TALBOT COUNTY

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Background

Talbot County has roughly 178,560 acres, including 600 miles of shoreline, the longest shoreline of any U.S. County (Talbot County, 2005). The 2020 predicted population is 37,000 people. Over half of the County is agriculture (60%), about a quarter is forest (24%), and smaller amounts are developed (13%) and wetlands (3%) (based on MDP 2002 land use GIS data). Note that wetland acreage estimates based on this land use data may be grossly underestimated. Better wetland estimates, as discussed latter in this document, are based on GIS data from DNR. A large area of development is located around Easton. Waterfront areas have development pressure for large lot developments.

There are large areas of soil classified as prime farmland (based on NRCS SSURGO GIS data), located mostly in the eastern portion of the County. In order to preserve agriculture in the County, wetland restoration/creation should attempt to avoid areas classified as prime farmland. Additional areas are classified as "prime farmland when drained." While it may not be desirable to exclude all soils classified as "prime farmland when drained" from consideration, these additional areas should be lower priority for wetland restoration/creation than soils not classified as prime farmland.

The County has several zoning districts. The rural agricultural conservation district is mainly for agriculture, with some low density residential. The rural conservation district should be dominated by natural systems and "resource development activities." Other zoning districts allow more intense development. Projects that reduce pollutant runoff are desirable in all zoning areas. Future growth should be located in the development areas around Easton, St. Michaels, Oxford, and Trappe (Talbot County, 2005). Sand and gravel mining is important to this County, with much of the eastern section of the County containing these deposits. Areas with prime deposits should not be developed so they can be mined in the future. The western portion of the County has fairly low elevations and poor drainage, requiring ditches to artificially drain land for farming. The eastern portion has soils better for farming and development since the soils are not as wet. There are some places on the Bay that have severe soil erosion (up to 16-18 ft/yr loss).

Talbot County drains into two different State-designated 6-digit watersheds: Choptank River (021304) and Chester River (021305). The 8-digit watersheds within the Talbot portion of the Choptank River watershed include: Lower Choptank (02130403), Upper Choptank (02130404), and Tuckahoe Creek (02130405). The 8-digit watersheds within the Talbot portion of the Chester River watershed include: Eastern Bay (02130501), Miles River (02130502), and Wye River (02130503).

Streams

The following information is from the Maryland Tributary Strategies 2004 document entitled *Maryland Upper Eastern Shore: Final Version for 1985-2002 Data*. This basin

drains Kent County and portions of Talbot, Queen Anne, and Cecil Counties and includes the waterways Miles, Bohemia, Elk, Chester, Sassafras and Northeast Rivers, Eastern, Crab Alley, and Prospect Bays. Land use is dominated by agriculture (58%), forest/wetland (32%), and urban (10%). Roughly 60-70% of the houses are on septic. Of the six major wastewater treatment plants, all either currently have or will have biological nutrient removal by 2005. The major source for nitrogen, phosphorus, and sediments is agriculture (74%, 73%, and 89% respectively). Water quality sampling found nitrogen, phosphorus, and total suspended solids to be good or fair, except in the Upper Chester River, which had the worst water quality. In 2001, SAV coverage exceeded the SAV goal at Bohemia, Elk Neck, Sassafras, and Back Creek but was below the SAV goal at Northeast, Chester, and Eastern Bay. The benthic community was the worst at Northeast River, Bohemia River, and Eastern Bay. This document describes BMP implementation success as follows:

> BMP implementation for conservation tillage, cover crops, retirement and treatment of highly erodible land, stream protection, and erosion and sediment control are all making good progress toward Tributary Strategy goals. For other BMPs, such as those for animal waste management systems, forested and grassed buffers, and stormwater management measures, progress has been slower, and in some cases, nonexistent.

The following information is based on the Maryland Tributary Strategies 2004 document entitled *Choptank River Basin Summary: Final Version for 1985-2002 Data*. The Choptank River basin includes land in Caroline, Dorchester, Queen Anne's and Talbot Counties. The basin supports over 80 fish species and the bottom section of the basin is important for waterfowl. This basin has a large amount of agriculture (58%) and a high number of agricultural ditches. Roughly half of the houses are on septic systems. Main water quality impairments are from non-point nutrients and sediments. In 2002, the main nitrogen, phosphorus, and sediment sources within the Choptank River basin were from agriculture (73%, 67%, and 87%, respectively). Based on tributary stations, nitrogen, phosphorus, and sediments were generally better at the mouth of the Little Choptank and Choptank Rivers than upstream Choptank River. In 2001, SAV along the Choptank River from Castle Haven Point to Bow Knee Point was much lower than the SAV goal, SAV in the outer Choptank River was roughly three-quarters of the SAV goal, and SAV in the Little Choptank River exceeded the SAV goal. The benthic community was generally good, but there were some differences in the different areas. Some samples within the lower mesohaline portion were slightly degraded, the upper mesohaline portion were moderately to severely degraded (due to nutrient enrichment, with many poor sites upstream of Cabin Creek), and the oligohaline portion was the best. This document describes the mixed success of BMP implementation as follows:

> In some cases, such as shore erosion controls, forest conservation, forest buffers, and nutrient management plans, the goals set in the Choptank Tributary Strategy have nearly been met or have been exceeded. For other BMPs, notably those dealing with stormwater management, implementation is falling short of the Tributary Strategy goals.

Wetlands

Wetland Classification

According to Tiner and Burke (1995), in 1981-1982 there were 19,967 acres of wetlands (3.3% of the State total). The wetland types were Estuarine (9,781 acres), Palustrine (9,993 acres) and Riverine (193 acres). Comparisons of this 1981-1982 wetland acreage with historic wetland acreage (based on hydric soils) represents a 69%, or 44,358 acre, loss (MDE, 2002).

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. Atlantic white cedar swamps may have been located historically in Talbot County (Upper Choptank River) (Dill et al., 1987). Few Atlantic white cedar swamps remain in Maryland since most have been converted to hardwood swamp. 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).

The 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). Talbot County had 4,781 acres of vegetated tidally-influenced wetlands (excluding SAV), mainly brackish and fresh marsh. 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 Talbot County based on vegetation type (McCormick and Somes, 1982).

