Chapter 2

Maryland's Land and Waterscape

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DEPARTMENT OF
NATURAL RESOURCES

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Introduction

Maryland is a state of great geographic diversity. Often called "America in Miniature," Maryland comprises a variety of habitats not often found in a single state. From the barrier islands, bald cypress swamps, and Delmarva Bays of the Eastern Shore to the mountain bogs, caves, and eastern hemlock forests of the Appalachian Plateau, Maryland encompasses a wide range of habitats that support an impressive number and variety of species.

Maryland's wildlife distribution and abundance are intricately connected to and ultimately dependent on the ecological integrity and diversity of its habitats. The state's varied physiographic features, geology and resulting soil types, topography, and climate support a range of plant communities and aquatic environments that provide diverse habitats for wildlife. These habitat characteristics directly influence the distribution of wildlife species in the state, especially for species at the northern or southern edges of their North American range and for endemic species with specific habitat requirements.

This chapter uses the framework of physiographic provinces to present an overview of this diversity, which lays the groundwork for identifying Maryland's wildlife and Species of Greatest Conservation Need (SGCN), discussed in Chapter 3 (**Element #1**), and wildlife habitats essential to their conservation, discussed in Chapter 4 (**Element #2**). An understanding of why certain species and habitats exist in Maryland also leads to an understanding of threats and developing conservation actions that are addressed in the State Wildlife Action Plan (SWAP or Plan). This chapter therefore provides information on the physical layout, attributes, and plants of Maryland, providing a regional context for the elements of subsequent chapters.

Maryland's Physiographic Provinces

Maryland's diverse landscape flows through a wide range of topographic features from the mountains to the sea. The state's landscape is divided into physiographic regions or provinces based primarily on soil types and the underlying regional geology. For the purposes of Maryland's SWAP, Maryland has been divided into six distinct physiographic provinces: (1) Lower Coastal Plain, (2) Upper Coastal Plain, (3) Piedmont, (4) Blue Ridge, (5) Ridge and Valley, and (6) Appalachian Plateau (Figure 2.1).

These six provinces are slightly different from those more commonly recognized in Maryland. According to the Maryland Geological Survey (MGS), the Coastal Plain is a single province, and the Atlantic Continental Shelf is its own province (MGS 2026a). Maryland's SWAP separates the Coastal Plain Province into the Lower and Upper Coastal Plains because of the important differences in physiography, habitat types, and therefore species found on either side of the Chesapeake Bay. As for the Atlantic Coastal Shelf Province, given that it is located exclusively offshore—and, furthermore, given that many aquatic species found in the Atlantic Ocean can also be found in the Coastal Bays or the Chesapeake Bay—it has been merged with the Lower Coastal Plain for the sake of simplicity.

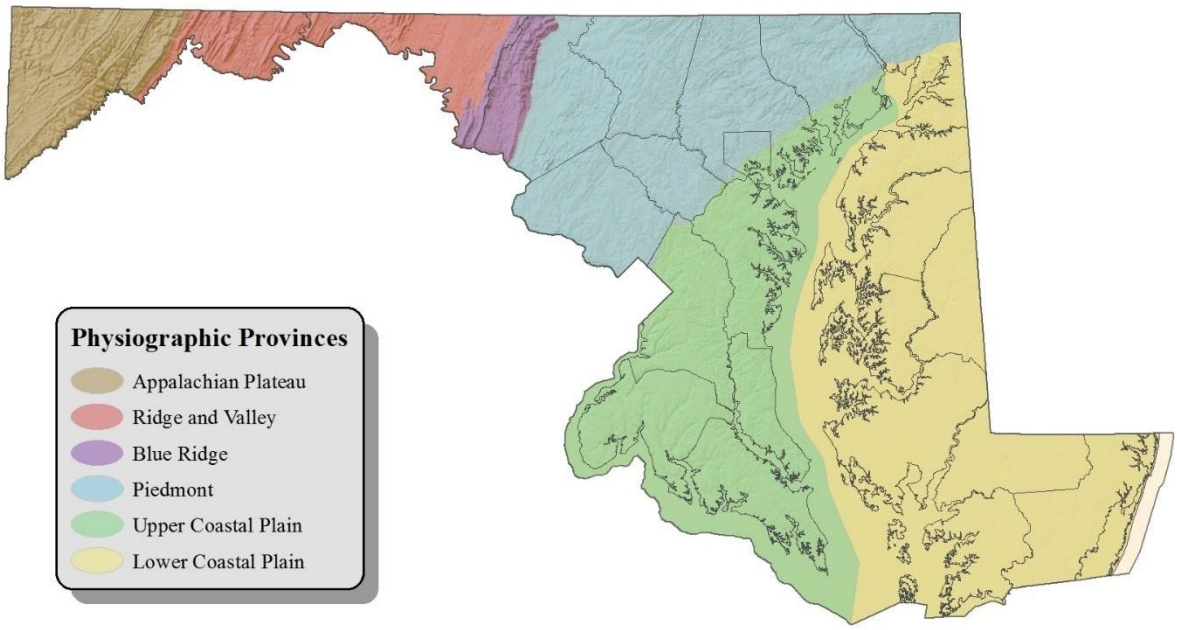

Figure 2.1 Physiographic Provinces of Maryland. Source: MD DNR.

All of these provinces have distinct characteristics that in turn support distinct sets of habitats and species. Given the importance of these provinces to Maryland's ecological diversity, the following sections detail the physical geography of and provide examples of plant species and communities that are found in each province. These plant communities in turn help form the basis for Maryland's Key Wildlife Habitats (KWHs), as discussed in Chapter 4. For a list of which KWHs can be found in which province(s), please see Table 4.1.

Furthermore, in order to more easily convey location information without becoming overly technical, later parts of the SWAP refer to regions of Maryland by their Maryland Department of Natural Resources (MD DNR) management region. There are four such regions: Eastern, Southern, Central, and Western. These are respectively referred to as eastern, southern, central, and western Maryland for the remainder of the SWAP. These regions are used much more widely than MD DNR and are more recognizable to the general public than the six physiographic regions. This section therefore includes references to which physiographic region corresponds to which management region of Maryland. They generally align with the physiographic provinces, so occasionally, terms may be used interchangeably. See Figure 2.2 for a visual of these management regions.

