The vast possibilities of our great future will become realities only if we make ourselves responsible for that future.

Gifford Pinchot

AGRICULTURE

Both Frederick and Carroll County's history since initial settlement in the mid-1700's has been closely tied to agriculture. The fertile soils, sufficient water, and its favorable climate and topography in both counties were strong attractions to the early settlers. The early agricultural industry was well diversified with grain crops, livestock, vegetables, fruit orchards, and for a short period, tobacco.

The rural agricultural landscape in the Monocacy River Watershed is part of Frederick's and Carroll's economy, culture, and history. Many of the towns and communities in each county were established to support the surrounding agricultural enterprises. The growth and expansion of agricultural activities also affected the physical landscape of the Monocacy River Watershed through the clearing of forestland, including in the River's floodplain, which is fertile with alluvial deposits from the River—silt, sand, clay, gravel and fine organic matter.

Agriculture and the Floodplain

In a presentation at the 1994 Restoration of Aquatic Ecosystems Symposium in St. Paul, Minnesota, Hershey (1994) and others reported that extensive damage to floodplain cropland and the associated agricultural infrastructure from the 1993 Missouri River floods were largely preventable with the strategic placement of trees and with more effective management of opportunities offered by natural stands. The costs for recovering and restoring some agricultural land from debris accumulation, sediment and sand deposition, and scour erosions after the 1993 floods exceeded its market value as cropland.

The strategic use of woody vegetation in floodplain agriculture causes significant reductions in flow velocities, which results in the deposition of suspended particles and trapping of debris (Hershey, 1994). Scour erosion is controlled by the dense mat of intertwined, fibrous roots that reinforce the top foot of soil. Perry (1989), reported that trees develop root systems that can extend horizontal distances up to two times the tree height.

Agroforestry

Agroforestry is the concept of combining trees with agriculture to enhance productivity, profitability, and environmental stewardship. The USDA defines Agroforestry as the intentional integration of trees and shrubs into crop and animal farming systems to enhance long-term production of food and other useful products, to protect the soil and water, diversify and expand local economies and provide wildlife habitat.

According to the USDA, there are five (5) widely recognized categories of Agroforestry in the US:

Silvopasture – combining trees with livestock and their forages on one piece of land. The trees provide timber, fruit, or nuts, as well as shade and shelter for livestock and their forages, reducing stress on the animals from hot summer sun, cold winter winds, or a downpour.

Alley cropping – planting crops between rows of trees to provide income while the trees mature. The system can be designed to produce fruits, vegetables, grains, flowers, herbs, bioenergy feedstocks, and more.

Forest farming – growing food, herbal, botanical, or decorative crops under a forest canopy that is managed to provide ideal shade levels as well as other products. It is sometimes called multi-story cropping.

Riparian forest buffers – natural or re-established areas along rivers and streams made up of trees, shrubs, and grasses. These buffers help filter farm runoff while the roots stabilize the banks of streams, rivers, lakes and ponds to prevent erosion. They also support wildlife and can provide another source of income when sustainably harvested.

Windbreaks – these shelter crops, animals, buildings, and soil from wind, snow, dust, and odors. These areas can also support wildlife and sometimes are called shelterbelts, hedgerows or living snow fences.

Some Agroforestry systems with specific applications to floodplains include riparian buffers and filter strips for bank stabilization and water quality protection; windbreaks to stabilize erodible soils; alley cropping for enhanced crop production and protection; as well as tree plantings for fuelwood and wildlife habitat. Agroforestry is implemented for several objectives, including productivity enhancement, profit increase, energy conservation, natural resource conservation, and environmental diversification and modification. (Hershey, 1994)

A recent study by Weller et.al. (2011) from the Smithsonian Environmental Research Center in Edgewater, Maryland examined geographic buffer prevalence along water flow pathways connecting cropland to stream with statistical models to test for buffer effects on stream nitrate concentrations from 321 Chesapeake Bay tributary watersheds. Their research concluded that riparian buffers in the Piedmont watersheds had the highest absolute potential to reduce nitrate concentrations and that restoration of buffer gaps downhill from cropland could achieve significant stream nitrate removal.