Major Vegetation Type	Vegetation Type	Acreage
Shrub Swamp *(Fresh)*	Swamp rose	5
	Smooth alder/Black willow	0
	Red maple/Ash	27
Swamp forest *(fresh except pine, which is often brackish)*	Bald cypress	0
	Red maple/Ash	188
	Loblolly pine	0
Fresh marsh	Smartweed/Rice cutgrass	40
	Spatterdock	118
	Pickerelweed/Arrow arum	381
	Sweetflag	6
	Cattail	667
	Rosemallow	44
	Wildrice	5
	Bulrush	110
	Big cordgrass	172
	Common reed	2
Brackish High Marsh	Meadow cordgrass/Spikegrass	552
	Marshelder/Groundselbush	1,076
	Needlerush	122
	Cattail	380
	Rosemallow	27
	Switchgrass	80
	Threesquare	46
	Big cordgrass	314
	Common reed	78
Brackish Low Marsh	Smooth cordgrass	341
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	4,214

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:

c. A decrease in the volume and velocity of flowing water.
   Value: Helps prevent stream channel and shoreline erosion, and habitat destruction.
d. Deposition and retention of fine sediment.
   Value: Helps maintain water quality and aquatic ecosystems.
e. 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 ditching and channelization of streams in some areas of Talbot County has likely reduced the ability of some floodplain wetlands to perform a flood attenuation function (Beston, pers. comm., 2006)

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 that 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.

Nontidal Wetlands of Special State Concern

There are several State-designated Nontidal Wetlands of Special State Concern, located in the northeast section of 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 lot of hydric soil that is not mapped wetlands (based on NRCS SSURGO GIS data and NWI/DNR wetlands). This is the case for the majority of the western portion of the County, along many of the larger creeks. While the majority is classified as “poorly drained,” there are some areas of “very poorly drained” soils. Hydric soils that are not currently wetlands may be good potential sites for wetland restoration. While not classified as hydric soil, there are additional ”somewhat poorly drained” soils that may be good areas for wetland creation.

Wetland restoration and preservation may be another useful tool for achieving TMDL requirements. Wetland restoration designed to achieve maximum water quality benefits towards the TMDL should be focused at the head of tide and upstream. The headwater zone of tidal waterbodies tends to be the location of maximum algal concentrations for several reasons. The tidal headwaters are more stagnant because they tend to be shielded from the wind-generated mixing. This zone is also the depositional area of nutrients from the tidal river's primary nontidal stream system. Finally, this area tends to be shallow. As a consequence, the water tends to be slightly warmer, which increases the rate of algae growth. Additionally, less water volume is available to dilute nutrient fluxes from the bottom sediments (George, 2006, pers. comm.).

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 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 Talbot County Comprehensive Plan has the following goals related to natural resources:

- Within the Chesapeake Bay Critical Area:
    - Protect water quality
    - Protect plant, fish, and wildlife habitat
    - Limit the impact of growth
    - Preserve wetlands
    - Restore SAV populations to improve finfish and shellfish populations

    - Streams. Currently there is a 100-foot buffer setback for development within the Critical Area.
- Protect groundwater
- Preserve and restore forest
- Maintain prime farmland
- Limit development in 100-year floodplain
- Protect sensitive resources
- Encourage agricultural and forestry best management practices
- Protect environmentally sensitive land through conservation easements.
- Streams outside the Chesapeake Bay Critical Area should also be protected. Perennial streams should get a 100-foot buffer between the stream and development and intermittent streams should get a 50-foot buffer.

Source water assessments were completed for 12 community water systems in this County. These water supplies withdraw from the confined aquifer, so they are not highly susceptible to human-induced contaminants. Some are susceptible to natural contaminants including arsenic, fluoride, and radon (MDE, 2003b). Specific systems are discussed in the section for the individual watershed.

There are no State-designated Natural Heritage Areas within this County.

Other Relevant Programs

Green Infrastructure and Greenways

There is a relatively small amount of land designated by DNR as Green Infrastructure within this 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.

Talbot County felt that the Maryland Green Infrastructure assessment downplayed the importance of some valuable forest land within the County, largely because many forest areas did not meet the minimum forest interior threshold. For this reason, they had The Conservation Fund develop a revised Green Infrastructure plan for Talbot County. To do this, they used the Maryland Green Infrastructure ecological ranking grid as their base, and made some modifications. In this plan, they evaluated ecological, aquatic, and agricultural resources. Based on these evaluations, they determined ten areas for focus of conservation efforts. These areas are discussed in the individual water section. The Conservation Fund also applied their revised ecological ranking to parcel data. While this parcel data is too detailed for this current wetland prioritization, it would be quite useful for more detailed investigations.

The Talbot County Comprehensive Plan recommends enhancing access to water, improving the bicycle system, and increasing greenways and linear parks.

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 Program
Land designated as Rural Legacy is located in the Tuckahoe Creek and Upper Choptank River watersheds. For detailed information on this program, refer to the specific watershed.

Priority Funding Areas
Priority Funding Areas are scattered throughout the County, with the largest ones being around Easton, Trappe, Oxford, and St. Michaels. Wetland restoration is less desirable in PFAs.

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.

Protected Areas
There are small scattered parcels of protected land throughout the County, with METs being some of the largest contiguous areas.

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.

Lower Choptank (02130403)

Background

The Talbot County portion of this watershed has roughly 68,687 land acres (based on MDP 2002 land use GIS data). Over half of the land use is agriculture (55%) and a quarter is forested (25%). A relatively large amount of land use is developed (18%) and a small amount is wetland (3%). Note that wetland acreage estimates based on this land use data may be grossly underestimated. Better wetland estimates, as discussed elsewhere in this document, are based on GIS data from DNR.

There are extensive freshwater tidal marshes located along meandering portions or on alluvial deposits along the Choptank River. Some of the regions highest densities of transient and wintering waterfowl are located in the Choptank River. Tidal marsh portions along the Choptank River, north of Cambridge, have had very large areas of marsh vegetation destroyed due to overly dense muskrat populations. While it changed the vegetative structure, it also resulted in loss of peat (Sipple, 1999).

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

- Estuarine
    - Emergent: 3,459 acres
    - Scrub shrub: 6 acres
    - Forested: 6 acres
    - Unconsolidated shore: 320 acres
- Palustrine
    - Aquatic bed: 5 acres
    - Emergent: 292 acres
    - Scrub shrub: 661 acres
    - Forested: 3,686 acres
    - Unconsolidated bottom: 665 acres
    - Unconsolidated shore: 4 acres
    - Farmed: 32 acres
- Riverine unconsolidated shore: 4 acres
- Total: 9,140 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 gain in wetlands (Walbeck, 2005).

