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Background

The following information is from the 2002 St. Mary's Quality of Life Plan. There are 231,280 acres of land with the majority being forest (54%), followed by agriculture (28%), based on 1997 data. There are over 400 miles of shoreline and 18% of the County is within the Chesapeake Bay Critical Area. Water-based recreation and economy are very important. The 6,384 acres Patuxent River Naval Air Station is an important employer in the County. The population in 2000 was 86,211. Growth is to be focused around existing developed area, including Lexington Park and Leonardtown.

The following information is summarized from the 1978 St. Mary's County Soil Survey. This County is surrounded by tidal water except where it connects with Charles County. It is surrounded on the northeast by the Patuxent River, the east by the Chesapeake Bay, the south by the Potomac River, and the west by the Wicomico River. There are roughly 200 miles of tidal shoreline. This County is within the Atlantic Coastal Plain physiographic province. Elevations are highest in the northwestern portion of the County. The area running from Charles County through the central portion of the County is the upland plateau. Included in this area are some steep sloped ravines. Along the rivers and Chesapeake Bay is the lowland plain. Roughly 19 percent of the soils are classified as poorly drained. 28% of the soils need artificial drainage before they can be successfully used for farming. There are 18,418 acres on floodplains.

Based on MDP 2002 GIS land use data, St. Mary County has 308,172 acres of open water and 230,836 acres of land. The land acres are divided as follows: urban 48,243 acres (21%), agriculture 60,308 acres (26%), forest 118,536 acres (52%), wetlands 2,887 acres (1%) and barren land 862 acres (<1%). Since MDP wetland acreage is often underestimated, DNR wetland data estimates, as discussed in the watershed sections of this document, are preferred.

There are large areas of soil classified as prime farmland (based on MDP Natural Soil Groups GIS data). In order to preserve agriculture in the County, wetland restoration/creation should attempt to avoid areas classified as prime farmland.

There are two different State-designated 6-digit watersheds and seven 8-digit watersheds: Patuxent River (021311) includes Patuxent River lower (02131101); Lower Potomac River (021401) includes Potomac River lower tidal (02140101), St. Mary's River (02140103), Breton Bay (02140104), St. Clement Bay (02140105), Wicomico River (02140106) and Gilbert Swamp (02140107).

Streams

The Maryland Tributary Strategies document *Lower Potomac River Basin Summary Final Version for 1985-2002 Data: January 31, 2004* describes the basin (an area containing parts of Charles, St. Mary's and Prince George's Counties) as follows. For the entire basin, land use is dominated by forest (60%), followed by agriculture (24%) and urban (16%). In 2002, the main nitrogen, phosphorus, and sediment sources within the Lower Potomac River basin were agriculture (38%, 41%, and 68% respectively) and urban (22%, 34%, and 11% respectively). Point sources also contributed nitrogen and phosphorus (22% and 8%). There is one major wastewater treatment plant in this County (Leonardtown). Water quality parameters at the tributary stations did not show a clear pattern based on location. Sites had poor to good total nitrogen levels with all sites having decreased nitrogen since 1985. Sites ranked poor for total nitrogen were at Indian Head and Morgantown Bridge – Route 301. Total phosphorus was poor to good, with some sites improving since 1985. The only site ranked poor was Morgantown Bridge – Route 301. Phosphorus was generally good at the northern Potomac section. Algae was ranked poor to good, with some stations showing a degrading trend since 1985. Total suspended solids were fair to good. During the period 1984 to 2002, of the five sites monitored for SAV abundance, four met SAV goals at least once during that period. In 2002, only Mattawoman Tidal Fresh site exceeded the goal. Benthic community sampling suggested an organic overenrichment in the oligohaline and tidal freshwater Potomac River and pollution (low dissolved oxygen) in the mesohaline Potomac River.

The Maryland Tributary Strategies document *Patuxent River Basin Summary Final Version for 1985-2002 Data: January 29, 2004* describes the Patuxent River Watershed (an area containing parts of St. Mary's, Anne Arundel, Prince George's, Calvert, Charles Howard, Montgomery). As of 1998, some BMP goals for this basin have been met (marine pumpouts, shore erosion, septic connections, and stormwater management retrofits) but some have not been met (controlling erosion and sediment, urban nutrients, septic pumping, enhanced stormwater management, forest practices). The Patuxent River receives water from the Little Patuxent, Middle Patuxent and Patuxent. This watershed has over 100 species of fish. Land use for the entire basin is dominated by forest (44%), followed by urban (30%), and agriculture (26%). About 70% of the houses are on municipal sewage and 81% are on public water. In 2002, the main nitrogen, phosphorus, and sediment sources within the Upper Potomac River basin were point sources (34%, 30%, 0%, respectively), urban (32%, 36%, 28%, respectively), agriculture (21%, 22%, and 55%, respectively). Tributary stations had total nitrogen levels mostly ranked as good and levels were generally improving since 1985. The two sites ranked poor were located at the northern portion (MD Route 97 and MD Route 4). Total phosphorus, total suspended solids, and algae were ranked poor to good, with most stations improving for phosphorus but not as much for the other parameters. Stations ranked poor were located in the middle portion of the river. Of the three sites sampled for SAV abundance, two (the upper and middle portion of the river) exceeded SAV goals during the period between 1984 and 2002.

Wetlands

According to Tiner and Burke (1995), in 1981-1982 there were 16,296 acres of wetlands (2.7% of the State's total). The wetland types were Estuarine (6,600 acres), Palustrine (9,671 acres), Riverine (157 acres), and Lacustrine (25 acres). Comparisons of this 1981-1982 wetland acreage with historic wetland acreage (based on hydric soils) represents a 67%, or 33,282 acre, loss (MDE, 2002).

A 1994 U.S. Fish and Wildlife Service report investigated status and trends of wetlands for the period from 1981-92 to 1988-89. There were over 49 acres of vegetated wetlands that were converted to uplands. The vast majority of losses (38 acres) were from paluatrine forested wetlands. There were over 3 acres of estuarine emergent wetlands that were lost due to upland conversion. Most conversions to upland resulted from housing, agriculture, and commercial development. There were over 150 acres of wetlands that were converted to another vegetated wetland type. There were approximately 119 acres of new pond construction in uplands, while pond construction in wetlands resulted in conversion of approximately 39 acres of wetlands to open water. Beaver activity was listed as the cause of changes to wetland water regimes and vegetation type in over 111 acres of wetlands. Beaver also created approximately 7 acres of wetlands from uplands (Tiner and Foulis, 1994).

The following wetland plant community descriptions are based on Tiner and Burke (1995).

- Estuarine wetlands can be salt or brackish tidal wetlands. Vegetation is largely dependent upon salinity and hydrology, with plant diversity increasing with decreased salinity and decreased flooding. They can be classified into five groups:
    - Estuarine intertidal flats are mud or sand shores that are exposed twice a day (at low tide) or less. These areas have sparse macrophytic vegetation.
    - Estuarine emergent wetlands have vegetation composition that is strongly influenced by salinity level and duration/frequency of inundation.
        - Brackish marshes are the most common type of Maryland Estuarine wetland, found along the Chesapeake Bay and tidal rivers. Low brackish marsh is often dominated by smooth cordgrass-tall form and water hemp while the high brackish marsh is often dominated by salt hay grass, salt grass, black needlerush, smooth cordgrass-short form, Olney three-square, switchgrass, common three-square, big cordgrass, common reed, salt marsh bulrush, seaside goldenrod, rose mallow, and narrow-leaved cattail.
        - Oligohaline marshes are only slightly saline and are located in the upper tidal rivers. Low oligohaline marshes are often dominated by arrow arum, pickerelweed, spatterdock, wild rice, soft-stemmed bulrush, narrow-leaved cattail, water hemp, and common three-square while high oligohaline marshes are often dominated by big cordgrass, common reed, narrow-leaved cattail, wild rice, broad-leaved cattail, and sweet flag.
    - Estuarine scrub-shrub swamps are often dominated by high-tide bush and groundsel bush.

  - Estuarine forested swamps are often dominated by loblolly pine. Due to sea level rise bringing in more salinity, some of these systems are being converted into salt marshes.
  - Estuarine Aquatic beds generally contain submerged aquatic vegetation, including eelgrass and widgeongrass in high salinity areas and widgeongrass and other species in lower salinity areas.
- Palustrine wetlands can be classified into four major groups depending on the dominant vegetation type: forested, scrub-shrub, emergent, and aquatic. These wetlands were described for the Maryland Coastal Plain Province.
  - Palustrine forested wetlands are the dominant palustrine wetland type on the Coastal Plain and are located in floodplains, depressions, and drainage divides. They can be classified into four main groups:
    - Tidally flooded wetlands are freshwater wetlands that are tidally influenced. Common tree species may include red maple, green ash, black willow and black gum.
    - Semipermanently flooded wetlands are nontidal wetlands that are flooded for much of the growing season. These are uncommon in Maryland. Some examples, dominated by bald cypress, are along Battle Creek and the Pocomoke River. Higher elevations may be dominated by red maple, black gum, sweet bay, swamp black gum, fringe tree, ironwood, and swamp cottonwood.
    - Seasonally flooded wetlands are nontidal wetlands that are flooded for generally longer than two weeks during the growing season. Some of the more common tree dominants include red maple, sweet gum, pin oak, willow oak, loblolly pine, or swamp chestnut oak. There is often a thick shrub understory.
    - Temporarily flooded wetlands are nontidal wetlands that are flooded the least of the four types, about a week. Seasonally saturated wetlands, wetlands having a high water table during the cooler months, are also included in this category. Some of these areas are managed for loblolly pine harvesting. Other tree dominants include red maple, sweet gum, black gum, willow oak, water oak, basket oak, swamp white oak, southern red oak, sycamore, black willow, American holly, sweet bay.
  - Scrub-Shrub wetlands are less common than forested wetlands on the Coastal Plain. They are often dominated by buttonbush (in the wetter systems), silky dogwood, arrowwood, alder and tree saplings.
  - Emergent wetlands are very diverse in the Coastal Plain region due to the occurrence of both tidal and nontidal wetlands. They can be categorized into several different types:
    - Tidal fresh marshes occur along the large coastal waterways, between the brackish marshes and tidal freshwater swamps. It is speculated that in addition to tidal flooding, temporary periods of salt water in these areas may discourage woody succession. These freshwater wetlands are often more diverse than wetlands with higher salinity levels. Vegetative dominance changes seasonally.

There is often a distinct vegetative zonation pattern based on elevation. Some common dominance types according to McCormick and Somes (1982) are arrowheads, big cordgrass, bulrushes, bur-marigold, cattails, common reed, giant ragweed, golden club, pickerelweed/arrow arum, purple loosestrife, reed canary grass, rose mallow, and smartweed/rice cutgrass

- Interdunal wet swales have a very high water table, allowing hydrophytic plants to grow adjacent to dunes having xeric plant species. These sites are often dominated by common three-square, salt hay grass, and rabbit-foot grass.
- Semipermanently flooded marshes are often dominated by cattail, spatterdock, arrow arum, water willow, and bur-reeds.
- Seasonally flooded marshes include isolated depressional wetlands called "potholes" or "Delmarva Bays" (mostly in Caroline, Kent, and Queen Anne's)
- Temporarily flooded wet meadows include areas recently timber harvested that will soon revert back to woody vegetation.

  - Aquatic beds include small ponds with vegetation on the bottom and/or surface. These are the wettest of the Palustrine types.

- Riverine wetlands are found within the channel and include nonpersistent vegetation.
- Lacustrine wetlands are associated with deepwater habitat (e.g. freshwater lakes, deep ponds, and reservoirs). They can be classified into lacustrine aquatic beds (wetlands are located in the shallow water) and lacustrine emergent wetlands (wetlands are located along the shoreline).

This same document (*Wetlands of Maryland*) provides numerous examples of various wetland communities found within each County and complete plant lists for certain wetland types.

