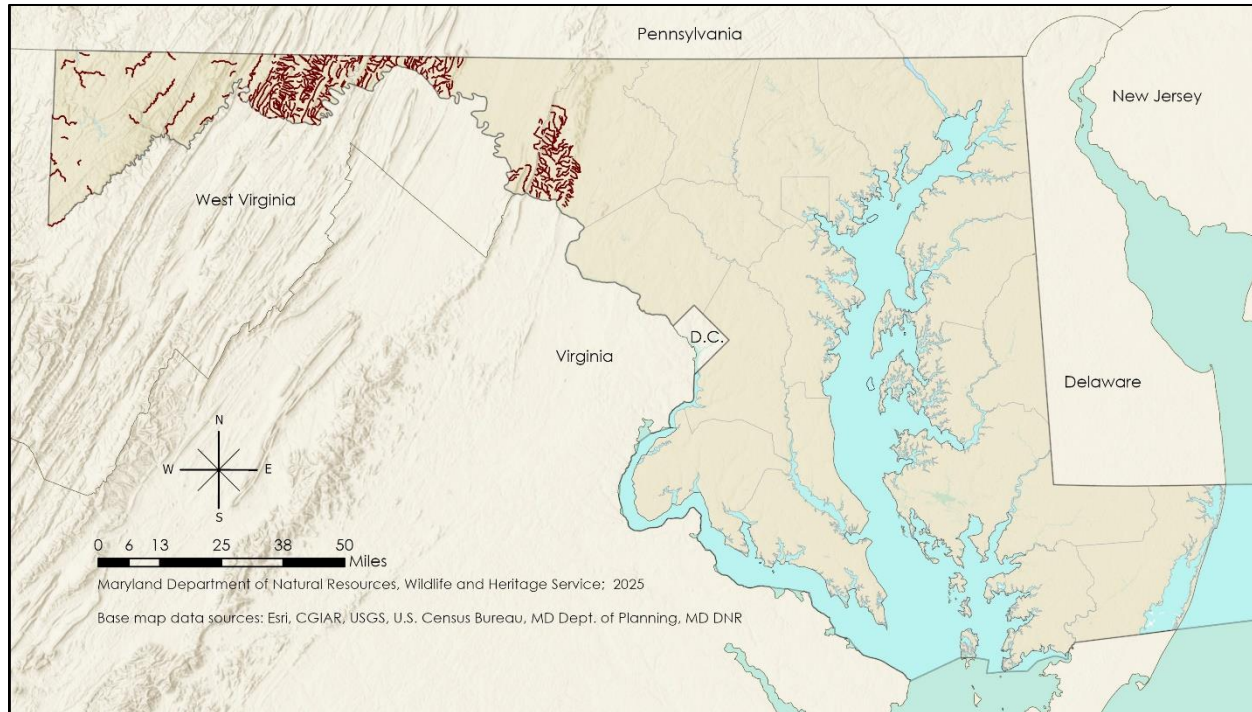


Figure 4.40 Location of Highland Streams in Maryland. Sources: Versar, Inc., USGS, and MD DNR.

Species of Greatest Conservation Need Associated with Highland Streams:

Birds

Louisiana waterthrush

Mammals

American mink
Eastern red bat
Eastern small-footed bat
Hoary bat
Indiana bat
Little brown bat
Northern long-eared bat
Silver-haired bat
Tricolored bat

Amphibians

Common mudpuppy
Eastern hellbender
Longtail salamander
Mountain dusky salamander
Red salamander
Seal salamander
Spring salamander

Reptiles

Eastern ribbonsnake
Queensnake
Wood turtle

Fish

Comely shiner
Johnny darter
Longnose sucker
Mottled sculpin
Stonecat
Striped shiner

Invertebrates (Aquatic)

Allegheny crayfish
Brook floater
Creeper
Green floater
Rock crayfish
Triangle floater

Insects (Coleoptera)

Appalachian tiger beetle

Insects (Odonata)

Appalachian jewelwing
Green-faced clubtail
Harpoon clubtail
Maine snaketail
Mustached clubtail
Rapids clubtail
Ski-tailed emerald
Southern pygmy clubtail
Spine-crowned clubtail
Splendid clubtail
Uhler's sundragon
Zebra clubtail



Piedmont Stream

Region(s): *Central*

Habitat Group: *Streams/Rivers*

NEAFWA: *Rivers & Streams*

Piedmont Streams, located from the western boundary of the Catoctin Mountains in Frederick County to the eastern border at the Fall Line, are among the most biologically productive systems in the state. The physical and chemical nature of Piedmont Streams is governed largely by the varying topography and geology of the Piedmont physiographic province. Streams along the eastern edge share similar physical characteristics with the neighboring Coastal Plain. Here, streams are typically low to moderate in gradient (1-2%) with silt, sand, and gravel substrates. High gradient streams west of the Fall Line are characterized by cobble-boulder substrates with bedrock outcrops. In certain areas, beaver activity along Piedmont Streams may represent an important form of natural disturbance and create habitat heterogeneity. Beaver-impounded stream sections help reduce sediment and nutrient loads in downstream areas, create shifting mosaics of different forest successional stages, and provide habitat for a variety of wildlife Species of Greatest Conservation Need.



Jay Kilian, MD DNR

Fish species commonly found in Piedmont Streams include American eel, tessellated darter, blacknose dace, Blue Ridge sculpin, common shiner, longnose dace, and bluntnose minnow. Streamside trees, roots, and submerged logs shape the stream channel and banks, creating pools, slow-water areas, and important cover habitat for a variety of aquatic species. Logs and leaf litter are also a primary source of organic matter, forming the base of the food web in these streams. River basins with Piedmont Streams draining into Chesapeake Bay include Susquehanna, Elk, Bush, Gunpowder, Patapsco, the upper portion of the Patuxent River, Middle Potomac, and the eastern portion of the Potomac-Washington Metro basins.

Maryland's Piedmont physiographic province has been the center of urban and suburban development in the state. Stream degradation associated with urbanization, including erosion, sedimentation, pollution, hydroperiod alterations (i.e., flashiness), and increased nutrients and temperatures, has reduced the biodiversity and ecological integrity of many Piedmont Streams.

County Distribution: Anne Arundel, Baltimore, Carroll, Cecil, Frederick, Harford, Howard, Montgomery, Prince George's

Places to Visit: Gunpowder State Park, Patapsco Valley State Park, Seneca Creek State Park



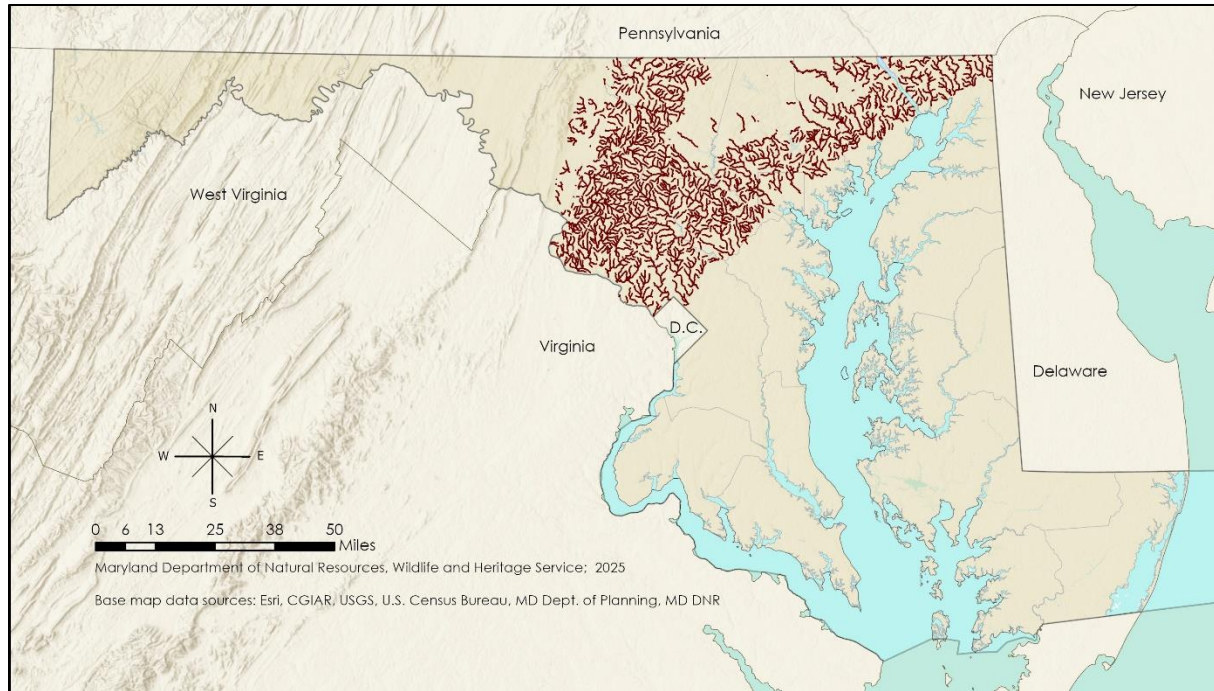


Figure 4.41 Location of Piedmont Streams in Maryland. Sources: Versar, Inc., USGS, and MD DNR.

Species of Greatest Conservation Need Associated with Piedmont Streams:

Birds

Louisiana waterthrush
Yellow-crowned night heron

Mammals

American mink
Eastern red bat
Hoary bat
Indiana bat
Little brown bat
Northern long-eared bat
Silver-haired bat
Tricolored bat

Amphibians

Longtail salamander
Red salamander
Spring salamander

Reptiles

Bog turtle
Eastern musk turtle
Eastern ribbonsnake
Queensnake
Spotted turtle
Wood turtle

Fish

Alewife
American shad
Blueback herring
Chesapeake logperch
Comely shiner
Hickory shad
Shield darter

Insects (Aquatic Orders)

Vernal springfly

Invertebrates (Aquatic)

Cambarus sp. C (formerly
acuminate crayfish)
Allegheny crayfish
Brook floater
Creeping
Green floater
Triangle floater
Yellow lance

Insects (Odonata)

Appalachian snaketail
Laura's clubtail
Royal river cruiser
Southern pygmy clubtail
Spine-crowned clubtail



Coastal Plain Stream

Region(s): Central, Eastern, Southern

Habitat Group: Streams/Rivers

NEAFWA: Rivers & Streams

Maryland's Coastal Plain Streams extend from the Fall Line eastward toward the Atlantic Ocean. These streams are typically low in gradient (<1%) and found at elevations of less than 50 feet above sea level. They represent the lower non-tidal and upper fresh tidal (salinity < 0.5 ppt) sections of larger stream and river systems, and form transition zones between upper non-tidal reaches and increasingly larger, saline tidal sections. Silt, sand, gravel, and small cobble are the dominant substrates. Most Coastal Plain Streams contain only runs, glides, and pools; however, gravel riffles are common in those streams draining the rolling hills on the western and upper eastern shore. Streams on the lower eastern shore are extremely sluggish with broad floodplains and braided channels. Since Coastal Plain Streams lack stable substrates such as bedrock and boulders, wood and submerged aquatic vegetation are important channel features. Submerged logs and tree roots slow the flow of nutrients and sediment, provide cover for fishes and stream insects, and control stream bank erosion. In certain areas, beaver activity along Coastal Plain Streams may represent an important form of natural disturbance and create habitat heterogeneity. Beaver-impounded stream sections help reduce sediment and nutrient loads in downstream areas, create shifting mosaics of different forest successional stages, and provide habitat for a variety of wildlife Species of Greatest Conservation Need.



MBSS, MD DNR

Eastern mudminnow, bluespotted sunfish, eastern creek chubsucker, and least brook lamprey are common Coastal Plain Stream fishes. These streams are also an important habitat for the American eel from the juvenile to adult stage. Sandy and gravel substrates of Coastal Plain Streams support a diverse community of freshwater mussels (*Unionidae*), many of which are listed as In Need of Conservation, Threatened, or Endangered in Maryland. Many of these riverine fish and mussel species are favorite prey items of river otter and muskrat. The Chester, Choptank, Nanticoke/Wicomico, Pocomoke, Lower Potomac, Patapsco, Gunpowder, Elk, Lower Susquehanna, Bush, Potomac-Washington Metro, West Chesapeake, and Patuxent River basins all contain Coastal Plain Streams.

County Distribution: Anne Arundel, Baltimore, Calvert, Caroline, Cecil, Charles, Harford, Howard, Kent, Prince George's, Queen Anne's, St. Mary's, Talbot

Places to Visit: Tuckahoe State Park, Millington Wildlife Management Area, Myrtle Grove Wildlife Management Area



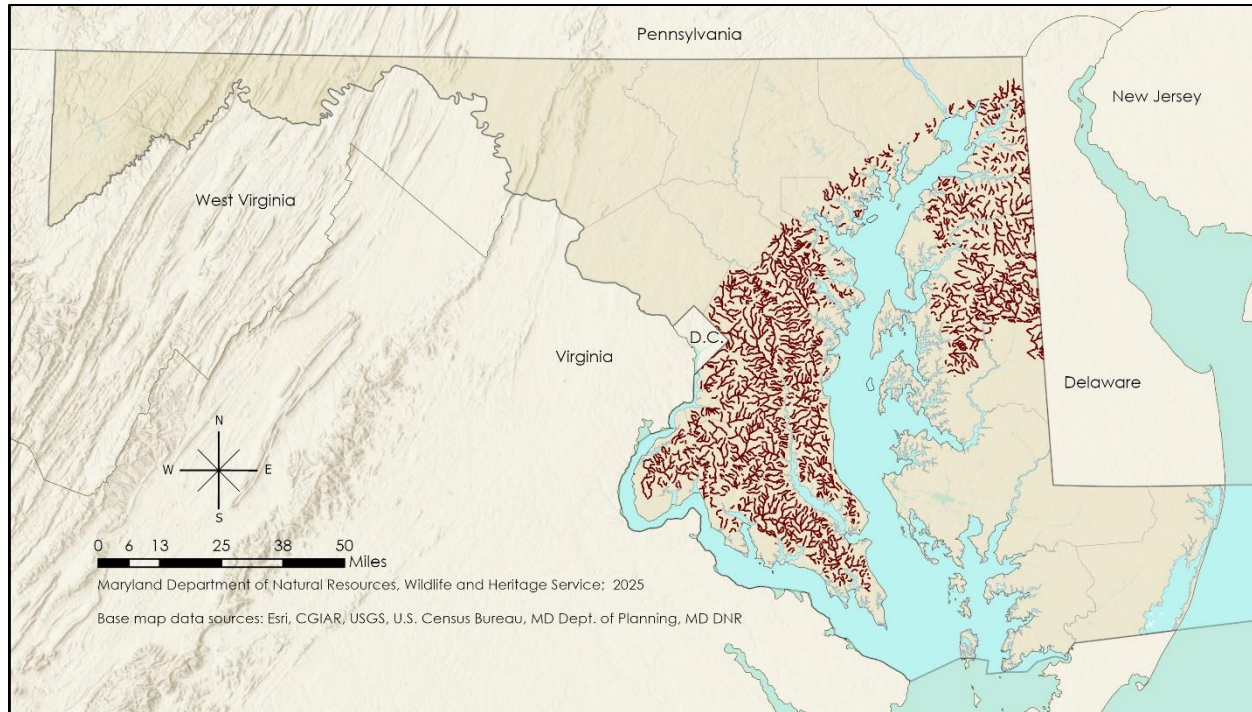


Figure 4.42 Location of Coastal Plain Streams in Maryland. Sources: Versar, Inc., USGS, and MD DNR.