Basin code	Permanent Impacts	Permittee Mitigation	Programmatic Gains	Other Gains	Net Change
02130403	-14.34	5.53	14.00	11.58	16.77

A forested/emergent wetland was constructed on private pasture land as a programmatic wetland mitigation project in 1994-95.

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. All waterways not specifically designated in COMAR are classified Use I, recreation contact and protection of aquatic life. This watershed is designated as follows:

- Choptank River and tributaries above Bow Knee Point and Wright Wharf: Use I, recreation contact and protection of aquatic life.
- Tred Avon River and tributaries above Easton Point: Use I, recreation contact and protection of aquatic life.
- All estuarine portions except those listed above: Use II, shellfish harvesting.

Water Quality

Source water assessments were completed for several water supplies in this watershed. The water supply name and susceptibility are as follows:

- *Easton*: fluoride, arsenic, radionuclides.
- *Town of Oxford*: fluoride, arsenic.
- *St. Michaels*: arsenic.
- *Town of Trappe*: arsenic, radionuclides.

The 1998 Clean Water Action Plan classified this watershed as Category 1, a watershed not meeting clean water and other natural resources goals and therefore needing restoration. Failing indicators include high monitored nutrient concentrations, poor SAV habitat index, a low tidal benthic IBI, a low non-tidal benthic IBI, high historic wetland loss (56,918 acres), high percent unforested stream buffer (62%), and being on the 303(d) List for water quality impairment. Indicators of Category 3 include five migratory fish spawning areas.

According to the 2002 Maryland Section 305(b) Water Quality Report, a portion of the tidal Lower Choptank River and tributaries fail to fully support all designated uses (93.1 $mi.^2$ supports, 33.8 $mi.^2$ fails to support) due to low oxygen, bacteria, and poor benthic community from nonpoint, eutrophication, industrial, and natural sources. Portions of the nontidal wadeable tributaries (i.e. East Branch Bolingbroke Creek subwatershed; DNR, 2000) fail to support all designated uses (3.5 mi. support, 2.3 mi. fail to support, 20.9 mi.

inconclusive) due to poor fish and benthic community from siltation, agricultural runoff, bank instability and stream alteration.

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:

- *Lower Choptank* (tidal); fecal coliform, nutrients, suspended sediments, poor biological community.
- *Unnamed tributary to Trappe Creek* (021304030463 non-tidal in Talbot); poor biological community. This waterway is also impaired by biochemical oxygen demand and phosphorus, but TMDLs have been completed for these pollutants.
- *Tred Avon River* (021304030462 tidal in Talbot); fecal coliform.
- *Tar Creek* (021304030461 tidal in Talbot); fecal coliform.
- *San Domingo Creek* (021304030457 tidal in Talbot); fecal coliform.
- *Jenkins Creek* (021304030458 tidal in Dorchester County); fecal coliform.
- *Indian Creek* (021304030458 tidal in Dorchester County); fecal coliform.
- *Warwick River* (021304030466 tidal in Dorchester County); fecal coliform.
- *Cummings Creek* (021304030455 tidal in Talbot); fecal coliform.
- *Northeast Branch* (021304030455 tidal in Talbot); fecal coliform.
- *Whitehall Creek* (021304030458 tidal in Dorchester County); fecal coliform.
- *Goose Creek* (021304030458 tidal in Dorchester County); fecal coliform.
- *Town Creek*; This waterway is impaired by biochemical oxygen demand, but a TMDL has been completed for this pollutant.
- *Unnamed tributary to Windmill Branch* (021304030464 non-tidal in Talbot); poor biological community.
- *Eastern Branch Bolingbroke Creek* (021304030459 non-tidal in Talbot); poor biological community.
- *Hunting Creek* (021304030471 non-tidal in Caroline); poor biological community.

The following information is summarized from the 2002 MDE document entitled *Total Maximum Daily Loads of Biochemical Oxygen Demand (BOD), Nitrogen and Phosphorus for Town Creek into which the Town of Oxford Wastewater Treatment Plant Discharges Talbot County, Maryland*. Town Creek has headwaters in Oxford and a drainage area of 597 acres. Town Creek drains into Tred Avon River and then into the Choptank River. The land use is dominated by agriculture (54%), followed by open water (24%) and urban (22%) (based on 1997 Maryland Department of Planning data). The Town of Oxford Waste Water Treatment Plant is within this drainage area. Dissolved oxygen was lower than that required by waters classified as Use II. Additionally, when the WWTP discharges at the maximum level allowed by the permit, the chlorophyll a will exceed 50ug/l. Water quality samples found low dissolved oxygen and high dissolved inorganic phosphorus associated with the WWTP. The low flow and annual TMDL requires a 50% reduction in controllable phosphorus from the WWTP and a 35% reduction in the nonpoint sources in the area.

The following information is summarized from the MDE 2002 document entitled *Total Maximum Daily Loads of Carbonaceous Biological Oxygen Demand (CBOD), Nitrogenous BOD (NBOD), and Total Phosphorus (TP) for an Unnamed Tributary of La Trappe Creek into which the Town of Trappe Waste Water Treatment Plant Discharges Talbot County, Maryland*. This nontidal Unnamed Tributary of La Trappe Creek drains into an ~4-acre in-stream pond, which overflows into Lower Choptank River. The drainage area is 252 acres and is dominated by agriculture (63%), urban (21%), forest/herbaceous (12%), and water (4%) (based on 1997 Maryland Department of Planning data). There is marsh adjacent to the pond. The Use I classification is violated by low dissolved oxygen levels and chlorophyll a levels >50ug/l. Trappe Waste Water Treatment Plant contributes a significant amount of BOD, the main pollutant of concern.

A TMDL and Water Quality Analysis for fecal coliform were completed for some areas within the lower Choptank basin. The sources of fecal coliform follow:

Waterway	Wildlife %	Humans %	Pets %	Livestock %
San Domingo Creek	26	<1	33	40
Ted Avon River	6	<1	12	83
Tar Creek	1	0	<1	99
Northeast Branch	63	1	12	25

Water quality designations based on fecal coliform were met in Jenkins Creek and Cummings Creek (MDE, 2004a).