Tidal wetland acreage was also estimated in *The Coastal Wetlands of Maryland* (Table 1). St. Mary's County had 3,167 acres of vegetated tidally-influenced wetlands (excluding SAV). A large amount of vegetated wetland is brackish high and low marsh. There is also a small amount of tidal fresh marsh, and shrub and wooded swamp. Due to the higher stress associated with higher salinity levels, brackish marsh often has lower species richness and species diversity than fresh tidal marsh. Brackish marsh may also have quite distinct plant zonation patterns.

Table 1. Tidal wetland acreage within St. Mary's County based on vegetation type (McCormick and Somes, 1982).

Major Vegetation Type	Vegetation Type	Acreage
Shrub Swamp *(Fresh)*	Swamp rose	0
	Smooth alder/Black willow	22
	Red maple/Ash	37
Swamp forest *(fresh except pine, which is often brackish)*	Bald cypress	0
	Red maple/Ash	1
	Loblolly pine	14

Fresh marsh	Smartweed/Rice cutgrass	12
	Spatterdock	0
	Pickerelweed/Arrow arum	0
	Sweetflag	0
	Cattail	0
	Rosemallow	8
	Wildrice	0
	Bulrush	0
	Big cordgrass	0
	Common reed	0
Brackish High Marsh	Meadow cordgrass/Spikegrass	605
	Marshelder/Groundselbush	640
	Needlerush	102
	Cattail	320
	Rosemallow	74
	Switchgrass	12
	Threesquare	186
	Big cordgrass	472
	Common reed	9
Brackish Low Marsh	Smooth cordgrass	653
Saline High Marsh	Meadow cordgrass/Spikegrass	0
	Marshelder/Groundselbush	0
	Needlerush	0
Saline Low Marsh	Smooth cordgrass, tall growth form	0
	Smooth cordgrass, short growth form	0
Submerged Aquatic Vegetation	Submerged aquatic plants	760

Wetland Functions

Stormwater and Flood Control

Wetlands are often credited with providing natural stormwater and flood control benefits. Inland wetlands adjacent to rivers, streams and creeks hold excess discharge and runoff during periods of increased precipitation such as tropical storms and hurricanes and during periods of rapid snow-melt in mountainous regions. Coastal wetlands also hold excess discharge from inland drainage networks as well as tidal waters during storms.

Several factors influence the effectiveness of a wetland in reducing adverse effects of stormwater and floods. Factors include the characteristics of the wetland, local land conditions, and landscape features in the surrounding larger watershed, as well as the type of storm itself. The physical structure of many wetlands, with dense vegetation, fallen trees, topography (hummocks, depressions), and complexity of stream channel systems serve as resistance features to slow flow of surface water from floods and surface runoff, the height of peak floods, and delay the timing of the flood crest. Wetlands are typically in topographically low position, which provides a natural basin for water

storage. The depth of the basin and soil characteristics affect the wetland's storage capacity at surface and subsurface levels. Water is released more slowly from the wetlands, thereby reducing both erosion and damage to property and structures farther downstream. In the surrounding areas, the ability of the land to also reduce runoff may aid the wetland in its flow retention/reduction function. At the landscape level, the position of the wetland in the watershed and the ratio of size of the wetland to the size of the watershed also affect the function. Wetlands higher in the landscape and of large in size in relation to the watershed are most effective. While wetlands retain surface flows that enter the wetlands at a gradual rate, they are considered to be more effective at reducing damages from short duration storms.

Also, some water will be removed from the wetland through ground water recharge, soil retention and evapotranspiration.

The associated value of this function can be summarized as follows:

a. A decrease in the volume and velocity of flowing water.
   Value: Helps prevent stream channel and shoreline erosion, and habitat destruction.
b. Deposition and retention of fine sediment.
   Value: Helps maintain water quality and aquatic ecosystems.
c. Water storage by extending the period of time during which flood waters are released back into the drainage system.
   Value: Helps prevent the flooding of homes, property, agricultural lands, and structures such as dams, bridges, and roads.

The topography in most of the County rises sharply adjacent to streams, resulting in a relatively narrow floodplain. The width of the floodplain greatly influences the amount of water that can be temporarily stored or slowed, so the flood attenuation function has probably moderate to low benefits. Most structures are located beyond the edge of the ravines bordering the wetlands.

Storm surge protection is probably performed less effectively by wetlands in St. Mary's County than at sites with broader expanses of tidal wetlands.

Groundwater Recharge and Discharge

Functions

Wetlands facilitate the flow of water between the ground water system and surface water system. Wetlands periodically perform different functions, depending on the gradient of the groundwater table and the topography of the land surface. The relationship of the groundwater table and the land surface dictates which function - groundwater recharge or discharge - a wetland performs.

Nearly all of Maryland's wetlands are ground water discharge areas, at least for some portion of the year (Fugro East, Inc., 1995). Variations in the depth of the ground water table, resulting from seasonal changes in climate, dictate which of these functions -

discharge or recharge - a wetland will perform at a given time.

Values

Ground water discharge helps maintain a wetland's water balance and water chemistry. This wetland function is also critical to the formation of hydric soils and the maintenance of ecosystem habitats in different types of wetlands.
Ground water recharge is the primary mechanism for aquifer replenishment which ensures future sources of groundwater for commercial and residential use.

Modification of Water Quality

Water Quality Improvement

Wetlands are valued for their ability to maintain or improve quality of adjacent surface waters. This ability is primarily accomplished by the following processes:

- Nutrient removal, transformation, and retention
- Retention of toxic materials
- Storage of the sediment transported by runoff or floods.

Hydrophytic vegetation (adapted to live in water) and microbial activity in soils help remove toxic substances and excess nutrients from surface water. Dissolved solids and other constituents may be removed or degraded, such that they become inactive, or incorporated into biomass. This occurs through adsorption and absorption by soil particles, uptake by vegetation and loss to the atmosphere through decomposition and exchange between atmosphere and water.

Nutrient Cycling: Addition, Removal and Transformation

Nutrients are carried into wetlands by hydrologic pathways of precipitation, river flooding, tides, and surface and ground water inflows. Outflows of nutrients are controlled primarily by outflow pathways of waters. The inflow and outflow of water and nutrients are important processes that effect wetland productivity.

Wetland biological and chemical processes remove suspended and dissolved solids and nutrients from surface and ground water and convert them into other forms, such as plant or animal biomass or gases. Debris and suspended solids (fine sediment or organic matter) may be removed by physical processes, such as filtering and sedimentation.

Soil characteristics, landscape position, and hydrology all contribute to the relative ability of a wetland to perform nutrient removal and transformation. Sufficient organic matter must be present for microorganisms in the soil to consume or transform the nutrients. Wetlands are often depressions in the landscape that hold water, transported sediment, and attached or dissolved nutrients for a longer period of time than a sloping area or areas with relatively higher elevations. A longer retention time allows for chemical interactions and plant uptake to occur.

Nitrogen undergoes some chemical transformations and may be taken up in soluble form, absorbed by plants through their roots, or consumed by anaerobic microorganisms that convert the nitrogen to organic matter (Mitsch and Gosselink, 2000). Anaerobic microbes may also convert the nitrogen from a nitrate form to nitrogen gas. Phosphorus is often

bound to clay particles, and these fine sediments are transported into wetlands by riparian flooding and tidal action. Phosphorus may be stored in a wetland attached to the clay particles, however, phosphorus becomes available for plant uptake in its soluble form after flooding, saturation and anaerobic conditions typical of a wetland occur. Nutrient processes vary seasonally. Cooler temperatures slow microbial activity and plant uptake while higher flows of water transport more materials out of non-isolated wetland systems. The transported organic material is critical for downstream food chain support.

Tidal wetlands are highly effective sinks and/or transformers of nutrients, as nutrients are taken up and stored by plants or released as nitrogen gas into the atmosphere. However, the uptake and transformation occurs on a seasonal basis during the growing season. At the end of the growing season, as plants die and decompose, nutrients are released back into the aquatic system.

Wetlands are most effective at nutrient transformation and uptake when there are seasonal fluctuations in water levels (Tiner and Burke, 1995). Wetlands that are temporarily flooded (saturated or inundated for brief periods early in the growing season) and those that are permanently inundated would generally be less effective than seasonally wet areas (saturated or inundated for longer periods during the early-mid growing season but are drier by the end of the growing season).

Toxics Retention

Retention of heavy metals has been reported most often in studies of tidal wetlands, though most wetlands are believed to serve as sinks for heavy metals. Accumulation is primarily in soils, with plants playing a more limited role (Mitsch and Gosselink, 2000). Plants such as cattails, bulrushes, and *Phragmites* are among the more effective and commonly used plants for uptake of toxic materials such as metals. As is the case for nutrient transformation and sediment retention, soil characteristics, landscape position, vegetation, and hydrology all contribute the relative ability of a wetland to retain toxic materials. The longer the duration that water and transported materials remain in the wetland, the greater the likelihood that the materials will be retained. Many wetlands have been constructed as part of stormwater management facilities to treat surface runoff.

Sediment Reduction

Wetlands along rivers, streams and coastal areas are important for removing sediment from surface and tidal waters. During large flood events, rivers frequently overtop their banks and water flows through adjacent floodplains and wetlands. Flood waters carry large volumes of suspended sediment, mostly fine sand, silt and clay. Because floodplains and wetlands provide resistance to flow - from dense vegetation, microtopography, and woody debris - the flow of water is slowed and sediment is deposited and stored in these areas. Similarly, coastal marshes and estuaries retain sediment brought in by tides and residual suspended sediment from rivers.

Lack of dense vegetation in some floodplains, and narrow width of floodplains, would reduce the ability of wetlands to slow velocities of floodwaters and allow settling of transported sediments.

Wildlife Habitat/Biodiversity

Wetlands provide important habitat for fish, wildlife, and plant species, including rare species. Large contiguous areas of wetland, forest or other relatively undisturbed land are most likely to support sensitive species and diverse, microhabitats. Habitat and biodiversity are threatened not only by direct impacts such as filling, drainage, sediment, and land clearing, but by introduction of exotic and invasive species. Wetlands that are important for habitat and biodiversity often require a relatively undisturbed adjacent buffer to protect the species and habitat from direct and indirect disturbance.

The following information is summarized from the 1994 document entitled *Opportunities to Preserve and Enhance the Quality of the Saint Mary's River and the County's Tidal Creeks* Oyster bars are present in many of the tidal creeks and the St. Mary's River. As of 1994, while these populations were decimated due to disease, a large enough population remains to allow possible recovery if the diseases subside. These waterways include: Canoe Neck Creek, Chaptico Bay, Cuckhold Creek, Hickory Landing Creek, Indian Creek, Saint George Creek, Saint Inigoes Creek, St. Mary's River, Smith Creek, Town Creek, and Trent Hall Creek. This document also characterizes the tidal creeks throughout the County.

Nontidal Wetlands of Special State Concern

There are several State-designated Nontidal Wetlands of Special State Concern scattered throughout the County. These are described in the section for the individual watersheds.

Wetland Restoration Considerations

Hydric soils suggest where wetlands are currently or were historically. There is a fair amount of hydric soil that is not mapped wetlands (based on MDP Natural Soil Groups GIS data and NWI/DNR wetlands), with large areas occurring along the Potomac River and Chesapeake Bay and smaller linear areas along the tributaries. Hydric soils that are not currently wetlands may be good potential sites for wetland restoration.

Vegetated stream buffers have the potential to intercept and remove nutrients, sediments, and other pollutants. Peterson et al. (2001) found that the smallest headwater streams, which are often found in association with springs and groundwater discharge wetlands, have the most rapid uptake and transformation of inorganic nitrogen (ammonium and nitrate) in comparison with other surface waters. The authors believed that the large surface to volume ratio in small streams resulted in rapid nitrogen uptake and processing. An excess of discharges to overload these systems would result in nitrogen being transported farther down the drainage systems to rivers and estuaries. Forested stream buffers can also improve down steam biodiversity by contributing organic matter to the food web, providing woody debris which increases diversity of physical habitat, and reducing stream temperature. Headwater streams are thought to be the most beneficial at these processes. Therefore, wetlands adjacent to streams should be high priority for restoration/preservation, with emphasis on headwater stream systems. Wetlands adjacent

to Scenic Rivers and around all tributaries of waterways used for drinking water (COMAR Use P) should also be ranked higher.