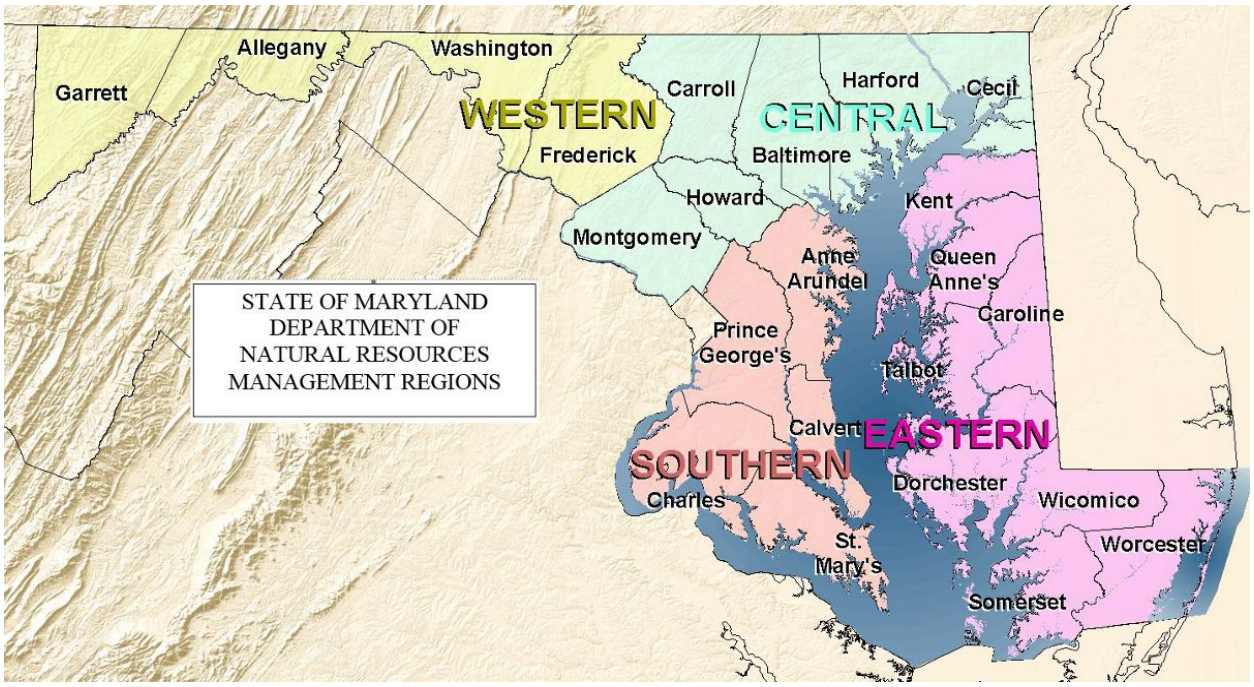

Figure 2.2 MD DNR Management Regions. Source: MD DNR.

Coastal Plain

The Coastal Plain contains approximately two-thirds of Maryland's land area, covering all or most of the area within 16 counties and Baltimore City that borders the Atlantic Ocean, Chesapeake Bay, and the Potomac River. It is bisected by the Chesapeake Bay, which divides it into two distinct regions: eastern Maryland, also known as the Eastern Shore, and southern Maryland. The Eastern Shore aligns with the Lower Coastal Plain; the Upper Coastal Plain roughly aligns with southern Maryland, though it includes small portions of central Maryland as well. The Upper Coastal Plain is also sometimes referred to as the Western Shore, but in order to avoid confusion with western Maryland, the 2025 SWAP revision does not use this term.

The Coastal Plain is characterized by low-lying landscapes with minor elevation change. Less than half of Maryland's Coastal Plain is above 10 feet in elevation; its highest point is below 450 feet (MGS 2008). It is bordered by the Piedmont Province to the west and the Atlantic Ocean and Delaware to the east. The geological boundary between the Coastal Plain and the Piedmont is marked by a transitional belt averaging approximately five miles in width, known as the Fall Zone or Fall Line. The Coastal Plain generally slopes gently downward from the Fall Zone as it approaches the Atlantic (UMBC 2003a), with higher elevations occurring mostly on the Upper Coastal Plain and lower elevations on the Lower Coastal Plain. These relative elevations are what give these provinces their names in the 2025 SWAP revision.

Mather Gorge, on Maryland's Fall Zone or Fall Line
(Chris Frye, MD DNR)

This region of Maryland is underlain by unconsolidated sediments of gravel, sand, silt and clay, and represents the youngest region of the state in geological terms (MGS 2026a). Sandier soils tend to be found closer to the Atlantic Ocean, and in some instances, these soils may be so sand-rich that they are economically valuable as sources of sand. Along shorelines, these loose sand soils can easily be seen in dunes and beaches. Where organic material is available, the Coastal Plain's sandy soils become loams, becoming highly acidic and retaining more moisture. In some shallow or exposed areas, soils may have silts or clays that further enhance their ability to retain moisture, host more diverse plant life, and support agriculture. Wetlands are found where silt, clay, and/or very fine sand create(s) wet, acidic soils, although these soils have been ditched and drained in many areas for use as farm fields. Tidal marsh and swamp soils are found along shorelines in the Coastal Plain and can either be sandy or rich in organic material, including peat. These wetlands in particular are less vulnerable to ditching and draining, as past research has shown that these soils may be highly toxic to crops due to sulfur that oxidizes when wetlands are drained (MDP 1973).

Wetland diversity in this region is exceptionally high and ranges from expansive freshwater to saline/estuarine marshes, tidal and palustrine swamps (e.g., bald cypress and Atlantic white cedar swamps), seasonally flooded depressions (e.g., Delmarva Bays and interdunal swales), and seepage swamps. This abundance of wetlands—and therefore favorable soil—is part of the reason why the Coastal Plain is heavily utilized for agriculture. Other contributing factors include its relative flatness, mild climate, and abundance of Chesapeake Bay tributaries scattered throughout the landscape (UMBC 2003a). These tributaries are warmer and lower in gradient than streams and rivers found elsewhere in Maryland. In fact, the Fall Line that divides the Piedmont from the Coastal Plain is defined as the area where streams tend to have falls as they pass from the rocky, higher-elevation Piedmont to the lower, flatter Coastal Plain. Coastal Plain streams and rivers also tend to have more woody debris (i.e., logs and fallen trees); some are even considered blackwater streams, with high tannin concentrations created by decomposing leaves (Boward et al. 1999).

Forest types on the Coastal Plain are shaped by this agriculture-favorable physiography and abundance of fresh water as well, as silviculture is also common. Much of the Coastal Plain's contemporary forest consists of successional or silvicultural stands of loblolly pine *(Pinus taeda).* These loblolly-dominated forests tend to be less biologically diverse and do not provide ideal habitat for most species native to the Coastal Plain. Prior to European settlement, the forests that covered the Coastal Plain consisted primarily of hardwoods, though they increasingly mixed with pine towards the south. These forests were likely combinations of oak-hickory, oak-

gum, or oak-pine, and today exist in second-growth form as the result of repeated cutting or agricultural abandonment.

Loblolly pine-dominated forest
(Will Parson, Chesapeake Bay Program)

The Coastal Plain is also home to the Chesapeake Bay and Coastal Bays. The Chesapeake Bay, which is the largest estuary in the United States, has a drainage area that extends into Virginia, West Virginia, Pennsylvania, Delaware, and New York. The Coastal Bays are smaller, saltier estuaries that are narrowly separated from the Atlantic Ocean by Fenwick and Assateague Islands. Along with supporting a wide range of aquatic species themselves, these bays are the sites of dozens of islands. These range from large, forested islands (e.g., Poole's, Coaches, and Barren Islands) to sandy islands less than 10 square meters in size. These smaller islands, referred to as Small Coastal Plain Islands in later chapters of the SWAP, serve as critical breeding sites for many of Maryland's colonial nesting waterbirds.