Agriculture in the Monocacy River's corridor is a prominent land use. According to a recent Frederick County GIS analysis of the entire River corridor, nearly half (41 percent) of the Monocacy River's floodplain is unforested, comprised of cultivated agricultural fields or pasture land, with a high potential for erosion and direct input of sediment and phosphorus into the River. A lack of woody vegetation in the River's floodplain short-circuits the natural flood control, nutrient and energy processing, and habitat provision that a forest riparian landscape provides. Cultivation and grazing in the River's floodplain can result in the washing away of topsoil, crop damage and loss, and challenges for farm machinery after storm events and flooding.

The images below depict two very different land management —stewardship — approaches to agriculture in the River's floodplain. The two photographs on the left

show operations with minimal or no forest cover along the River corridor with high potential for soil erosion and runoff to enter the Monocacy River. The agricultural operation on the right includes a forest buffer in the River's flat floodplain, providing natural filtration and erosion control, plus habitat for birds and other River inhabitants.

The narrow, one-tree-wide buffer that is present along many sections of the Monocacy River has the potential to be eliminated and wiped-out by the next flood or disease or pest. This bleak future scenario will result in a less resilient River corridor with no protective and beneficial vegetation for the Scenic Monocacy River.

Increasing the tree canopy along the River will reduce direct sediment and phosphorus delivery into the Monocacy River. Because the first step in soil erosion occurs when raindrops hit and loosen the soil, a tree canopy will reduce soil erosion by reducing the number of raindrops that land directly on the ground. Tree leaves substantially reduce the velocity of raindrops before they strike the ground—some rainwater slowly runs down tree trunks to the soil and some evaporates before it reaches the ground. The duff layer in a forested floodplain further aids to slow overland flow of water and to increase infiltration of rainfall. A forested River floodplain enhances the scenic qualities of the Monocacy River.

Enhancing the River's corridor with new woody vegetation should not be viewed as restricting agriculture in the River's floodplain; it is simply establishing and growing another 'crop'—trees---which can aid in overall farm productivity by lessening destructive cropland impacts from floodwaters and by reducing challenges to planting and harvesting in the River's floodplain.

However important agriculture is to our local economy, history, and culture, we all—residents, land owners, businesses, government—have responsibility to be superior stewards of our shared River resource—not just for the drinking water it supplies nor its capacity to assimilate treated wastewater, but the habitat it provides for wildlife, the recreational opportunities, the solitude, and

the sense of place and identity the River brings to our community and State. The promotion of our agricultural heritage and its future should also include support and enhancement of the complete River resource---the water, as well as the wetlands, floodplain, forests, habitats, and landforms within its corridor.

There is a long arc of investment in and appreciation of agriculture in both counties. Below is a listing of the various agricultural land preservation programs in the Monocacy River Watershed.

Frederick County: Existing Preservation Programs/Accomplishments

Frederick County has a goal to permanently protect 100,000 acres with various agricultural land preservation programs. In addition, the County has a goal to preserve at least 80 percent of the remaining undeveloped lands within Priority Preservation Areas (PPAs). Priority Preservation Areas are areas in the County designated to receive extra prioritization in the programs, described more fully below. To date, the County has over 52,000 acres permanently preserved and an additional 5,300 acres in temporary preservation agreements. Of that, 36,050 acres fall within the Monocacy watershed. Landowners enrolling in the following programs must have a Soil and Water Conservation Plan. Inspection, follow-up, and revisions to the Soil and Water Conservation Plan are required in order to ensure water quality is addressed and protected along with the agricultural operation. Easements provide legal assurance that intense residential development or other non-agricultural related commercial or industrial uses will not occur.

Maryland Agricultural Land Preservation Foundation (MALPF) Program

The MALPF is part of the Maryland Department of Agriculture. There are currently 123 farms under easement in a total of 19,141 acres. Of that, 13,607 acres are located within the Monocacy watershed. In addition, there are 51 temporary MALPF District properties that encompass 5,362 acres in Frederick County, of which 4,072 acres are located within the Monocacy watershed. A recent addition to the MALPF easement program is the completion of a Baseline Report prior to easement settlement. This report requires farm inspections to ensure no serious erosion or water quality issue is unaddressed prior to easement settlement.

