

3.0 DESCRIPTION OF THE WATERSHED

The Lower Bush Creek watershed, designated as Frederick County Watershed M-19, includes the lands surrounding the western portion of Bush Creek and its tributaries. Lower Bush Creek watershed encompasses a land area of approximately 12,800 acres (20 square miles). Bush Creek is a mid-sized tributary to the Monocacy River; the confluence is located at the Monocacy National Battlefield. From the mouth of Bush Creek, the Monocacy River flows nine miles in a southerly direction, where it joins the Potomac River near Dickerson, MD. From Dickerson, the Potomac River flows southeast for approximately 150 miles before emptying into the Chesapeake Bay.

3.1 Geological Setting

Frederick County lies within two of the three geologic provinces in Maryland, the Piedmont Province and the Appalachian Province. The Piedmont Province extends from Washington D.C. and Baltimore to Catoctin Mountain and is divided into an Eastern and Western Division. The Lower Bush Creek watershed is located within the Western Division which is characterized by gently rolling terrain and slow-flowing streams. The Division, in turn, is divided into three regions, the Frederick Valley (flat land of the lower watershed); the Piedmont Upland (heavily rolling upland with numerous low knobs and ridges and shallow narrow stream beds), and the Triassic Upland (gently rolling land). The Lower Bush Creek watershed lies within the Piedmont Upland Region.

The Piedmont Upland Region is rooted in the Precambrian Era. Its rock materials are different from those found in other regions such as the Frederick Valley and Triassic Upland that once served as a deposit area for the erosion materials from the Piedmont Upland Region. The Piedmont material existed before the formation of the Appalachian Mountains. The Piedmont Upland was formed on bedrock composed of slightly metamorphosed slate, phyllite, and metabasalt. Before metamorphism, this rock consisted of volcanic ash and basaltic lava flows that erupted in the Late Pre-Cambrian time from a volcanic center lying to the east. Areas of limestone, now formed into marble, occur as lenses within the meta-volcanic rock. Other phyllites and quartzites, originally marine shales and sandstones, occur in the Piedmont Upland with the meta-volcanic rocks. The quartzites form the characteristic low knobs and ridges which rise about the surrounding land surfaces.

3.1.1 Topography

Typical of this region, slopes vary, generally ranging between 3-15 percent. In many instances, steeper slopes are located immediately adjacent to the stream valleys, particularly along the mainstem of Bush Creek (FCDPZ 1993a, 1993b).

Topographic maps show that the watershed generally slopes from east to west (USGS 1984, 1986, 1993a, 1993b). The highest point in the lower portion of the Lower Bush Creek watershed is a hilltop 635 feet in elevation located northwest of the intersection of Ed McClain and Fingerboard Roads. The mouth of Bush Creek at its confluence with the Monocacy River is the lowest point in the watershed, with an elevation slightly less than 240 feet. Average elevations within the watershed are approximately 400 feet.

3.1.2 Soils

Related to the geology of the area are the predominate soils. The predominant soil types found in the Bush Creek watershed include Manor, Linganore, Glenelg and Urbana series. The soils as mapped by the county survey within the watershed boundaries are described below.

Manor Series. By far the most predominant soil types are the Manor Series, which are distributed throughout the entire watershed area. The soils in this series are moderately deep and somewhat excessively drained. They formed in materials weathered from thin, platy schistose rocks that in most places contain a great deal of mica. The soils are not highly fertile or productive and erode very easily if not properly maintained. Permeability is moderate or moderately rapid. This is also the most extensive soil series in Frederick County as it dominates in the agriculture of the uplands within the Piedmont Plateau area. The Manor soils are associated with many other soils from similar materials, such as the Glenelg, Linganore, and Urbana which are also found in the Lower Bush Creek watershed and described below.

None of the soils within the Manor series have been classified as prime farmland soils by the Natural Resources Conservation Service, however, they are classified as farmland of statewide importance.