DNR assessed the development risk for all land within Maryland. Wetlands within areas of high development risk should be higher priority for preservation.

In order to maintain water quality of surface water reservoirs, wetlands within the watersheds of surface water reservoirs should be higher priority for preservation.

Wetland restoration may be more desirable in land uses that contribute high pollution, currently provide relatively low amounts of biodiversity, and are easy to convert to wetlands. As a general rule, agriculture fits these criteria more than other land use types. Forested land is generally not as high of a pollutant source and it also provides better habitat for plants and wildlife. For these reasons, converting upland forest to wetland may provide fewer benefits than converting agriculture to wetlands. However, projects that have converted artificially drained forest to wetland have resulted in beautiful wetlands with diverse ecology. Additionally, wetlands may be built in urban land use, but they are generally much smaller and sometimes more costly. Urban areas may provide good potential for wetlands designed for storm water management.

MDE has designated some areas as Wellhead Protection Areas (WPAs). In some WPAs, the water table is near the surface, with only a few feet of soil to filter any water entering the ground. Excavation of a few feet would significantly reduce the filtering capacity of the soil, allowing the wetland to act as a direct pathway for nutrients and other pollutants to enter the groundwater. Therefore, wetland creation designs within WPAs should consider the impact to groundwater quality.

Sensitive Resources

The source water assessment found that the community water systems in the County, withdrawing from confined aquifers, are not susceptible to land use contaminants, but are susceptible to naturally occurring arsenic and radon.

Restoration efforts should include sites that improve shellfish/oyster harvesting and reduce sediments. The Chesapeake Bay Foundation is working with some Mennonite and Amish farmers to do stream restoration and water quality improvement projects.

The following information is from the 2002 *St. Mary's Quality of Life Plan*. Population is projected to be 114,800 by the year 2020. Five aquifers are used for potable water (the Patapsco, Aquia, Piney Point, Magothy, and Mattaponi) and should be adequate to meet the growing population. There are four wastewater treatment plants in the County (Leonardtown, Pine Hill Run, St. Clement's Shore, and Wicomico Shores). Primary growth centers are Lexington Park and Leonardtown, while secondary growth centers are Charlotte Hall, New Market, Mechanicsville, Hollywood, Piney Point. There are some additional smaller growth centers. Some of the environmental resources goals listed in the comprehensive plan include:

- Protect natural features which provide erosion control, sediment/nutrient filtering, wildlife habitat, flood control
- Establish a network of greenways and easements
- Enhance waterfront access
- Conserve fish, wildlife and plant habitats
- Conduct environmental education for waterfront property owners
- Protect tidal and nontidal wetlands
- Maintain and enhance natural stream environment
- Protect RTE species and habitats
- Protect and restore the natural floodplain
- Maintain and enhance forest cover
- Protect steep land

Other Relevant Programs

Green Infrastructure and Greenways
Green Infrastructure hubs and corridors are spread fairly evenly through the County. Areas within the GI network that are currently unprotected should be protected. There are also small sections of Green Infrastructure considered to be "gaps," currently in development, agriculture, or barren land. It is desirable to restore these areas back to natural vegetation, as they can provide a wildlife corridor, a protective buffer, and may be especially important along the waterways. For more detailed information, refer to section on the individual watershed.

Ecologically Significant Areas
DNR designates areas that contain habitat for rare, threatened and endangered species and rare natural community types. These areas are buffered to create the "sensitive species project review areas" GIS layer, intented to assist in assessing environmental impacts and reviewing potential development changes. This layer generally includes designated Natural Heritage Areas, Wetlands of Special State Concern, Colonial Waterbird Colonies, and Habitat Protection Areas.

Natural Heritage Areas
There are no State-designated Natural Heritage Areas (NHA) located in this County.

Rural Legacy
Designated Rural Legacy land is located in the northern portion of the County and around St. Mary's River (proposed). Wetland preservation may be very desirable within these areas. For detailed information about the program, refer to the individual watershed section (Patuxent River Lower).

Priority Funding Areas
The largest Priority Funding Area is around the Lexington Park/California area (around Rte. 235). Other large PFAs are around New Market/Mechanicsville (on Rte. 5), Leonardtown, and around Piney Point Creek. Wetland restoration/creation may not be desirable within these areas.

Stakeholders in wetland management may have conflicting goals for wetlands in Priority Funding Areas. Some may advocate preserving wetlands in these areas as greenways, for aesthetics, or as unique communities in a developing area. Other interests may seek flexibility and expedited review of proposals to impact wetlands due to other goals for growth and economic development in a designated area. There may be benefits to protecting and restoring wetlands for water quality in a growth area, particularly as an offset against future or existing TMDLs. Preservation of biodiversity may be more of a challenge due to possible increases in nonpoint source pollution and fragmentation. Stormwater management associated with growth may also reduce certain nonpoint source impacts to wetlands in PFAs.

Agricultural Easements

Some properties are within agricultural easements. Some are permanent and some are shorter-term. There is some controversy about conducting wetland restoration within agricultural easements. Most would agree that it is desirable to preserve good farmland. However, properties within these easements may also contain spots of soil with lower productivity due to wetness. These low productivity spots may be a hassle to the farmer and may be good areas for wetland restoration. First, the property owner may be able to benefit from an additional program for that low productivity area, resulting in the owner getting more money for the land and utilizing the land to its full extent. Since these property owners are already involved in a preservation program, they may be more likely to consider additional programs. Second, since some of these agricultural easements are temporary, after the agricultural easement expires, the land owner may decide to get out of agriculture, and a wetland program could help to preserve some of the land from development.

Watershed Information

Information on individual State-designated 8-digit watershed basins is as follows.

Patuxent River lower (02131101)

Background

Based on MDP 2002 GIS land use data the St. Mary's County portion of the Patuxent River lower watershed has 118,373 acres of open water and 26,477 acres of land. The land acres are divided as follows: urban 4,519 acres (17%), agriculture 9,749 acres (37%), forest 11,553 acres (44%), wetlands 549 acres (2%) and barren land 106 acres (<1%). Since MDP wetland acreage is often underestimated, DNR wetland data estimates, as discussed later in this document, are preferred.

Mill Creek and Horse Landing Creek, flowing into the Patuxent River, are examples of streams within steep valleys (Gibson, 1978).

Fresh tidal marsh are located along meandering portions along the Patuxent River. It likely took hundreds or thousands of years to create these wetlands. The tidal portion extends from Queen Anne's Bridge in Anne Arundel County to the discharge into the Chesapeake Bay, roughly forty-five miles. The freshwater tidal marsh section runs from Ferry Landing (in Calvert) to Waysons Corner (in Anne Arundel). Between Ferry Point and Cocktown Creek, there is a transition zone with fresh and brackish. South of Cocktown Creek is brackish marsh. It is believed that the Patuxent River was historically wider and deeper, but due to agricultural sedimentation in the 18th and 19th centuries, this open water converted into low marsh and eventually high marsh. It is also believed that common reed has been spreading along the Patuxent River, near Mataponi Creek, due to the heavy sedimentation occurring there. The common reed in the freshwater tidal marshes has replaced the once prevalent stands of wildrice. As of the early 1980s, wildrice was still abundant around Ferry Point and between a mile below MD Rte. 4 and the southern end of Jug Bay (Sipple, 1999).

The Patuxent River was designated as a scenic river by the Maryland General Assembly. The following is a summary from a document titled *Patuxent River Policy plan: An update for 1984 to 1997*. (DNR, 1997). The Patuxent River Commission supports, coordinates, and implements programs, policies, and projects of the Patuxent River. Among the managements plans proposed for the Patuxent River include:

- Establishment of "a primary management area" delineating the area along the river and its tributaries to identify and manage land from which pollution is most likely to be transported into the river.
  - Prince George's County- has established the Patuxent River Management Area, with criteria for stream and wetland buffers within Patuxent watershed
  - Montgomery County- has adopted a master plan for Patuxent River, with guidelines for the protection of steep slopes, wetlands, reservoirs, and other sensitive areas in the Patuxent River watershed.
- Implementation of a comprehensive watershed management approach to control all sources of pollution and resource degradation.
- Continued restoration, improvement, and protection the habitat functions of aquatic and terrestrial living resources. These include:
  - Riparian forest- to stabilize stream banks.
  - Stream quality- to improve spawning ranges.
  - Wetlands-protection and restoration.
  - Forest land- to enhance contiguous tracts of forest.
  - Submerged aquatic vegetation and tidal marsh.
  - Concentrating new development in and around existing developed areas and population centers while protecting the rural and agricultural landscape.
  - Enhancing the environmental quality and community design in new and existing communities.
  - Developing a sense of stewardship for the Patuxent River and its watershed through increased public education and participation programs.

- Funding to support and meet the above plans.

Estimates of wetland acreage for the entire watershed, based on DNR mapped wetlands, are as follows:

- Estuarine
  - Emergent: 4,372 acres
  - Scrub shrub: 89 acres
  - Forested: 10 acres
  - Unconsolidated shore: 125 acres
- Palustrine
  - Aquatic bed: 73 acres
  - Emergent: 605 acres
  - Scrub shrub: 1,040 acres
  - Forested: 7,619 acres
  - Unconsolidated bottom: 687 acres
  - Unconsolidated shore: 7 acres
  - Farmed: 79 acres
- Total: 14,707 acres

MDE tracks all regulated nontidal wetland activity in Maryland, including regulated wetland impacts and gains. Based on data for the time period of January 1, 1991 through December 31, 2004, for this watershed, there has been a slight loss in wetlands (Walbeck, 2005).

Basin code	Permanent Impacts	Permittee Mitigation	Programmatic Gains	Other Gains	Net Change
02131101	-11.56	9.98	0	0.15	-1.43

Code of Maryland Regulations

All Maryland stream segments are categorized by Sub-Basin and are given a "designated use" in the Code of Maryland Regulations 26.08.02.08. Stream segments within the St. Mary's County portion of this watershed are designated Use I, recreation contact and protection of aquatic life, unless designated below.

- Use II: shellfish harvesting; all estuarine portions of tributaries.

Water Quality

The 1998 Clean Water Action Plan classified this watershed as Category 1, a watershed not meeting clean water and other natural resource goals and therefore needing restoration. It is also classified as a "Selected" Category 3, a pristine or sensitive watershed most in need of protection. Failing indicators include low SAV abundance and habitat index, poor tidal and non-tidal benthic index of biological integrity (BIBI), poor non-tidal instream habitat index, and high amount historic wetland loss (42,599 acres). Indicators for Category 3 include high imperiled aquatic species indicator, migratory fish spawning area, high number of wetland-dependent species, high amount of headwater streams in Interior Forest, and high percent of the watershed being forested.

According to the 2002 305(b) report, a portion of the nontidal mainstem and tributaries fail to support all designated uses due to pesticides, nutrients, low oxygen, and bacteria due to nonpoint sources, failing septics, natural sources (poor tidal flushing), eutrophication, and other sources. The nontidal, wadeable tributaries do support all designated uses. Lake Lariat does not support all designated uses due to Hg in fish due to atmospheric deposition and other sources.