Species of Greatest Conservation Need Associated with Coastal Plain Streams:

Birds

Great blue heron
Great egret
Louisiana waterthrush
Yellow-crowned night heron

Mammals

American mink
Eastern red bat
Hoary bat
Little brown bat
Silver-haired bat
Tricolored bat

Amphibians

Mud salamander
Red salamander

Reptiles

Eastern mud turtle
Eastern musk turtle
Eastern ribbonsnake
Plain-bellied watersnake
Queensnake
Rainbow snake
Spotted turtle
Striped mud turtle
Wood turtle

Fish

American brook lamprey
Bridle shiner
Chesapeake logperch
Comely shiner
Flier
Glassy darter
Ironcolor shiner
Mud sunfish
Shield darter
Stripeback darter
Swamp darter

Invertebrates (Aquatic)

Cambarus sp. C (formerly
acuminate crayfish)
Alewife floater
Creeper
Dwarf wedgemussel
Eastern lampmussel
Eastern pondmussel
Northern lance
Paper pondshell
Tidewater mucket
Triangle floater

Insects (Odonata)

Appalachian snaketail
Banded spiketail
Blackwater bluet
Coppery emerald
Laura's clubtail
Royal river cruiser
Selys' sundragon
Sparkling jewelwing
Uhler's sundragon



Blackwater Stream

Region(s): Central, Eastern, Southern

Habitat Group: Streams/Rivers

NEAFWA: Rivers & Streams

Blackwater Streams are sluggish, low gradient (<1%) systems predominantly located within the Pocomoke and Nanticoke/Wicomico basins of Maryland's Coastal Plain physiographic province. They are generally acidic, with pH levels less than 6, and dissolved organic carbon greater than 8 mg/L. In contrast to other streams, dissolved oxygen levels are low (< 5mg/L) due to increased bacterial respiration from the decomposition of organic matter. The substrate consists primarily of silt, sand, and organic matter, with minor and isolated amounts of small gravel. Because of the lack of a larger, more stable substrate, in-stream wood is of critical importance in defining hydrologic features and providing cover for the aquatic biota.



Jay Kilian, MD DNR

Biodiversity in Blackwater Streams is typically low and limited to only organisms that are tolerant of the naturally acidic conditions. In certain areas, beaver activity along Blackwater Streams may represent an important form of natural disturbance and create habitat heterogeneity. Beaver-impounded stream sections help reduce sediment and nutrient loads in downstream areas, create shifting mosaics of different forest successional stages, and provide habitat for a variety of wildlife Species of Greatest Conservation Need. Common fishes include eastern mudminnow, pirate perch, golden shiner, eastern creek chubsucker, tadpole madtom, and redbfin pickerel. The benthic macroinvertebrate community is dominated by dragonfly, amphipod, and isopod taxa.

County Distribution: Anne Arundel, Calvert, Caroline, Charles, Dorchester, Harford, Kent, Prince George's, Queen Anne's, Somerset, St. Mary's, Talbot, Wicomico, Worcester

Places to Visit: Pocomoke State Park, Zekiah Swamp Natural Environmental Area



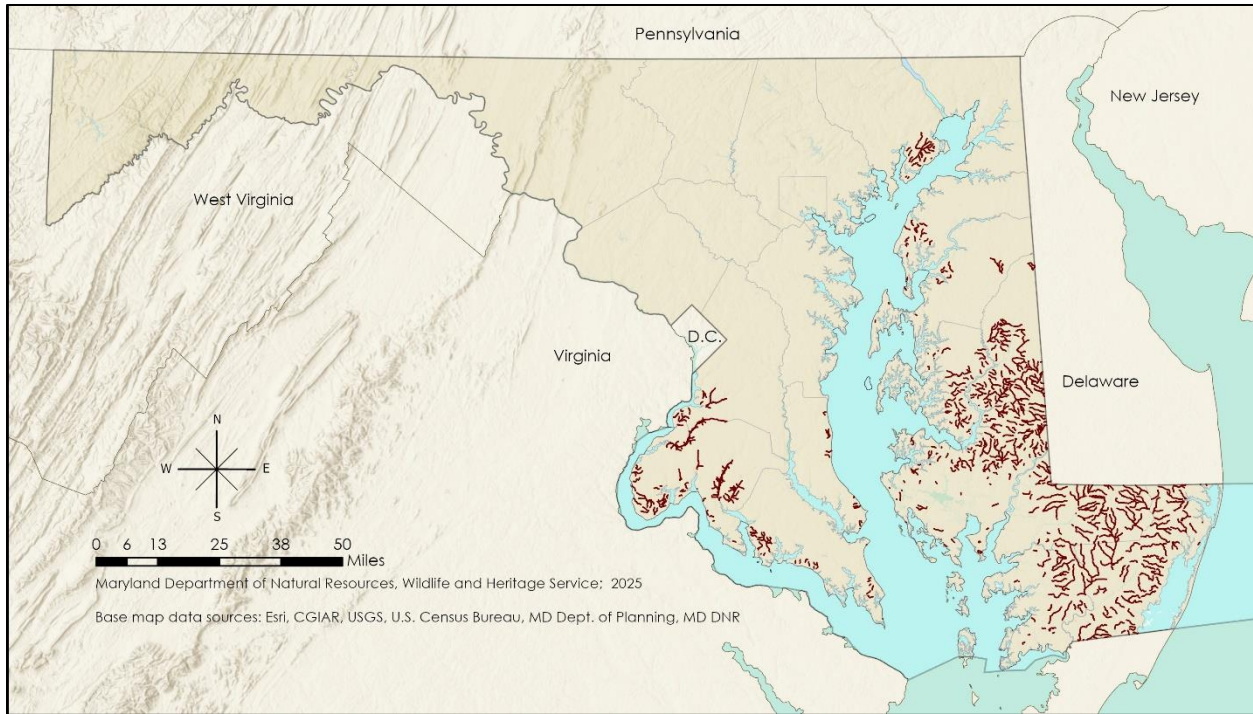


Figure 4.43 Location of Blackwater Streams in Maryland. Sources: Versar, Inc., USGS, and MD DNR.

Species of Greatest Conservation Need Associated with Blackwater Streams:

Birds

Great blue heron
Great egret
Louisiana waterthrush

Mammals

American mink
Eastern red bat
Hoary bat
Silver-haired bat
Tricolored bat

Amphibians

Mud salamander

Reptiles

Eastern mud turtle
Eastern ribbonsnake
Plain-bellied watersnake
Queensnake
Spotted turtle
Striped mud turtle

Fish

Banded sunfish
Blackbanded sunfish
Flier
Ironcolor shiner
Mud sunfish
Swamp darter

Invertebrates (Aquatic)

Alewife floater
Eastern lampmussel
Northern lance

Insects (Odonata)

Blackwater bluet
Coppery emerald
Royal river cruiser
Selys' sundragon
Sparkling jewelwing



Highland River

Region(s): Western

Habitat Group: Streams/Rivers

NEAFWA: Rivers & Streams

Large Highland Rivers in Maryland are located in the western portion of the state in the Youghiogheny and Potomac River basins. Highland Rivers consist of riffle/run and pool habitat sequences with substrate ranging from large boulders to sand and silt. The energy base for these

systems includes large woody debris and leaf litter, as well as primary production by periphyton, phytoplankton, and aquatic macrophytes. These large river systems support a diversity of game fish species including smallmouth bass, chain pickerel, and walleye. Several gamefish species (tiger muskellunge, walleye, brown trout, and rainbow trout) are stocked in Highland Rivers. Nongame species common in these systems include redbreast sunfish, rock bass, Potomac sculpin, northern hogsucker, and margined madtom.



James McCann, MD DNR

Degradation and loss of species associated with highland and coldwater tributaries have ultimately affected the downstream conditions of Maryland's Highland River habitats. Highland Rivers serve as receiving waters for effluents from industrial sources and municipal sewage treatment plants. The damming of Highland Rivers for drinking water reservoirs and hydroelectric power generation has altered these habitats considerably, often reducing available habitats for many fish and mussel Species of Greatest Conservation Need.

County Distribution: Allegany, Frederick, Garrett, Washington

Places to Visit: Potomac State Forest, Green Ridge State Forest, Sideling Hill Wildlife Management Area, Swallow Falls State Park



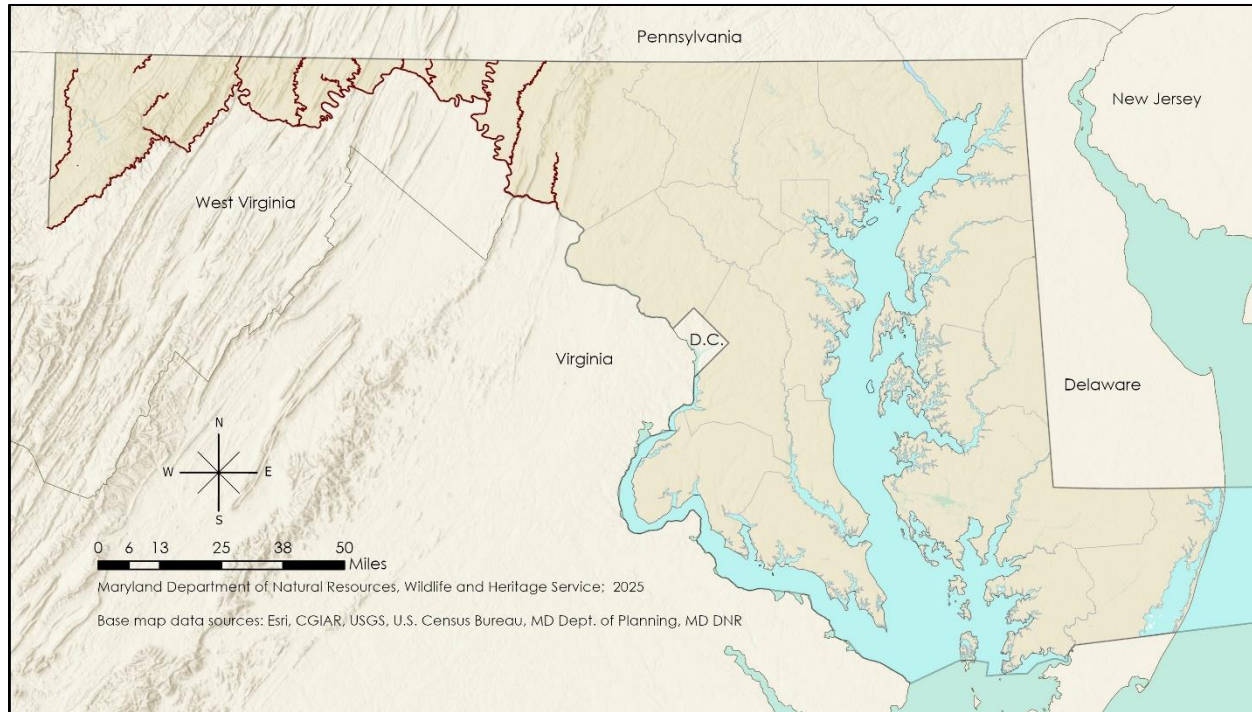


Figure 4.44 Location of Highland Rivers in Maryland. Sources: Versar, Inc., USGS, and MD DNR.

Species of Greatest Conservation Need Associated with Highland Rivers:

Birds

Bald eagle
Great blue heron
Great egret
Louisiana waterthrush
Spotted sandpiper

Mammals

American mink
Eastern red bat
Eastern small-footed bat
Hoary bat
Indiana bat
Little brown bat
Northern long-eared bat
Silver-haired bat
Tricolored bat

Amphibians

Common mudpuppy
Eastern hellbender

Reptiles

Eastern spiny softshell
Queensnake
Wood turtle

Fish

Johnny darter
Longnose sucker
Stonecat
Striped shiner

Invertebrates (Aquatic)

Allegheny crayfish
Brook floater
Creeper
Eastern lampmussel
Green floater
Paper pondshell
Triangle floater
Yellow lampmussel

Insects (Coleoptera)

Appalachian tiger beetle
Potomac firefly

Insects (Odonata)

Appalachian jewelwing
Green-faced clubtail
Maine snaketail
Midland clubtail
Pygmy snaketail
Rapids clubtail
Royal river cruiser
Rusty snaketail
Spine-crowned clubtail
Splendid clubtail
St. Croix snaketail



Piedmont River

Region(s): Central

Habitat Group: Streams/Rivers

NEAFWA: Rivers & Streams

Large rivers of the Piedmont physiographic province represent transitional habitats between headwater streams and tidal portions of Chesapeake Bay. Physically, Piedmont Rivers consist of large riffle/run and pool sequences with substrate ranging from large boulders to sand and silt. As transition zones between upland habitats and lowlands of the Coastal Plain,

Piedmont Rivers are home to a diverse aquatic fauna, often consisting of a mixture of Piedmont and lowland species. Chemical, physical, and hydrologic stability typical of large Piedmont Rivers also contributes to high species diversity.



Jay Kilian, MD DNR

Fish species common to Piedmont Rivers include American eel, river chub, spottail shiner, common shiner, white sucker, pumpkinseed, redbreast sunfish, bluegill, rock bass, quillback, margined madtom, and channel catfish. Popular game fishes include smallmouth bass and largemouth bass. Piedmont Rivers provide spawning habitat for many migratory fish species of the Chesapeake Bay such as blueback herring (*Alosa aestivalis*), alewife (*Alosa pseudoharengus*), white perch, yellow perch, striped bass, and several species of shad. Piedmont Rivers also serve as wintering habitats for migratory waterfowl. Although logs and leaf litter still play a large role in the food base of these systems, open tree canopies allow for the growth of periphyton, phytoplankton, and aquatic macrophytes, providing additional sources of energy to the food chain. Connectivity between river channels and the adjacent floodplain is important for the movement and exchange of organic matter in these systems. Floodplains also provide refuge for aquatic species during periods of high flows. Piedmont River habitat can be found in portions of the Susquehanna, Gunpowder, and Patapsco Rivers, the upper portion of the Patuxent River, and the eastern portion of the Potomac-Washington Metro, and Middle Potomac basins.