Frederick County Critical Farms Program (FCCFP)

The FCCFP assists farmers in buying farmland. This program was created to help farmers compete with non-farm buyers who often do not have the resources available to farmers to buy farmland. Since 1994 the County has assisted in the acquisition of 37 farm parcels by fulltime farmers on 4,643 acres of land. There are currently 1,048 acres of farmland in temporary FCCFP agreements in the Monocacy watershed.

Frederick County Installment Purchase Program (FCIPP)

The FCIPP supplements local land preservation efforts and provides an attractive alternative to existing land preservation programs. It works through the County's Bonding Authority to acquire easements at today's prices and pay for them with a deferred principle payment and annual tax exempt interest payments. The FCIPP has preserved 17,305 acres of land since 2002, of which 11,470 are in the Monocacy watershed.

Rural Legacy Program (RLP)

There are two approved RLP areas in Frederick County; the Mid-Maryland Land Trust Association, Inc (MMLTA) and the Carrollton Manor Land Trust Association (CMLTA). The MMLTA is in the western part of the County along South Mountain extending from U.S. 340 north to Myersville. The CMLTA is in the southern part of the County east of the Catoctin Mountains to the Monocacy River. The RLP has 37 properties covering 4,848 acres put under a preservation easement. Thirty-four of these properties have been preserved in the MMLTA area and the CMLTA area has one easement located in the Monocacy watershed.

Federal Farm and Ranch Protection Program (FFRPP)

The FFRPP makes money available for farmland preservation. Frederick County has made joint application with other Maryland Counties through the Maryland Agricultural Land Preservation Foundation (MALPF) Program. The County has easements on 496 acres that have used FFRPP funds independent of MALPF and are all located within the Monocacy watershed.

Maryland Environmental Trust (MET)

MET is a quasi-governmental organization of the State Department of Natural Resources with the purpose of protecting scenic open spaces including farm and forestland, wildlife habitat, waterfront, unique or rare areas, and historic sites. Since the first easement donated to MET in 1975, there have been 48 properties on 4,398 acres placed under an MET easement in Frederick County. A total of 3,359 easement acres are located within the Monocacy watershed.

Conservation Reserve Enhancement Program (CREP)

CREP is a state-federal partnership that helps landowners plant streamside buffers, establish wetlands, protect highly erodible land, and create wildlife habitat while providing them with a steady, dependable land rental income. Frederick County is a high priority and was awarded funding to preserve 1,114 acres with CREP, of which 689 are located in the Monocacy watershed.

The following chart summarizes the acreage of preserved lands in Frederick County's preservation programs that border the Monocacy River. The total linear, Monocacy River-frontage of these preserved properties is 10.8 miles.

Preservation Program	Acres of Preserved Properties w/ River Frontage
Maryland Agricultural Land Preservation Foundation (MALPF)	1,458
Installment Purchase Program (IPP)	676
Maryland Environmental Trust	626
Conservation Reserve Enhancement Program	64
Frederick County-held Preservation Easement	191

Priority Preservation Areas (PPAs)

House Bill 2 from the 2006 Maryland Legislature required counties seeking state certification of Agricultural Preservation Program to designate PPAs and add a PPA element to their comprehensive plan. A PPA may consist of a single parcel of land, multiple connected parcels of land, or multiple unconnected parcels of land, and include Rural Legacy areas. It shall be capable of supporting profitable agricultural and forestry enterprises; be governed by local policies that stabilize the land base so that development does not convert or compromise agricultural or forest resources; and be large enough to support the kinds of agricultural operations that the county seeks to preserve. Three PPAs as follows are located within the Monocacy watershed.

Carrollton Manor Priority Preservation Area: This PPA contains approximately 19,337 acres located south of Ballenger Creek, east of U. S Route 15, west of the Monocacy River, and extending south to the Potomac River. A small portion is located within the Monocacy watershed near Adamstown.

Walkersville Priority Preservation Area: This PPA encompasses 9,458 acres virtually surrounding the Town of Walkersville and extends west to the Monocacy River and north to the Town of Woodsboro. It includes the highest concentration of prime farmland anywhere in the County and is located entirely within the Monocacy watershed.