The 2004 303(d) List contains basins and subbasins that have measured water quality impairment and may require a TMDL. The basin/subbasin name, subbasin number (if applicable), and type of impairment are as follows:

- *Patuxent River lower* (tidal); fecal coliform, poor biological community, sediments, nutrients, chlorpyrifos (in water).
- *Mill Creek* (tidal); fecal coliform.
- *Mill Creek* (021311010884 tidal in Calvert County); fecal coliform.
- *Solomons Island Harbor* (021311010873 tidal in Calvert County); fecal coliform.
- *Harper and Parson Creeks* (021311010871 tidal in St. Mary's County); fecal coliform.
- *Goose Creek* (021311010871 tidal); fecal coliform.
- *Indian Creek* (021311010887 tidal in St. Mary's/Charles County); fecal coliform.
- *Town Creek* (021311010872 tidal in St. Mary's County); fecal coliform.
- *St. Thomas Creek* (021311010877 tidal in St. Mary's County); fecal coliform.
- *Island Creek* (021311010878 tidal in Calvert County); fecal coliform.
- *Washington Creek* (021311010884 tidal in St. Mary's County); fecal coliform.
- *Persimmons Creek* (021311010884 tidal in St. Mary's County); fecal coliform.
- *Battle Creek* (021311010879 tidal in Calvert County); fecal coliform.
- *Buzzard Island Creek* (021311010882 tidal); fecal coliform.
- *Buzzard Island Creek* (021311010882 non-tidal in Calvert County); poor biological community.
- *Summerville Creek Unnamed Tributary* (021311010894 non-tidal in Prince Georges County); poor biological community.
- *Fowler's Mill Branch* (021311010902 non-tidal in Calvert County); poor biological community.
- *Cuckold Creek* (021311010874 non-tidal in St. Mary's County); fecal coliform, poor biological community.
- *Swanson Creek* (021311010890 non-tidal in Prince Georges County); poor biological community.
- *Patuxent River Unnamed Tributary* (021311010895 non-tidal in Calvert County); poor biological community.
- *Cocktown Creek Unnamed Tributary* (021311010896 non-tidal in Calvert County); poor biological community.
- *Chew Creek* (021311010899 non-tidal in Calvert County); poor biological community.
- *Hall Creek* (021311010902 non-tidal in Anne Arundel County); poor biological community.

Multiple subbasins within this watershed are impaired by a April 7, 2000 PEPCO oil spill. Impaired areas include Swanson, Washington, Trent Hall, Persimmon, Indian, and Cremona Creeks, and Golden Beach. A TMDL is not required for these contaminants since other controls will results in water quality designation attainment.

A TMDL has been completed for Island Creek, Town Creek, Trent Hall Creek, St. Thomas Creek, Harper, Pearson Creeks, Goose Creek and Indian Creek and a Water Quality Analysis for Battle Creek of fecal coliform in Calvert, Charles and St. Mary's Counties, Maryland. There are no direct point sources of fecal coliform. Sources of fecal coliform are below:

Waterway	Livestock %	Pets %	Humans %	Wildlife %
Island Creek	39	19	1	40
Town Creek	0	62	4	34
Trent Hall Creek	62	13	1	25
St. Thomas Creek	24	26	2	49
Harper and Pearson Creeks	0	2	<1	98
Goose Creek	0	2	<1	98
Indian Creek	65	13	1	22

Battle Creek was not impaired by fecal coliform (MDE, 2004f).

A Draft TMDL was completed for fecal coliform in restricted shellfish harvesting areas in Solomons Island Harbor (on the northeast side of the Patuxent River), Washington and Persimmon Creeks, and Cuckold Creek (all located on the southwest side of the Patuxent River) within this watershed (MDE, 2005b). There are no point discharge permits for fecal coliform within these basins. Nonpoint sources of fecal coliform are listed below:

Waterway	Livestock %	Pets %	Humans %	Wildlife %
Solomons Island Harbor Basin	8	74	4	14
Washington and Persimmon Creeks Basin	48	16	1	36
Cuckold Creek Basin	56	24	1	19

Restoration/Preservation

As part of the Development District Master Plan for Lexington Park, open space and town greens should be installed in Lexington Park to create a green atmosphere. The plan also recommends expanding wooded riparian buffers along stream and protecting forested floodplains. This plan recommends established neighborhood parks and a greenway/trail system through the development area. These areas may be desirable locations for wetland restoration. Greenways and trails should be established within Hilton Run and Jarboesville Run watersheds. Existing wetlands within the Lexington Park Development District are mostly within stream valleys and floodplains. This plan also recommends working with the DNR Green Infrastructure.

To assist with meeting the tributary strategy goals for the Patuxent River, the document entitled *Tributary Strategies for Nutrient Reduction in Maryland's Patuxent Watershed within St. Mary's County* was developed. Some of the objectives and actions proposed in this document include:

- Improve erosion and sediment control practices in development
- Improve stormwater management
- Improve septic systems
- Limit future increases in nutrient loading
- Preserve undeveloped land and agricultural land
- Protect and restore sensitive areas (stream corridors, wetlands, forest, aquatic systems) for waters quality and habitat
- Reduce agricultural nutrients and sediment by reducing erosion, runoff, leachate, and animals in stream
- Reduce shoreline erosion, encouraging non-structural erosion control where feasible

There is a fair amount of State-designated Green Infrastructure in the St. Mary's County portion of this watershed (DNR, 2000-2003). Some of this network is protected by State-owned Elms Property, Greenwell State Park, Chesapeake Bay Foundation property, several METs, and small County-owned properties. A large protected area, outside of the GI network, is the Patuxent Naval Air Test Center. Most of the GI network is still unprotected. Since some areas within the GI network are considered as gaps, areas currently in a land use other than natural vegetation, these may be desirable locations for restoration. According to the 2000 Maryland Greenways Commission document, there are several existing or potential greenways including:

- *Patuxent Regional Greenway*
- *Patuxent River Water Trail*
- *McIntosh Run Greenway*

The following information is based on the document *Rural Legacy FY 2003: Applications and State Agency Review*. The Huntersville Rural Legacy Area includes approximately 5,000 acres. This area is currently largely undeveloped (94%). This area was chosen in order to protect the shoreline of the Patuxent River and tributaries, and other sensitive habitats (e.g. Killpeck Creek marshes). The goal is to protect 3,890 acres (78%). Currently, 2,000 acres (40%) of this land is protected through various methods. The sponsor is Patuxent Tidewater Land Trust. The report also includes a list of property owners who are interested in selling an easement and the priority of acquiring these easements. Since the Rural Legacy Program funds are not adequate enough to support all of these requests, other programs should consider preservation of these sites.

There are two State-designated Wetland of Special State Concern in this watershed and one potential WSSC.

- *Carroll's Pond Peat Bog*. This area is unprotected.
- *Mill Creek Pond*. This is a large millpond and adjacent wetland system located along Mill Creek, a tributary of Hickory Landing Creek. It contains diverse wetland fauna and flora, one being a rare plant species. Pond water quality is

good. The watershed is relatively undisturbed and forested steep slopes are adjacent to the pond. This site is unprotected. Main threats include logging/forest clearing and development resulting in siltation and alteration of hydrology (McCarthy et al., 1988).

- There is an additional WSSC proposed in 2002, located just west of Carroll's Pond Peat Bog.

The watershed contains examples of high quality, relatively undisturbed tidal wetland shrub communities. The sites serve as references for their respective vegetative community types. The community dominated by *Baccharis halmifolia/Iva frutescens/Panicum virgatum* (Groundsel tree/Marsh elder/Switch grass) is daily to irregularly flooded by mesohaline waters (Harrison and Stango, 2003).

Maryland Department of Planning designated Killpeck/Trent Hall Creeks as Areas of Critical State Concern in their 1981 document. These fresh water to tidal marsh areas provide great habitat for species including mink, otter, wood ducks, over-wintering swans, migratory waterfowl, and eagle. It also contains oyster/clam nursery and feeding areas and a fish spawning area. The buffer are mature hardwoods. This area is threatened by sedimentation from development and development itself (MDP, 1981).

Specific recommendations for restoration:

- Restore wetlands and streams within the headwaters.
- Restore "gaps" in the Green Infrastructure network to natural vegetation, especially along waterways.
- Recommendations from the document entitled *Tributary Strategies for Nutrient Reduction in Maryland's Patuxent Watershed within St. Mary's County*:
    - Protect and restore sensitive areas (stream corridors, wetlands, forest, aquatic systems) for waters quality and habitat
    - Reduce agricultural nutrients and sediment by reducing erosion, runoff, leachate, and animals in stream
    - Reduce shoreline erosion, encouraging non-structural erosion control where feasible
- Recommendations from the Development District Master Plan for Lexington Park:
    - Expand wooded riparian buffers along stream and protecting forested floodplains.
    - Establish neighborhood parks and a greenway/trail system through the development area. These areas may be desirable locations for wetland restoration. Greenways and trails should be established within Hilton Run and Jarboesville Run watersheds.
- Recommendations from the *Patuxent River Policy plan: An update for 1984 to 1997.* (DNR, 1997) include restoration/enhancement of:
        - Riparian forest to stabilize stream banks.
        - Stream quality to improve spawning ranges.
        - Wetlands.
        - Forest land to enhance contiguous tracts of forest.

    - Submerged aquatic vegetation and tidal marsh.

Specific recommendations for protection:

- Protect wetlands and streams within the headwaters.
- Protect WSSC and buffers.
- Protect portions of Green Infrastructure that are not currently protected, especially along waterways.
- Protect additional DNR-designated Ecologically Significant Areas containing wetlands that are not already protected.
- Protect land within the designated Rural Legacy Area.
- Protect the designated Area of Critical State Concern: Killpeck/Trent Hall Creeks
- Recommendations from the *Patuxent River Policy plan: An update for 1984 to 1997*. (DNR, 1997) include protecting:
    - Riparian forest to stabilize stream banks.
    - Wetlands and tidal marsh.
    - Contiguous tracts of forest.
    - Submerged aquatic vegetation.

<u>Potomac River lower tidal (02140101)</u>

Background

Based on MDP 2002 GIS land use data the St. Mary's County portion of the Potomac River L tidal watershed has 153,918 acres of open water and 6 acres of land. The land acres are divided as follows: urban 2.5 acres (42%), and forest 3.5 acres (58%). Since MDP wetland acreage is often underestimated, DNR wetland data estimates, as discussed later in this document, are preferred.

Estimates of wetland acreage for the entire Maryland portion of the watershed, based on DNR mapped wetlands, are as follows:

- Estuarine
    - Emergent: 1,455 acres
    - Scrub shrub: 66 acres
    - Forested: 9 acres
    - Unconsolidated shore: 102 acres
- Lacustrine aquatic bed: 42 acres
- Palustrine
    - Aquatic bed: 20 acres
    - Emergent: 339 acre
    - Scrub shrub: 331 acres
    - Forested: 4,624 acres
    - Unconsolidated bottom: 227 acres
    - Unconsolidated shore: 5 acres
    - Farmed: 85 acres
- Total: 7,306 acres

MDE tracks all regulated nontidal wetland activity in Maryland, including regulated wetland impacts and gains. Based on data for the time period of January 1, 1991 through December 31, 2004, for this watershed, there has been a slight loss in wetlands (Walbeck, 2005).

Basin code	Permanent Impacts	Permittee Mitigation	Programmatic Gains	Other Gains	Net Change
02140101	-0.52	0	0	0	-0.52

Code of Maryland Regulations
All Maryland stream segments are categorized by Sub-Basin and are given a "designated use" in the Code of Maryland Regulations 26.08.02.08. Stream segments within the St. Mary's County portion of this watershed are designated Use I, recreation contact and protection of aquatic life, unless designated below.

- Use II: shellfish harvesting; All estuarine portions of tributaries.

Water Quality

The 1998 Clean Water Action Plan classified this watershed as Category 1, a watershed not meeting clean water and other natural resource goals and therefore needing restoration. It is also classified as a Category 3, a pristine or sensitive watershed in need of protection. Failing indicators include poor SAV abundance and habitat index, poor tidal benthic index of biotic integrity (BIBI), high historic wetland loss 42,383 acres. Indicators for Category 3 include migratory fish spawning areas, high percent headwater streams in Interior Forest (28%), and high percent of watershed being forested (59%).

According to the 2002 305(b) report, of the tidal mainstem and Maryland tributaries not identified below, a portion fails to support all designated uses (63 miles) due to PCBs, low oxygen, and bacteria due to nonpoint sources, poor tidal flushing, and eutrophication. The remaining portion fully supports all uses (243 miles). Data for the nontidal, wadeable tributaries is inconclusive.