Piedmont Rivers are often located in highly urbanized portions of Maryland. Stressors associated with urbanization have negative effects on these habitats. Combined sewer overflows designed to carry domestic, commercial, and industrial wastewater often deliver untreated sewage to Piedmont Rivers during storm flows. These outflows can reduce the biological health of these habitats. As with Highland Rivers, Piedmont Rivers have also been impounded for drinking water reservoirs and for hydroelectric power generation. Impoundments have reduced the available habitat for several fish and mussel Species of Greatest Conservation Need and also reduced upstream access to spawning grounds by many migratory fishes. Furthermore, the degradation of upstream Piedmont and Coldwater Streams within the greater watershed areas has negatively affected downstream Piedmont Rivers.

County Distribution: Baltimore, Carroll, Cecil, Frederick, Harford, Howard, Montgomery



Places to Visit: Patapsco Valley State Park, Gunpowder Falls State Park, Susquehanna State Park

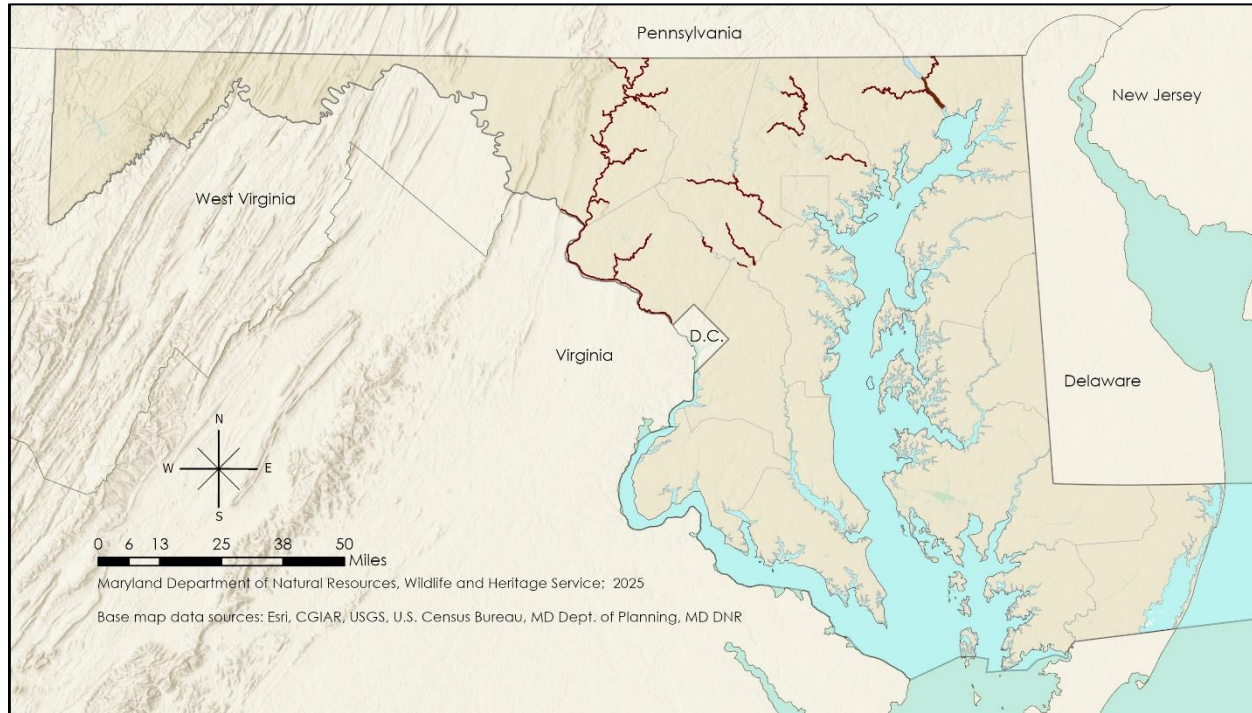


Figure 4.45 Location of Piedmont Rivers in Maryland. Sources: Versar, Inc., USGS, and MD DNR.

Species of Greatest Conservation Need Associated with Piedmont Rivers:

Birds

Bald eagle
Great blue heron
Great egret
Horned grebe
Louisiana waterthrush
Pied-billed grebe
Spotted sandpiper
Yellow-crowned night heron

Mammals

American mink
Eastern red bat
Hoary bat
Indiana bat
Little brown bat
Northern long-eared bat
Silver-haired bat
Tricolored bat

Amphibians

Eastern hellbender

Reptiles

Northern map turtle
Queensnake
Wood turtle

Fish

Alewife
American shad
Blueback herring
Chesapeake logperch
Comely shiner
Hickory shad
Shield darter

Invertebrates (Aquatic)

Alewife floater
Allegheny crayfish
Brook floater
Creepers
Eastern lampmussel

Invertebrates (Aquatic, continued)

Green floater
Paper pondshell
Tidewater mucket
Triangle floater
Yellow lampmussel
Yellow lance

Insects (Aquatic Orders)

Vernal springfly

Insects (Odonata)

Appalachian snaketail
Green-faced clubtail
Laura's clubtail
Midland clubtail
Rapids clubtail
Royal river cruiser
Rusty snaketail
Spine-crowned clubtail
St. Croix snaketail



Coastal Plain River

Region(s): Central, Eastern, Southern

Habitat Group: Streams/Rivers

NEAFWA: Rivers & Streams

Coastal Plain Rivers are low-gradient, slow-flowing rivers (typically fifth order and larger) in the Lower and Upper Coastal Plain physiographic provinces. They represent the lower non-tidal and upper fresh tidal (salinity < 0.5 ppt) sections of larger river systems, and form transition zones between upper non-tidal river sections and increasingly larger, saline tidal sections that eventually flow into and form part of the Chesapeake Bay. Coastal Plain Rivers consist of predominantly pool/glide habitat with sand and silt substrates. Large woody debris is a prominent element in structuring pool habitat and serves as an important source of coarse organic matter to riverine food webs. Open tree canopies allow for the growth of microorganisms (e.g., periphyton, phytoplankton) as well as aquatic plants, which serve as primary producers within these habitats. Connectivity between river channels and the adjacent floodplain is important for the movement and exchange of organic matter in Coastal Plain River systems. Floodplains provide refugia for aquatic species during periods of high flows and for prey species from main channel fish predators. The extensive pool habitat common in Coastal Plain Rivers is home to many large predator fish species, typically uncommon in headwater Coastal Plain Streams.



Jason Harrison, MD DNR

Fish species common to Coastal Plain Rivers include American eel, pumpkinseed, redbreast sunfish, bluegill, shorthead redhorse, quillback, longnose gar, and warmouth. Popular game fishes in these rivers include largemouth bass, chain pickerel, and black crappie. Coastal Plain Rivers also provide spawning habitat for many migratory fish species of Chesapeake Bay, such as Atlantic sturgeon (*Acipenser oxyrinchus*), striped bass, blueback herring (*Alosa aestivalis*), alewife (*Alosa pseudoharengus*), white perch, yellow perch, American shad (*Alosa sapidissima*), and hickory shad (*Alosa mediocris*). Sand and gravel substrates of Coastal Plain Rivers support a diverse community of freshwater mussels (*Unionidae*), many of which are listed as In Need of Conservation, Threatened, or Endangered in Maryland. Many of these riverine fish and mussel species are favorite prey items of river otter and muskrat. Coastal Plain Rivers also serve as wintering habitats for migratory waterfowl. Coastal Plain River habitats can be found in portions of the Chester, Choptank, Nanticoke, Lower Potomac, Patapsco, Patuxent, Pocomoke, Potomac-Washington Metro, and Wicomico river basins.

Degradation and loss of species associated with Coastal Plain and Blackwater Stream tributaries upstream have ultimately affected the downstream conditions of Maryland's Coastal Plain River habitats. Maryland Coastal Plain Rivers also tend to be located in predominantly agriculturally focused watersheds, meaning that nutrient enrichment and sedimentation associated with agricultural land-use practices have reduced habitat quality and quantity available to many fish



and mussel Species of Greatest Conservation Need. Stream blockages have also reduced upstream access to spawning habitats for migratory fishes.

County Distribution: Anne Arundel, Baltimore, Calvert, Caroline, Cecil, Charles, Dorchester, Harford, Kent, Prince George’s, Queen Anne’s, Somerset, St. Mary’s, Talbot, Wicomico, Worcester

Places to Visit: Tuckahoe State Park, Idylwild Wildlife Management Area, Pocomoke State Park

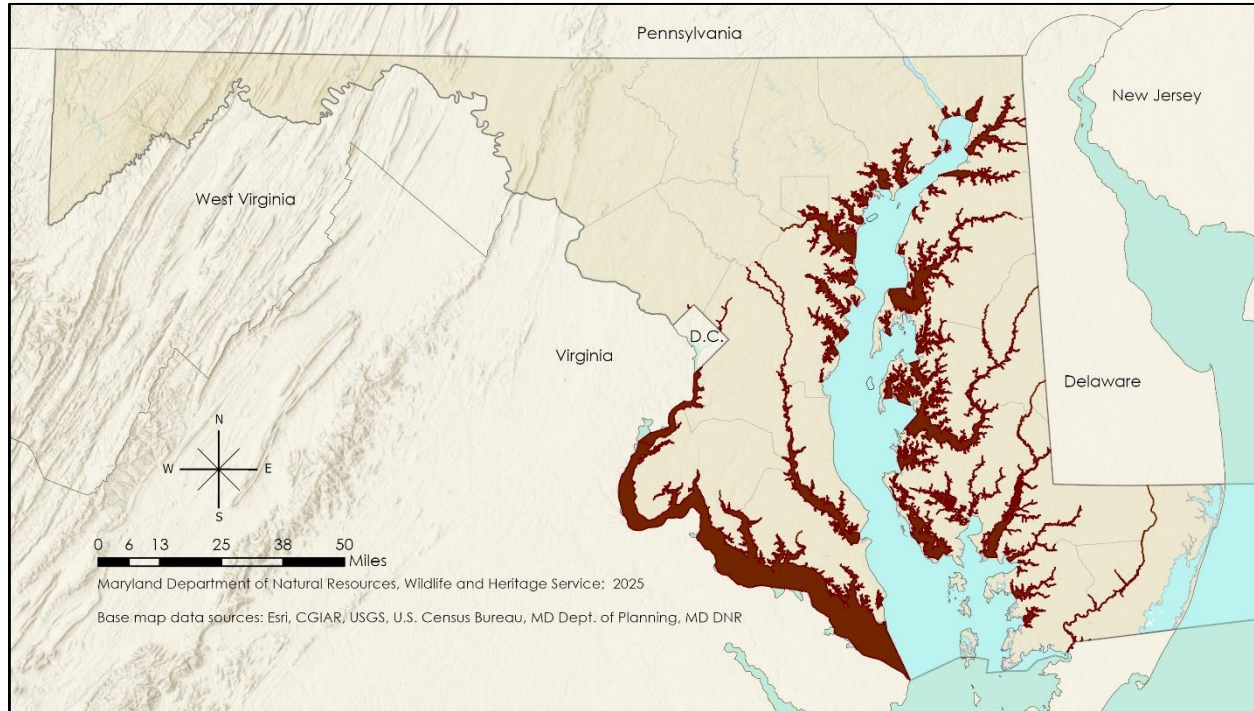


Figure 4.46 Location of Coastal Plain Rivers in Maryland. Sources: Versar, Inc., USGS, and MD DNR.

Species of Greatest Conservation Need Associated with Coastal Plain Rivers:

<u>Birds</u>	<u>Mammals</u>	<u>Invertebrates (Aquatic)</u>
American black duck	American mink	Alewife floater
Bald eagle	Bottlenose dolphin	Creeper
Bank swallow	Eastern red bat	Eastern lampmussel
Black scoter	Hoary bat	Eastern pondmussel
Blue-winged teal	Little brown bat	Northern lance
Canvasback	Silver-haired bat	Paper pondshell
Common goldeneye	Tricolored bat	Tidewater mucket
Common loon		Triangle floater
Forster's tern		Yellow lampmussel
Gadwall		Yellow lance
Great blue heron		
Great egret		
Greater scaup		
	<u>Reptiles</u>	<u>Insects (Odonata)</u>
	Green sea turtle	Appalachian snaketail
	Kemp's ridley sea turtle	
	Leatherback sea turtle	
	Loggerhead sea turtle	



Horned grebe
Laughing gull
Least tern
Lesser scaup
Long-tailed duck
Louisiana waterthrush
Pied-billed grebe
Red-throated loon
Redhead
Spotted sandpiper
Surf scoter
White-winged scoter

Diamond-backed terrapin
Northern map turtle
Plain-bellied watersnake
Queensnake
Rainbow snake
Wood turtle

Coppery emerald
Laura's clubtail
Royal river cruiser

Fish

Alewife
American shad
Atlantic sturgeon
Blueback herring
Bridle shiner
Chesapeake logperch
Flier
Glassy darter
Hickory shad
Shortnose sturgeon
Swamp darter



Bay and Ocean

Chesapeake Bay

Region(s): Central, Eastern, Southern

Habitat Group: Bay/Ocean

NEAFWA: Estuaries

The Chesapeake Bay drainage area extends into six states: Maryland, Virginia, West Virginia, Pennsylvania, Delaware, and New York, making it the largest estuary in the country. An estuary is a partly enclosed waterbody where freshwater from rivers mixes with saline water from the ocean, forming brackish water of 0.5-25 parts per thousand (ppt).

This dynamic, highly productive ecosystem is affected by changes in freshwater input, tides, winds, and sub-surface currents that create variable salinity, temperature, water clarity, nutrient availability, and oxygen concentration. The Chesapeake Bay plays a vital role in the cycling and movement of nutrients between its tributaries, the Bay itself, and the Atlantic Ocean. The phytoplankton and zooplankton that subsist on these nutrients are important food sources for fish and other aquatic organisms, which themselves become food for larger fish, seabirds, ducks, marine mammals, and turtles. Critical sub-habitats that play an important role in the estuary include:



SAV in the Chesapeake Bay (Peter McGowan, USFWS)

Shellfish Beds

Bivalve mollusks such as oysters, razor clams, and hard clams aggregate in large numbers to form beds that provide critical habitat for a wide array of organisms. Shellfish beds, such as oyster reefs, create vertical heterogeneous structure on otherwise featureless soft bottom areas of Chesapeake Bay. This structure is important for barnacles, anemones, sea squirts, sponges, sea stars, tube-building worms, snails, crabs, and many other invertebrates. Cracks and crevices formed by shellfish beds provide refuge for small, reclusive fishes like gobies and blennies as well as juvenile fishes of many species. The plethora of organisms associated with shellfish beds attracts larger fishes and other predators. Shellfish beds also provide important ecological services by assimilating nutrients and carbon, improving water quality, and reducing suspended sediments.