Glenelg Series. Glenelg solids are located primarily in the area between MD 75 and MD 80 as well as extending along the northwest side of MD 80. These soils are moderately deep and well drained. They are formed in materials weathered from micaceous schists, most of which contained considerable quartzite. The Glenelg soils are more strongly weathered than the Manor soils, but the parent materials are the same or very similar. Generally, this series occurs on undulating and hilly Piedmont uplands in the eastern and southern part of Frederick County. Permeability is moderate.

Four of the Glenelg soils are considered as prime farmland.

Linganore Series. The Linganore series covers a small area along the southwest portion of the watershed. These soils are moderately deep and somewhat excessively drained.

They formed in materials weathered from dark-colored hard, slaty schist or phyllite. Permeability is moderate to moderately rapid.

Generally these soils are found extensively in the eastern to southeastern part of the County. Small to fairly large areas are widely scattered on slaty ridges throughout the Piedmont areas. In some places hard bedrock is only a few inches below the surface. In many eroded areas the surface soil is a mass of slate chips with little fine soil material. Some areas are channery and others are both channery and gravelly.

None of the Linganore soils are classified as prime farmland.

Urbana Series. Urbana soils cover an area between Ed McClain Road and Prices Distillery Road within the watershed. These soils are deep and moderately drained. They are formed in material weathered from sericitic schists. Schist fragments are common throughout the soil, with some areas containing stones and out-croppings of hard schist. Similar to Manor and Glenelg soils the Urbana soils developed from micaceous material; similar to Linganore soils, they developed from hard, slaty, dark-colored schist. Permeability is slow.

The Urbana soils are fairly fertile, but they are only moderately productive. Generally, these soils occur on the more nearly level to gently rolling uplands of the Piedmont Plateau in the eastern and southeastern parts of Frederick County.

None of the Urbana soils are classified as prime farmland.

3.2 General Land Uses

The watershed includes a mixture of agricultural, developed, and naturally vegetated lands. At present, the watershed is predominantly used for agricultural purposes that consist of crop production and grazing of cattle. Scattered, large forested tracts remain within the watershed, often in areas of steeper slopes. Near the creek's confluence with the Monocacy River, the Monocacy National Battlefield provides a large area of open and wooded park land. Three population centers are located (1) at the southern margin of the watershed in the Town of Urbana along Urbana Pike (MD 355), (2) in the northeastern corner of the watershed in and around New Market, and (3) near the Monocacy National Battlefield, between Araby Church Road and Urbana Pike. The small town of Ijamsville includes primarily older residences. Other residential properties are located throughout the watershed, with densities varying by location. Currently, the highest densities of homes are located in areas near the perimeter of the watershed, particularly near Interstate 70 (I-70). These include residences along MD 75 north of the I-70 interchange in The Meadow at New Market development, along Reels Mill Road near Double Tree Court, and along Ijamsville and Mussetter Roads. A recent residential development at Ijamsville and Mussetter Roads is situated near a golf course just beyond the watershed divide.

One area of the watershed, a 200-acre farm southwest of New Market, is listed as an agricultural preservation area under the Maryland Agricultural Land Preservation Program (Maryland Greenways Commission 1996; Tim Blaser, FCDPZ, personal communication). Under this easement program, development rights are sold and held in perpetuity by a land conservation foundation. Because of high development pressure, it is unlikely that many additional lands in the watershed will be added to this program.

Remote sensing data were used to characterize general watershed land cover. Using a GIS, the watershed boundary was overlaid on the MRLC data for the mid-Atlantic region, a land cover data set developed by USEPA and U.S. Geological Survey (USGS) for use in environmental assessment. Based on early 1990s satellite imagery (Landsat Thematic Mapper), MRLC characterizes lands into general land cover classes at a 30-by-30 meter resolution. Although this data set does not depict the most current condition (given recent development that has occurred in the watershed during the mid-to-late 1990s), it does give an overall picture of land cover and allows estimation of general land cover statistics. The watershed map of MRLC land cover was enhanced in several locations where field observations and inspection of 1993 aerial photographs indicated that real conditions differed substantially from those depicted by MRLC alone (Figure 2-3; Table 3-1). In particular, MRLC appeared to underrepresent developed areas, tending to classify sparsely developed areas as agricultural land cover.