The 2004 303(d) List contains basins and subbasins that have measured water quality impairment and may require a TMDL. The basin/subbasin name, subbasin number (if applicable), and type of impairment are as follows:

- *Potomac River lower tidal* (non-tidal); nutrients, sediments, PCBs (in fish tissue), poor biological community.
- *Tall Timbers Cover* (021401010697 tidal in St. Mary's County); fecal coliform.
- *Whites Neck Creek* (021401010702 tidal in St. Mary's County); fecal coliform.
- *Poplar Hill Creek* (021401010698 non-tidal in St. Mary's County); poor biological community.
- *Tarleton Branch* (021401010698 non-tidal in St. Mary's County); poor biological community.
- *Belvedere Creek* (021401010698 non-tidal in St. Mary's County); poor biological community.
- *Ditchley Prong* (021401010704 non-tidal in Charles County); poor biological community.

A TMDL for fecal coliform was completed for Tall Timbers Cover and Whites Neck Cove. Fecal coliform sources for Tall Timbers Cove were wildlife (78%), human (1%), and pets (22%) and sources for Whites Neck Cove were wildlife (36%), human (<1%), pets (8%), and livestock (56%).

Restoration/Preservation

There is some Green Infrastructure scattered in this watershed (DNR, 2000-2003), all unprotected except Point Lookout State Park and St. Clements Island State Park. Additional protected land, outside of GI network, are METs. Since some areas within the GI network are considered as gaps, areas currently in a land use other than natural vegetation, these may be desirable locations for restoration. According to the 2000 Maryland Greenways Commission document, there are several existing or potential greenways including:

- *Potomac River Greenway*
- *Potomac River Water Trail*
- *Wicomico Scenic River Water Trail*

There are no State-designated Nontidal Wetlands of Special State Concern in the St. Mary's
County portion of this watershed.

Specific recommendations for restoration:

- Restore wetlands and streams within the headwaters.
- Restore "gaps" in the Green Infrastructure network to natural vegetation, especially along waterways.

Specific recommendations for protection:

- Protect wetlands and streams within the headwaters.
- Protect portions of Green Infrastructure that are not currently protected, especially along waterways.
- Protect additional DNR-designated Ecologically Significant Areas containing wetlands that are not already protected.

<u>St. Mary's River (02140103)</u>

Background

Based on MDP 2002 GIS land use data the St. Mary's River watershed has 3,220 acres of open water and 35,230 acres of land. The land acres are divided as follows: urban 6,639 acres (19%), agriculture 8,330 acres (24%), forest 19,767 acres (56%), wetlands 284 acres (1%) and barren land 210 acres (1%). Since MDP wetland acreage is often underestimated, DNR wetland data estimates, as discussed later in this document, are preferred.

Wicomico River and St. Mary's River are tidal for several miles upstream of the confluence with the Potomac River (Gibson, 1978).

1,445 acres within St. Mary's River State Park is included in the Maryland Wildlands Preservation System, suggesting the protected area has retained its wilderness character and/or contains rare species or habitat.

Estimates of wetland acreage for the entire watershed, based on DNR mapped wetlands, are as follows:

- Estuarine
  - Emergent: 500 acres
  - Scrub shrub: 16 acres
  - Forested: 18 acres
  - Unconsolidated shore: 12 acres
- Palustrine
  - Emergent: 138 acres
  - Scrub shrub: 295 acres
  - Forested: 2,743 acres
  - Unconsolidated bottom: 188 acres
  - Farmed: 68 acres
- Total: 3,977 acres

MDE tracks all regulated nontidal wetland activity in Maryland, including regulated wetland impacts and gains. Based on data for the time period of January 1, 1991 through December 31, 2004, for this watershed, there has been a slight gain in wetlands (Walbeck, 2005).

Basin code	Permanent Impacts	Permittee Mitigation	Programmatic Gains	Other Gains	Net Change
02140103	-5.23	6.24	0	0.51	1.53

A 1997 USACE Lower Potomac River study found that St. Mary's River watershed was likely to experience high population growth and associated negative impacts to the aquatic systems over the next 20 years. Therefore, the USACE and St. Mary's County completed a study to manage future growth and propose restoration opportunities. Identified problems within the watershed include flooding, inadequate stormwater management, impaired stream channels, and unprotected critical habitat. As the first part of this study, the Center for Watershed Protection identified the baseline conditions of the subwatershed. The following information is summarized from this report. MBSS found conditions to be worst in the upper headwaters of Upper St. Mary's, Jarboesville Run, and Hilton Run subwatersheds, and better going downstream. A rare fish species was identified in the headwaters of Jarboesville Run subwatershed. John's Creek and Pembrook Run subwatersheds had good conditions overall. A 2001 study conducted in conjunction with the Corps found streams draining older developed areas to be most severely impacted. Subwatershed management health, based on current and future impervious cover was estimated to be as follows:

- Upper St. Mary's: current – sensitive; future – impacted

- Jarboesville Run: current – sensitive/impacted; future – impacted/non-supporting
- Hilton Run: current – sensitive; future – impacted
- Pembrook Run: current – sensitive; future – impacted
- Unnamed East: current – impacted; future – non-supporting
- John's Creek: current – sensitive; future – sensitive

The second part of this study included the document entitled *The Upper St. Mary's River Watershed Stream and Floodplain Condition Assessment*. This document is based on the survey of roughly 30 nontidal stream miles within seven subwatersheds (Fisherman's Creek, Hilton Run, Jarboesville Run, John's Creek, Pembrook Run, Unnamed East Tributary, and Upper St. Mary's River). Generally steam and floodplain functioning is good, with the majority of problems being channel incision and stream bank instability. Many streams have large wetlands and low stream gradients, reducing channel erosion (e.g. Upper St. Mary's River, Jarboesville Run, Hilton Run). However, these streams may still be overwhelmed by increases in urban stormwater. Some of the other stream reaches (i.e. Pembrook Run, Fisherman's Creek, and John's Creek) have high stream gradient and lack extensive streamside wetlands, so are susceptible to channel erosion even within urbanization. Poorer stream ratings were found in the first order streams due to the corresponding high development in those areas, as compared to the lower amounts of development in the downstream portions. Many of the stream channels were estimated to be disconnected with the adjacent floodplain. This survey found that stream bank instability and lack of stream bank vegetation is leading to high sediment within the channel. The majority of riparian buffers were adequate. Stream restoration opportunities were prioritized using criteria of degree of physical stream impairment, biological condition, and future land use to predict success. They identified six 1st priority stream reaches, one within Jarboesville Run, three within John's Creek, one within Fisherman's Creek, and one within Hilton Run.

The St. Mary's River Project is a US Department of Housing and Urban Development funded project run through St. Mary's College, with the primary goal being to establish a water quality monitoring program in the tidal St. Mary's River and watershed. Based on this monitoring, they found the sites generally had good water quality. However, some sites were clearly impacted and degraded. From the period between 1999 and 2002, SAV levels increased. However, in years of high water discharge, there is strong evidence that water quality will deteriorate, stressing the aquatic organisms. It appears that storm events were correlated with stream degradation and a decline in water quality and organism habitat. Low oxygen levels were reported for the deep areas of the tidal river.

Code of Maryland Regulations
All Maryland stream segments are categorized by Sub-Basin and are given a "designated use" in the Code of Maryland Regulations 26.08.02.08. Stream segments within this watershed are designated Use I, recreation contact and protection of aquatic life, unless designated below.

- Use II: shellfish harvesting; All estuarine portions of tributaries.

Water Quality

The 1998 Clean Water Action Plan classified this watershed as Category 1, a watershed not meeting clean water and other natural resource goals and therefore needing restoration. It is also classified as a "Selected" Category 3, a pristine or sensitive watershed most in need of protection. Failing indicators include poor SAV abundance and habitat index, and high historic wetland loss (26,406 acres). Indicators for Category 3 include migratory fish spawning area, high percent headwater streams in Interior Forest (36%), high percent watershed forested, and presence of designated Wildland Acres.

According to the 2002 305(b) report, of the tidal mainstem, embayments, and tributaries, a small portion (<1 mile) fails to support all uses due to bacteria from nonpoint sources and natural sources, while the remainder (16 miles) was inconclusive. Of the nontidal wadeable streams, a portion (29 miles) fails to support all uses due to a poor biological community, a portion (12 miles) fully supports all uses, while the remainder (17 miles) was inconclusive. St. Mary's Lake fails to support all uses due to nutrients from upstream and natural sources.

The 2004 303(d) List contains basins and subbasins that have measured water quality impairment and may require a TMDL. The basin/subbasin name, subbasin number (if applicable), and type of impairment are as follows:

- *St. Mary's River* (tidal); sediments, nutrients.
- *St. Mary's River Unnamed Tributary* (021401030714 non-tidal); poor biological community.
- *St. Mary's River* (021401030719 non-tidal); poor biological community.
- *St. Mary's River Unnamed Tributary* (021401030719 non-tidal); poor biological community.
- *St. Mary's Lake* (021401030718); A TMDL has been completed for methylmercury in fish tissue.
- *St. Inigoes Creek* (021401030710 tidal); fecal coliform.
- *Carthegena Creek* (021401030709 tidal); fecal coliform.
- *Locust Grove Cove* (021401030709 tidal); fecal coliform.
- *Penbrook Run* (021401030716 non-tidal); poor biological community.
- *Warehouse Run* (021401030714 non-tidal); poor biological community.
- *Maple Run* (021401030718 non-tidal); poor biological community.

A TMDL of mercury was completed for the DNR-owned St. Mary's Lake, a lake along Western Branch, a tributary of St. Mary's River. The following information is summarized from that document. The watershed of this lake is mostly forest/herbaceous (80%), developed (8%), agriculture (8%), and open (4%) (based on 1997 MDP data). This lake has a Surface Water Use Designation of Use 1 – water contact recreation and protection of aquatic life. However, MDE has issued a fish consumption advisory, suggesting limits on fish consumption from this lake due to mercury. The majority of mercury is from atmospheric sources, many of which are outside of the State, so is widespread. EPA cites coal-fired electric power generators as the main culprit. In Maryland, the main sources are as follows: 43% power plants, 31% municipal waster combustors, 19% medical waste incinerators, 6% Portland cement plants, and 1% other.

If existing and proposed regulatory controls for mercury emissions are imposed, this TMDL will be successfully implemented.

A water quality analysis was completed for eutrophication of St. Mary's Lake, summarized as follows. Winters Apartment is the only permitted discharge, releasing treated domestic wastewater to a lagoon on a tributary of Western Branch. This lake was on the 1998 list as being impaired by nutrients. However, later water quality sampling found that dissolved oxygen and nutrients do support designated use, so a TMDL for nutrients is not required at this time. For this reason, it is recommended that St. Mary's Lake be removed from the 303d list.

A TMDL for fecal coliform was completed for Locust Grove Cove, St. Inigoes Creek, and Carthegena Creek.

Restoration/Preservation

As part of the Development District Master Plan for Lexington Park, open space and town greens should be installed in Lexington Park to create a green atmosphere. The plan also recommends expanding wooded riparian buffers along stream and protecting forested floodplains. This plan recommends established neighborhood parks and a greenway/trail system through the development area. These areas may be desirable locations for wetland restoration. Greenways and trails should be established within Hilton Run and Jarboesville Run watersheds. Existing wetlands within the Lexington Park Development District are mostly within stream valleys and floodplains. This plan also recommends working with the DNR Green Infrastructure. Some areas designated within the Green Infrastructure that have been developed or have been approved for development include: Westbury and Fox Chase near Chancellors Run Road, Cecil's Mill near Great Mills, First Colony, Patuxent Boulevard area, and Willows Road corridor.

Green Infrastructure is spread throughout this watershed (DNR, 2000-2003), with large hubs around St. Mary's River State Park, St. Mary's Lake, and west of Elms WMA. Another large protected GI network, in additional to the above, is St. Mary's City Park. The majority of the GI network is unprotected. Since some areas within the GI network are considered as gaps, areas currently in a land use other than natural vegetation, these may be desirable locations for restoration. According to the 2000 Maryland Greenways Commission document, there are several existing or potential greenways including:

- *St. Mary's River Greenway*
- *St. Mary's River Water Trail*
- *Potomac River Greenway*
- *Washington, Potomac and Chesapeake Rail Trail*

The following information is based on the document *Rural Legacy FY 2003: Applications and State Agency Review*. The proposed St. Mary's River Rural Legacy Area includes approximately 28,200 acres. This area is currently largely undeveloped (81%). This area was chosen in order to protect "areas with high water quality impact," scenic areas around St. Mary's City and College, and encourage educational opportunities. The goal is

to protect 17,600 acres (62%). Currently, 6,630 acres (24%) of this land is protected through various methods. The sponsor is Patuxent Tidewater Land Trust. The report also includes a list of property owners who are interested in selling an easement and the priority of acquiring these easements. Since the Rural Legacy Program funds are not adequate enough to support all of these requests, other programs should consider preservation of these sites.