Submerged Aquatic Vegetation (SAV)

SAV refers to the underwater flowering plants that flourish in the shallow waters of the Chesapeake and Coastal Bays and their tidal tributaries. These rooted vascular plants form large beds in waters below the mean low-tide line to depths of around 10 feet. SAV, also known as seagrass, serves a vital ecological role in estuaries, absorbing nutrients and increasing oxygen concentrations in surrounding waters. Dense SAV beds also slow currents, reduce wave action, stabilize sediments, and reduce shoreline erosion. The vertical structure created by the stems and leaves within these dense beds provides substrate and a rich food supply for isopods and other invertebrates. These submerged



aquatic plants are also a bountiful food source on which many species of migratory waterfowl depend; geese and ducks rely on the grasses, as well as the tubers, as a primary food source. Even decaying SAV plant matter can be an important food source for other animals such as amphipods, shrimp, and other detritivores. SAV beds also serve as critical habitat for blue crabs, especially during the molting process, and provide cover and habitat for a rich diversity of smaller fish and foraging grounds for larger fish.

Salinity is an important determinant of the distribution of estuarine aquatic organisms. Aquatic community composition gradually changes from freshwater species, in the low salinity tidal-fresh areas at the northern end of the Chesapeake, towards marine species, in the higher salinity areas closer to Virginia at the mouth of the Chesapeake. Some species, however, are found in both. The spawning and nursery areas of these anadromous fish, including American shad (*Alosa sapidissima*) and Atlantic sturgeon (*Acipenser oxyrinchus*), are located in tidal-fresh areas; for some species (e.g., hickory shad [*Alosa mediocris*]), they even extend into non-tidal streams. As these spawning and nursery areas are sensitive to suburban and urban development, rural watersheds tend to provide better habitat.

Temperature is also a major driver of important biological functions including metabolism, migration, reproduction, and feeding. Increasing temperatures over the past several decades have shifted anadromous fish spawning to earlier in the year. As a result, eggs and larvae are subject to more volatile weather conditions during the winter–spring transition. Furthermore, increasing summer temperatures have made shallower waters less suitable, both in extent and duration, during warmer months. Due in part to this outsized threat facing shallow water habitats, organizations like the Chesapeake Bay Program have recently highlighted these shallower waters of the Bay as a conservation focus area. Efforts are underway to assess these habitat areas and the populations they support—particularly fish—in order to determine the scale and scope of needed conservation and restoration work.

Excessive nutrient pollution (especially nitrogen and phosphorus) has reduced the quality of the Chesapeake Bay’s waters in recent decades. Large expanses of the deep waters of the Chesapeake Bay often become devoid of life-giving oxygen during summer months and some subestuaries exhibit depleted oxygen even at shallower depths. Low oxygen can form “dead zones” and make Bay waters uninhabitable to most subsurface and benthic aquatic species. Improvements in sewage treatment plants, stormwater retention, and reduction of impervious surfaces and runoff of fertilizers have been a major focus of Chesapeake Bay cleanup efforts.

County Distribution: Anne Arundel, Baltimore, Baltimore City, Calvert, Caroline, Cecil, Charles, Dorchester, Harford, Kent, Queen Anne’s, Prince George’s, Somerset, St. Mary’s, Talbot, Wicomico, Worcester

Places to Visit: Sandy Point State Park, Point Lookout State Park, Chesapeake Bay



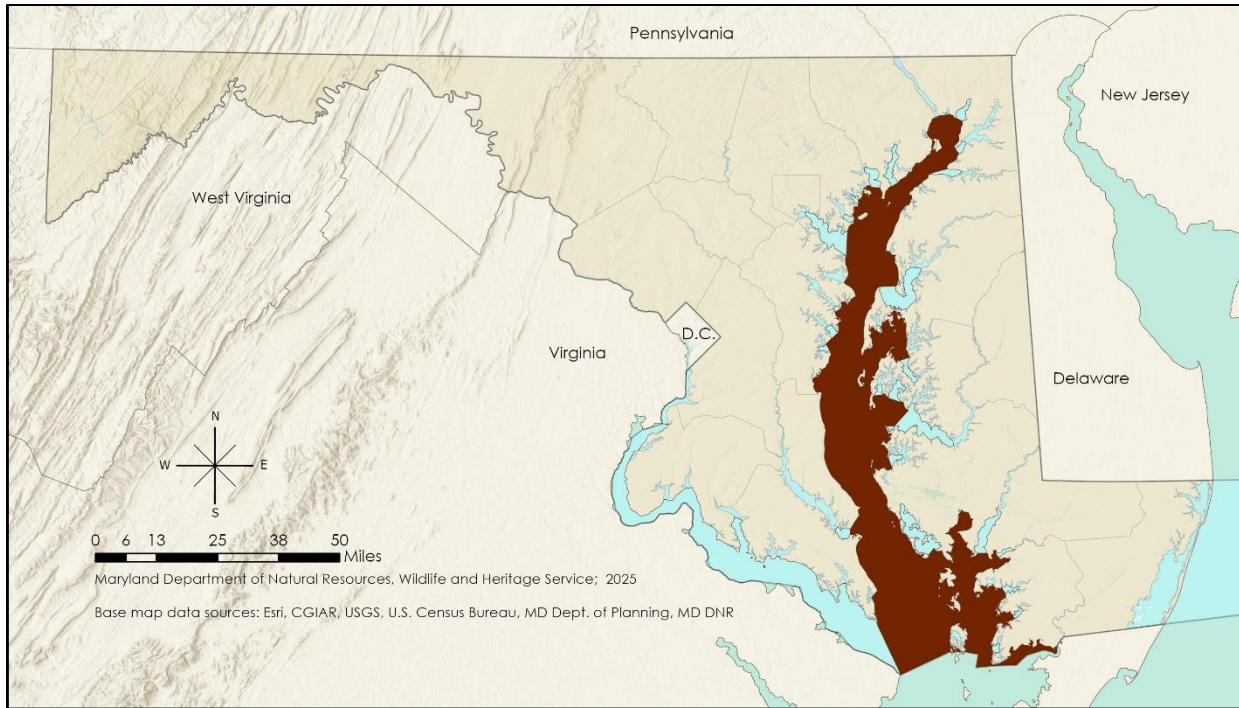


Figure 4.47 Location of Chesapeake Bay in Maryland. Sources: MD DNR and CBP.

Species of Greatest Conservation Need Associated with the Chesapeake Bay:

Birds

American black duck
Bald eagle
Black scoter
Black skimmer
Black-legged kittiwake
Brown pelican
Canvasback
Common goldeneye
Common loon
Gadwall
Greater scaup
Horned grebe
Lesser scaup
Long-tailed duck
Northern gannet

Birds (continued)

Pied-billed grebe
Red phalarope
Red-necked phalarope
Red-throated loon
Redhead
Surf scoter
White-winged scoter

Reptiles

Green sea turtle
Kemp's ridley sea turtle
Leatherback sea turtle
Loggerhead sea turtle
Diamond-backed terrapin
Northern map turtle

Mammals

Bottlenose dolphin
West Indian manatee

Fish

Alewife
American shad
Atlantic sturgeon
Blueback herring
Hickory shad
Shortnose sturgeon

Invertebrates (Aquatic)

Horseshoe crab



Coastal Bays

Region(s): Eastern

Habitat Group: Bay/Ocean

NEAFWA: Estuaries

There are a total of five Coastal Bays in Maryland. From north to south, they are: Assawoman, Isle of Wight, Sinepuxent, Newport, and Chincoteague. Although they are all narrowly separated from the Atlantic Ocean by Fenwick and Assateague Islands, the Ocean City and Chincoteague Inlets provide oceanic influences on these bays. Generally higher than within the lower Chesapeake Bay, salinity within the Coastal Bays often exceeds 20-30 parts per thousand (ppt), which is closer to the Atlantic Ocean salinity, around 35 ppt.



Chincoteague Bay (Angel Willey, MD DNR)

Covering approximately 363 square kilometers (140 square miles), these bays and associated tributaries average only 0.9 meters (3 feet) in depth and are influenced by a watershed of 453 square kilometers (175 square miles). The surrounding land varies in use and population density. To the east, Fenwick Island is heavily developed, whereas Assateague Island has been left in a much more natural state thanks to protection from Assateague State Park and Assateague Island National Seashore. The mainland varies as well, being much more urbanized to the north, rural to the south, and moderately developed between.

Coastal Bays provide vital habitat for various fishes, invertebrates, marine mammals, birds, and turtles. This is partially because, though shallow and relatively small, Coastal Bays contain many sub-habitats that support a wide variety of plants and animals. These include:

Submerged Aquatic Vegetation (SAV)

Two species of SAV are found in Maryland's Coastal Bays: eelgrass (*Zostera marina*) and widgeon grass (*Ruppia maritima*). SAV beds used to be found in all of the Bays, though they are currently limited to the Bays south of the Ocean City Inlet. They provide shelter and food for a variety of fishes, other vertebrates (e.g., turtles), and invertebrates. See the Chesapeake Bay Key Wildlife Habitat for more information.

Macroalgae

Over 20 genera of macroalgae have been documented in the Coastal Bays, including species found in Chlorophyta (green), Phaeophyta (brown), Rhodophyta (red), and Xanthophyta (yellow-green). Macroalgae are considered good food and shelter habitat for many species, though it can be a detriment at times. Too much macroalgae can smother SAV and reduce dissolved oxygen during its decomposition.

Small Islands

Though they are considered a separate Key Wildlife Habitat (see the Small Coastal Plain Islands section), islands are difficult to fully separate from the Coastal Bays due to their abundance within the Bays. The remaining islands within the Bays provide vital, fast-



disappearing nesting ground for colonial waterbirds, many of which are growing increasingly rare due in part to this decline in suitable habitat. Horseshoe crabs (*Limulus polyphemus*) also rely heavily upon these islands for spawning grounds, and diamond-backed terrapins (*Malaclemys terrapin*) use them for nesting as well.

County Distribution: Worcester

Places to Visit: Assateague State Park, Assateague Island National Seashore

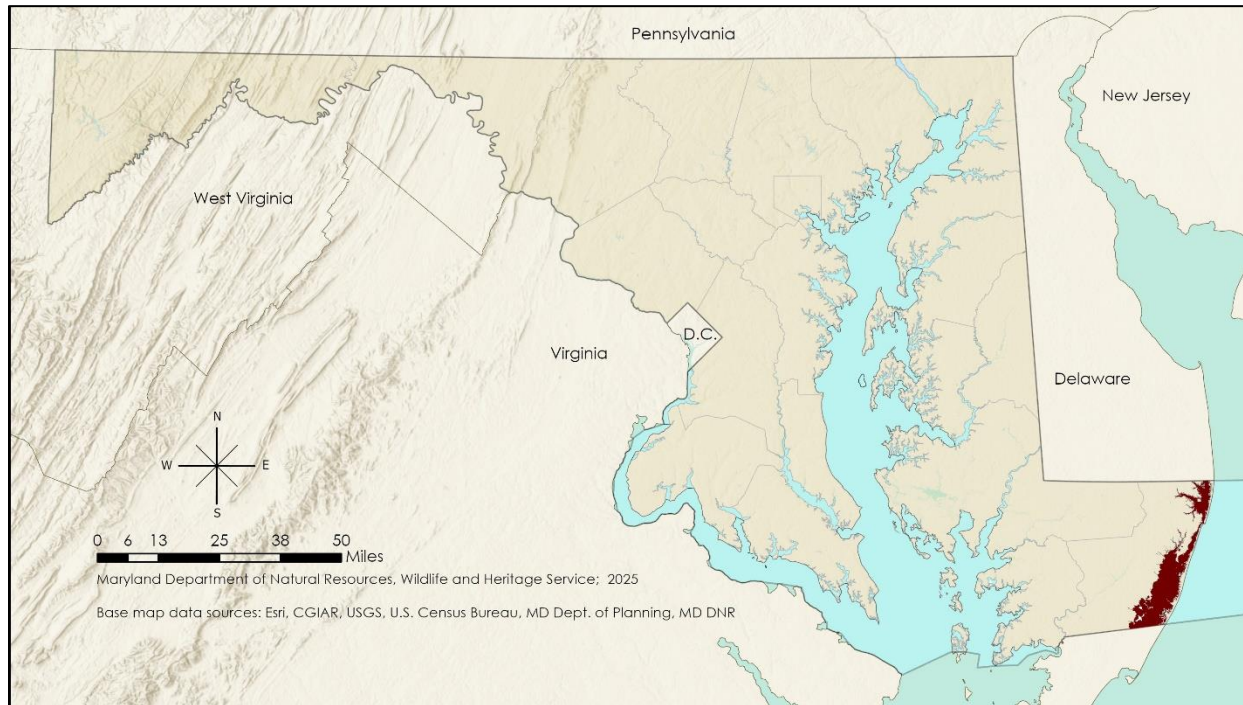


Figure 4.48 Location of Coastal Bays in Maryland. Sources: Versar, Inc., USGS, and MD DNR.

Species of Greatest Conservation Need Associated with Coastal Bays:

Birds

American black duck
Bald eagle
Black scoter
Black skimmer
Black-legged kittiwake
Brant
Brown pelican
Canvasback
Common goldeneye
Common loon
Gadwall
Greater scaup
Horned grebe
Lesser scaup

Birds (continued)

Long-tailed duck
Pied-billed grebe
Red phalarope
Red-necked phalarope
Red-throated loon
Redhead
Surf scoter
White-winged scoter

Mammals

Bottlenose dolphin
West Indian manatee

Reptiles

Green sea turtle
Kemp's ridley sea turtle
Leatherback sea turtle
Loggerhead sea turtle
Diamond-backed terrapin

Fish

Alewife
Blueback herring

Invertebrates (Aquatic)

Horseshoe crab



Atlantic Ocean

Region(s): Eastern

Habitat Group: Bay/Ocean

NEAFWA: Marine Nearshore;
Marine Offshore & Oceanic

The Atlantic Ocean off the coast of Maryland contains a variety of important marine sub-habitats including benthic, canyons, corals, nearshore, and pelagic. The chemical and physical properties (e.g., temperature, salinity, dissolved oxygen, pH, and suspended sediments) of open water affect the distribution and abundance of aquatic species.