This network of wetland, forested, sandy, and aquatic habitats supports a wide range of wildlife, from birds to fish to sand-dependent insect species. Agricultural activities can prove either boon or threat depending on management techniques, potentially adding another important habitat type to this network: working lands. Agricultural lands managed with biodiversity and conservation in mind can provide pseudo-grassland habitat for birds, pollinators, small mammals, and other species groups. On the other hand, overapplication of pesticides, herbicides, and fertilizers can increase runoff into the Coastal Plain's abundant wetland and aquatic habitats, negatively affecting both terrestrial and aquatic species. In recent years, it has also become more common for farmers to lease or sell their lands to solar companies, which takes away from the stock of important working land habitat unless carefully sited, designed, and managed.

Lower Coastal Plain

The largest of Maryland's provinces, the Lower Coastal Plain Province comprises the portion of the Coastal Plain east the Chesapeake Bay and Elk River. It is also referred to as eastern Maryland or the Eastern Shore. This province is easily identified by its flat, low-lying landscape with many tidal wetlands and tributaries that drain into the Chesapeake Bay and the Coastal Bays on the Atlantic coast. Elevations are usually less than 60 feet above sea level, with much of the Lower Coastal Plain being even lower in elevation.

Soils on the Lower Coastal Plain tend to be sandier than those on the Upper. These deep sand soils are very permeable and do not retain moisture well; in fact, when they are exposed at the surface without vegetation, they are easily eroded by wind and water (MDP 1973). This combination of exposed sandy soil, low elevation, and plentiful water features makes the Lower Coastal Plain especially vulnerable to water-based, climate change-related threats such as sea-

level rise, saltwater intrusion, and increased storm intensity and frequency. Some soils on the Lower Coastal Plain have also been influenced by a long history of human activity. At several shoreline sites, extensive Native American shell-middens, formed from accumulations of discarded oyster shells over thousands of years, have created an altered soil composition that supports a unique and diverse plant community (McAvoy & Harrison 2012). These rare natural and cultural resources represent special contributions to soil and habitat diversity resulting from the rich Native American history of Maryland.

Native American oyster shell-midden
(Torben Rick, Smithsonian)

The Lower Coastal Plain is the only physiographic province in Maryland with direct access to the Atlantic Ocean. This means that ocean-dependent SGCN such as the North Atlantic right whale *(Eubalaena glacialis)*, Cory's shearwater *(Calonectris borealis)*, and white shark *(Carcharodon carcharias)* are exclusive to this region of Maryland. Other habitat types limited to the Lower Coastal Plain and generally related to this proximity to the Atlantic Ocean are dunes, maritime swamps, and Coastal Bays.

Additionally, the Eastern Shore of Maryland is part of the Delmarva Peninsula. This peninsula is shared by Delaware, Virginia, and Maryland, and is bound by the Chesapeake Bay, Delaware Bay, and Atlantic Ocean. This separation from the rest of the eastern seaboard means that certain habitats and species are found only on this peninsula. Seasonally flooded Delmarva Bays, for instance, are unique to this region, as is the state-listed Delmarva fox squirrel *(Sciurus niger cinereus)*.

Upper Coastal Plain

The Upper Coastal Plain is bounded by the Fall Line to the west and the Chesapeake Bay to the east. Though not an exact match, it is also a close approximation of what is considered southern Maryland. From its western edge, the Upper Coastal Plain generally grades downward to sea level at the waters of the Chesapeake Bay (UMBC 2003a). Though still relatively flat and low-lying, the Upper Coastal Plain is higher and more variable in elevation than the Lower; it features bluffs made of older, stiffer clays and marls with a more dramatic scarp and terrace topography. One example of this topography can be found at Calvert Cliffs, an area that encompasses a long stretch of tall, steep-to-vertical bluffs along the Chesapeake Bay. The Upper Coastal Plain also has higher freshwater input due to nearby Piedmont and Appalachian geology, leading to slightly different stream, river, and wetland conditions than the Lower Coastal Plain.

Though not necessarily restricted to Maryland's Upper Coastal Plain, the aforementioned coastal bluff habitat type is highly concentrated in this area. Calvert Cliffs is the best example of this

Calvert Cliffs (MD DNR)

habitat found in Maryland. The eroding cliff faces provide vital habitat to various species of tiger beetle, including the state- and federally listed Puritan tiger beetle *(Ellipsoptera puritana)*. Similar (if smaller and more scattered) habitats can be found at the mouth of the Sassafras River and elsewhere in the state.

Plants of the Coastal Plain

The flora of the Coastal Plain is diverse, with 148 of the 454 plant SGCN (see Chapter 3) restricted to this province spanning 16 KWHs (see Chapter 4). The previously mentioned Delmarva Bay is just one of these KWHs. These shallow, seasonally flooded freshwater wetlands are generally small (< 1 acre) but numerous, with several thousand bays present on the Delmarva Peninsula. The plants of these bays are adapted to a seasonal drawdown of the groundwater, with extreme variation in dominant species. Early in the spring, when the bays are full, they appear like any other pond with emergent and floating vegetation. The same bay may appear as grassland in late summer and fall with a completely different set of dominant species. The species composition is zonal and associated with hydrology and position within the bays, from open grassy swales dominated by herbaceous species near the lower, depressional center of the pond to forested wetlands around their perimeters. Delmarva Bays harbor 45 rare and uncommon plant species, eight globally rare plant species, and the federally endangered Canby's dropwort (*Tiedemannia canbyi*); the latter occurs in a single pond in Queen Anne's County. One of the more intriguing globally rare plants is the diminutive Harper's fimbristylis (*Fimbristylis perpusilla*). This is a tiny, inconspicuous grass-like plant which grows only a few inches tall that is restricted to the very center (i.e., the lowest elevation) of the ponds. It may grow in dense patches in the exposed muddy soil, but only in those years when the ponds are completely dry. The total habitat area in the state for this species may be less than a half-acre, with each pond contributing a few square feet. Delmarva Bays also provide habitat for narrow endemic species such as the Mid-Atlantic beakrush (*Rhynchospora mesoatlantica*), which occurs in a few ponds in Dorchester County.

Of the native plant communities endemic to Chesapeake Bay, the intertidal habitats (i.e., those occurring along the shorelines between low and high tides) along the Chesapeake Bay and its tidal tributaries comprise a distinctive set of globally rare and near-endemic species. Seaside alder (*Alnus maritima* ssp. *maritima*) is a wetland shrub restricted to tidal rivers on the Eastern Shore and Delaware, with two other subspecies having disjunct populations occurring in Georgia (ssp. *georgiensis*) and Oklahoma (ssp. *oklahomensis*). This odd distribution is thought to be the result of range retraction during a glacial epoch, leaving isolated populations in disparate locations that have now diverged genetically and ecologically. Another globally rare species is the regional endemic Maryland bur-marigold (*Bidens bidentoides*) that occurs in the upper Chesapeake Bay, Delaware Bay, and a few scattered populations in New Jersey and New York. Maryland has the lead responsibility for conservation of this species, as Maryland populations

comprise the bulk of individuals within its narrow range. Intertidal habitats are also locations for federally threatened sensitive joint-vetch (*Aeschynomene virginica*) and the globally rare Parker's pipewort (*Eriocaulon parkeri*), a species exhibiting steep regional declines in fresh-tidal waters of the Chesapeake Bay.