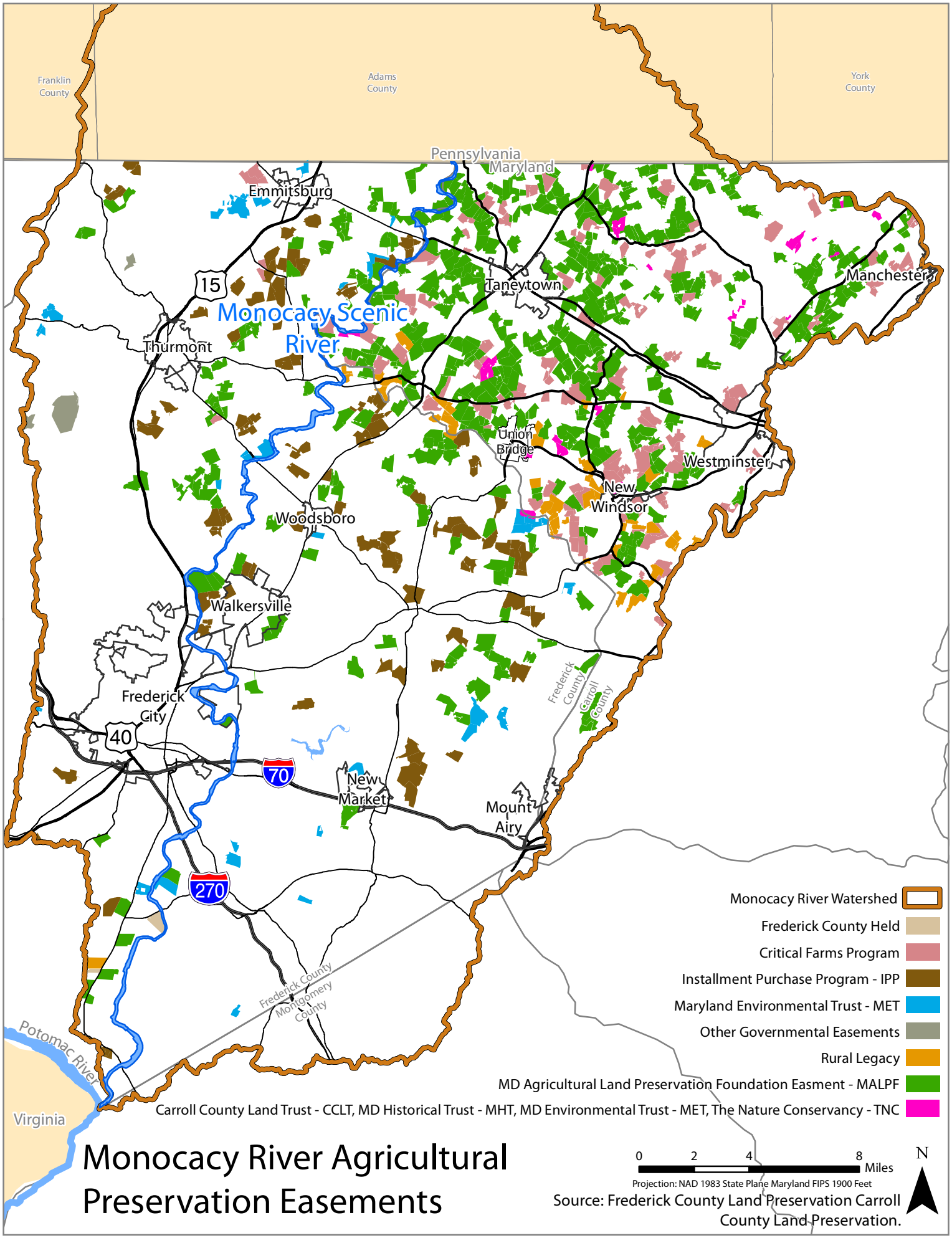
Eastern County Priority Preservation Area: This PPA is the largest encompassing 48,427 acres east of MD 75, west of the Carroll County line, and extending south to the Town of New Market. The northern extent is MD 194 north of Ladiesburg. The area includes 9,264 acres of permanently preserved acres, which is over 19 percent of the total land area. This PPA is located entirely within the Monocacy watershed.