Changes in ocean temperatures and resulting shifts in weather and currents have impacted the distribution of marine animals in recent decades. Expanded use of our oceans for transport, renewable energy, tourism, and fisheries has resulted in an increased need for regional ocean planning to improve understanding of how resources and places are used, managed, and conserved. Emerging concerns about ocean acidification, microplastic transport, and other contaminants such as Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS) have been the focus of recent research.



Jason Harrison, MD DNR

These sub-habitats, in general order of distance from shore (closest coming first), are as follows:

Nearshore

Nearshore oceanic habitat encompasses the part of the ocean closest to the coast. The nearshore sea bottom consists of sandy substrate with shoals, sand ridges, and slews. It is dynamic in nature due to waves breaking on the sand bars and surf zone. Various species of bony fishes, sharks, marine mammals, and sea turtles frequent this area just off the coast of Maryland.

Corals

While Maryland isn't known for extensive coral reefs like those found in tropical regions, coral gardens are indeed found off the coast of Ocean City. These are considered artificial reefs created by sinking materials like ships, concrete rubble, and other objects to provide habitat for marine life. These reefs are then colonized by fouling animals like barnacles, mussels, and coral, creating a living reef ecosystem that supports a variety of marine life.

Benthic

Benthic habitat refers to the bottom of the ocean. The benthic habitat off the coast of Maryland is a dynamic environment with a mixture of sandy and silty sediments. It supports a diverse array of bottom-dwelling organisms that play a crucial role in the coastal ecosystem. The specific kinds of benthic organisms present can vary depending on factors like depth, sediment type, water temperature, and salinity. One such organism is the horseshoe crab (*Limulus polyphemus*), which requires a healthy benthic zone in order to thrive.



Pelagic

Open water is also known as the pelagic zone, the largest habitat on earth. The pelagic zone is used by species that live in the water column (i.e., away from shore and not on the bottom). Open water plays a vital role in the cycling and movement of nutrients from nearshore to offshore areas and at upwellings of deeper water toward the surface. The phytoplankton and zooplankton that live on these nutrients provide important food sources for fish and other aquatic organisms, which in turn become food for seabirds, marine mammals, sea turtles, sharks, and other large marine species. These waters also support a number of recreational and commercial fisheries.

Canyons

The Baltimore Canyon, located approximately 60 miles off the coast of Maryland, is a significant underwater canyon known for its steep drop-offs, nutrient-rich waters, and rich marine life. It is a popular spot for offshore big game and commercial fishing, as its deep waters attract tuna, marlin, mahi-mahi, and wahoo. Marine mammals such as dolphins and whales also frequent the area.

County Distribution: Worcester

Places to Visit: Atlantic Ocean

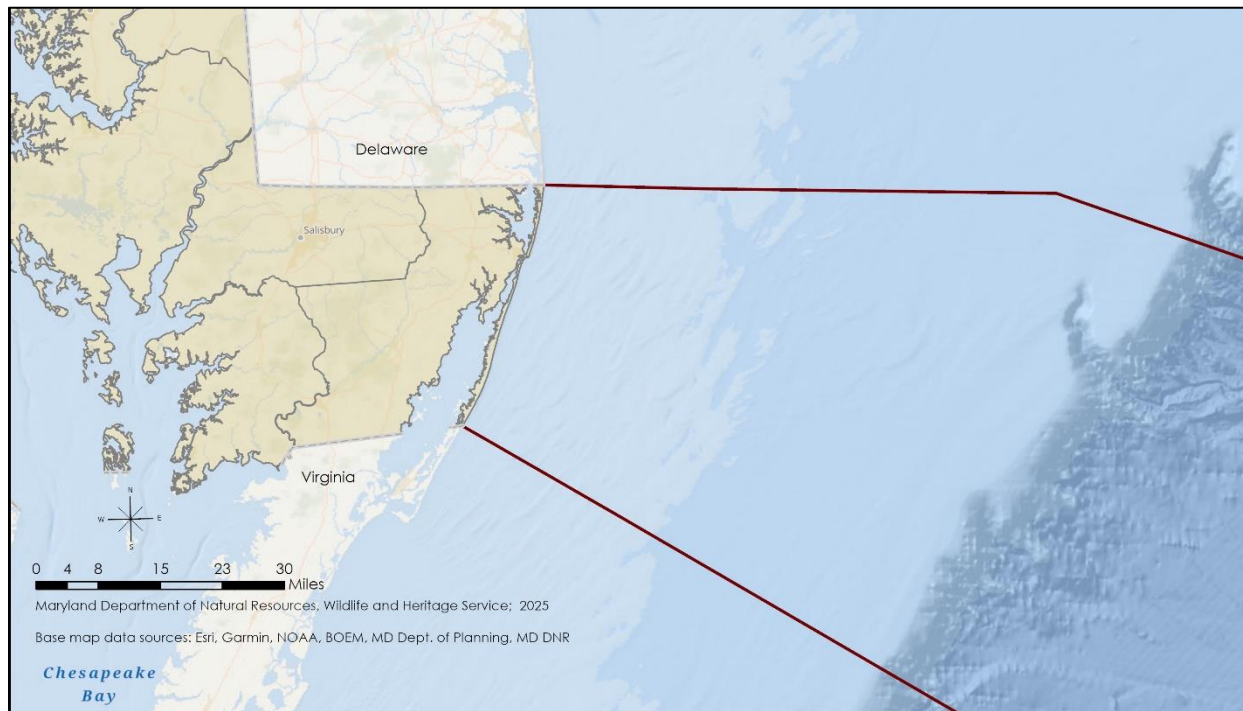


Figure 4.49 Location of Atlantic Ocean in Maryland. Sources: MD DNR and SDI-BOEM.



Species of Greatest Conservation Need Associated with the Atlantic Ocean:

Birds

Bald eagle
Black scoter
Black skimmer
Black-legged kittiwake
Brant
Brown pelican
Canvasback
Common goldeneye
Common loon
Cory's shearwater
Greater scaup
Horned grebe
Leach's storm-petrel
Lesser scaup
Long-tailed duck
Northern gannet
Red phalarope
Red-necked phalarope
Red-throated loon
Redhead
Sargasso shearwater
Surf scoter
White-winged scoter

Mammals

Blue whale
Bottlenose dolphin
Fin whale
Harbor porpoise
Humpback whale
Minke whale
North Atlantic right whale
Sei whale
Sperm whale

Reptiles

Green sea turtle
Kemp's ridley sea turtle
Leatherback sea turtle
Loggerhead sea turtle

Invertebrates (Aquatic)

Horseshoe crab

Fish

Alewife
American shad
Atlantic angel shark
Atlantic sturgeon
Blueback herring
Dusky shark
Hickory shad
Longfin mako
Sand tiger shark
Sandbar shark
Shortnose sturgeon
Whale shark
White shark



Small Coastal Plain Island

Region(s): Central, Eastern, Southern

Habitat Group: Bay/Ocean

NEAFWA: N/A

Small Coastal Plain Islands are isolated islands in the tidal Chesapeake Bay and Coastal Bays. These islands vary in size from tiny ($<10 \text{ m}^2$) to up to one to two hectares and do not support forested habitats. Large, forested islands (e.g., Poole's, Coaches, and Barren Islands; and the large salt marsh islands of the lower Chesapeake Bay) are not included in this Key Wildlife Habitat (KWH). These small islands serve as critical breeding sites for many of Maryland's colonial nesting waterbirds and are essential to maintaining a robust and sustainable guild of these species. Other than great blue herons (*Ardea herodias*) and the occasional colony of black-crowned night herons (*Nycticorax nycticorax*), yellow-crowned night herons (*Nyctanassa violacea*), and least terns (*Sterna antillarum*), colonial nesting waterbirds generally do not breed within most other KWHs.



Peter Stango, MD DNR

The vegetation of the Small Coastal Plain Islands KWH is simple and not compositionally diverse. Plant species composition varies but is primarily salt marsh cordgrass (*Spartina alterniflora*), salt marsh hay (*Sporobolus pumilus*), salt marsh spikegrass (*Distichlis spicata*), black needle rush (*Juncus roemerianus*), bigleaf marsh-elder (*Iva frutescens*), groundsel tree (*Baccharis halimifolia*), northern bayberry (*Morella pensylvanica*), and wax myrtle (*Myrica cerifera*). Patches of open sand and shell, especially at the upper elevations of beaches and berms, are essential to barren habitat nesting species of colonial waterbirds. Clumps of groundsel, bayberry, and wax myrtle are frequently used by colonial nesting wading birds, including herons, egrets, and ibis. Other species that require sandy habitats for reproduction include diamond-backed terrapin (*Malaclemys terrapin*) and a number of bee species.

These islands are critically threatened by erosion due to a combination of sea-level rise and land subsidence. When they become too small, breaching and overwash occurs during storm surges, eliminating them as safe nesting habitats. In the Coastal Bays, concentrated placement of sandy dredge spoil to create artificial small islands has met with some success. However, these efforts have been limited and lack sufficient reinforcement to provide for long-term establishment in this dynamic estuarine environment. Therefore, the construction and deployment of an anchored floating platform, or raft, has been used successfully for several years to provide a nesting artificial island for hundreds of common terns (*Sterna hirundo*) in the early 2020s. This project is seen as a stop-gap measure until additional dredge spoil islands can be created and maintained.

County Distribution: Anne Arundel, Baltimore, Calvert, Cecil, Charles, **Dorchester**, Kent, Prince George's, Queen Anne's, **Somerset**, St. Mary's, Talbot, and Wicomico, and **Worcester**

Places to Visit: Cedar Island Wildlife Management Area, Sinepuxent Bay Wildlife Management Area



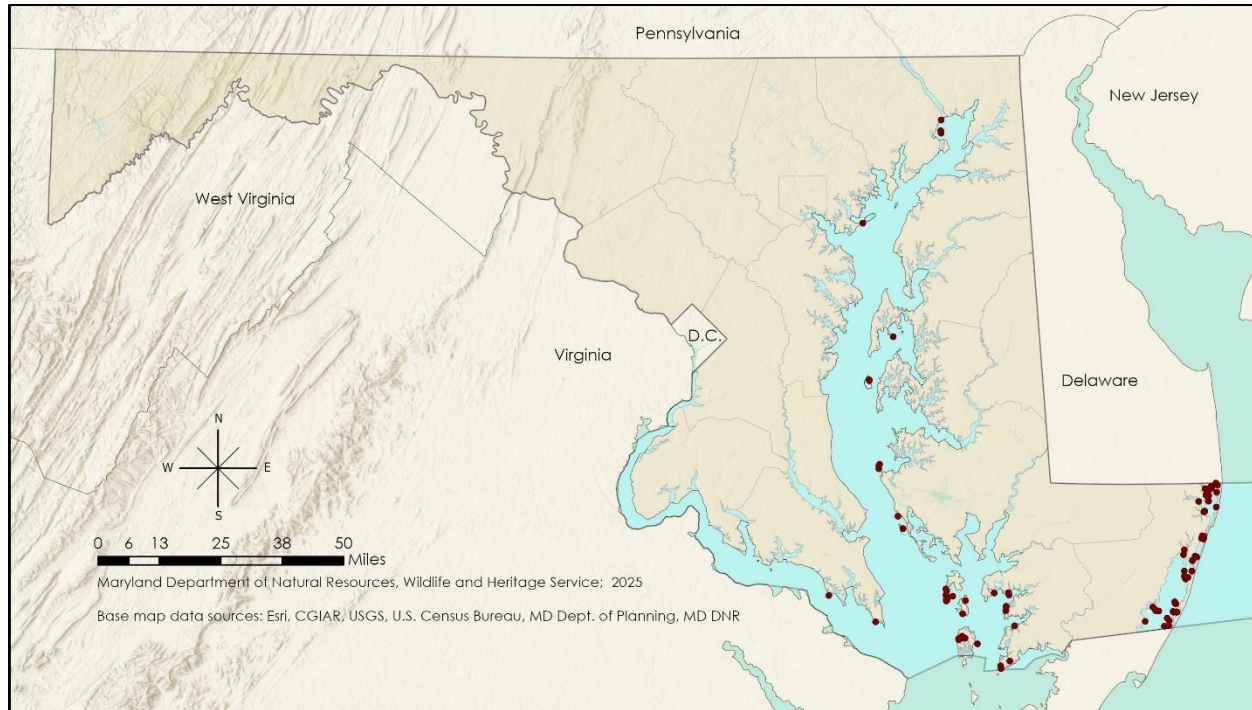


Figure 4.50 Location of Small Coastal Plain Islands in Maryland. Source: MD DNR.

Species of Greatest Conservation Need Associated with Small Coastal Plain Islands:

Birds

American bittern
American black duck
American oystercatcher
Bald eagle
Black rail
Black skimmer
Black-bellied plover
Black-crowned night heron
Blue-winged teal
Boat-tailed grackle
Brant
Brown pelican
Coastal Plain swamp sparrow
Common gallinule
Common tern
Dunlin
Forster's tern
Gadwall
Glossy ibis
Great blue heron
Great egret
Greater yellowlegs

Birds (continued)

Gull-billed tern
Ipswich sparrow
Laughing gull
Least bittern
Least tern
Lesser yellowlegs
Little blue heron
Marsh wren
Nelson's sparrow
Northern harrier
Pied-billed grebe
Piping plover
Roseate tern
Royal tern
Ruddy turnstone
Rufa red knot
Saltmarsh sparrow
Sanderling
Sandwich tern
Savannah sparrow
Seaside sparrow
Semipalmated sandpiper
Short-billed dowitcher

Birds (continued)

Short-eared owl
Snowy egret
Sora
Spotted sandpiper
Swamp sparrow
Tricolored heron
Whimbrel
Willet
Wilson's plover
Yellow warbler
Yellow-crowned night heron

Reptiles

Diamond-backed terrapin

Insects (Coleoptera)

Eastern beach tiger beetle

Insects (Odonata)

Atlantic bluet

Insects (Hymenoptera)

A cellophane bee (*Colletes speculiferus*)
A mason bee (*Osmia chalybea*)



Subterranean Habitats

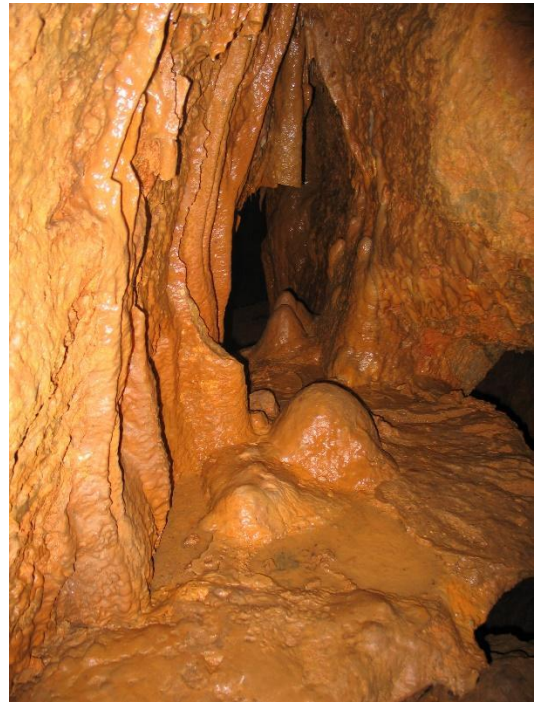
Cave and Karst

Region(s): Central, Western

Habitat Group: Subterranean

NEAFWA: Caves & Karst

Caves are natural, underground cavities or tunnels. They contain unique, fragile environments that support highly specialized animal communities and a variety of rare species. Over 100 caves have been documented in Maryland, most of which are located in the Ridge and Valley and Appalachian Plateau physiographic regions, with occasional smaller caves occurring in the Piedmont. Caves are most numerous in Washington County, followed by Allegany, Garrett, and Frederick Counties, the largest of which is Crabtree Cave in Garrett County with over 1,200 m of passages. Two types of caves exist in Maryland: solutional and non-solutional caves. The latter are formed by mechanical (tectonic) processes and are known as fissure caves, occurring as joints, faults, or fractures in bedrock. They are less numerous than solutional caves and are usually relatively small, shallow, and lack extensive passageways. They occur in a variety of rock formations, including the Pottsville Sandstone Formation in Garrett County, Tuscarora Sandstone Formation in Allegany and Washington Counties, and Weverton Quartzite Formation in Frederick County.