A reference site for a tidal forested wetland community is also found in the watershed. The community is dominated by *Pinus taeda/Morella cerifera/Spartina patens* (Loblolly pine/Wax myrtle/Saltmeadow cordgrass). There is some uncertainty regarding the long-term stability of this community type, as it may represent a transitional community due to reflecting changes from sea level rise (Harrison et al., 2004).

There are two State-designated Wetland of Special State Concern in this watershed and one potential WSSC.

- *St. Mary's River Bottomland*. This wooded floodplain contains a State Endangered amphibian. This site has not been disturbed for many years (DNR, 1991). This site is along the St. Mary's River and is protected by St. Mary's River State Park.
- *West California Swamp (DNR proposed this site be deleted from the WSSC list)*. This wetland is located in the headwaters of St. Mary's River, on the northern border of Wildwood. It contains a wetland complex, including seepage shrub swamp. There was a large population of a State Endangered wetland plant species. However, nearby construction may have impacted this species since the time of the survey (DNR, 1991). It is unprotected.

Specific recommendations for restoration:

- Restore wetlands and streams within the headwaters.
- Restore "gaps" in the Green Infrastructure network to natural vegetation, especially along waterways.
- *The Upper St. Mary's River Watershed Stream and Floodplain Condition Assessment*: Stream restoration opportunities were prioritized using criteria of degree of physical stream impairment, biological condition, and future land use to predict success. They identified six 1st priority stream reaches, one within Jarboesville Run, three within John's Creek, one within Fisherman's Creek, and one within Hilton Run.
- Development District Master Plan for Lexington Park:
    - Open space and town greens should be installed in Lexington Park to create a green atmosphere.
    - Expanding wooded riparian buffers along stream and protecting forested floodplains.
    - Established neighborhood parks and a greenway/trail system through the development area. These areas may be desirable locations for wetland restoration. Greenways and trails should be established within Hilton Run and Jarboesville Run watersheds.

- A 1998 KCI Technologies study located potential wetland mitigation sites within this watershed and the McIntosh subwatershed. Descriptions on the potential sites within the McIntosh subwatershed can be found in the Breton Bay watershed section.
    - Eastern Branch subwatershed - near confluence of Eastern Branch and Pembrook Run. This 10-20 acre wetland site does not have hydric soils, but has possible hydrology from surface runoff and groundwater. It is contiguous to 25-100 acres of existing wetland/forest.
    - Hilton Run subwatershed – mid reach, along confluence of two 1st order streams. This potential >20 acre wetland/forest mitigation site has 50% hydric soils, and has possible hydrology of surface and subsurface flow. The area is contiguous to 25-100 acres of existing forest area and is located near a park.
    - Jarbesville Run subwatershed – along a tributary north of Strickland Road. This potential 10-20 acre wetland site does not have hydric soils, but could get potential hydrology from surface and subsurface flow, and flooding. The area is contiguous to 25-100 acres of existing wetland/forest area.
    - Western Branch subwatershed - along border between large farm and parkland. This potential 1-10 acre wetland does not have hydric soils, but has possible hydrology of surface runoff. The area is contiguous to 25-100 acres of existing wetland/forest area, including existing ponds and wetlands along the edge of the farm and forest.
    - St. Mary's River subwatershed – along Andrews Church Road. This potential 1-10 acre wetland site is about 50% hydric soils, and has possible hydrology of surface and subsurface flow, and flooding. The area is contiguous to 25-100 acres of existing wetland/forest area.
    - St. Mary's River subwatershed – off Rte. 237. This potential 1-10 acre wetland site is 50% hydric soil and has possible hydrology from surface flow. The area is contiguous to 25-100 acres of existing wetland/forest area. Expanding development in the area may exclude use of this site.
    - St. Mary's River subwatershed. This potential 10-20 acre wetland site has 50% hydric soils. The area is contiguous to 25-100 acres of existing wetland/forest area. This area may be desirable for large mitigation or mitigation bank since it is relatively isolated compared to other sites.

Specific recommendations for protection:

- Protect wetlands and streams within the headwaters.
- Protect WSSC and buffers.
- Protect portions of Green Infrastructure that are not currently protected, especially along waterways.
- Protect additional DNR-designated Ecologically Significant Areas containing wetlands that are not already protected.
- Protect land within the designated Rural Legacy Area.

<u>Breton Bay (02140104)</u>

Background

Based on MDP 2002 GIS land use data the Breton Bay watershed has 3,455 acres of open water and 29,835 acres of land. The land acres are divided as follows: urban 3,520 acres (12%), agriculture 11,543 acres (39%), forest 14,501 acres (49%), wetlands 253 acres (1%) and barren land 18 acres (<1%). Since MDP wetland acreage is often underestimated, DNR wetland data estimates, as discussed later in this document, are preferred.

A Watershed Restoration Action Strategy was completed for Breton Bay. The following information is based on the watershed characterization. There are estimated to be 35,193 land acres. Forest Interior is estimated at 42% of the land, including the important MacIntosh Run Forest Block (as identified in The Nature Conservancy's ecoregion-based planning process). A bird survey found 14 of the 19 Maryland forest interior species in the region including Breton Bay watershed. Roughly 15% of the watershed is prime farmland (mostly in the north), 16% is hydric soils and 18% is erodible land.

Estimates of wetland acreage for the entire watershed, based on DNR mapped wetlands, are as follows:

- Estuarine
    - Emergent: 247 acres
    - Scrub shrub: 6 acres
    - Unconsolidated shore: 1 acre
- Palustrine
    - Emergent: 120 acres
    - Scrub shrub: 105 acres
    - Forested: 2,214 acres
    - Unconsolidated bottom: 255 acres
    - Unconsolidated shore: 1 acre
    - Farmed: 12 acres
- Total: 2,962 acres

MDE tracks all regulated nontidal wetland activity in Maryland, including regulated wetland impacts and gains. Based on data for the time period of January 1, 1991 through December 31, 2004, for this watershed, there has been a slight gain in wetlands (Walbeck, 2005).

Basin code	Permanent Impacts	Permittee Mitigation	Programmatic Gains	Other Gains	Net Change
02140104	-1.99	2.59	0	0	0.60

Code of Maryland Regulations

All Maryland stream segments are categorized by Sub-Basin and are given a "designated use" in the Code of Maryland Regulations 26.08.02.08. Stream segments within this watershed are designated Use I, recreation contact and protection of aquatic life, unless designated below.

- Use II: shellfish harvesting; All estuarine portions of tributaries.

Water Quality

The 1998 Clean Water Action Plan classified this watershed as "Priority" Category 1, a watershed not meeting clean water and other natural resource goals and therefore needing restoration. Since it is a "Priority" Category 1 watershed, this watershed was selected as being one of the most in need of restoration within the next two years since it failed to meet at least half of the goals. It is also classified as a Category 3, a pristine or sensitive watershed in need of protection. Failing indicators include poor SAV abundance and habitat index, high historic wetland loss (17,931 acres), and high soil erodibility (0.33). Indicators for Category 3 include migratory fish spawning areas, percent headwater streams occurring in Interior Forest (35%), and percent watershed forested.

According to the 2002 305(b) report, of the tidal mainstem, embayment, and tributaries, a portion (<1 mile) fails to support all uses due to bacteria, while the remainder (5 miles) had inconclusive results. Of the nontidal wadeable streams, a portion (12 miles) fully supports all uses, while the remainder had inconclusive results (9 miles).

The 2004 303(d) List contains basins and subbasins that have measured water quality impairment and may require a TMDL. The basin/subbasin name, subbasin number (if applicable), and type of impairment are as follows:

- *Breton Bay* (tidal); sediments, nutrients.
- *Moll Dyers Run Unnamed Tributary* (021401040720 non-tidal); poor biological community.
- *Cherry Cover Creek* (021401040720 tidal); fecal coliform.

A Draft TMDL was completed for fecal coliform in the restricted shellfish harvesting area within Cherry Cove Creek (MDE, 2005a).

Excess nutrient loads have resulted in algae blooms and low dissolved oxygen, especially in late summer in the upper Breton Bay. Upper Breton Bay tended to have higher algae, fecal coliform. High sediment deposition, possibly being transported from Town Run and other tributaries, is resulting in sand bar formation near the mouth of Town Creek. In order to protect public health from elevated fecal coliform levels, MDE has placed some restrictions on shellfish harvesting, including tidal waters near Leonardtown being "restricted" and the central area of Breton Bay being "conditionally approved." The Leonardtown Wastewater Treatment Plant, the main point source, was recently upgraded to reduce nutrient loads. Since there is such extensive forest in the watershed, it is likely that the majority of nutrients come from the small remaining portion. Submerged aquatic vegetation acreage has been lower than in the past. USFWS data suggests that water quality is the limiting factor, with water quality in the upper Breton Bay being too poor to support SAV but water quality in the lower Breton Bay being sufficient to support SAV. There are small populations of oysters in Breton Bay, but a high incidence of disease will limit restoration. There is a Federally endangered freshwater mussel found in the nontidal waters. Benthic communities are rated as fair to poor in the majority of the areas and good in a few areas (Shanks, 2002).

The following information is based on the 2002 nutrient synoptic survey. Nutrient loads and yields were generally low compared to other State watersheds. The macroinvertebrate communities were ranked "fair" or "good." Habitat assessment were "supporting" with the main habitat issues being stream bank erosion and excessive sediment within riffles. Two fish blockages, both due to elevated culverts, were found. There is some habitat degradation due to storm water flows.

Restoration/Preservation

Of the 196 stream miles within the watershed, 177 were surveyed in the 2003 Stream corridor Assessment, as summarized. Of the environmental concerns found during the survey, erosion was the most common (136 sites – with 20 severe and 5 very severe), followed by inadequate stream buffer (97 sites – 16 severe or very severe), channel alteration (42 sites – three severe or 2,400 feet), fish migration barriers (34 sites – mainly from road crossings), pipe outfalls (24 sites, and trash dumping (24 sites), unusual conditions (14 sites), and in/near stream construction (4 sites). Some of these areas may be desirable for restoration.

Potential sites for restoration of stream buffers and wetlands were identified in 1998. A stream assessment was conducted in 2001 (by the Potomac River Association, Inc.), and may have identified stream sections with large amounts of sediment. The Center for Watershed Protection is working to identify areas for restoration and retrofits for erosion reduction. Shoreline erosion is occurring at a rate of 0-2 ft/yr for 21% of the shoreline, 2-4 ft/yr for 3%, and $\geq$4 ft/yr for 6%. Planned TMDLs for Breton Bay are scheduled for nutrients in 2004, fecal coliform in 2007 and suspended sediment in 2008. An area at the mouth of McIntosh Run is at risk by future sea-level rise. McIntosh Run watershed was assessed in 1998 to locate sites unsuitable for development and sites with forest or wetland mitigation potential. All identified sites were located in Burnt Mill Creek and Lower McIntosh Run watersheds. Potential sites for wetland restoration were based on the following criteria: hydric soil, open land, within 50 feet of stream, within 300 feet of wetlands (Shanks, 2002).