MBSS samples found FIBI and BIBI ranging from fair to very poor.

Restoration/Preservation

All of the State-designated Green Infrastructure within this watershed is located in the eastern portion (DNR, 2000-2003). These mostly include corridors connecting small hubs, nearly all unprotected. Some of these corridors have GI "gaps" that may be ideal for restoration to natural vegetation. According to the Maryland Greenways Commission document, there are three potential greenways:

- *Easton-Clayton Rail Trail*.
- *St. Michaels Bike Trail*.
- *Talbot County Scenic Byways*

The Conservation Fund also designated some areas within this watershed as Green Infrastructure.

- *Sherwood-Tilghman Bay Coast*: This area is between the Chesapeake Bay and Harris Creek.
- *Claiborne/Eastern Bay Shores*: This important aquatic area includes some protected land in the northern part and could provide public water access.
- *Choptank-Tuckahoe Riparian Zone*: This area was chosen in order to protect the valuable riverine wetlands, vegetated riparian corridor, and water quality of the waterways.

- *Bolingbroke Creek Reach*: This important ecological area is located along Bolingbroke Creek, in the far southern portion of the County.
- *Island Neck*: This wetland ecosystem (in need of preservation) lies along the Choptank River, and is between LaTrappe Creek and Island Creek.
- *Easton-Trappe Rural Divide*: This is an area of productive agricultural land that should remain rural.

As part of an ongoing project to classify the vegetative communities in Maryland, MDNR created the document entitled *Shrubland Tidal Wetland Communities of Maryland's Eastern Shore*. In this document, they categorize nine shrubland tidal wetland communities, including some in Talbot County. One of the reference sites, the best example of a particular community type, is the *Iva frutescens/Spartina patens* (Marsh elder/Saltmeadow cordgrass) shrub community. These wetland types are daily to irregularly flooded by mesohaline (brackish) waters. Sites are found along Cummings Creek and Harris Creek.

There is one State designated Nontidal Wetland of Special State Concern (WSSC) and a potential WSSC within the Talbot County portion of the watershed.

- *Seth Pond (DNR name: Seth Forest)*. This pond contains a deep detritus layer at the pond bottom, providing good habitat for two rare aquatic beetle species. In recent years, this pond was altered to improve its value for waterfowl. Since this alteration, no beetles have been reported. Seasonal ponds are becoming less common on the Eastern Shore (DNR, 1991). This site is within DNR-owned Seth Demonstration State Forest.
- There is an potential WSSC located between Cummings Creek and Northwest Branch. 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.

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 tidal wetlands used as reference sites in the DNR tidal wetland vegetative community studies, since they are high-quality systems (e.g. near Cummings Creek, and along Flatty Cove: Harrison, 2001; Harrison and Stango, 2003).

<u>Upper Choptank (02130404)</u>

Background

The Talbot County portion of this watershed has roughly 36,284 land acres (based on MDP 2002 land use GIS data). Land use is dominated by agriculture (64%), followed by forest (24%), developed land (6%), and wetland (6%). Note that wetland acreage estimates based on this land use data may be grossly underestimated. Better wetland estimates, as discussed elsewhere in this document, are based on GIS data from DNR.

This watershed is located partially in Caroline County, Queen Anne County, and Delaware. The entire Maryland portion of the watershed has roughly 60% agriculture, 30% forest/brush, and 8% developed. The Delaware portion of this watershed has less intense land use, with more forest (45%) and less agriculture (50%) and developed (3%) land use than Maryland. A large amount of developed land and agriculture are on hydric soils. Many of the agricultural areas have PDA ditches, which are critical to their production.

Sipple (1999) noted that the Choptank River, like other middle sections of estuaries, has a strong meandering pattern, with the outside of the river bend abutting uplands and the inside of the bend being covered in extensive fresh to slightly brackish tidal marsh. During the twice daily tides, the river overflows to the smaller stream banks and over the marsh surface. As the water recedes, the marshes act as a sediment trap, with sediment being deposited throughout the marsh. The spatially heterogeneous wetland vegetation also provides important habitat for bald eagles, various ducks, muskrat, and other wildlife.

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

- Estuarine
    - Emergent: 3,265 acres
    - Scrub shrub: 2 acres
    - Unconsolidated shore: 109 acres
- Palustrine
    - Aquatic bed: 2 acres
    - Emergent: 519 acres
    - Scrub shrub: 931 acres
    - Forested: 10,045 acres
    - Unconsolidated bottom: 604 acres
    - Farmed: 620 acres
- Riverine unconsolidated shore: 176 acres
- Total: 16,272 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 gain in wetlands (Walbeck, 2005).

Basin code	Permanent Impacts	Permittee Mitigation	Programmatic Gains	Other Gains	Net Change
02130404	-6.27	1.06	80.00	12.59	87.38

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. This watershed is designated Use I, recreation contact and fishing.

Water Quality

Source water assessments were completed for some water supplies in this watershed. The water supply name and susceptibility are as follows:

- *Swann Haven Mobile Home Park* (northeast of Crofton): radionuclides.
- *Talbot Mobile Home Park* (east of the Easton Municipal Airport): radionuclides n.

The 1998 Clean Water Action Plan classified this watershed as Category 1, a watershed not meeting clean water and other natural resources 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 a high modeled phosphorus loading, a poor SAV habitat index, a low benthic IBI, a low non-tidal benthic IBI, high historic wetland loss (48,169 acres), high soil erodibility (0.28), and being on the 303(d) List for water quality impairment. Indicators of Category 3 include a high imperiled aquatic species indicator and six migratory fish spawning areas.

According to the 2002 Maryland Section 305(b) Water Quality Report, the tidal and nontidal Upper Choptank River and tidal tributaries fully supports all designated uses (14.1 mi.^{2}). Nontidal wadeable tributaries fail to support all designated uses (127.5 mi.) due to poor biological community from siltation, low oxygen, channelization and changes in hydrology.