Dan Feller, MD DNR

Solutional caves can be quite deep and extensive, representing by far the largest caves in Maryland. They are formed by the dissolving action of groundwater, which is naturally slightly acidic, with soluble, carbonate rock (usually limestone). Over millennia, these and related processes lead to the development of complex passages or tunnels and various speleothems or “formations” (carbonate deposits on cave surfaces) such as stalagmites, stalactites, helictites and cave “coral.” Some caves also contain subterranean streams, water-filled sinkholes, and springs. Solutional caves and other karst features are most numerous in the Tomstown Limestone Formation in Washington County, which contains massive dolomites and limestones over 300 m thick. Other important cave-bearing formations include the Greenbrier Formation in Garrett County and the Tonoloway, Waynesboro, Beekmantown and Stones River formations in Washington County.

County Distribution: Allegany, Baltimore, Carroll, Frederick, Garrett, Howard, Washington



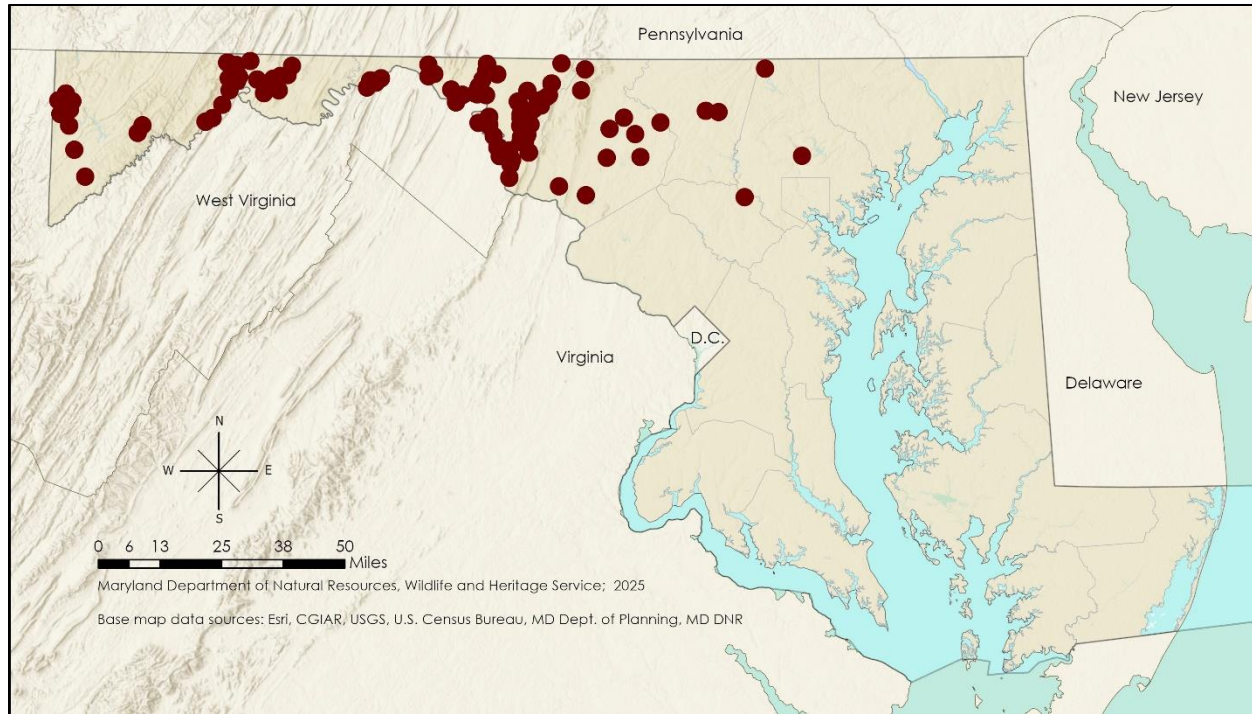


Figure 4.51 Location of Caves and Karsts in Maryland. Source: MD DNR.

Species of Greatest Conservation Need Associated with Caves and Karsts:

Mammals

Allegheny woodrat
Eastern small-footed bat
Indiana bat
Little brown bat
Northern long-eared bat
Silver-haired bat
Tricolored bat

Amphibians

Longtail salamander

Invertebrates (Snails)

Appalachian springsnail
Blue Ridge springsnail

Invertebrates (Cave and Groundwater)

A cave obligate planarian (*Sphalloplana buchanani*)
Allegheny spring isopod (*Caecidotea alleghenyensis*)
Biggers' cave amphipod (*Stygobromus biggersi*)
Franz's cave isopod (*Caecidotea franzi*)
Friendly cave amphipod (*Stygobromus amicus*)
Greenbrier cave amphipod (*Stygobromus emarginatus*)
Hoffmaster's cave planarian (*Sphalloplana hoffmasteri*)
Holsinger's cave isopod (*Pseudobaicalasellus holsingeri*)
Maus' cave isopod (*Pseudobaicalasellus mausi*)
Pennsylvania cave amphipod (*Crangonyx dearolfi*)
Price's cave isopod (*Conasellus pricei*)
Shenandoah Valley cave amphipod (*Stygobromus gracilipes*)
Vandel's cave isopod (*Pseudobaicalasellus vandeli*)



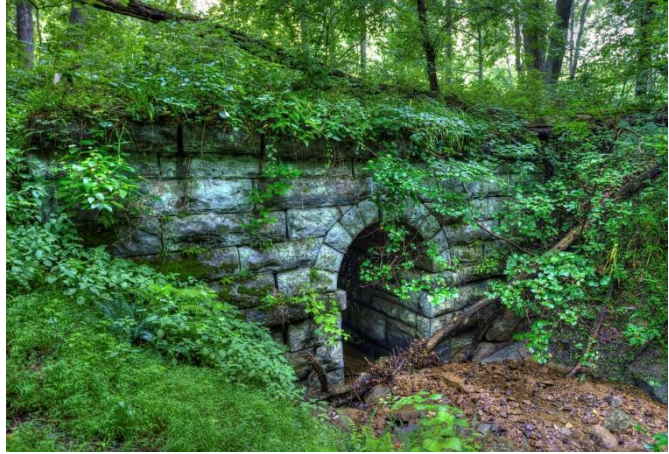
Artificial Structure: Mine and Tunnel

Region(s): *Western*

Habitat Group: *Subterranean*

NEAFWA: *Mines & Tunnels*

Additional Notes: *An artificial or human-made habitat*



Richard Orr

Mines are man-made, underground tunnels from which coal and other mineral resources (e.g., limestone, copper, gold, chromium) are extracted. In Maryland, most are located on the Appalachian Plateau, with some smaller, now inactive mines in the Ridge and Valley and Piedmont regions. Most cave-dwelling species of conservation concern are absent in these artificial habitats, but abandoned mines and railroad tunnels can provide a surrogate, cave-like habitat for a limited number of cave-dwelling species. This is especially true for more mobile vertebrates such as bats that utilize abandoned mines and railroad tunnels, which are currently the most significant overwintering habitat remaining for a number of rare and declining bat species. The habitat suitability of these abandoned mines and railroad tunnels for cave-dwelling animals depends on a variety of factors, including the level of human disturbance, size and/or depth, passage complexity, rock formation type, temperature, humidity, and the presence or absence of groundwater.

County Distribution: Allegany, Frederick, Garrett, Washington

Places to Visit: Brush Tunnel, Paw Paw Tunnel



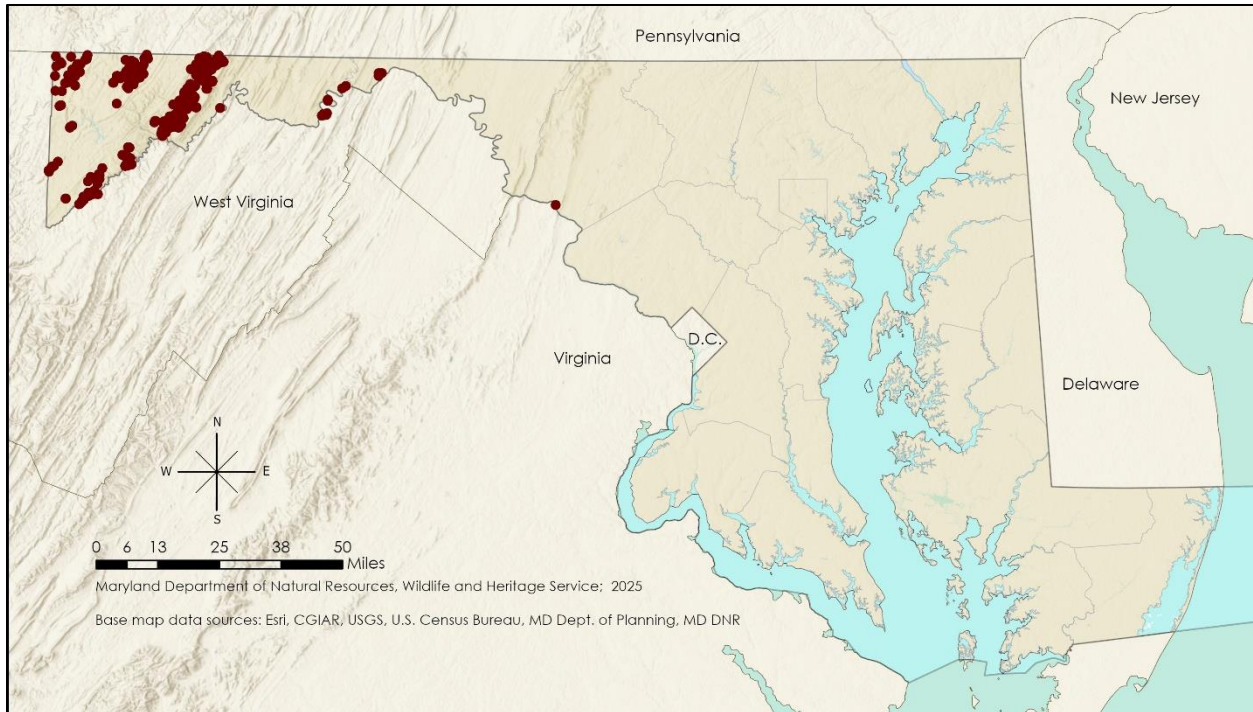


Figure 4.52 Location of Mines and Tunnels in Maryland. MD DNR, Maryland Department of the Environment, USGS.

Species of Greatest Conservation Need Associated with Mines and Tunnels:

Mammals

Allegheny woodrat
Eastern small-footed bat
Indiana bat
Little brown bat
Northern long-eared bat
Silver-haired bat
Tricolored bat

Invertebrates (Snails)

Appalachian springsnail

Invertebrates (Cave and Groundwater)

Franz's cave isopod
Hoffmaster's cave planarian
Maus' cave isopod
Vandel's cave isopod



Other Habitats

Working Lands

Managed Successional Forest

Region(s): All

Habitat Group: Working Lands

NEAFWA: Agriculture: Plantations/
Orchards

Additional Notes: An artificial or human-made habitat

Managed Successional Forests are primarily upland areas, occasionally wetlands, that are in an early successional forest state (i.e., dominated by shrubs and small trees [< 8 m tall]) due to forest management practices, land use change, or some other form of human disturbance. This habitat occurs statewide in three broad settings:



James McCann, MD DNR

1. **Recently Logged Forests.** In this setting, early successional forest begins to develop within one year of a timber harvest and may persist for 10–20 years or more. This partially depends on pre-harvest forest conditions, soil type, the size and type of regeneration cut (e.g., clearcutting, single-tree selection, shelterwood), post-harvest silvicultural treatments (e.g., seedling plantings vs. natural regeneration, thinnings), and the degree to which deer herbivory and invasive plant species impede native plant establishment and growth. Habitat suitability for most early successional species of conservation concern tends to peak 5–15 years following harvest. Many species that require early successional forests are no longer present once tree canopy closure is attained.
2. **Succeeding Non-forested Land.** These are areas that were converted to agriculture or some other non-forested condition and have been recently allowed to succeed or are otherwise managed in a way that has led to the development of early successional forest habitat. Examples include former cropland and pasture, old fields, and reclaimed strip mines that are reverting to a forested state via natural succession or plantings. Early successional forest habitat may persist for 10–20 years or longer depending, in part, on prior land use, soil conditions, the size of the opening, surrounding habitat conditions, and the degree to which deer herbivory and invasive plant species impede native plant establishment and growth.
3. **Forest Edges.** Forest edges are usually abrupt, narrow (typically 1–10 m wide), linear ecotones between a forested and nonforested habitat (e.g., cropland, road, transmission line right-of-way, backyard) or between two dissimilar forest age classes (e.g., a mature forest and a recent clearcut). These conditions can provide early successional forest habitat for some of the early successional wildlife species, especially if a “soft” edge or



gradual transition between the two adjoining habitats is present and is wider than is often found along a forest edge. However, Species of Greatest Conservation Need (SGCN) that require early successional forests and shrublands are often not found along forest edges because they require larger habitat patches than the narrow band of shrubs along the narrow forest edge ecotone. Also, these ecotones suffer greatly from excessive deer herbivory to the extent that a “browse line” is often evident along forest edges, rendering them unsuitable for shrubland breeders, as well as from increased rates of predation and nest parasitism from brown-headed cowbirds. Some shrubland species, such as yellow-breasted chat (*Icteria virens*), are area-sensitive and require larger habitat patches for increased nesting success. Much as forest interior breeding bird specialists avoid forest edges, shrubland breeding birds avoid edges as well (Rodewald & Vitz 2005).