Carroll County

Since 1980, Carroll County has been purchasing conservation easements on farmland from willing sellers with the goal of protecting 100,000 acres from development. For many years, the county operated only the program administered by the State of Maryland. Over time, Carroll adopted additional programs to better meet the specific needs of farm owners, greatly increasing participation. Ag land preservation is accomplished through the use of a deed of easement recorded in the land records that effectively removes development potential from the land. As of June 30, 2015, Carroll County has 66,642 acres under permanent easement countywide.

Carroll County operates three programs that preserve farm and rural lands. These programs have preserved many acres along the Monocacy River and within the Upper Monocacy Drainage Basin:

1. The Carroll County Agricultural Land Preservation Program (ALPP), which has two payment options – lump sum or, the County's leveraged installment purchase that offers 20 years of tax free interest with principal paid at the end.

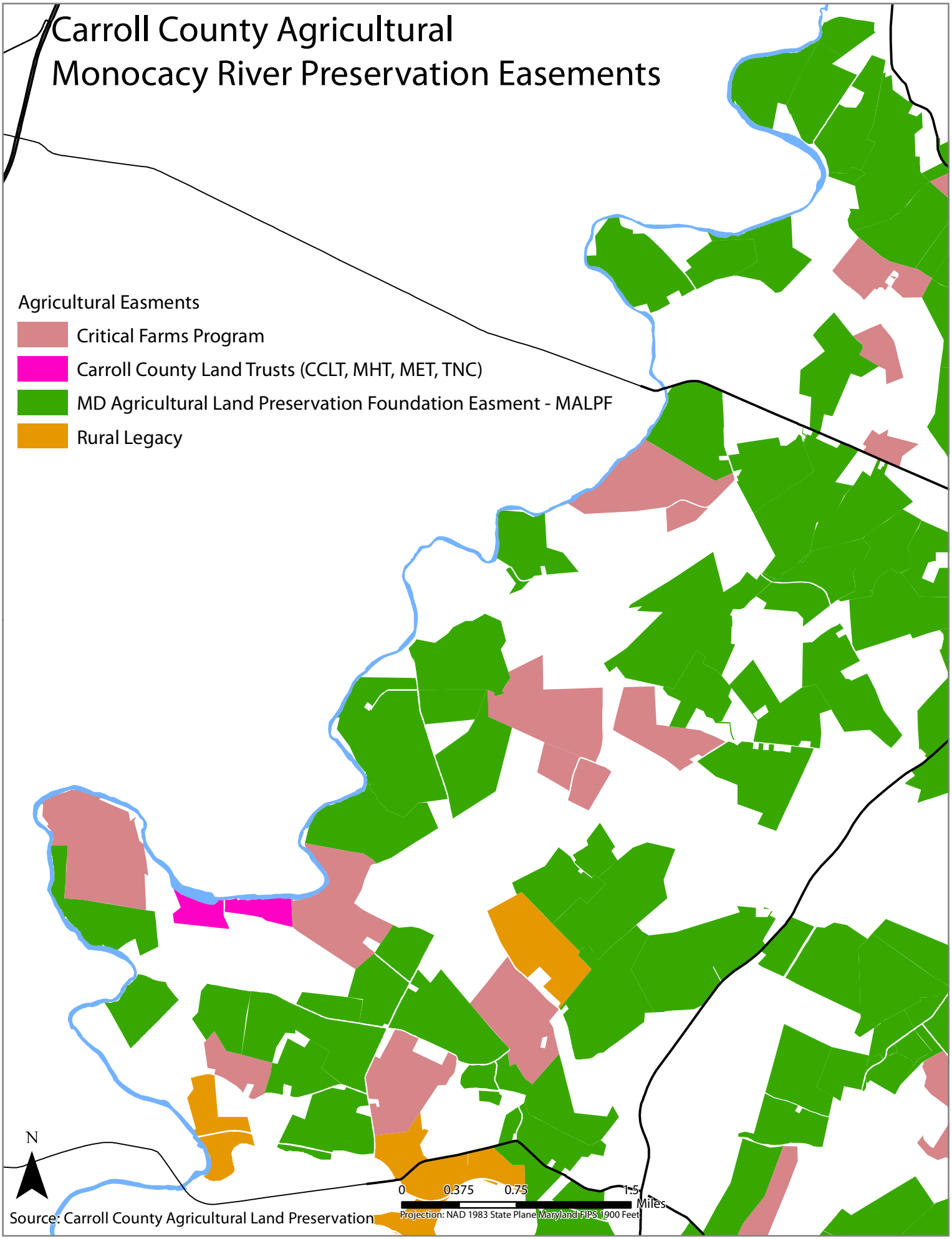


Monocacy River Agricultural Preservation Easements

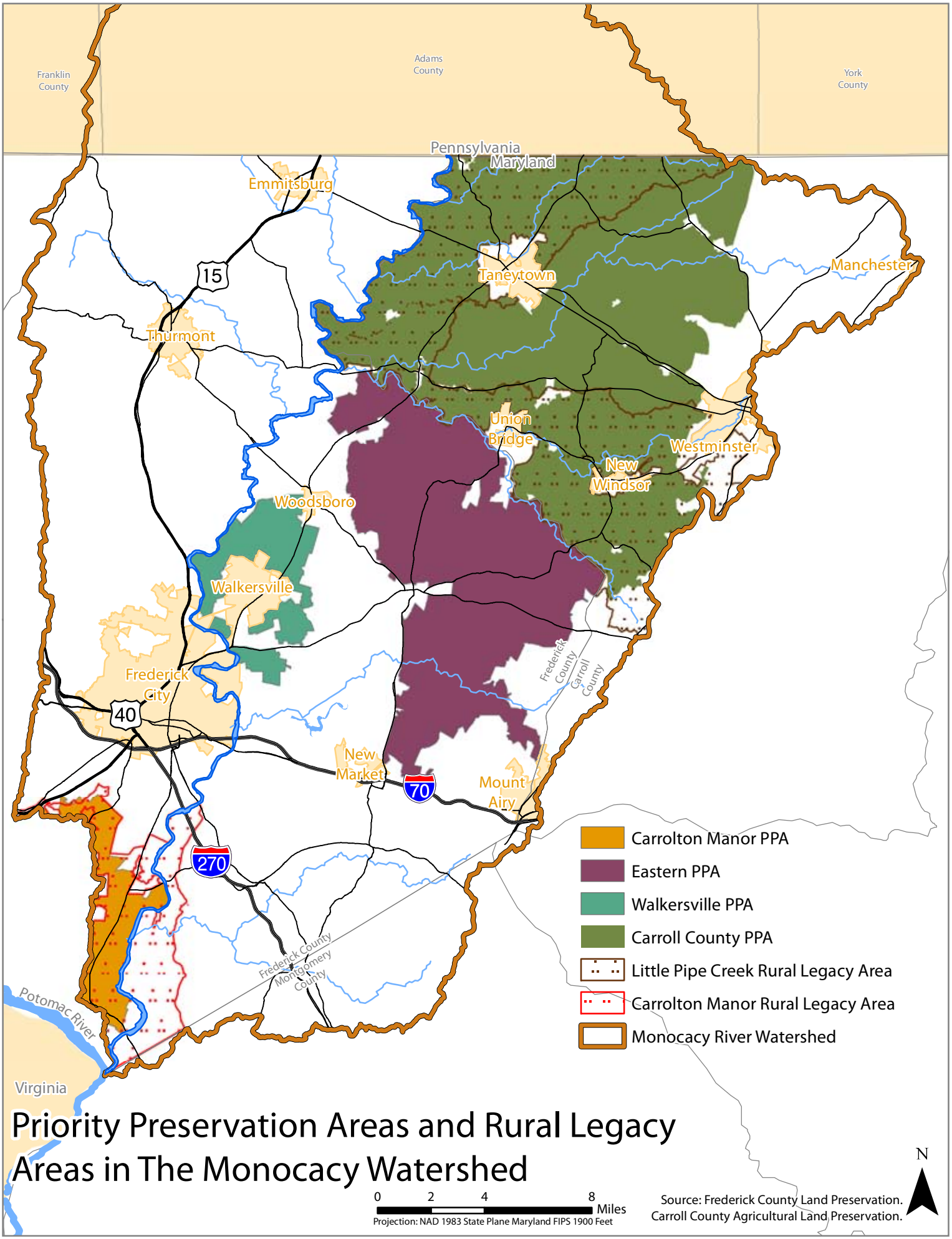
Projection: NAD 1983 State Plane Maryland FIPS 1900 Feet

Source: Frederick County Land Preservation Carroll County Land Preservation.