Much of the lower Eastern Shore is covered by a surficial layer of well-drained sands of the Parsonburg Formation or Parsonburg Sand Sheet. Parsonburg sands extend from southern New Jersey across the Delmarva Peninsula and southern Maryland to eastern Virginia. They contain large areas of elliptical sand dunes where Coastal Plain Oak-Pine Forests are a common KWH. These forests are particularly fire-prone, and natural stands are often dominated by fire-tolerant species such as shortleaf pine (*Pinus echinata*), pond pine (*Pinus serotina*), pitch pine (*Pinus rigida*), blackjack oak (*Quercus marilandica*), and post oak (*Quercus stellata*). Although many of these inland dune systems have been converted to plantations, as mentioned above, excellent representatives of these fire-prone communities remain in Pocomoke State Forest. These sandy woodlands and shrublands provide habitat for plants that thrive in full sun and in harsh, nutrient-poor growing conditions, such as sundial lupine (*Lupinus perennis*), which is one of Maryland's most showy wildflowers. Due to the nutrient-poor status of the sands, many of the plant SGCN of the Parsonburg sands are nitrogen-fixing legumes, some of the rarest including Fernald's tick-trefoil (*Desmodium fernaldii*), Pineland tick-trefoil (*Desmodium strictum*), hairy snoutbean (*Rhynchosia tomentosa*), and spiked hoary-pea (*Tephrosia spicata*). Shade-intolerant and fire-dependent species of wildflowers such as late goldenrod (*Solidago tarda*) and threadleaf gerardia (*Agalinis setacea*) are also present. Shade-intolerant grasses may thrive in the dry open sands, including woolly three-awn (*Aristida lanosa*), rough dropseed (*Sporobolus clandestinus*), and few-flowered witchgrass (*Dichanthelium oligosanthes* var. *oligosanthes*).

Sundial lupine (Lupinus perennis)
(Chris Frye, MD DNR)

On the Upper Coastal Plain, Coastal Plain Pine-Oak Forests are of a slightly different character. The rare natural communities there are remnants of once widespread natural communities that occurred along the Fall Line. There are also fire-prone forests, sandy barrens, and woodlands that support single-population species such as scaly gayfeather (*Liatris squarrosa*) and golden heather (*Hudsonia ericoides*). The Upper Coastal Plain also contains natural communities that occur nowhere else in Maryland, including the globally rare Fall-Line Gravel Terrace Bogs. Located between Washington, DC and Baltimore, these irreplaceable habitats are small but highly diverse wetlands that support numerous rare species of plants and animals. Rare species such as ten-angled pipewort *(Eriocaulon decangulare*) that occupy this habitat require an open canopy and are not present when woody plants dominate. The combination of the development pressure in the Baltimore–Washington corridor and suppression of the natural fire regime means

that many of these habitats and the species associated with them are at risk, with some that have already been lost entirely.

Instances of the Coastal Plain Seepage Acidic Fen KWH occur across the Coastal Plain province and contain some of Maryland's rarest plants, including the northern pitcherplant (*Sarracenia purpurea*) and red milkweed (*Asclepias rubra*). These fens dot the Coastal Plain and are generally small, isolated wetlands surrounded by swamp forests or other mesic forest types. Other carnivorous plants such as sundews (*Drosera* spp.), bladderworts (*Utricularia* spp.), and several species of rare orchids including tuberous grass-pink (*Calopogon tuberosus*) and white fringed orchid (*Platanthera blephariglottis* var. *blephariglottis*) are restricted to this KWH. In southern Maryland, these fens contain a population of kidneyleaf grass-of-parnassus (*Parnassia asarifolia*), one of the most intricately beautiful flowers in the flora. Maryland populations are disjunct from the Appalachian/Ozarkian core and are the northernmost (and likely easternmost) populations in the United States.

Case Study: Conservation of Red Milkweed (Asclepias rubra) *in Maryland*

Red milkweed is a species occurring in acidic wetlands in the southeastern United States. Maryland sits at the northeastern edge of its range, which extends from Texas to Florida and north to New York (where it is now presumed extirpated). In Maryland, red milkweed is in critical decline across all known sites. Current census data indicates only about 86 plants remain statewide. These populations are small, isolated, and highly vulnerable, with many individuals remaining in a non-flowering state for years.

Red milkweed (Asclepias rubra) (Jim Brighton, Maryland Biodiversity Project)

Key Threats to Recovery

Reproductive Barriers: Like most milkweeds, this species is self-incompatible, meaning it requires pollen from genetically different individuals to produce seeds. In small populations, a lack of compatible mates or low pollinator activity often leads to reproductive failure. For instance, a small population in Wicomico County aborted its flowers for three consecutive years despite being protected from deer.

Habitat Management: Without natural fire cycles, woody plants and aggressive species—such as the invasive Phragmites australis and the native Smilax rotundifolia—quickly overgrow the milkweed's habitat.

Human Impact: Many surviving plants are located under utility lines or along roadsides, making them highly susceptible to herbicide applications. This is the likely cause of the species' disappearance from a site in Worcester County.

Climate Change: Populations on fringe freshwater wetlands have been lost due to sea-level rise and salt intrusion.

Conservation and Monitoring

MD DNR's Wildlife and Heritage Service has implemented several strategies to halt this decline:

Deer Exclusion: Wire cages have successfully protected large populations in Worcester County, leading to robust fruit sets with hundreds of seeds per pod. However, caging alone is ineffective for smaller populations that lack compatible pollen.

Population Augmentation: To combat genetic isolation, the Service is expanding its program to include hand-pollination (using pollen from different sites) and the outplanting of greenhouse-raised seedlings.

As most forested areas on the Coastal Plain have experienced hundreds of years of logging and conversion into loblolly pine plantations, large, intact upland forests are rare. The areas of Mesic Mixed Hardwood Forest KWH that remain contain habitat for globally rare species such as Virginia least trillium (*Trillium pusillum* var. *virginianum*), a species endemic to Maryland and Virginia that is restricted to ancient shorelines of the Atlantic Ocean on the lower Delmarva Peninsula. One old growth parcel of Mesic Mixed Hardwood Forest on the Coastal Plain also contains a large population of the rare nodding pogonia (*Triphora trianthophoros*).