The historical extent of early successional forest in Maryland is uncertain, and the origin, distribution, and characteristics of today’s forms of this habitat are likely to be quite different in many cases. Prior to widespread European colonization, fires set by Native Americans and settlers—and lightning strikes, to a lesser degree—played a major role in creating and sometimes perpetuating forest conditions dominated by shrubs and small trees. Herbivores (e.g., beaver, bison, and elk), topography, edaphic conditions and storm-related events (e.g., floods, ice storms, and tropical storms) also played a significant role. Together, these agents of change maintained a shifting mosaic of early successional habitat embedded within a landscape that was likely dominated by old growth forest and a variety of grassland, shrubland, and wetland habitats. The degree to which these factors affected the landscape varied by region and with local conditions (e.g., soil type, forest type, slope, and aspect). According to the United States Department of Agriculture (USDA) and the United States Forest Service (USFS), there were approximately 118,000 acres of small diameter forest lands in Maryland as of 2024 (USDA 2024). The small diameter forest type can be defined as live trees 1.0 to 4.9 inches (2.5–12.5 cm) in diameter and can be considered early successional forest.

County Distribution: Statewide

Species of Greatest Conservation Need Associated with Managed Successional Forests:

<u>Birds</u>	<u>Mammals</u>	<u>Reptiles</u>
American woodcock	Appalachian cottontail	Copperhead
Black-billed cuckoo	Bobcat	Eastern box turtle
Blue-winged warbler	Eastern red bat	Plain-bellied watersnake
Common nighthawk	Hoary bat	Rainbow snake
Golden-winged warbler	Indiana bat	Scarletsnake
Least flycatcher	Least shrew	Smooth greensnake
Mourning warbler	Least weasel	Timber rattlesnake
Northern bobwhite	Little brown bat	
Prairie warbler	Northern long-eared bat	<u>Insects (Lepidoptera)</u>
Swamp sparrow	Silver-haired bat	Indian skipper
Willow flycatcher	Southeastern shrew	
Yellow warbler	Southern bog lemming	
Yellow-breasted chat	Tricolored bat	



Managed Grassland

Region(s): All

Habitat Group: Working Lands

NEAFWA: Grasslands

Additional Notes: An artificial or human-made habitat



Bonnie Ott

Managed Grasslands are anthropogenically created, open, upland areas dominated by grasses and other herbaceous vegetation. The vegetation can vary in height (~0.15–2 m tall), structure, and composition, and may include a mix of both native and non-native species.

However, those dominated by native species tend to have greater conservation value. Some scattered shrubs and small trees (<8 m tall) may be present, but they are usually limited (<25% cover), patchy, and/or confined to the outer periphery of the opening as a soft forest edge or ecotone. Generally, grassland suitability as habitat for wildlife increases with size and area-to-edge ratio. Grasslands at least 4 hectares (ha) in size to well over 100 ha are needed to support a number of area-sensitive grassland Species of Greatest Conservation Need (SGCN), particularly birds. In addition to grassland size, other patch metrics (e.g., shape, degree of fragmentation) and landscape metrics (e.g., proximity to other grasslands, percentage of grassland, and openings in the surrounding landscape), as well as vegetation composition, height, and structure, can be important predictors of the presence and abundance of these species.

Historically, tens of thousands of acres of grasslands and savanna-like habitats once stretched across Maryland, with grass species forming a continuous ground cover with patches of scattered trees such as blackjack (*Quercus marilandica*) and post (*Quercus stellata*) oak, as well as an assortment of shrub species. Prior to European settlement, much of central Maryland, including Baltimore, Harford, and Carroll counties and adjacent counties in Pennsylvania, was covered by this prairie-like grassland intermingled among wooded valleys (Mayre 1920). Further west, accounts from the eighteenth and nineteenth centuries also depict large natural grasslands in the Hagerstown, Middletown, and Frederick valleys (Mayre 1955), and around The Glades area of Garrett County. It is believed that these openings were created and maintained by a combination of soil conditions, large grazing mammals (e.g., woodland bison, elk), and periodic fires. These grassland ecosystems have nearly vanished due to habitat loss resulting from development, agriculture, solar electricity production, fire suppression, and the disappearance of large ungulates. The largest remaining native grassland is the Serpentine Barren woodland complex at Soldiers Delight Natural Environment Area in Baltimore, which has been under restoration for over 25 years.

Most of the state's remaining grassland fauna persist in one or more of the following settings: (1) active pastures and hayfields; (2) fallow fields and grass plantings; (3) mowed edges of airports and military airfields; (4) reclaimed strip mines on the Appalachian Plateau. Managed grasslands occur statewide in these broad settings:



1. **Active pasture and hayfields.** These active agricultural fields are dominated by a mix of native and non-native herbaceous vegetation. They are managed or maintained primarily through livestock grazing, mowing, haying, and, in some cases, prescribed burns. The [Monocacy Grasslands Important Bird Area](#), identified by Audubon Mid-Atlantic, includes the largest remaining stronghold with the most diverse assemblage of grassland and associated shrubland species in the state.
2. **Fallow fields and grass plantings.** This includes former agricultural land and other forms of anthropogenically created open land that is in the earliest stages of natural succession and dominated by a mix of native and non-native herbaceous vegetation. It includes some of the agricultural land management practices used in the U.S. Department of Agriculture (USDA) Conservation Reserve Program (CRP) and Conservation Reserve Enhancement Program (CREP). Unlike hayfields and pasture, these areas typically receive little or no active management. In the absence of human intervention, they become increasingly dominated by shrubs and small trees and, over time, would succeed to a forested condition. Grassland habitat may persist for approximately 10–20 years depending, in part, on prior land use, soil conditions, the size of the opening, surrounding habitat conditions, and the degree to which deer herbivory and invasive plant species impede woody plant establishment and growth.
3. **Airfields.** Areas surrounding airfields must be maintained, usually via mowing, in some form of grass-dominated state to prevent woody plant growth and comply with airport safety regulations. Although airfields are typically under a strict mowing regime that limits their habitat suitability for many grassland-associated wildlife, areas along the periphery that are mowed infrequently or seasonally can provide substantial habitat for some species of conservation concern, including grassland nesting birds and migratory species, like upland sandpiper (*Bartramia longicauda*) and eastern meadowlark (*Sturnella magna*).
4. **Reclaimed strip mines.** This includes large acreages of reclaimed coal-strip mined lands in the Appalachian Plateau physiographic region that have been planted in grasses, usually fescue, and are now dominated by herbaceous vegetation. Grasses and other herbaceous plants grow best in these areas due to the compacted soils causing poor water infiltration, as well as low soil nutrient content from the loss of organic matter. Thus these areas function as barrens with natural succession prevented or greatly delayed. Although strip mining destroys or severely degrades natural forested terrestrial and aquatic ecosystems, these large anthropogenic grasslands now provide the best remaining habitats for Henslow's sparrow (*Centronyx henslowii*), as well as being significant for many other grassland SGCN, including frosted elfin (*Callophrys irus*), American kestrel (*Falco sparverius*), bobolink (*Dolichonyx oryzivorus*), and grasshopper sparrow (*Ammodramus savannarum*).

County Distribution: Statewide



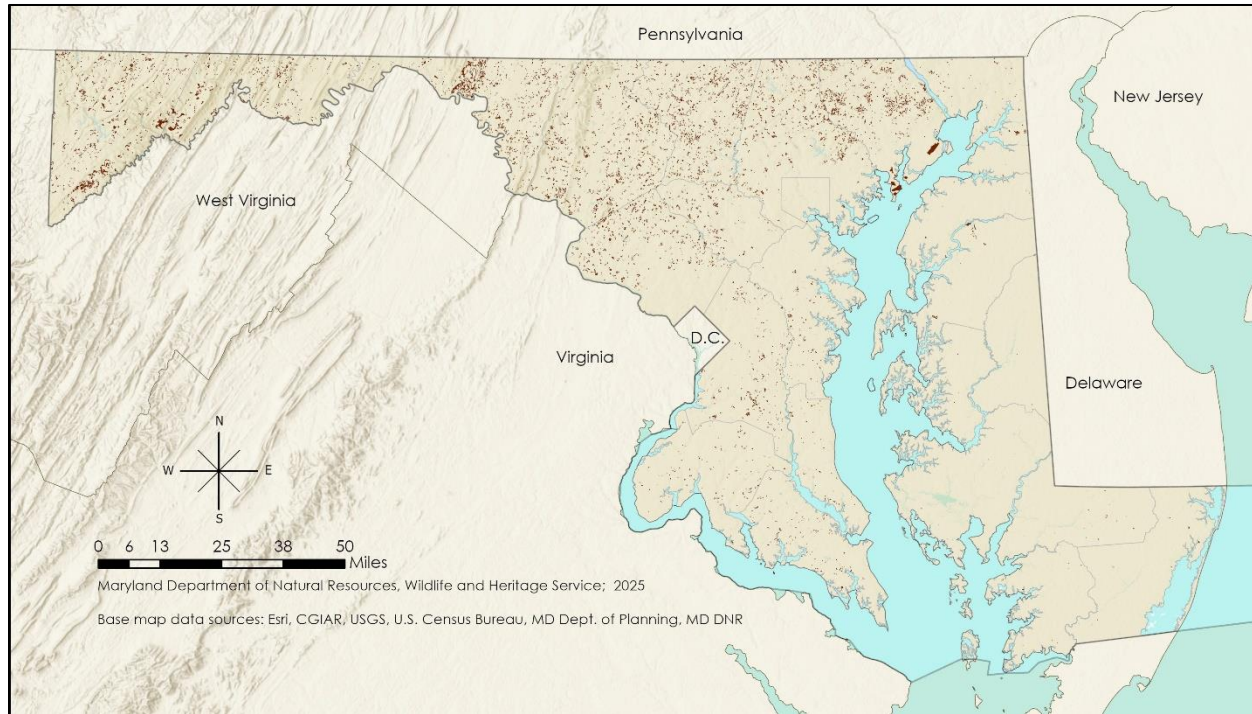


Figure 4.53 Location of Managed Grasslands in Maryland. Sources: MD DNR and Maryland Department of Planning's Land Use/Land Cover 2010.

Species of Greatest Conservation Need Associated with Managed Grasslands:

Birds

American barn owl
American kestrel
American woodcock
Black-billed cuckoo
Bobolink
Common nighthawk
Dickcissel
Eastern meadowlark
Golden eagle
Golden-winged warbler
Grasshopper sparrow
Henslow's sparrow
Loggerhead shrike
Long-eared owl
Northern bobwhite
Northern harrier
Savannah sparrow
Sedge wren
Short-eared owl
Swamp sparrow
Upland sandpiper
Vesper sparrow
Yellow-breasted chat

Mammals

Bobcat
Eastern red bat
Hoary bat
Indiana bat
Least shrew
Least weasel
Little brown bat
Silver-haired bat
Tricolored bat

Reptiles

Bog turtle
Eastern box turtle
Smooth greensnake
Wood turtle

Insects (Hymenoptera)

A cemolobus bee (*Cemolobus ipomoeae*)
A cuckoo bee (*Nomada seneciophila*)
Howard's cuckoo nomad bee (*Epeolus howardi*)
Sunflower miner bee (*Andrena helianthi*)

Insects (Lepidoptera)

Cobweb skipper
Frosted elfin
Indian skipper
Leonard's skipper



Roadside and Utility Right-of-Way**Region(s):** All**Habitat Group:** Working Lands**NEAFWA:** Grasslands**Additional Notes:** An artificial or human-made habitat

Jason Harrison, MD DNR

These habitats comprise a mixture of managed grasslands and shrub-dominated early successional forest areas that are maintained along roadsides, gas pipelines, and in powerline rights-of-way. Vegetation composition includes both native and non-native species and varies across the region. Depending on site conditions (e.g., soils, geology, slope, aspect, etc.) and how vegetation along the roadside or right-of-way is managed, these areas may, to some degree, mimic the natural disturbances and early successional phases of adjacent natural systems. Because these areas are usually rather narrow, although long, strips of habitat, they are typically not suitable for vertebrates that are area-sensitive and require the interior of large habitat patches for optimal breeding conditions. Therefore, these areas are more valuable as habitat for species, especially invertebrates, which may not require large habitat patches, as migratory or dispersal corridors for birds and other vertebrates, or as additional “linkage” habitat that connects and expands the size of adjacent patches of managed successional forests or grasslands. In highly fragmented or mosaic landscapes, connectivity between habitat patches may be important for the survival of wildlife on a species-specific basis.

There are 15 plant Species of Greatest Conservation Need (SGCN) that occur only along powerline and utility rights-of-ways and roadsides. This may seem a surprising number of plant SGCN for seemingly anthropogenic meadows, which contrast with the focus on natural communities in the State Wildlife Action Plan. However, these plants are often obligate heliophytes, meaning that they require full sun. They are often associated with fire-prone pine and oak savannas, as well as woodlands that were historically more widespread in the southeastern U.S. Most savannas were fire-maintained, but with widespread fire suppression in the nineteenth and twentieth centuries, most became overgrown and succeeded to forests. While roadsides and utility rights-of-way that capture remnants of these historically occurring natural communities have no formally recognized ecological community name within the Maryland State or National Vegetation Classifications, these meadows are regarded as significant natural features and often have high species diversity. An example of such a meadow in Dorchester County contained >70 species in a single 400 square meter plot and had populations of rare species such as low showy aster (*Eurybia spectabilis*), which is common in the New Jersey Pine Barrens; pale false foxglove (*Agalinis skinneriana*), a species commonly occurring in Midwestern Prairies; and shortleaf beardgrass (*Gymnopogon brevifolius*), a species of southern Pine Barrens.