Based on the WRAS process, The Center for Watershed Protection developed the final Watershed Restoration Action Strategy in 2003, summarized as follows.
WRAS objectives include:

- Reducing sediment and nutrient loads
    - Stormwater retrofits
    - Stream restoration/stabilization (Town Run and Unnamed tributary to McIntosh Run)
- Encourage sound agricultural and forestry practices
- Increase education/outreach by citizens
    - Tree plantings
    - SAV plantings
- Enhance aesthetic and recreational values for residents

This WRAS identified four subwatershed as being high priority for implementation:

- Macintosh Run DD "A": this subwatershed consists of many wetlands and floodplain. A small tributary within this subwatershed had severe and very severe erosion. A portion of this watershed is within the development district of Leonardtown. The mainstem of McIntosh Run supports a federally endangered mussel. Wetland and stream restoration /stabilization are proposed.
- Town Run: This subwatershed has a large portion of Leonardtown development district. Active erosion and channel instability are evident. Stormwater management is inadequate. Stream restoration/stabilization and stormwater retrofit are recommended.
- Moll Dyers Run: There were several moderate severity problems identified within this watershed (based on the SCA). Citizen-based projects should be the focus here.
- Combs Creek/Cherry Cove: Since there are many new and established residential communities along the shoreline, this subwatershed may provide good opportunities for community involvement and education.

A large Green Infrastructure hub is located north of Leonardtown and portions of another large hub in the eastern portion of the watershed, linking to St. Mary's Lake. The only protected land is a small County-owned property. Since some areas within the GI network are considered as gaps, areas currently in a land use other than natural vegetation, these may be desirable locations for restoration. According to the 2000 Maryland Greenways Commission document, there are several existing or potential greenways including:

- *McIntosh Run Greenway*
- *Leonardtown Loop Trail*
- *Potomac River Greenway*
- *Washington, Potomac and Chesapeake Rail Trail*

A partnership of the U.S. Fish and Wildlife Service, Maryland Environmental Trust, Department of Natural Resources, and St. Mary's County has a goal to protect 1400 acres of Riparian Habitat to protect water quality in a 2-mile reach that contains the federally endangered dwarf wedgemussel. A FWS Recovery Land Acquisition Grant to buy a conservation easement on an 85-acre property containing riparian forest adjacent to the mussel reach has been awarded. Negotiations are underway (Murphy, 2006, pers. comm.).

There are two State-designated Wetlands of Special State Concern in this watershed and one potential WSSC.

- *Miski Run Woods (DNR name: McIntosh Woods)*. This large diverse bottomland forest contains calcareous soils, three rare plant species, interior bird habitat (DNR, 1991). The site has adjacent steep slopes. Due to its proximity to Leonardtown, development pressure is high. Main threats include clearing of the surrounding forest, development, and invasion of non-native plants. This site is unprotected. (McCarthy et al., 1988).
- *Upper McIntosh Run (DNR name: McIntosh Run South)*. This area is located in the western portion of Leonardtown and is currently unprotected.

- There is a large additional potential WSSC, located north and west of Leonardtown. This site would connect Miski Run Woods WSSC and Upper McIntosh Run WSSC. It includes portions of McIntosh Run, Brooks Run, Lows Run, Rich Neck Creek, and Burnt Mill Creek.

Specific recommendations for restoration:

- Restore wetlands and streams within the headwaters.
- Restore "gaps" in the Green Infrastructure network to natural vegetation, especially along waterways.
- A 1998 KCI Technologies study located potential wetland mitigation sites within the McIntosh subwatershed and St. Mary's River watershed. Descriptions on the potential sites within the St. Mary's River watershed can be found in that watershed section.
    - Burntmill/Tom Swamp/Richneck subwatershed – off Parsons Mill Road, south of Burnt Mill Creek. This potential 1-10 acre wetland site has no hydric soils, but has possible hydrology through surface and subsurface flow. The area is contiguous to 25-100 acres of existing forest area.
    - Burntmill/Tom Swamp/Richneck subwatershed – along Jones Road. This potential 1-10 acre wetland site has no hydric soils, but has possible hydrology through surface and subsurface flow. The area is contiguous to >100 acres of existing forest. This site is relatively secluded.
    - Burntmill/Tom Swamp/Richneck subwatershed – along headwaters of Tom Swamp Run and MacIntosh Road. This potential >20 acre forest/wetland site has about 20% hydric soils, and has possible hydrology through surface and subsurface flow. The area is contiguous to 25-100 acres of existing wetland/forest area.
    - Burntmill/Tom Swamp/Richneck subwatershed – south of Burnt Mill Drive by confluence of Miski Run and Burnt Mill/Tom Swamp/Rich Neck. This potential >20 acre wetland/forest site has about 40% hydric soils, and has possible hydrology through surface and subsurface flow and flooding. The area is contiguous to >100 acres of existing forest area. This area was recommended as a high priority site.
    - Miski/Greenhill Run subwatershed – off Maypole Road, close to confluence of Greenhill Run and McIntosh Run. This potential 10-20 acre wetland/forest site has 50% hydric soils, and has possible hydrology through surface and subsurface flow. The area is contiguous to 25-100 acres of existing forest area.
    - McIntosh Run subwatershed – end of Greenbriar Road. This potential 1-10 acre wetland site has 20-40% hydric soils, but has possible hydrology through surface and subsurface flow and flooding. The area is contiguous to <25 acres of existing forest/wetland area.
    - McIntosh Run subwatershed – east of McIntosh Run and Rte. 5. This potential 20 acre wetland/forest site has no hydric soils, but has possible hydrology through surface and subsurface flow. Flood attenuation may also be possible here. The area is contiguous to 25-100 acres of existing forest area.

- Recommendations based on the WRAS:
  - Reducing sediment and nutrient loads
  - Stormwater retrofits
  - Stream restoration/stabilization (Town Run and Unnamed tributary to McIntosh Run)
  - This WRAS identified four subwatershed as being high priority for implementation:
    - Macintosh Run DD "A": Wetland and stream restoration /stabilization are proposed.
    - Town Run: Stream restoration/stabilization and stormwater retrofit are recommended.
    - Moll Dyers Run: Citizen-based projects should be the focus here.
    - Combs Creek/Cherry Cove: This subwatershed may provide good opportunities for community involvement and education.
- Recommendations based on the 2001 stream assessment (by the Potomac River Association, Inc.)
- Reduce shoreline erosion.
- Recommendations based on the 2003 Stream corridor Assessment: erosion, inadequate stream buffer, fish migration barriers.

Specific recommendations for protection:

- Protect wetlands and streams within the headwaters.
- Protect WSSC and buffers.
- Protect portions of Green Infrastructure that are not currently protected, especially along waterways and large GI hubs.
- Protect additional DNR-designated Ecologically Significant Areas containing wetlands that are not already protected, including the potential WSSC.

<u>St. Clement Bay (02140105)</u>

Background

Based on MDP 2002 GIS land use data, the St. Clement Bay watershed has 6,033 acres of open water and 32,007 acres of land. The land acres are divided as follows: urban 5,518 acres (17%), agriculture 10,646 acres (33%), forest 15,335 acres (48%), wetlands 427 acres (1%) and barren land 82 acres (<1%). Since MDP wetland acreage is often underestimated, DNR wetland data estimates, as discussed later in this document, are preferred.

Estimates of wetland acreage for the entire watershed, based on DNR mapped wetlands, are as follows:

- Estuarine
  - Emergent: 275 acres
  - Scrub shrub: 4 acres
  - Unconsolidated shore: <1 acre
- Palustrine

  - Emergent: 62 acres
  - Scrub shrub: 245 acres
  - Forested: 3,860 acres
  - Unconsolidated bottom: 150 acres
  - Unconsolidated shore: <1 acre
  - Farmed: 22 acres
- Total: 4,619 acres

MDE tracks all regulated nontidal wetland activity in Maryland, including regulated wetland impacts and gains. Based on data for the time period of January 1, 1991 through December 31, 2004, for this watershed, there has been a slight loss in wetlands (Walbeck, 2005).

Basin code	Permanent Impacts	Permittee Mitigation	Programmatic Gains	Other Gains	Net Change
02140105	-0.51	0	0	0	-0.51

Code of Maryland Regulations
All Maryland stream segments are categorized by Sub-Basin and are given a "designated use" in the Code of Maryland Regulations 26.08.02.08. Stream segments within this watershed are designated Use I, recreation contact and protection of aquatic life, unless designated below.

- Use II: shellfish harvesting; All estuarine portions of tributaries.

Water Quality

The 1998 Clean Water Action Plan classified this watershed as Category 1, a watershed not meeting clean water and other natural resource goals and therefore needing restoration. It is also classified as a Category 3, a pristine or sensitive watershed in need of protection. Failing indicators include poor SAV abundance and habitat index, poor non-tidal instream habitat index, and high soil erodibility (0.34). Indicators of Category 3 included presence of migratory fish spawning area and high percent of headwater streams occurring in Interior Forest (27%).

According to the 2002 305(b) report, a portion of the tidal mainstem and tributaries (2 miles) fail to support all designated uses due to bacteria from nonpoint and natural sources. The remaining portion (3 miles) had inconclusive data. Of the nontidal, wadeable tributaries, one portion (9 miles) fails to support all uses due to low pH, low oxygen, and siltation from habitat alteration and channelization, one portion (25 miles) fully supports all uses, and the remaining portion (41 miles) had inconclusive data.

The 2004 303(d) List contains basins and subbasins that have measured water quality impairment and may require a TMDL. The basin/subbasin name, subbasin number (if applicable), and type of impairment are as follows:

- *St. Clement Bay* (tidal); fecal coliform.

A TMDL was completed for fecal coliform in St. Clements Bay, Canoe Neck Creek, and St. Patrick Creek. Sources of fecal coliform were as follows (MDE, 2004b):

Waterway	Wildlife %	Human %	Pets %	Livestock %
St. Clements Bay	12	<1	3	85
Canoe Neck Creek	11	<1	3	86
St. Patrick Creek	4	<1	1	95

Restoration/Preservation

There are linear Green Infrastructure hubs and corridors throughout the watershed and a large Green Infrastructure hub in the headwaters of Canoe Neck Creek. The only protected areas are a few small County-owned properties. Since some areas within the Green Infrastructure network are considered as gaps, areas currently in a land use other than natural vegetation, these may be desirable locations for restoration. According to the 2000 Maryland Greenways Commission document, there are several existing or potential greenways including:

- *Washington, Potomac and Chesapeake Rail Trail*
- *Potomac River Greenway*

There is one State-designated Wetland of Special State Concern in this watershed. Church Swamp is a large swamp forest and drier bottomland woods containing five rare plant species, forest interior birds, and good habitat for reptiles and amphibians. This site is unprotected. The main threat is logging, which has already occurred in some portions of the site. Additional threats are from development, other increases in siltation, and alteration of hydrology (McCarthy et al., 1988).

Specific recommendations for restoration:

- Restore wetlands and streams within the headwaters.
- Restore "gaps" in the Green Infrastructure network to natural vegetation, especially along waterways.

Specific recommendations for protection:

- Protect wetlands and streams within the headwaters.
- Protect WSSC and buffers.
- Protect portions of Green Infrastructure that are not currently protected, especially along waterways.
- Protect additional DNR-designated Ecologically Significant Areas containing wetlands that are not already protected.

<u>Wicomico River (02140106)</u>

Background

Based on MDP 2002 GIS land use data the St. Mary's County portion of the Wicomico River watershed has 2,830 acres of land. The land acres are divided as follows: urban 812

acres (29%), agriculture 945 acres (33%), forest 1,042 acres (37%), and barren land 31 acres (1%). Since MDP wetland acreage is often underestimated, DNR wetland data estimates, as discussed later in this document, are preferred.

The Wicomico River and Zekiah Swamp were designated as scenic rivers by the Maryland General Assembly. In 1994, Charles and St. Mary's Counties established the Wicomico Scenic River Commission (WSRC), with the goal of encouraging conservation and maintenance of the watershed and surrounding resources. The following information is from the WSRC website. The Wicomico River is 16 miles long, traveling through rolling plateau. It runs from Zekiah Swamp to Cobb Island, joining with the Potomac River. The entire watershed is designated for special environmental and cultural concern in the 1987 Maryland Scenic Rivers Act. The Wicomico River and tributaries provide important habitat for finfish and wildlife. The River is considered to be one of Maryland's most productive oyster grounds. There are over 150 bird species frequently reported and this is within the neo-tropical migrating bird route. Hurricane Agnes in 1972 dropped the salinity levels in the River, resulting in a massive decline in the oyster fishery. Once the salinity returned to normal, the State worked on restoring this oyster population, with good success. Many crustaceans are found along the River, including blue crabs. There are eleven plant species tracked within the DNR Natural Heritage Program RTE database. These species are being threatened by habitat destruction and timber harvesting.