In Lower Bush Creek watershed, enhanced MRLC data showed land uses to be largely agricultural, with row crop and pasture comprising about 57.2 percent of the total watershed area. Hay/pasture lands form the majority of the agricultural lands, with smaller amounts of row crop. Forest and wetlands cover 35.4 percent of the watershed. Developed urban lands made up about 6.0 percent of the watershed area as of the early 1990s.

Aggregated Land Cover Classes	Acres	Percent
Agriculture	7,319.5	57.2
Forest	4,289.3	33.5
Developed	763.3	6.0
Wetlands	248.2	1.9
Forested Wetlands	146.1	
Herbaceous Wetlands	102.1	
Water	26.5	0.2
Other	154.8	1.2
Total	12,801.5	100.0

Because MRLC does not provide detailed information on human land use activities, a separate land use map was developed as part of the zoning and population analysis and is discussed in Section 4.8. While MRLC only depicts developed areas in general classes ranging from low- to high-intensity developed land, enhancement of these data allowed incorporation of planning and zoning information to more fully characterize human uses of the landscape.

3.3 Vegetation and Land Cover

Forest and wetlands play a role in maintaining water quality, while nonpoint runoff from agricultural and urbanizing lands appears to be the most important source of pollution in the watershed. Therefore, all vegetative cover types are evaluated in this watershed assessment. Vegetation and landcover in the Bush Creek watershed consists of agricultural land, forested areas (deciduous and coniferous), oldfield (transitional vegetation), wetlands, and developed areas (residential, commercial and industrial). With the exception of developed land, these landcover types are described in more detail below. The estimated aerial extent of each as a percentage of the overall study area (derived using the analysis method described above) is presented. Developed areas are also delineated within the mapping analysis, but most vegetation within developed areas is limited to lawns or cultivated species and as such will not be addressed further in this section. A listing of major plant species observed during this August-September 1999 field effort is presented in Appendix B, Table B-1.

Agricultural Land

As previously mentioned agricultural land covers approximately 57 percent of the Lower Bush Creek watershed. The principal crops observed at the time of the August and September 1999 fieldwork were soybeans, corn, and wheat. From residual field stubble, it is apparent that many of the fields in the area were also planted with early season crops such as rye, winter wheat, and barley prior to soybeans (i.e., the soybeans were planted using the "no-till" method). Several varieties of soybeans were noted, including full season and partial season types. The partial season varieties are typically planted in late March or early April in the area, after an early season crop such as winter wheat is harvested. Dairy farms in the area typically planted hay, legumes, and corn fodder crops.

Forested Areas

Forested areas cover approximately 33.5 percent of the study area. Because of the general agricultural nature of the watershed, upland forest is usually located along ridges spreading into lower areas, and running adjacent to creeks, rivers, and roads. A good portion of the forested areas in the watershed is clumped into larger sections where topography or railroad rights of way preclude development or farming. The largest contiguous forested parcels in the watershed area occur in three areas of the central portion of the watershed. The largest forested tract is located west of the county landfill,

in the area surrounding the intersection of Reels Mill Road and Ball Road. A second large forested area is located along Reichs Ford Road east of the landfill. The third forested area occurs east of Mussetter and Prices Distillery Roads and west of the terminus of Ganley Road. Numerous smaller parcels and forested lots are scattered throughout the watershed.

Generally, the forests around Bush Creek are characterized by trees with an average size of approximately 12 inches diameter at breast height (dbh), with larger trees having a dbh of about 24 inches. The tree canopy in the contiguous forested areas is relatively dense, and ranges from about 50 feet to about 80 feet. The forest also possesses moderately dense shrub and herbaceous layers.

Principal trees in upland forest areas include pignut hickory, slippery elm, tulip poplar, black oak, and chestnut oak. Tulip poplar trees are much more prevalent on lower slopes. Spicebush and Japanese honeysuckle were clearly the predominant species in the shrub/woody layer of the upland forest. The herbaceous layer is often sparse in certain forested parcels, owing to the shade created by the dense tree and shrub layer. Predominant herbaceous species throughout include mayapple, white avens, jumpseed, and clearweed.