An intriguing herbaceous species-dominated community exists on the Coastal Plain that has yet to be thoroughly described or named, as we do not have ecological knowledge of these communities prior to settlement by Europeans. These were undoubtedly grasslands or savannas that were maintained by frequent episodes of fire—as with Coastal Plain Oak-Pine Forests—but they occur on more level ground adjacent to wetland communities like Delmarva Bays. As this habitat type is both scattered throughout the Coastal Plain and little-understood, some plant SGCN of the Coastal Plain are therefore assigned to the Roadside and Utility Right-of-Way KWH. These open meadows contain a diverse array of rare plants that are most commonly associated with southern pine barrens or midwestern prairies, including the globally rare pale false foxglove (*Agalinis skinneriana*), wand-like three-awn grass (*Aristida virgata*), slender plume grass (*Erianthus strictus*), low showy aster (*Eurybia spectabilis*), shortleaf beardgrass (*Gymnopogon brevifolius*), and dwarf iris (*Iris verna* var. *verna*).

Piedmont

The second largest province in Maryland, the Piedmont Province—a close approximation of central Maryland—extends from Catoctin Mountain in the west to the Coastal Plain in the east. This divide between the two provinces, the Fall Line or Fall Zone, is occasionally visible to the naked eye due to the presence of rapids and falls where it is crossed by rivers and streams, such as at Great Falls along the Potomac River. This irregular line also runs roughly along Interstate 95 (Pyzik et al. 2004). Elevations in the Piedmont Province range from approximately 100 to over 1,200 feet above sea level, with its highest point being Sugarloaf Mountain (1,282 feet) in Frederick County (MGS 2008).

The soils of the Piedmont tend to have a high proportion of clay. A band of red clay extends through northern Prince George's County, northwestern Anne Arundel County, and eastern Washington, DC, covered by a few inches to several feet of surface soil. In other areas, the bedrock of the Piedmont creates an acidic, thin soil that contains a high percentage of shale or

other rock fragments. Broad ridges or upland depressions often have moderately well-drained, thin (< 2 feet), silty or loamy soils that are perched on top of an underlying clay or hardpan layer, which also seasonally traps the shallow water table and creates strongly acidic wetlands (MDP 1973). This is reflected in the number of groundwater-fed wetland habitats unique to the Piedmont Region, including the Piedmont Seepage Wetland and Piedmont Upland Depression Swamp KWHs (see Chapter 4). Floodplain and rocky soils are similar to those found in the mountains, which results in multiple floodplain habitat types being shared across these regions.

As the different types of hard igneous and metamorphic rocks found underlying the Piedmont weather and erode at different rates, they form the distinct topography of the Piedmont: rolling hills with deeply incised stream valleys, which mark where less resistant rock has eroded more quickly. In general, habitat diversity in the Piedmont is high but very localized due to the numerous bedrock formations (i.e., calcareous, mafic, felsic) and high-gradient rivers along the Fall Line. Historically, the forests of Maryland's Piedmont could have been characterized as oak-chestnut, but since the near eradication of the American chestnut by chestnut blight, they have now been replaced by oak-hickory and oak-pine forests with scattered pockets of mixed mesophytic (i.e., moderate moisture level) forests. In addition, the thousands of acres of grasslands that once existed in northern Maryland (Mayre 1920) have been reduced to small pockets where soils are poorly developed and bedrock is exposed. These are partially contained in the Piedmont-specific Serpentine Barren KWH, which develops in the shallow soils over serpentine bedrock. Most take the form of graminoid-dominated oak savannas, open grasslands, or a mix of the two, with patches of exposed bedrock common due to the shallowness of the soil.

Streams and rivers of the Piedmont tend to be steeper in gradient and therefore more swiftly moving than those of the Coastal Plain. Substrates are rockier as well. This tumbling of water over rocks tends to result in streams and rivers with higher levels of dissolved oxygen; water temperatures are also cooler than those of the Coastal Plain (Boward et al. 1999), though warmer than waters further west.

The Piedmont is the connecting region between the flat Coastal Plain to the east and the more mountainous areas of Maryland to the west. As such, it functions as a sort of transition zone, sharing certain characteristics, habitats, and species with both extremes of the state. This results in a very biodiverse region, given that both upland and lowland species and habitats can be found in the Piedmont. Piedmont streams and rivers in particular serve as vital connectors between the upstream aquatic habitats of western Maryland and the downstream aquatic habitats of southern and eastern Maryland, including the Chesapeake Bay. This means that threats to Piedmont streams and rivers affect all of Maryland's freshwater habitats. In terms of upstream effects, impoundments for drinking water reservoirs and hydroelectric power generation have reduced upstream access to spawning grounds for many migratory fishes. In terms of downstream effects, water quality degradation—from runoff, dumping, and combined sewer overflows—reduces quality of both Piedmont rivers and streams and those downstream in the Coastal Plain.

These kinds of issues are only exacerbated by the fact that central Maryland (i.e., the Piedmont Province, along with parts of the Upper Coastal Plain) contains some of the most urbanized areas in the state. More development pressure and population density means more pollution, habitat loss/fragmentation, and other human-related threats. This negatively affects terrestrial habitats as

well as aquatic ones. Undeveloped areas are increasingly fragmented due to the continued conversion of forest and agricultural lands to residential use—and associated roads, power lines, and other infrastructure—as the urban centers of Baltimore and the District of Columbia continue to expand.

Plants of the Piedmont

The Maryland Piedmont is home to over forty plant SGCN that occur nowhere else in Maryland. Many of these plants are associated with Glade, Barren and Cliff habitat types, including the Acidic Glade and Barren, Cliff and Outcrop, and aforementioned Serpentine Barren KWHs. While Serpentine Barrens occur over surficial outcroppings of serpentinite that contain heavy metals toxic to most plant life, they also support a suite of plant SGCN that occur nowhere else in the state. These include the globally rare serpentine aster (*Symphyotrichum depauperatum*), the endemic Octoraro Creek chickweed (*Cerastium velutinum* var. *villosissimum*), and Endangered grasses such as northern dropseed (*Sporobolus heterolepis*) and tufted hairgrass (*Deschampsia cespitosa*). Small streams that cut through Serpentine Barrens provide the only known habitat for the Endangered fringed gentian (*Gentianopsis crinita*).

Nantucket shadbush (Amelanchier nantucketensis) (Chris Frye, MD DNR)

Large river systems in the Piedmont have cut deep into the surrounding geological formations as they approach the Coastal Plain, forming a variety of cliff, outcrop, and river scour-bar habitats. The Potomac River at Great Falls (i.e., the Potomac Gorge), for example, has an outsized contribution to species diversity in Maryland despite its limited geographic area. Some of the more unique plant communities in Maryland occur at Great Falls. The Potomac Gorge sustains populations of rare species such as McDowell's sunflower (*Helianthus occidentalis*), which is more commonly associated with Midwestern prairies; the globally rare Nantucket shadbush (*Amelanchier nantucketensis*), a shrub more commonly associated with previously glaciated regions of New England; and the globally rare racemose goldenrod (*Solidago racemosa*), which is restricted to riverscour habitat throughout its narrow range. Historical components of the flora of Great Falls that highlight its unique phytogeography—though not SGCN themselves—include running buffalo clover (*Trifolium stoloniferum*) and curly heads (*Clematis ochroleuca*).