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:

- *Upper Choptank* (tidal); nutrients, suspended sediment.
- *Choptank River Unnamed Tributary 1* (021304040487 non-tidal in Caroline); poor biological community.
- *Choptank River Unnamed Tributary* (021304040496 non-tidal in Caroline); poor biological community.
- *Miles Creek Unnamed Tributary* (021304040473 non-tidal in Talbot); poor biological community.
- *Beaverdam Branch* (021304040483 non-tidal in Talbot); poor biological community.
- *Herring Run Unnamed Tributary* (021304040490 non-tidal in Caroline); sedimentation.
- *Broadway Branch* (021304040509 non-tidal in Caroline); poor biological community.
- *Forge Branch* (021304040505 non-tidal in Caroline); poor biological community.

- *Forge Branch Unnamed tributary* (021304040505 non-tidal in Caroline); poor biological community.
- *Forge Branch Unnamed tributary* (021304040504 non-tidal in Caroline); sedimentation.
- *Oldtown Branch* (021304040508 non-tidal in Caroline); poor biological community.
- *Oldtown Branch Unnamed Tributary 1* (021304040508 non-tidal in Caroline); poor biological community.
- *Fowling Creek Unnamed Tributary 1* (021304040485 non-tidal in Caroline); poor biological community.
- *Harrington Beaverdam Ditch Unnamed Tributary 1* (021304040515 non-tidal); poor biological community.
- *Tidy Island Creek* (021304040512 non-tidal in Caroline); poor biological community.
- *Tidy Island Creek Unnamed Tributary* (021304040509 non-tidal in Caroline); sedimentation.
- *Tidy Island Creek Unnamed Tributary 1* (021304040514 non-tidal in Caroline); poor biological community.
- *Coolspring Branch* (021304040514 non-tidal in Caroline); poor biological community.
- *Robins Creek Unnamed Tributary* (021304040486 non-tidal in Caroline); poor biological community.
- *Andover Branch Unnamed Tributary* (021304040515 non-tidal); poor biological community.

The following information is based on the 2002 DNR document entitled *Upper Choptank River Watershed Characterization*. In addition to problems with nutrients and sediments, there are areas of high chlorophyll levels, poor water clarity, and high fecal coliform. There is a fish consumption advisory in the Choptank River regarding contamination by PCB and pesticides in catfish and white perch (Shanks, 2002). 60% of the sites were rated as “poor” or “very poor” for benthic macroinvertebrates and “good” or “fair” for fish. This suggests that fish may be more tolerant of agricultural ditches than benthic macroinvertebrates. SAV is fairly sparse, likely due to limited water clarity and depth of the river, and are located along the shoreline. Community wells generally draw from deep aquifers. Fish populations seem fairly healthy. The Upper Choptank River is the third most important spawning and nursery for striped bass. The most important spawning and nursery area is from Denton to Bow Knee Point.

The following is based on TURPA, Creek Watchers, CISNET, TMDL, and Chesapeake Bay Program data as compiled by Horn Point Laboratory and summarized by Shanks (2002). Although DO is generally above 5mg/L in this watershed, as unnamed tributary at North Dover Road had a reading below 2mg/L and the site at Old Town Branch (in Caroline County) had a reading of 3mg/L. Total suspended solids were higher downstream of Tuckahoe Creek and lower upstream of Denton. Chlorophyll a is generally higher between Denton and Tuckahoe Creek. Tributary strategy teams sampled

two sites. Ganey Wharf had poor nitrogen and suspended sediments and fair phosphorus while Red Bridges had fair nitrogen and phosphorus.

MBSS sampled streams between 1994 and 2000. The BIBI rankings ranged from good to very poor. Those ranked good and fair were generally downstream of Denton while those ranked very poor tended to be upstream of Denton.

The DNR document entitled *Report on Nutrient and Biological Synoptic Surveys in the Upper Choptank Watershed, March/April 2002* explains the water conditions:

> Broadway Branch had baseline to moderate nutrient concentrations and yields. The macroinvertebrate sample and habitat assessment at the watershed outlet indicated habitat as the primary problem. Chicken Branch had excessive nutrient concentrations and yields throughout the watershed. The macroinvertebrate sample and habitat assessment at the watershed outlet indicated both habitat and water quality problems. Forge Branch had a full range of nutrient concentrations and yields, with moderate yields at the watershed outlet. Macroinvertebrate sampling and habitat assessment indicated only minor habitat problems. Watts Creek had some areas of elevated nutrients, but all yields were baseline at the watershed outlet. Macroinvertebrate sampling and habitat assessment indicated this stream was in excellent condition. Nutrient concentrations and yields in Long Branch were moderate at worst. Macroinvertebrate sampling and habitat assessment indicated a possible water quality problem from something other than nutrients. Little Creek had the full range of nutrient concentrations and yields. Low flow limited the impact of excessive concentrations. The macroinvertebrate sampling and habitat assessment indicated a water quality problem that could be associated with low pH. The Talbot County watersheds also had a full range of nutrient concentrations and yields. The upper portion of the Beaverdam watershed was the focus of the elevated concentrations and yields. Macroinvertebrate sampling and habitat assessment indicated habitat degradation was the primary impact on the benthic community rather than water quality. Sampling in untargeted subwatersheds found the full range of nutrient concentrations and yields. Contributions from Delaware into the upper portion of the watershed were minimal. Seven other subwatersheds, two originating in Delaware, had excessive nutrient yields.

Restoration/Preservation

The *Upper Choptank River Strategic Watershed Restoration Action Plan* was completed in 2003. Some recommendations included in this plan are as follows:

- Preserve land in order to protect natural resources and water quality
- Protect wetland, buffers, and forests
- Preserve the most productive agricultural land

This watershed has small State-designated hubs and corridors spread throughout (DNR, 2000-2003). This land is largely unprotected with the exception of several METS and a TNC property (Choptank Wetlands Preserve). According to the Maryland Greenways Commission document, there are three potential greenways:

- *Easton-Clayton Rail Trail*.
- *Tuckahoe River Greenway.*
- *Choptank and Tuckahoe River Water*.

The Conservation Fund also designated some areas within this watershed as Green Infrastructure.

- *Outer Easton Agricultural Buffer*: This area is both important agricultural land and has high ecological value. Therefore, a combination of strategies should be employed here.
- *Tuckahoe Rural Legacy Area*: This area contains productive agriculture and is part of the Rural Legacy area.
- *Easton-Trappe Rural Divide*: This is an area of productive agricultural land that should remain rural.
- *Choptank-Tuckahoe Riparian Zone*: This area was chosen in order to protect the valuable riverine wetlands, vegetated riparian corridor, and water quality of the waterways.