Carroll County Agricultural Monocacy River Preservation Easements



Source: Carroll County Agricultural Land Preservation


Franklin County
Adams County
York County
Pennsylvania
Maryland
Emmitsburg
Taneytown
Manchester
15
Thurmont
Union Bridge
Westminster
New Windsor
Woodsboro
Walkersville
Frederick City
40
Frederick County
Carroll County
New Market
70
Mount Airy
270
Frederick County
Montgomery County
Potomac River
Virginia
Carrolton Manor PPA
Eastern PPA
Walkersville PPA
Carroll County PPA
Little Pipe Creek Rural Legacy Area
Carrolton Manor Rural Legacy Area
Monocacy River Watershed
Priority Preservation Areas and Rural Legacy Areas in The Monocacy Watershed
0 2 4 8
Miles
Projection: NAD 1983 State Plane Maryland FIPS 1900 Feet
Source: Frederick County Land Preservation.
Carroll County Agricultural Land Preservation.
N

2. The Critical Farms Program, which Carroll County pioneered, assists applicants in the fee purchase of a farm, paying more than half of the cost or appraised value, and includes preservation via an easement through the state program.

3. The Rural Legacy Program is funded through a state grant program which operates in two designated areas within Carroll County, including the Little Pipe Creek Rural Legacy Area, which includes the Upper Monocacy Drainage Basin.

Upper Monocacy River Drainage Basin / Little Pipe Creek Rural Legacy Area

Carroll County's western boundary includes 86,250 linear feet of the Monocacy River and the interior includes 27,124 acres of the Upper Monocacy River Drainage Basin. Of the Basin acreage, 12,086 acres are in permanent preservation easements.

This region is contained within the Little Pipe Creek Rural Legacy Area. All of the Upper Monocacy Drainage Basin within Carroll County is within Carroll's Priority Preservation Area (PPA), a region designated in response to House Bill 2 enacted during the 2006 Maryland General Assembly. The designation is an incentive to target lands within the area for priority ranking for preservation. The PPA contains approximately 64 percent of the preserved land in Carroll County.

In addition to a very active program for retiring development potential, the Carroll County Ag Land Preservation Program (ALPP) and the Rural Legacy Program also focus on water quality improvement by including permanent stream buffers in conservation easement requirements. Riparian buffers included in easements vary between 25 and 100 feet wide on both sides of streams. Carroll County was the first jurisdiction in Maryland to require stream buffers in a locally-operated and funded agricultural land preservation program. The ALPP also requires Total Resource Management Plans and Forest Stewardship Plans, with requirements for implementation.

Lower Monocacy Drainage Basin / Preserved Acres

The Lower Monocacy Drainage Basin that lies within Carroll County contains 5,463 acres. It lies in close proximity to the municipality of Mount Airy and has been significantly fragmented by residential development. However, 546 acres have been preserved in a block within this basin region and some large parcels still remain.

The following chart summarizes the acreage of preserved lands in Carroll County's preservation programs that border the Monocacy River. The total linear, Monocacy River-frontage of these preserved properties is 9.7 miles.

Preservation Program	Acres of Preserved Properties w/ River Frontage
Maryland Agricultural Land Preservation Foundation (MALPF)	1,548
Carroll County Agricultural Land Preservation Program (CALPP)	534
Carroll County Land Trust	78
Rural Legacy	94

Recommendations

7-1) Frederick and Carroll Counties should continue to employ a wide range of economic incentives, financial aid, and technical assistance for landowners to protect, maintain, and restore the forestlands in the Monocacy River Corridor.