Several unique habitats occur along Montane-Piedmont Floodplains at the meeting point between the metamorphic and igneous rocks of the Piedmont and the unconsolidated sediments of the Coastal Plain in the Fall Zone. The Montane-Piedmont Floodplain KWH is home to the globally rare rock grape (*Vitis rupestris*), which occurs along the Potomac River, and

Open barren habitat at Soldiers Delight
(Chris Frye, MD DNR)

Susquehanna doll's-daisy (*Boltonia asteroides* var. *asteroides*), which is endemic to the Susquehanna River in Maryland and adjacent Pennsylvania. Piedmont Seepage Wetland and Montane-Piedmont Acidic Seepage Swamps provide wetland habitat for the federally threatened swamp pink (*Helonias bullata*), the Endangered death-camas (*Stenanthium leimanthoides*), and the Threatened Canada burnet (*Sanguisorba canadensis*).

The unifying characteristics of most of these habitats are that they are frequently disturbed by flood or fire and have sparse tree cover. Many of the plant SGCN in the Piedmont are obligate heliophytes, meaning that they require sunny locations where forests give way to open, frequently disturbed habitats. Natural disturbances such as fire are vital to the health of these plant communities. In the absence of natural disturbances, artificial stand-ins such as prescribed fire can serve the same function(s).

Blue Ridge, Ridge and Valley, & Appalachian Plateau

To the west of the Piedmont lies the mountainous region of the state, often referred to as western Maryland. Though the match between these mountainous physiographic regions and western Maryland counties is not exact, with the eastern half of Frederick County in fact on the Piedmont Plateau (see Figures 2.1 and 2.2), this is the colloquial understanding of western Maryland. This mountainous region of Maryland—which comprises the Blue Ridge, Ridge and Valley, and Appalachian Plateau Provinces—will therefore be referred to as western Maryland for much of the SWAP.

This region of Maryland is characterized by sub-ranges of the Appalachian Mountains and the valleys between them. During its formation hundreds of millions of years ago, folding and faulting (i.e., tectonic forces) wore the area nearly flat and then raised it up once more, creating a series of ridges and valleys: ridges where more resistant rock was raised and resisted erosion, valleys where less resistant rock has been eroded by flowing water, even though much of it was once raised to the same level as the ridges (UMBC 2003b).

Soils in the more mountainous areas of Maryland are often thin, with loose rocks or bare bedrock exposed on the surface. Even in places where bedrock is not exposed, it can be nearly so, with less than 20 inches of soil between the surface and the bedrock below. This is because the dramatic relief of the mountains creates steep slopes where soils may be easily eroded, especially if the land has been cleared. The mountain soils frequently contain gravel or rock fragments as the underlying rock is weathered to produce the soil; some of the gravel concentrations are even high enough to be economically valuable for road fill and other uses. Soils may be strongly acidic depending on the area's rock type (e.g., acid shale, sandstone). Ridges and hillsides

composed of limey shales, limestones, and clays have created clay-rich soils interspersed with rock outcrops (MDP 1973).

The lower-lying portions of western Maryland, the valleys, have much more fertile soils. This is due in part to the abundance of rivers that flow through western Maryland; river floodplains have deeper, well-drained soils of loamy alluvium that were deposited by their rivers or streams during floods. This process has created fertile soils excellent for farming. However, floodplain soils located farther from the river or stream tend to have higher concentrations of finer sediments and are poorly to very poorly drained (MDP 1973).

Winders Cave (Dennis Slifer, MGS)

The geology of western Maryland is an important factor in determining the abundance, distribution, and integrity of several wildlife habitats. Not only does it influence the topography of the mountains and valleys, but several valuable habitats occur only on certain geologic features. For example, there are over 50 caves in western Maryland (MGS 2026b), many of which provide habitat for numerous specialized, subterranean species. The distribution of limestone rocks creates karst—a landscape of caves, springs, and seeps—and limestone cliff habitats for other specialized species. Shale Barrens and other bare rock habitats are also present in this region due to the occurrence of those particular geological layers. These habitat types, found nowhere else in Maryland, contribute greatly to Maryland's biodiversity and are responsible for a significant portion of the species on the SGCN list.

Other terrestrial habitats in western Maryland include forests and wetlands. Forested habitats in this region are a mix of natural forests and human-made conifer stands akin to the loblolly pine plantations of the Coastal Plain. The majority of northern hardwood forests in Maryland are found in the Appalachian Plateau and Ridge and Valley physiographic provinces, where higher elevations and a cooler climate provide favorable growing conditions for northern tree species. Oak, oak-pine, and oak-hickory forests are also common. Managed conifer forests can still be found where they were established in the 1930s by Civilian Conservation Corps work crews. Though not necessarily ideal habitat for the native flora and fauna of western Maryland, these human-created stands serve as stand-in habitat for the natural conifer forests that were depleted by logging in the nineteenth and early twentieth centuries. Wetland habitats are somewhat rarer, though a mix of floodplain and groundwater wetlands still occurs throughout these three physiographic provinces. They are less common in the Blue Ridge and Ridge and Valley Provinces, occurring only in topographic slopes and depressions; however, wetlands of the Appalachian Plateau are more diverse, manifesting in the form of wet thickets, shrub bogs,

seasonally flooded wet meadows, and marshes (LaBranche et al. 2003). Springs are also more common in western Maryland than any other part of the state.

Given its relative distance from the Chesapeake Bay and Atlantic Ocean, aquatic habitats in these three provinces are solely freshwater. On the whole, water temperatures are cooler, gradients are steeper, and waters are faster-flowing than the rest of the state, though rivers and streams of the Ridge and Valley and Appalachian Plateau Provinces calm where they pass through valleys and meander on wide floodplains (Roth et al. 1999). Western Maryland is also home to some of the rarer stream and river types in Maryland, including the biologically unique Limestone Stream KWH, which is found only in the Blue Ridge and Ridge and Valley Provinces. Headwaters of many rivers that feed the Chesapeake Bay are found in these provinces as well, including the Potomac River Basin.

The Ridge and Valley and Appalachian Plateau provinces have traditionally been areas for coal extraction, in the form of both deep and strip mines. Though active and/or poorly managed mining operations can present threats to species and habitats of western Maryland, old mines can also serve as pseudo-cave habitat for subterranean and cave-dwelling species, and capped strip mines can create much-needed grassland habitat. Other forms of energy have been increasing in more recent decades, especially wind energy, which can interrupt important bird migration corridors if not carefully sited. Though banned in Maryland at the time of writing, shale gas extraction (i.e., hydraulic fracturing) also has the potential to impact western Maryland more than any other region.

Human populations are relatively sparse throughout the montane provinces and are mostly confined to the larger valleys, where land is more easily built upon and soils are more fertile. Suburban and second-home development from large urban centers (e.g., Baltimore, Washington, D.C., Pittsburgh), however, is rapidly encroaching on the mountain areas, leading to habitat loss and fragmentation. This increase in development also means an increase in impervious surfaces. Combined with increased storm volatility as a result of climate change, this means that—even though sea-level rise and saltwater intrusion is not an issue in this region of the state—western Maryland is facing an increase in flash flooding. Historic floods like those in 2025 are likely to become more common in western Maryland as both development and climate change continue.