The following information is summarized from the document *Rural Legacy FY 2003: Applications and State Agency Review*. The Agricultural Security Corridor, specifically the Tuckahoe RLA, is partially located in this County. The sponsors include Eastern Shore Rural Legacy Sponsor Board and Eastern Shore Land Conservancy, Inc. This area is in the northeastern section of the County, adjacent to the Tuckahoe Creek. The goals were to protect areas with good agricultural soils, wildlife habitat, and historical and economic values, and water quality of the Tuckahoe Creek. There are approximately 6,869 acres of land in the Talbot County section of the Tuckahoe RLA (based on GIS data). There are 1,237 acres of protected land within the Talbot County portion of this Rural Legacy area. 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 always adequate enough to support all of these requests, other programs should consider preservation of these sites.

As part of an ongoing project to classify the vegetative communities in Maryland, DNR created the document entitled *Shrubland Tidal Wetland Communities of Maryland's Eastern Shore*. In this document, they categorize nine shrubland tidal wetland communities, including some in Talbot County. One of the reference sites, the best example of a particular community type, is the *Alnus serrulata-Viburnum recognitum/Impatiens capensis* tidal wetland on Kings Creek (north of Kingston Road). This community type is ranked S4: "a designation meaning that more than 100 occurrences are known in the State or fewer occurrences if they contain a large number of individuals." This site is threatened from invasion by *Phragmites* near the mouth of the creek. King's Creek also supports a forested tidal wetland community reference community. The site is dominated by *Fraxinus profunda-Nyssa biflora/Polygonum*

arifolium (Pumpkin ash-Swamp blackgum/Winterberry/Halberd-leaved tearthumb. This community type is flooded daily or irregularly by fresh water, with occasional pulses of higher salinity water from spring high tides or low river flow (Harrison et al., 2004). The wetlands are often found between uplands and emergent tidal wetlands, with variable microtopography of hollows and hummocks.

During this same project, DNR also created the document entitled *Herbaceous Tidal Wetland Communities of Maryland's Eastern Shore*. In this document, they characterized 14 community types, with some being found in this County. Two reference sites, the best example of two particular community types, are *Typha (angustifolia, latifolia)-Hibiscus moscheutos* herbaceous vegetation and *Panicum virgatum* tidal herbaceous vegetation located in King's Creek Preserve (southwest of Kingston Landing). These community types have high species richness and diversity and were designated S4, a community type being "secure under present conditions in Maryland." These sites are owned by The Nature Conservancy and are at risk for invasion by *Phragmites*.

The document entitled *Upper Choptank River Watershed Characterization* made several recommendations including:

- Headwater
- Stream buffer
- Hydric soils
- Within 300 feet of existing wetlands
- On agricultural land
- Restore fish passages. There were 21 identified fish blockages in 2001.

There is one State designated Nontidal Wetland of Special State Concern (WSSC) and a potential WSSC within the Talbot County portion of the watershed.

- *Adkins Marsh (DNR name: Choptank Wetlands)*. This site is along the Choptank River and a large portion is within TNC Choptank Wetlands Preserve.
- There is a potential WSSC within DNR-owned Seth Demonstration State Forest and an unprotected potential WSSC east of Easton.

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.
- Based on the *Upper Choptank River WRAS*:
    - Preserve land in order to protect natural resources and water quality
    - Protect wetland, buffers, and forests
    - Preserve the most productive agricultural land
- Protect remaining unprotected WSSC and buffers.
- Protect portions of Green Infrastructure that are not currently protected, especially along the Choptank and other waterways.

- Protect additional DNR-designated Ecologically Significant Areas containing wetlands that are not already protected.
- Protect tidal wetlands used as reference sites in the DNR tidal wetland vegetative community studies, since they are high-quality systems (e.g. along the Choptank River, Kings Creek, Beaverdam Branch, and Miles Creek: Harrison, 2001; Harrison and Stango, 2003; Harrison et al., 2004).
- Protect land within the designated Rural Legacy Area.

Tuckahoe Creek (02130405)

Background

The Talbot County portion of this watershed has roughly 15,459 land acres (based on MDP 2002 land use GIS data). About three-fourths of this land use is agriculture (77%), with smaller amounts of forest (17%), developed land (5%), and wetland (2%). Note that wetland acreage estimates based on this land use data may be grossly underestimated. Better wetland estimates, as discussed elsewhere in this document, are based on GIS data from DNR.

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

- Estuarine
  - Emergent: 44 acres
  - Unconsolidated shore: 2 acres
- Palustrine
  - Emergent: 724 acres
  - Scrub shrub: 283 acres
  - Forested: 10,898 acres
  - Unconsolidated bottom: 270 acres
  - Farmed: 1,023 acres
- Riverine
  - Emergent: 21 acres
  - Unconsolidated shore: 33 acres
- Total: 13,298 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
02130405	-1.44	1.12	2.30	0.00	1.98

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. This watershed is designated Use I, recreation contact and fishing.

Water Quality

The 1998 Clean Water Action Plan classified this watershed as "Priority" Category 1, a watershed not meeting clean water and other natural resources 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 a high modeled nitrogen and phosphorus loading, a low non-tidal benthic IBI, high historic wetland loss (35,689 acres), high percent unforested stream buffer (63%), high soil erodibility (0.30), and being on the 303(d) List for water quality impairment. Indicators of Category 3 include a high non-tidal fish IBI, high imperiled aquatic species indicator, and six migratory fish spawning areas.

According to the 2002 Maryland Section 305(b) Water Quality Report, water quality results for the tidal portion of the Tuckahoe Creek were inconclusive. A portion of the nontidal wadeable tributaries (unnamed tributary to Tuckahoe Creek, Blockston Branch, Mason Branch, unnamed tributary to Mason Branch; DNR, 2000) failed to fully support all designated uses (2.5 mi. fully support, 31.1 mi. fail to support, 56.8 mi. were inconclusive) due to a poor benthic community. Possible reasons for this poor community include low dissolved oxygen, siltation, changes in habitat, channelization, and sewer/septic systems. Tuckahoe Lake (86.0 acres) fully supports all designated uses.