Principal riverine trees along Bush Creek and its tributaries included hackberry, black cherry, tree of heaven, tulip poplar, red maple, and slippery elm. In the shrub layer of these wetter regions, poison ivy, Japanese honeysuckle, tartarian honeysuckle, multiflora rose, and spicebush are the principal species. In the herbaceous layer, wingstem, pokeweed, wicker microstegium, and several unidentified polytrichum moss species were observed.

Oldfield

Mapping analysis and field observation indicated that oldfield areas within Lower Bush Creek watershed are typically found at the edges of cultivated fields and abandoned lots. The oldfield observed in the study area was predominantly herbaceous with few scrubby trees and shrubs, and was dominated by broomsedge, yarrow, late flowering boneset, white snakeroot, and butter-and-eggs. The small trees that are scattered within the areas of oldfield or occur around the periphery (generally at the outer edge of cultivated fields and upland deciduous forest) included tree of heaven, black locust, black cherry, and sassafras.

Wetlands

Wetlands features maps for the study area were reviewed (MDNR 1999a-d). These maps are based on photointerpretation of high altitude, color aerial photography using the Cowardin et al. (1979) classification system.

Approximately 7,325 acres of Frederick County (approximately 1.7 percent of the county) were mapped as wetlands during the late 1970s. About 6,355 acres (87 percent) of these wetlands were vegetated; the remaining 970 acres were unvegetated wetlands (primarily open waters of ponds and lakes). The most abundant vegetated wetlands types in Frederick county were non-tidal deciduous forested (3,775 acres) and non-tidal emergent (1,789 acres).

Wetlands were identified within the Bush Creek watershed area by examining aerial and satellite mapped photo images. Approximately 1.9 percent of the Lower Bush Creek watershed can be described as wetlands. These wetlands are 1.1 percent forested and 0.8 percent herbaceous. These wetlands, as mapped by MDNR, are generally very linear, and are associated with Bush Creek and its tributaries. The remaining wetlands are isolated, very small and scattered. These isolated wetlands (i.e., not associated with any of the creeks or tributaries in the watershed area) are generally herbaceous and are very small (2 acres or less).

Reichs Ford Road Landfill site has constructed several small ponds or lagoons, within its boundaries; these wetlands were mapped by MDNR as PUBHx (palustrine, unconsolidated bottom, permanently flooded, excavated) or PUBHh (palustrine, unconsolidated bottom, permanently flooded, diked). They are used as water quality retention ponds, from which constructed outfalls discharge into Bush Creek.

Several of the identified wetlands areas within the Lower Bush Creek watershed were investigated during a vegetation survey conducted by Versar scientists in August and September 1999. Principal vegetation was noted during the September 1999 reconnaissance by spot-checking the two major types of wetlands (forested and herbaceous), and is described in the following:

Forested Wetlands

The most common species in the tree layer of the forested wetlands were green ash, red maple, silver maple, box elder, black willow, slippery elm, American elm, sycamore, and eastern cottonwood. The predominant shrubs in the shrub layers are spicebush, southern arrowwood, multiflora rosa (found in dry to wet places), speckled alder (in wettest places), as well as small saplings of the predominant tree species. The herbaceous layer in the forested wetlands is typically sparse. Jewelweed, several smartweed species, clearweed, wingstem, honeysuckle, and false nettle are the most abundant species.

Herbaceous Wetlands

In herbaceous wetlands found in the watershed, predominant species generally include jewelweed, common rush, reed canary grass, barnyard grass, rice cut grass, water smartweed, straw-colored cyperus, arrow leaved tearthumb, sensitive fern, and sallow

sedge. Seemingly unique to the watershed, field reconnaissance efforts discovered a one-acre herbaceous wetlands area and pasture located along the northern end of Ed McClain Road that was dominated by sweet flag and dwarf St. John's Wort. Depending on wetness, degree of human disturbance, and other factors (cattle grazing), the shrub layer is moderately dense to nonexistent in some wetlands; principal shrub and woody vine species include spicebush, red osier dogwood, poison ivy, and multiflora rose, pussy willow, speckled alder, and southern arrowwood. The few species of trees observed in the herbaceous wetlands were black willow, green ash, black locust, and persimmon.