County Distribution: Statewide

Species of Greatest Conservation Need Associated with Roadsides and Utility Rights-of-Way:

Birds

Baltimore oriole
Black-billed cuckoo
Blue-winged warbler
Golden-winged warbler
Prairie warbler
Swamp sparrow
Willow flycatcher
Yellow warbler
Yellow-breasted chat

Mammals

Eastern red bat
Hoary bat
Indiana bat
Least shrew
Little brown bat
Northern long-eared bat
Silver-haired bat
Tricolored bat

Amphibians

Eastern narrow-mouthed toad
Upland chorus frog

Reptiles

Bog turtle
Copperhead
Mountain earthsnake
Rainbow snake
Smooth greensnake
Timber rattlesnake

Insects (Coleoptera)

Common claybank tiger beetle
Cow path tiger beetle
Northern barrens tiger beetle
Splendid tiger beetle

Insects (Hymenoptera)

A cemolobus bee (*Cemolobus ipomoeae*)
A leafcutter bee (*Paranthidium jugatorium*)
A sweat bee (*Sphecodes brachycephalus*)
Golden Alexanders miner bee (*Andrena ziziae*)
Nude plasterer bee (*Colletes nudus*)
Sunflower miner bee (*Andrena helianthi*)

Insects (Lepidoptera)

Cobweb skipper
Edwards' hairstreak
Frosted elfin
Harris's checkerspot
Indian skipper
Leonard's skipper
Northern metalmark
Northern oak hairstreak
Olympia marble
Pepper and salt skipper
Silvery blue

Plants

Pale false foxglove (*Agalinis skinneriana*)
Purple giant-hyssop (*Agastache scrophularifolia*)
Wand-like three-awn grass (*Aristida virgata*)
Purple milkweed (*Asclepias purpurascens*)
Field sedge (*Carex conoidea*)
Rigid sedge (*Carex tetanica* var. *canbyi*)
Velvety sedge (*Carex vestita*)
Slender plume grass (*Erianthus strictus*)
Low showy aster (*Eurybia spectabilis*)
Stiff gentian (*Gentianella quinquefolia*)
Shortleaf beardgrass (*Gymnopogon brevifolius*)
Dwarf iris (*Iris verna* var. *verna*)
Hairy ludwigia (*Ludwigia hirtella*)
Slender rattlesnake-root (*Nabalus autumnalis*)
Pink milkwort (*Polygala incarnata*)



(Sub)urban

Artificial Structure: Buildings and Other Structures

Region(s): All

Habitat Group: (Sub)urban

NEAFWA: Developed Areas

Additional Notes: An artificial or human-made habitat



Chesapeake Conservancy

This habitat includes buildings, bridges, and other man-made structures that, in some specific cases, provide important surrogate habitat for a small number of Species of Greatest

Conservation Need (SGCN). These species have adapted over time to use artificial structures in the absence of sufficient suitable natural features or habitats. Examples include the American peregrine falcon's (*Falco peregrinus anatum*) use of tall buildings and bridges as nest sites in place of undisturbed cliff faces with sufficient prey populations nearby; least tern (*Sternula antillarum*) use of building rooftops with suitable substrates (i.e., loose, light-colored gravel) near tidal waters in place of natural sandy islands and sand bars lacking predators and human disturbance; and little brown bat (*Myotis lucifugus*) use of houses and barns as maternity sites to raise their young in place of undisturbed, large, old hollow trees. Some species, such as chimney swifts (*Chaetura pelagica*), have virtually no natural alternatives remaining, while other species can still use natural alternatives, but have a much higher chance for survival or reproductive success using man-made alternatives because of the changed landscape.

In aquatic environments, man-made reefs composed of concrete, fabricated reef structures, sunken ships/barges, or other materials attract reef-associated species in areas where shellfish beds and other natural reefs have declined or have been lost to siltation. These artificial structures provide attachment substrate for algae, sponges, oysters, and other invertebrates, and serve as shelter, nursery, and feeding habitat for many aquatic species, including some SGCN.

County Distribution: Statewide

Species of Greatest Conservation Need Associated with Buildings and Other Structures:

<u>Birds</u>	<u>Birds (continued)</u>	<u>Mammals</u>	<u>Reptiles</u>
American barn owl	Greater scaup	Indiana bat	Diamond-backed terrapin
American peregrine falcon	Least tern	Little brown bat	
Black scoter	Lesser scaup	Northern long-eared bat	<u>Plants</u>
Canvasback	Long-tailed duck	Silver-haired bat	Tennessee bladderfern
Chimney swift	Redhead	Tricolored bat	(<i>Cystopteris tennesseensis</i>)
Common goldeneye	Surf scoter		
Common loon	White-winged scoter		
Common nighthawk			



Urban and Suburban Environment

Region(s): All

Habitat Group: (Sub)urban

NEAFWA: Developed Areas

Additional Notes: An artificial or human-made habitat

Urban and suburban areas are places where human developments are more densely concentrated into large and small cities, towns, and other local municipalities. Although Maryland is sectioned into 23 counties, it also has [157 incorporated municipalities](#). The Urban and Suburban Environment Key Wildlife Habitat includes these areas and their vicinities, where housing densities often range from [0.2 to 8 units per acre](#). Urban and Suburban Environments are scattered across Maryland, but are concentrated in areas along the Fall Line, including the sprawling, merged metropolis areas of Baltimore City and around Washington, DC. In urban and suburban areas, remnant woodlands, shrublands, and meadows can be critical patches of refugia, especially for migrant and highly mobile wildlife. These areas act as oases in otherwise unsuitable landscapes. These habitat remnants can concentrate migrant birds and other passage wildlife in areas that offer what they need (i.e., food, water, and shelter) along their route.



The National Aquarium's Harbor Wetland in Baltimore (Dave Harp, Bay Journal)



Public park in Hagerstown (City of Hagerstown Parks and Recreation)

Urban and Suburban Environments also may act as surrogate wildlife habitat, where the human-built structures and spaces mimic the functionality of natural landforms and habitats. Ecosystem composition and structure are shaped by the land manager's wishes and often by local ordinances, and so can change over time, although structurally they tend to be regular across the landscape. In general, urban or high-density environments are characterized by a high percentage of impermeable surfaces like roads, roofs, and walkways with low levels of widely spaced vegetation like street trees or shrubs. Open spaces, like parks, are found dotted throughout the landscape. These small patches are used by a limited number of resident wildlife species generally adapted to omnivorous diets, the heat island effect, and regular human disruption.

In some cases, these urban surrogate habitats are designed with wildlife needs at the forefront. One recent example of this is the National Aquarium's Harbor Wetland exhibit in Baltimore's Inner Harbor, a human-made habitat area designed to provide the ecosystem services of the tidal marshlands that were present in the Harbor before industrialization. According to Aquarium staff, since the exhibit's opening, over 160 different species have been documented in and around Harbor Wetland, including various species of fishes, turtles, birds, and invertebrates.



Suburban environments and rural towns are lower density and often include large areas of low growing, often cold season grasses as lawn. Other common plants include annual and perennial vegetation such as forbs, ferns, and graminoids, interspersed with trees and woody shrubs. Small patches of landscape may approximate woodlands. Suburbs also tend to include higher proportions of edge habitat, between surrounding forest or grassland and yard, or golf course, or linear roadside vegetation.

Water is often a component of urban, suburban, and rural towns, as many are built along rivers and streams, but water quality is impacted by a high proportion of impermeable surface. Contaminated runoff, increased temperatures, higher flow rates compared to forested streams, and increased non-native aquatic plant and animal species can reduce the quality of both flowing and non-flowing water.

Urban, suburban, and rural towns include surrogate habitat features, either as part of the built environment—such as chimneys as snags for chimney swift (*Chaetura pelagica*) breeding and migration, or tall buildings and bridges mimicking cliffs for raptor nesting sites (see the Artificial Structure: Buildings and Other Structures Key Wildlife Habitat)—or provided as intentional habitat features. Bat boxes and bird boxes simulate cavities, as do warped boards or loose siding on buildings. Landscaping choices may also provide for small patch habitat needs in the form of pollinator gardens, fish ponds, rock gardens, or bird baths. Seasonality and appropriate maintenance may also govern the availability of these habitats. Regular mowing or pruning can maintain these habitats in a given seral stage, depending on the landowner’s management. Plant species are often used without regard to natural range and may include species native to region or anywhere else in the world, climate permitting. Current state regulations and cultural shifts encourage the use of native plants and the removal of invasive species, with the expectation that more native wildlife species will benefit from increased patches of functional habitat.

County Distribution: Statewide

Places to Visit: Patterson Park, Druid Hill Park, Leakin Park, and Greenbelt Park



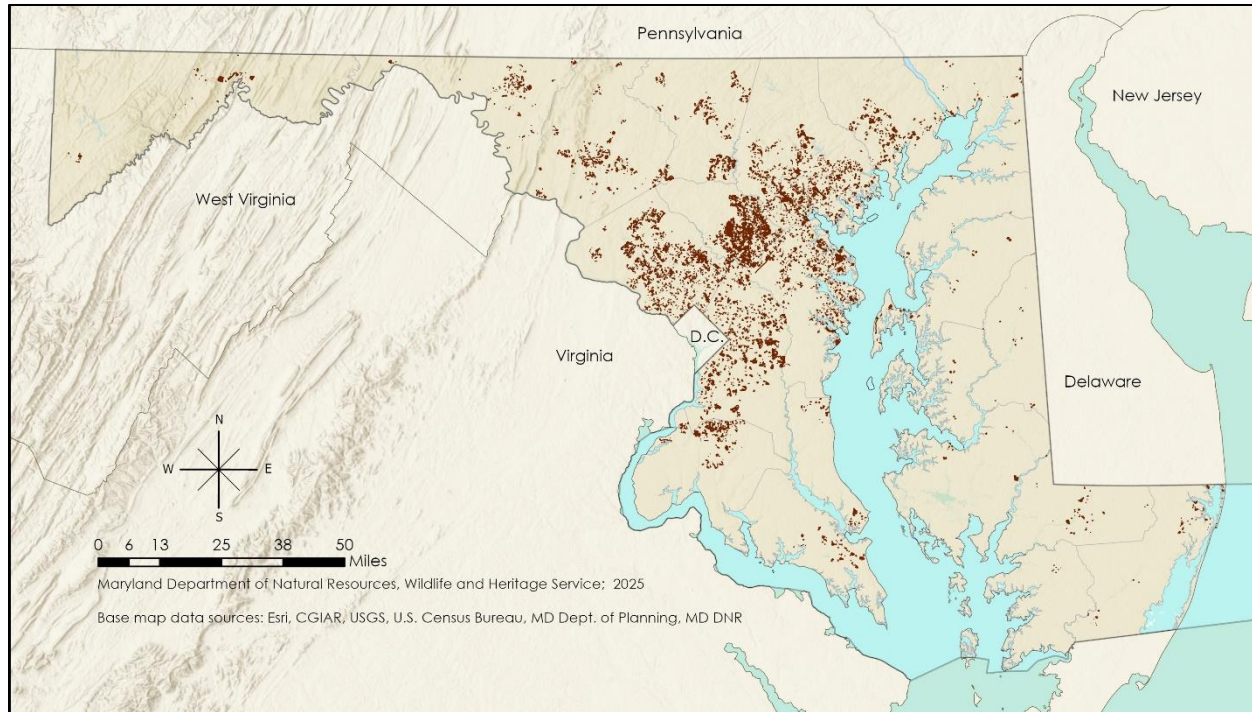


Figure 4.54 Location of Urban and Suburban Environments in Maryland. Sources: MD DNR and MDP.

Species of Greatest Conservation Need Associated with Urban and Suburban Environments:

Birds

Acadian flycatcher
American peregrine falcon
American redstart
American woodcock
Bald eagle
Baltimore oriole
Bicknell's thrush
Black-and-white warbler
Black-billed cuckoo
Black-throated blue warbler
Black-throated green warbler
Blackburnian warbler
Blue-winged warbler
Brown creeper
Canada warbler
Cerulean warbler
Chimney swift
Golden-winged warbler
Hooded warbler
Kentucky warbler
Least flycatcher
Louisiana waterthrush
Magnolia warbler
Mourning warbler

Mammals

Eastern red bat
Gray fox
Little brown bat

Invertebrates (Mites)

Ash flower gall mite (*Aceria fraxiniflora*)
Ash key gall mite (*Aceria fraxinivora*)
Ash leaf gall mite (*Aceria fraxini*)

Insects (Coleoptera)

An ash seed weevil (*Lignyodes bischoffi*)
An ash seed weevil (*Lignyodes fraxini*)
An ash seed weevil (*Lignyodes helvolus*)
An ash seed weevil (*Lignyodes horridulus*)
Charlie Brown's flea beetle (*Capraita sexmaculata*)
Eastern ash bark beetle (*Hylesinus aculeatus*)
Encircled borer (*Agrilus subcinctus*)

Insects (Hymenoptera)

A cemolobus bee (*Cemolobus ipomoeae*)

Insects (Diptera)

Ash bullet gall midge (*Dasineura pellex*)
Swollen ash gall midge (*Dasineura tumidosae*)

Insects (Hemiptera)

Fringetree lace bug (*Leptoypha mutica*)
Riley's 13-year cicada (*Magicicada tredecim*)

Insects (Lepidoptera)

Angel moth
Ash borer moth (*Podosesia syringae*)
Ash leaf cone roller moth (*Caloptilia fraxinella*)
Ash sphinx (*Manduca jasminearum*)
Ash tip borer moth (*Papaipema furcata*)
Banded ash clearwing moth (*Podosesia aureocincta*)
Cobweb skipper



Nashville warbler	A leafcutter bee (<i>Paranthidium</i>	Frosted elfin
Northern parula	<i>jugatorium</i>)	Gray comma
Northern saw-whet owl	A long-horned bee (<i>Epimelissodes</i>	Great ash sphinx (<i>Sphinx chersis</i>)
Northern waterthrush	<i>comptus</i>)	Great purple hairstreak
Olive-sided flycatcher	Azalea mining bee (<i>Andrena cornelli</i>)	Grote's sallow moth
Ovenbird	Blackheaded ash sawfly (<i>Tethida barda</i>)	Indian skipper
Prairie warbler	Golden Alexanders miner bee (<i>Andrena</i>	Inkblot palpita moth (<i>Palpita</i>
Rusty blackbird	<i>ziziae</i>)	<i>illibalis</i>)
Savannah sparrow	Nude plasterer bee (<i>Colletes nudus</i>)	Leonard's skipper
Scarlet tanager	Sunflower miner bee (<i>Andrena</i>	Northern oak hairstreak
Veery	<i>helianthi</i>)	Palamedes swallowtail
Wood thrush	Sunflower sweat bee (<i>Dieunomia</i>	Pepper and salt skipper
Worm-eating warbler	<i>heteropoda</i>)	Purple plagodis moth (<i>Plagodis</i>
Yellow warbler	Texas mason bee (<i>Osmia texana</i>)	<i>kuetzingi</i>)
Yellow-throated vireo		Splendid palpita moth (<i>Palpita</i>
		<i>magniferalis</i>)

This chapter provided extensive descriptions of the Key Wildlife Habitats (KWHs) that exist in Maryland, including KWH distributions, conditions, and associated Species of Greatest Conservation Need (SGCN). (**Element #2**). The next chapter will discuss threats facing Maryland's wildlife species and their habitats (**Element #3**).



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