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:

- *Tuckahoe Creek*; nutrients, suspended sediments.
- *Tuckahoe Creek Impoundment*; While methylmercury in fish tissue (from atmospheric deposition) is an impairment to this waterway, a TMDL has been completed for this contaminant.
- *Unnamed tributary to Tuckahoe Creek* (021304050517 in Talbot); sedimentation.
- *Blockston Branch* (021304050529 in Queen Anne); sedimentation.
- *Mason Branch* (021304050534); sedimentation.
- *Mason Branch* (021304050537); sedimentation.
- *Unnamed tributary to Mason Branch* (021304050536 in Queen Anne); poor biological community.

MBSS found FIBI were all rated good, while BIBI were rated fair and very poor, with the very poor site located on an unnamed tributary to Tuckahoe Creek.

Restoration/Preservation

There are some small State-designated Green Infrastructure hubs and corridors spread throughout the watershed (DNR, 2000-2003), mostly unprotected, including along Tuckahoe Creek. According to the Maryland Greenways Commission document, three potential greenways exist:

- *Easton-Clayton Rail Trail*.
- *Tuckahoe River Greenway.*
- *Choptank and Tuckahoe River Water*.

The Conservation Fund also designated some areas within this watershed as Green Infrastructure.

- *Tuckahoe Rural Legacy Area*: This area contains productive agriculture and is part of the Rural Legacy area.
- *Choptank-Tuckahoe Riparian Zone*: This area was chosen in order to protect the valuable riverine wetlands, vegetated riparian corridor, and water quality of the waterways.

The following information is summarized from the document *Rural Legacy FY 2003: Applications and State Agency Review*. The Agricultural Security Corridor, specifically the Tuckahoe RLA, is partially located in this County. The sponsors include Eastern Shore Rural Legacy Sponsor Board and Eastern Shore Land Conservancy, Inc. This area is in the northeastern section of the County, adjacent to the Tuckahoe Creek. The goals were to protect areas with good agricultural soils, wildlife habitat, and historical and economic values, and water quality of the Tuckahoe Creek. There are approximately 6,869 acres of land in the Talbot County section of the Tuckahoe RLA (based on GIS data). There are 1,237 acres of protected land within the Talbot County portion of this Rural Legacy area. 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 always adequate enough to support all of these requests, other programs should consider preservation of these sites.

As part of an ongoing project to classify the vegetative communities in Maryland, DNR created the document entitled *Shrubland Tidal Wetland Communities of Maryland's Eastern Shore*. In this document, they categorize nine shrubland tidal wetland communities, including some in Talbot County. One of the reference sites, the best example of a particular community type, is the *Alnus serrulata-Viburnum recognitum/Impatiens capensis* tidal wetland along Tuckahoe Creek. These wetland types are daily to irregularly flooded by mesohaline (brackish) waters. Tuckahoe Creek also supports reference sites for two tidal forested wetland community types: *Fraxinus pennsylvanica/Acer rubrum/Polygonum spp.* (Green ash/Red maple/Smartweed and *Fraxiuns profunda/Nyssa biflora/Polygnoum arifolium* (Pumpkin ash-Swamp blackgum/Halberd-leaved tearthumb). Both community types may be subject to freshwater, daily to irregular, tidal flooding. The former community is minimally influenced by tidal waters at the upper tidal limits. The second community is is found in lower landscape positions with greater tidal influence (Harrison et al., 2004).

There is one State designated Nontidal Wetland of Special State Concern (WSSC) and a potential WSSC within the Talbot County portion of the watershed.

- *Geib Fairview Ponds*. This wetland complex includes forest swamp, shrub swamp, and seasonal ponds. The seasonal pond contains three RTE plant species (DNR, 1991). Main threats include alteration of the hydrology. Non-native plant species should be monitored and controlled if necessary. The forested buffer should also be protected (Ludwig et al., 1987). This site is unprotected.
- There is a large potential WSSC near Queen Anne/Hillsboro that 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.

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 Tuckahoe Creek and other waterways.
- Protect additional DNR-designated Ecologically Significant Areas containing wetlands that are not already protected.
- Protect tidal wetlands used as reference sites in the DNR tidal wetland vegetative community studies, since they are high-quality systems (Harrison, 2001; Harrison and Stango, 2003).
- Protect land within the designated Rural Legacy Area.

<u>Eastern Bay (02130501)</u>

Background

The Talbot County portion of this watershed has 2,866 land acres (based on MDP 2002 land use GIS data). Over half of the land use is agriculture (58%). The remaining land use is forest (29%), developed land (10%), and wetlands (3%). Note that wetland acreage estimates based on this land use data may be grossly underestimated. Better wetland estimates, as discussed elsewhere in this document, are based on GIS data from DNR.

Some of the regions highest densities of transient and wintering waterfowl are located in the Eastern Bay. The Eastern Bay has excellent wintering and transient concentration areas of black ducks (Sipple, 1999).

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

- Estuarine
    - Emergent: 1,007 acres
    - Scrub shrub: 54 acres
    - Forested: 19 acres

  - Unconsolidated shore: 174 acres
- Palustrine
  - Emergent: 73 acres
  - Scrub shrub: 111 acres
  - Forested: 1011 acres
  - Unconsolidated bottom: 67 acres
  - Farmed: 80 acres
- Total: 2,598 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
02130501	-6.53	4.03	1.18	0	-1.32

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 not specifically listed in COMAR are designated Use I, recreation contact and protection of aquatic life. The estuarine portions of this watershed are designated Use II, shellfish harvesting.

Water Quality

Based on the source water assessment, the water supply for Clairborne is susceptible to arsenic and radionuclides.

The 1998 Clean Water Action Plan classified this watershed as Category 1, a watershed not meeting clean water and other natural resources goals and therefore needing restoration. Failing indicators include a high percent unforested stream buffer (84%) and being on the 303(d) List for water quality impairment.

According to the 2002 Maryland Section 305(b) Water Quality Report, portions of the Eastern Bay and tidal tributaries fail to support all designated uses (68.7 $mi.^2$ support, 17.7 $mi.^2$ fail to support) due to poor benthic community, bacteria, low oxygen, and nutrients from nonpoint, upstream, natural eutrophication and low tidal flushing.

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:

- *Eastern Bay*; nutrients, suspended sediment.
- *Little Creek* (021305010429 tidal in Queen Anne's County); fecal coliform.
- *Shipping Creek* (021305010429 tidal in Queen Anne's County); fecal coliform.