7-2) Modify the evaluation forms used in the Frederick County and Carroll County Agricultural Preservation Programs to assign higher ranking to farms along the Monocacy River applying for enrollment into the various land preservation programs.

7-3) Create a new Monocacy River Corridor Priority Preservation Area (PPA) in Frederick County

7-4) Consider the establishment of a Monocacy Scenic River Best Management Practice (MSR-BMP) set-aside program, whereby a percentage of agricultural preservation funding for River-front lands enrolling in the various preservation programs is dedicated to establishing new forest buffer plantings along the Monocacy River mainstem, OR

7-5) Consider the establishment of a Monocacy River Resource Protection BMP premium payment in the agricultural land preservation programs for landowners who establish new forest buffer plantings along the Monocacy River mainstem.

7-6) Collaborate with the USDA's Natural Resource Conservation Service (NRCS) and the local Soil Conservation Districts (SCDs) to initiate a program to design and implement Agro-forestry systems to increase environmental resilience and protection and maintain productive agricultural operations in the Monocacy River's floodplain

7-7) Both Frederick and Carroll Counties should consider partnering with the local SCDs and the USDA's NRCS to engage a farmer in the Agricultural Preservation Program in a pilot project to install the following innovative BMPs along the Monocacy River or within the watershed to reduce nitrogen, phosphorus, and sediment inputs:

Saturated Buffers

Riparian buffers intercept surface water (and some shallow groundwater) when it runs off the land, transforming—denitrifying—nitrate to harmless nitrogen gas, and capturing phosphorus and sediment coming off fields. However, the use of below-grade drainage tiles on agricultural fields bypasses these land practices and can introduce nitrogen and phosphorus directly into streams and the Monocacy River. Water from drain tiles can be diverted to a 'saturated buffer' which stays wetter than a typical riparian buffer and operates more like natural wetlands that provides the

right environment for microbes to digest (denitrify) much of the nitrate in the drain tile water. The use of saturated buffers was developed at the National Laboratory for Agriculture and the Environment in Ames, Iowa, but has potential for application in the Monocacy River Watershed to help achieve Chesapeake Bay TMDL nutrient and sediment reduction requirements.

Bioreactors

These devices have been successfully used on Maryland's Eastern Shore in the Choptank River Watershed and in New York's Upper Susquehanna and Finger Lakes Watersheds to reduce the nitrogen levels of water from agricultural lands. Field water is diverted or pumped to a pit filled with wood chips, which mimic the conditions in a waste water treatment plant, providing the medium for bacteria to convert the nitrate from fertilizers or manure into harmless nitrogen gas. The water then flows out of the pit and has significantly reduced nitrogen content. Bioreactors help to recreate the natural process that would have occurred on land that is more suited to be a fallow wetland, but has been engineered for agriculture.

7-8) Request the NRCS/SCD to consider modifying management of Soil & Water Conservation Plans and Total Farm Resource Plans for River-front properties to focus on Monocacy Scenic River Best Management Practices (MSR-BMP) that actively restore floodplain function by enhancing woody riparian buffers along the Monocacy River mainstem.

7-9) Frederick and Carroll Counties should consider increasing Agricultural Land Preservation programmatic resources for involvement in future Chesapeake Bay TMDL nutrient trading scenarios that occur between the agricultural sector and other land use sectors.

7-10) Frederick and Carroll Counties should partner with the University of Maryland Cooperative Extension, the University of Maryland's Department of Agricultural and Resource Economics, the US Forest Service, and the Alliance for the Chesapeake Bay to bring the program, "Family Forest and Agriculture Legacy Planning" to Carroll and Frederick Counties. "Legacy Planning" is a process that involves family members in discussions and decisions about current and future use, management, preservation, and overall goals related to land management, estate transfer and inheritance.

7-11) Promote the CREP permanent easement program through targeted mailing outreach to Monocacy River-front landowners in Frederick County, with initial focus on lands within the MD-DNR's Ecologically Significant Areas (ESAs).

7-12) Establish a premium payment for Monocacy River-front landowners in Frederick County who establish new forest plantings in the River corridor through the CREP permanent easement program, to further incentivize enrollment in CREP.