Blue Ridge

The Blue Ridge Province lies just to the west of the Piedmont. Measuring 10 miles wide and accounting for just 3% of Maryland's land area, it is the smallest of Maryland's physiographic provinces. Most of its land area is given over to the Blue Ridge Mountains, one of the sub-ranges of the Appalachians. These mountains are formed from quartzite and gneiss anticlines (i.e., upward rock folds), which are very resistant to weathering and erosion, forming distinct ridges representing Catoctin and South Mountains. A small valley region lies between these two ridges as well. (MGS 2026a). At 2,140 feet above sea level, Quirauk Mountain on the South Mountain ridge is the highest point in the Blue Ridge Province, and the eighth highest in Maryland (MGS 2026c). The lowest elevation in this physiographic province is 250 feet along the Potomac River in Washington County near Harper's Ferry (MGS 2008).

Although no habitat type is necessarily limited to this physiographic region, certain habitats—and therefore species—are more highly concentrated in this area of Maryland than any other. The Montane-Piedmont Oak-Pine Forest KWH, for example, is quite common on the relatively low slopes of the Blue Ridge Mountains. Other habitats found in this physiographic region include other forest types, glades and barrens, cliffs and rock outcrops, caves, rivers and streams, and the occasional floodplain or groundwater-fed wetland.

Ridge and Valley

Continuing eastward, the Ridge and Valley Province comprises about 7% of Maryland's land area and is characterized by southwest to northeast-oriented mountain ridges, deeply dissected trellis stream drainage patterns, and a high degree of topographic relief between parallel mountain ridges and river valleys (Roth et al. 1999). It lies between South Mountain to the east and Dans Mountain to the west. Elevation ranges from 200 to 2,000 feet, with Warrior Mountain in Allegany County representing the highest point at 2,185 feet above sea level (MGS 2026c). The Great Valley, located in the eastern part of the Ridge and Valley, forms a broad lowland at about 500 to 600 feet in elevation and is dominated by karst topography (Roth et al. 1999). Also called the Hagerstown Valley, this area of Maryland is one of the most important agricultural areas in the state (UMBC 2003b).

The Ridge and Valley is also the driest part of the state, receiving less than 40 inches of rain annually (MDSCO 2026). This is because of the rain shadow effect created by the mountain ranges on either end of the province; the Allegheny Mountain range blocks most of the precipitation from the west, and the Blue Ridge Mountains blocks precipitation moving in from the east. This results in warmer, drier summers than much of the rest of western Maryland (UMBC 2003b). A combination of the region's climate and geology means that the Ridge and Valley Province is the sole region of Maryland where the Shale Barren KWH can be found. This habitat type develops on steep, dry slopes, where only species adapted to drought stresses can thrive. Aside from this unique habitat type, the Ridge and Valley shares many habitats with the Blue Ridge province, though differences in climate mean that slightly different species are found in each region.

Appalachian Plateau

The Appalachian Plateau Province, representing 8% of Maryland's landscape, has the state's highest elevations (generally 2,000 to over 3,000 feet), with parallel mountain ridges sometimes separated by dramatic gorges and whitewater rivers (Roth et al. 1999). This region of Maryland is also home to the largest range in elevation: Garrett County, the westernmost county in the state, shows 2,400 feet in relief, with the lowest elevation at 960 feet along the Potomac River at Bloomington and Backbone Mountain—the state's highest point—at an elevation of 3,360 feet above sea level (MGS 2008). The region is demarcated by Dans Mountain to the east and the Maryland–West Virginia border to the west.

Backbone Mountain (Jim Belsey, NPS)

Unlike the sharp ridges of the neighboring Ridge and Valley, this region features broad, horizontal layers of sedimentary rock that have been eroded into flat-topped ridges and deep river valleys. The Appalachian Plateau is well-known for its cold subarctic swamps formed after the last Ice Age, such as those found at Finzel and Cranesville. These wetland complexes are glacial relics with cold, dense air sinking into bowl-shaped valleys, creating a climate much colder than the surrounding Appalachian Mountains. Combined with the already colder climate expected of higher elevations, this means that the Appalachian Plateau is significantly cooler than the rest of Maryland, with the entire region experiencing the lowest maximum, minimum, and average temperatures of the entire state (MDSCO 2026). It is also wetter than the rest of the state, with much of the region accumulating an average of 50 or more inches of precipitation each year (MDSCO 2026).

This combination of high elevations, cool temperatures, and wet conditions is only found in this region of Maryland, meaning that it plays an outsized role in the state's habitat and species diversity, considering its small geographical area. Multiple habitat types are found only in this part of the state. For example, the High Elevation Ridge Forest KWH only occurs along Maryland's highest mountain ridges. This forest type occupies some of the most inhospitable habitats in Maryland, situated on exposed sites that are frequently subjected to high winds throughout the year and ice storms during the winter months. Montane Acidic Fens are also only found in this part of Maryland. This KWH exemplifies the aforementioned subarctic swamps of western Maryland and supports multiple species that are only or nearly only found in this habitat. Additional habitat types common to the other provinces of western Maryland can also be found on the Appalachian Plateau, though in somewhat colder and wetter iterations.

Plants of Blue Ridge, Ridge and Valley

Thirty plant SGCN are restricted to the Ridge and Valley and five are restricted to the Blue Ridge. Some habitats and plant communities are found in both regions, including the Montane-Piedmont Oak-Pine KWH. This forest type forms the forested matrix in which all the other KWHs of these regions are embedded. Species such as black-fruit mountain-ricegrass (*Patis racemosa*) occur within the forested matrix but do not often flower until stimulated by an opening in the closed canopy forest, which can follow timber harvest or wildfire.

Though many of these rare species are found in the mountains of these regions, some are found in the valleys, due in large part to their underlying geologies. In the eastern part of the Ridge and Valley, for example, Hagerstown Valley formed over several geological formations of limestone and dolomite-producing calcareous soils (i.e., high pH soils containing calcium and other plant nutrients). These calcium-rich habitats contain some of the most floristically diverse communities in Maryland, including the Basic Glade and Barren and Mesic Mixed Hardwood Forest KWHs. These KWHs are also found scattered throughout the Blue Ridge Province.

Occurrences of the Basic Glade and Barren KWH can be found over limestone formations, chiefly in the Hagerstown Valley on steep-to-moderately-steep slopes along the Potomac River and its major tributaries. The globally rare tall larkspur (*Delphinium exaltatum*) occurs on exposures of limestone, as do the early buttercup (*Ranunculus fascicularis*) and prairie goldenrod (*Solidago rigida*). In the more mesic limestone forests that are included within the Mesic Mixed Hardwood Forest KWH, one of Maryland's most beautiful wildflower species, snow trillium

(*Trillium nivale*), can be found on steep slopes over limestone. The presence of this species in particular is a novelty because most populations occur within the boundaries of previously glaciated territory, of which this area is not.