Wicomico River and St. Mary's River are tidal for several miles upstream of the confluence with the Potomac River (Gibson, 1978). Most of the Wicomico River is mesohaline (5.0-18.0 ppt salinity). Tidal marsh vegetation in the upper Wicomico River estuary is classified as coastal shallow fresh marsh (e.g. Allens Fresh), while the tidal wetland community in the middle and lower estuary are classified as coastal salt marsh. These areas have thick stands of grass which provide habitat and food for fish, birds, and other wildlife, control shoreline erosion, and filter out sediment (DNR, 1994).

Some relevant recommendations resulting from *The Wicomico Scenic River Study and Management Plan* are as follows:

- Acquire land along Allens Fresh and the Zekiah Swamp, with land adjacent to the Zekiah Swamp Natural Environment Area as highest priority.
- Focus conservation for both Charles and St. Mary's Counties in the Wicomico River/Zekiah Swamp watersheds.
- Restrict livestock from the streams and shorelines.
- Restore Gilbert Run spawning areas for anadromous fish.
- Protect floodplain swamp areas to maintain anadromous fish productivity.
- Preserve remaining Forest Interior Dwelling Bird Habitat.

Chaptico Bay is a large coastal salt marsh containing dense reeds and grasses. This dense vegetation helps protect the shoreline from erosion by the tides or storms and provides food and habitat for many types of wildlife (WSRC, 2005).

Estimates of wetland acreage for the entire watershed, based on DNR mapped wetlands, are as follows:

- Estuarine
  - Emergent: 1,861 acres
  - Scrub shrub: 116 acres
  - Forested: 2 acres
  - Unconsolidated shore: 7 acres
- Palustrine
  - Aquatic bed: 2 acres
  - Emergent: 120 acre
  - Scrub shrub: 171 acres
  - Forested: 3,416 acres
  - Unconsolidated bottom: 171 acres
  - Unconsolidated shore: 4 acres
  - Farmed: 41 acres
- Total: 5,910 acres

MDE tracks all regulated nontidal wetland activity in Maryland, including regulated wetland impacts and gains. Based on data for the time period of January 1, 1991 through December 31, 2004, for this watershed, there has been a slight loss in wetlands (Walbeck, 2005).

Basin code	Permanent Impacts	Permittee Mitigation	Programmatic Gains	Other Gains	Net Change
02140106	-0.69	0	0	0	-0.69

Code of Maryland Regulations

All Maryland stream segments are categorized by Sub-Basin and are given a "designated use" in the Code of Maryland Regulations 26.08.02.08. Stream segments within the St. Mary's County portion of this watershed are designated Use I, recreation contact and protection of aquatic life, unless designated below.

- Use II: shellfish harvesting; All estuarine portions of tributaries.

Water Quality

The 1998 Clean Water Action Plan classified this watershed as Category 1, a watershed not meeting clean water and other natural resource goals and therefore needing restoration. It is also classified as a Category 3, a pristine or sensitive watershed in need of protection. Failing indicators include high SAV abundance and habitat index, high historic wetland loss (23,879 acres), and high soil erodibility (0.29). Indicators for Category 3 include migratory fish spawning areas, high amount of wetland-dependent species, and high percent of headwater streams in Interior Forest (24%).

According to the 2002 305(b) report, a portion of the tidal mainstem and tributaries (<1 mile) fail to support all designated uses due to bacteria from nonpoint and natural sources. The remaining portion (18 miles) fully supports all uses. Of the nontidal, wadeable tributaries, one portion (6 miles) fails to support all uses due to poor biological

community, one portion (8 miles) fully supports all uses, and the remaining portion (45 miles) had inconclusive data.

The 2004 303(d) List contains basins and subbasins that have measured water quality impairment and may require a TMDL. The basin/subbasin name, subbasin number (if applicable), and type of impairment are as follows:

- *Wicomico River* (tidal); nutrients, sediments.
- *Charleston Creek* (021401060733 tidal in Charles County); fecal coliform.
- *Budds Creek* (021401060739 non-tidal in St. Mary's County); poor biological community.

A TMDL was completed for Charleston Creek (in Charles County) and Chaptico Bay (in St. Mary's County). Fecal coliform sources in Charleston Creek are from livestock (63%), pets (3%), humans (<1%), and wildlife (34%). Sources to Chaptico Bay were similar: livestock (66%), pets (8%), humans (<1%), and wildlife (26%) (MDE, 2004e).

Restoration/Preservation

There are several linear Green Infrastructure hubs and corridors in this watershed, including around Chaptico Run, Chaptico Creek, Hayden Run, and Coffee Hill Run. These areas are unprotected. Since some areas within the Green Infrastructure network are considered as gaps, areas currently in a land use other than natural vegetation, these may be desirable locations for restoration. According to the 2000 Maryland Greenways Commission document, there are several existing or potential greenways including:

- *Chaptico/Mechanicsville/Huntersville Greenway*
- *Washington, Potomac and Chesapeake Rail Trail*
- *Potomac River Greenway*
- *Wicomico Scenic River Water Trail*

There are no State-designated Nontidal Wetlands of Special State Concern in the St. Mary's County portion of this watershed.

Maryland Department of Planning designated Chaptico Run as an Area of Critical State Concern in their 1981 document. This fresh water to high tidal marsh area provides good habitat for wood ducks, migratory waterfowl, anadromous fish, shad, herring, mink, terrapin and other species. Sedimentation from nearby development is the only known threat (MDP, 1981).

Specific recommendations for restoration:

- Restore wetlands and streams within the headwaters.
- Restore "gaps" in the Green Infrastructure network to natural vegetation, especially along waterways.
- Recommendations based on *The Wicomico Scenic River Study and Management Plan*: Restrict livestock from the streams and shorelines.

Specific recommendations for protection:

- Protect wetlands and streams within the headwaters.
- Protect portions of Green Infrastructure that are not currently protected, especially along waterways.
- Protect additional DNR-designated Ecologically Significant Areas containing wetlands that are not already protected.
- Protect the designated Area of Critical State Concern: Chaptico Run.
- Recommendations based on *The Wicomico Scenic River Study and Management Plan*:
    - Focus conservation for both Charles and St. Mary's Counties in the Wicomico River/Zekiah Swamp watersheds.
    - Protect floodplain swamp areas to maintain anadromous fish productivity.
    - Preserve remaining Forest Interior Dwelling Bird Habitat.

Gilbert Swamp (02140107)

Background

Based on MDP 2002 GIS land use data the Gilbert Swamp watershed has 13,728 acres of open water and 59,253 acres of land. The land acres are divided as follows: urban 16,675 acres (28%), agriculture 10,560 acres (18%), forest 30,914 acres (52%), wetlands 913 acres (2%) and barren land 190 acres (<1%). Since MDP wetland acreage is often underestimated, DNR wetland data estimates, as discussed later in this document, are preferred.

Wetlands historically existed along Gilbert Run, above the MD Rte. 234 bridge, but have been lost due to channelization (MDP, 1981). Apparently, this had been a very controversial project since Gilbert Run had been a beautiful system (Sipple, 1999). Gilbert Run was altered in the 1960's to reduce flooding. This included constructing three dams and nine miles of stream channelization. There is concern that this stream alteration negatively impacts the Wicomico River by increasing sediment and pesticides, changing salinity, and reducing finfish habitat (DNR, 1994).

Some relevant recommendations resulting from *The Wicomico Scenic River Study and Management Plan* are as follows:

- Acquire land along Allens Fresh and the Zekiah Swamp, with land adjacent to the Zekiah Swamp Natural Environment Area as highest priority.
- Focus conservation for both Charles and St. Mary's Counties in the Wicomico River/Zekiah Swamp watersheds.
- Restrict livestock from the streams and shorelines.
- Restore Gilbert Run spawning areas for anadromous fish.
- Protect floodplain swamp areas to maintain anadromous fish productivity.
- Preserve remaining Forest Interior Dwelling Bird Habitat.

Estimates of wetland acreage for the entire watershed, based on DNR mapped wetlands, are as follows:

- Estuarine emergent: 17 acres

- Palustrine
    - Aquatic bed: 1 acre
    - Emergent: 58 acre
    - Scrub shrub: 57 acres
    - Forested: 1,752 acres
    - Unconsolidated bottom: 87 acres
    - Unconsolidated shore: 1 acre
    - Farmed: 16 acres
- Riverine unconsolidated shore: <1 acre

Total: 1,989 acres

MDE tracks all regulated nontidal wetland activity in Maryland, including regulated wetland impacts and gains. Based on data for the time period of January 1, 1991 through December 31, 2004, for this watershed, there has been a slight gain in wetlands (Walbeck, 2005).

Basin code	Permanent Impacts	Permittee Mitigation	Programmatic Gains	Other Gains	Net Change
02140107	-0.68	0.92	3.60	0.21	4.05

Code of Maryland Regulations
All Maryland stream segments are categorized by Sub-Basin and are given a "designated use" in the Code of Maryland Regulations 26.08.02.08. Stream segments within the St. Mary's County portion of this watershed are designated Use I, recreation contact and protection of aquatic life.

Water Quality

The 1998 Clean Water Action Plan classified this watershed as Category 1, a watershed not meeting clean water and other natural resource goals and therefore needing restoration. It is also classified as a "Selected" Category 3, a pristine or sensitive watershed most in need of protection. Failing indicators include poor non-tidal benthic index of biotic integrity (BIBI), poor non-tidal instream habitat index, and high soil erodibility (0.37). Wetland loss was estimated to be 14,582 acres. Indicators for Category 3 include high imperiled aquatic species indicator, high amount of wetland-dependent species, high percent headwater stream in Interior Forest (29%), and high percent watershed being forested.

According to the 2002 305(b) report, a portion of the mainstem creek and tributaries (3 miles) fail to support all designated uses due to poor biological community and siltation from habitat alteration and channelization. A portion (15 miles) fully supports all uses and another portion (34 miles) had inconclusive results. from nonpoint and natural sources. Data for Wheatley Lake is inconclusive.

The 2004 303(d) List contains basins and subbasins that have measured water quality impairment and may require a TMDL. The basin/subbasin name, subbasin number (if applicable), and type of impairment are as follows:

- *Gilbert Swamp* (tidal); nutrients, sediments,
- *Wheatley Run* (021401070750 non-tidal in Charles County); poor biological community.
- *Church Run* (021401070746 non-tidal); poor biological community.

Restoration/Preservation

The St. Mary's County portion of this watershed has two Green Infrastructure corridors, both unprotected. Since some areas within the Green Infrastructure network are considered as gaps, areas currently in a land use other than natural vegetation, these may be desirable locations for restoration. According to the 2000 Maryland Greenways Commission document, a potential greenway is called the Washington, Potomac and Chesapeake Rail Trail.

There are no State-designated Nontidal Wetlands of Special State Concern in the St. Mary's County portion of this watershed.

Specific recommendations for restoration:

- Restore wetlands and streams within the headwaters.
- Restore "gaps" in the Green Infrastructure network to natural vegetation, especially along waterways and large hubs.
- Recommendations based on *The Wicomico Scenic River Study and Management Plan*:
    - Restrict livestock from the streams and shorelines.
    - Restore Gilbert Run spawning areas for anadromous fish.

Specific recommendations for protection:

- Protect wetlands and streams within the headwaters.
- Protect portions of Green Infrastructure that are not currently protected, especially along waterways.
- Recommendations based on *The Wicomico Scenic River Study and Management Plan*:
    - Acquire land along Allens Fresh and the Zekiah Swamp, with land adjacent to the Zekiah Swamp Natural Environment Area as highest priority.
    - Focus conservation for both Charles and St. Mary's Counties in the Wicomico River/Zekiah Swamp watersheds.
    - Protect floodplain swamp areas to maintain anadromous fish productivity.
    - Preserve remaining Forest Interior Dwelling Bird Habitat.