Further west, shale and sandstone bedrock forms the rugged terrain of the Ridge and Valley in Allegany County, with much of the area contained in Green Ridge State Forest. The forest is defined by several prominent parallel ridges that run generally northeast to southwest, separated by narrow valleys following small streams. Green Ridge State Forest is one of the driest regions in Maryland, receiving an average of only 36 inches of precipitation annually (MD DNR 2025). These chronic dry conditions favor a drought-resistant flora. Many smaller streams within the forest dry up completely during the summer months and all streams exhibit a significant summer drawdown. One species that has adapted well to these conditions is the federally endangered harperella (*Harperella nodosa*), which can withstand the seasonal drawdown events where it occurs on exposed scour bars and stream banks.

The Shale Barren KWH is also a frequent component of the landscape in the Ridge and Valley. Shale Barrens have a unique flora, including Central Appalachian endemics such as Kate's Mountain clover (*Trifolium virginicum*). Other rare species include stiff-hair sunflower (*Helianthus hirsutus*); characteristic but rare shrubs such as Allegheny plum (*Prunus alleghaniensis*) and common snowberry (*Symphoricarpos albus*); low herbs such as mountain parsley (*Taenidia montana*) and rusty woodsia (*Woodsia ilvensis*), a tiny fern of crevices in exposed seams of shale.

The Acidic Glade and Barren KWH is present primarily in the form of ecological communities known as Sandstone Glades in Allegany County. Sandstone Glades occupy mid-slope positions on several mountain ridges in Allegany County, including Wills Mountain, Haystack Mountain, Warrior Mountain, Martin Mountain, and Collier Mountain, which run parallel to each other and are separated by small streams in flat valleys. Sandstone Glades are characterized by open expanses of pavement-like sandstone slabs dominated by species that are tolerant of the harsh growing conditions. Characteristic species of Sandstone Glades include running serviceberry (*Amelanchier spicata*), which grows in thin soil of crevices in sandstone, and wild bleedinghearts (*Dicentra eximia*), which grows abundantly in the outcrops and boulderfields over Tuscarora Sandstone.

Rock outcrop habitat in the Blue Ridge region (Chris Frye, MD DNR)

Instances of the Cliff and Outcrop KWH occur throughout the Blue Ridge and Ridge and Valley both. These include generally small (<1 ha), exposed outcrops of shales, sandstones, mudstones, and limestones. They occupy positions where streams undercut the rocks, on erosion-resistant rocks exposed on steep slopes, or on the tops of ridges. The flora of these communities varies according to the underlying

geology and soil chemistry. One species, running shadbush (*Amelanchier humilis*), occupies one extreme of soil chemistry restricted to outcrops of limestone. At the other extreme, Appalachian sandwort (*Geocarpon glabrum*) occupies an exposure of resistant quartzite at a single location in the Blue Ridge. The occurrence of this species is an example of a plant that is disjunct (i.e., geographically distant) from its core range in the Southern Appalachian Mountains well to the south. Similarly, Canby's mountain-lover (*Paxistima canbyi*) and bearberry (*Arctostaphylos uva-ursi*) occur as single populations that are wide disjuncts from the nearest locations in the southeast and northeast, respectively. Other species are relics of past climates, including the highland rush (*Oreojuncus trifidus*) and Houghton's umbrella-sedge (*Cyperus houghtonii*), both of which occur on exposed cliffs of Tuscarora Sandstone in the Ridge and Valley. Small outcrops of more calcareous shale may hold populations of American harebell (*Campanula rotundifolia*), ebony sedge (*Carex eburnea*), and Michaux's stitchwort (*Sabulina michauxii*).

Appalachian sandwort (Geocarpon glabrum) (Chris Frye, MD DNR)

Wild calla (Calla palustris) (Richard Wiegand, MD DNR)

Plants of the Appalachian Plateau

The Appalachian Plateau is the westernmost province in Maryland, spanning Garrett County and far western Allegany County. It is defined by a unique, boreal-influenced ecosystem with plant species that are often found in colder, historically glaciated, and high-elevation environments. Due to this boreal influence, the flora of Maryland's Appalachian Plateau contrasts sharply with other physiographic provinces. Forty-nine plant SGCN are restricted to this province, and many of them occur in the Montane Acidic Fen KWH that is well-represented in Garrett County. Species such Fernald's mannagrass (*Torreyochloa pallida* var. *fernaldii*), Canada yew (*Taxus canadensis*), wild calla (*Calla palustris*), Tuckerman's sedge (*Carex tuckermanii*), slender cottongrass (*Eriophorum gracile*), lesser panicled sedge (*Carex diandra*), slender sedge (*Carex lasiocarpa*), creeping snowberry (*Gaultheria hispidula*), small cranberry (*Vaccinium oxycoccos*), and American larch (*Larix laricina*) are more commonly associated with previously glaciated territory in the northeastern U.S. and Canada.

The High Elevation Ridge Forest KWH is also restricted to this province. Species that occur here are adapted to extreme weather such as icing events, high winds, and deep snow that may exceed 100 inches annually (MSA 2026). Species more typical of the high-elevation spruce and fir forests of the Southern Appalachian Mountains also occur here, including mountain woodfern (*Dryopteris campyloptera*) and beaked dodder (*Cuscuta rostrata*). The Hemlock-Northern Hardwood Forest KWH also occurs as a primary forest type in this region. It is home to some of the rarest plant species in Maryland, including bunchberry (*Chamaepericlymenum canadense*), Clinton lily (*Clintonia borealis*), and kidneyleaf twayblade (*Neottia smallii*).

In mid-to-lower elevations with deep valleys and ravines, the landscape provides shelter from the winds and accumulates deep nutrient-rich soil of the Cove Forest KWH. Unlike the sparser Northern Hardwood understory, the Cove Forest KWH features a lush carpet of ferns and rare endemics like Fraser's sedge (*Carex fraseriana*). In the valleys, high-gradient coldwater streams and rivers such as the Youghiogheny River and Casselman River contain representatives of the Montane-Piedmont Floodplain KWH that possess a very different flora than the adjacent Ridge and Valley. Two species that occur only in Garrett County along rocky streambanks and cobble bars are fowl bluegrass (*Poa palustris*) and blue monkshood (*Aconitum uncinatum*). The North Branch of the Potomac River contains Maryland's only viable populations of pipevine (*Isotrema macrophyllum*), an endemic to the Appalachian Mountains that is found in Maryland near its northern range limits. Together, these diverse habitats and rare botanical relics establish the Appalachian Plateau as a critical sanctuary for biodiversity, preserving a distinct northern landscape found nowhere else in Maryland.

This chapter summarized the landscapes, waterscapes, plant communities, and other physical characteristics of Maryland through the lens of its physiographic provinces. This lays the groundwork for describing the Key Wildlife Habitats (KWHs) found in the state (addressing **Element #2**) and their associated species. The next chapter will provide information on the full array of flora and fauna found in Maryland and will identify Maryland's Species in Greatest Conservation Need (SGCN) (addressing **Element #1**).

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