Restoration/Preservation

There is no State-designated Green Infrastructure within the Talbot County portion of this watershed (DNR, 2000-2003).

The Conservation Fund designated one area within this watershed as Green Infrastructure. Claiborne/Eastern Bay Shores in an important aquatic area, includes some protected land in the northern part, and could provide public water access.

The watershed contains an example of a high quality, relatively undisturbed tidal wetland that serves as reference sites for the community type dominated by the shrubs *Baccharis halmifolia*/*Iva frutescens/Panicum virgatum* (Groundsel tree/Marsh elder/Switch grass). The vegetative community is daily to irregularly flooded by mesohaline waters.

Specific recommendations for restoration:

- Restore wetlands and streams within the headwaters.

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 tidal wetlands used as reference sites in the DNR tidal wetland vegetative community studies, since they are high-quality systems (e.g. near Claiborne: Harrison, 2001; Harrison and Stango, 2003).

Miles River (02130502)

Background

This watershed has roughly 27,365 land acres (based on MDP 2002 land use GIS data). Over half of the land use is agriculture (54%). The remaining land use is forest (27%), developed land (18%), and wetlands (1%). Note that wetland acreage estimates based on this land use data may be grossly underestimated. Better wetland estimates, as discussed elsewhere in this document, are based on GIS data from DNR.

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

- Estuarine
    - Emergent: 433 acres
    - Scrub shrub: 17 acres
    - Forested: 8 acres
    - Unconsolidated shore: 85 acres
- Palustrine
    - Aquatic bed: <1 acre
    - Emergent: 34 acres
    - Scrub shrub: 316 acres

  - Forested: 1,505 acres
  - Unconsolidated bottom: 199 acres
  - Farmed: 19 acres
- Total: 2,616 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
02130502	-3.43	0.54	0	0.33	-2.56

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 not specifically listed in COMAR are designated Use I, recreation contact and protection of aquatic life. The estuarine portions (except St. Michaels Harbor) are designated Use II, shellfish harvesting.

Water Quality

Source water assessments were completed for several water supplies in this watershed. The water supply name and susceptibility are as follows:

- *Easton*: fluoride, arsenic, radionuclides.
- *Martingham Utilities*: arsenic and radionuclides.
- *St. Michaels*: arsenic.
- *Jensens Hyde Park MHP* (East of Easton Municipal Airport): fluoride, arsenic, radionuclides.

The 1998 Clean Water Action Plan classified this watershed as Category 1, a watershed not meeting clean water and other natural resources goals and therefore needing restoration. Failing indicators include a high modeled phosphorus loading, a high percent unforested stream buffer (67%), and being on the 303(d) List for water quality impairment. Indicators of Category 3 include a migratory fish spawning area.

According to the 2002 Maryland Section 305(b) Water Quality Report, a portion of the Miles River and tributaries fail to support all designated uses (1.2 $mi.^2$ failed to support, 10.2 $mi.^2$ inconclusive) due to bacteria from septic systems, nonpoint and natural sources, and poor tidal flushing. Water quality results for nontidal wadeable tributaries were inconclusive (12.1 mi.).

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:

- *Miles River* (tidal); fecal coliform, nutrients, suspended sediments.

- *Hunting Creek* (021305020439 tidal); fecal coliform.
- *Leeds Creek* (021305020439 tidal); fecal coliform.

A Draft TMDL was completed in 2005 for fecal coliform in the restricted shellfish harvesting areas of Miles Creek and Leeds Creek (MDE, 2005). There are no permitted point source discharges of fecal coliform into this basin. Nonpoint sources of fecal coliform are as follows:

Basin	Livestock %	Pets %	Human %	Wildlife %
Miles River Basin	92	2	<1	6
Leeds Creek Basin	11	13	1	76

A Draft WQA was completed for fecal coliform in Hunting Creek (MDE, 2005). Fecal coliform criteria are being met in Hunting Creek, so a TMDL for fecal coliform is not required for this waterway.

Restoration/Preservation

There are several small State-designated Green Infrastructure hubs and connecting corridors throughout this watershed (DNR, 2000-2003). Some of this land is protected by private conservation or through METs but large unprotected hubs are still located near Copperville and Todds Corner. There are also some GI "gaps" along Miles River that may be desirable locations for restoration to natural vegetation. According to the Maryland Greenways Commission document, three potential greenways exist:

- *Easton-Clayton Rail Trail*.
- *Talbot County Scenic Byways*.

The Conservation Fund also designated some areas within this watershed as Green Infrastructure.

- *Outer Easton Agricultural Buffer*: This area is both important agricultural land and has high ecological value. Therefore, a combination of strategies should be employed here.
- *Miles/Wye East River Peninsula*: This area has high ecological value, including large forests and wetlands and significant Miles River waterfront.

The watershed contains reference communities of high quality, relatively undisturbed tidal shrub communities. Both vegetative community types are subject to daily or irregular flooding by mesohaline waters. Miles Creek Creek and Skipton Creek support the community type *Iva frutescens/Spartina cynosuroides* (Marsh elder/Big cordgrass). The second community type is *Iva frutescens/Spartina patens* (Marsh elder/Saltmeadow cordgrass) on Goldsborough Creek.

There is potential Nontidal Wetland of Special State Concern (WSSC) within the Talbot County portion of the watershed. This site is mostly within TNC Third Haven Wood Preserve. Small remaining portions of this important wetland are 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.

Specific recommendations for protection:

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

Wye River (02130503)

Background

The Talbot County portion of this watershed has roughly 20,821 land acres (based on MDP 2002 land use GIS data). The dominant land use is agriculture (70%), followed by forest (23%), developed land (7%). Note that wetland acreage estimates based on this land use data may be grossly underestimated. Better wetland estimates, as discussed elsewhere in this document, are based on GIS data from DNR.

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

- Estuarine
    - Emergent: 667 acres
    - Scrub shrub: 24 acres
    - Unconsolidated shore: 134 acres
- Palustrine
    - Emergent: 137 acres
    - Scrub shrub: 186 acres
    - Forested: 3,570 acres
    - Unconsolidated bottom: 225 acres
    - Farmed: 83 acres
- Total: 5,024 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
02130503	-1.68	0	6.00	0	4.32

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 not specifically listed in COMAR are designated Use I, recreation contact and protection of aquatic life. The estuarine portions of this watershed are designated Use II, shellfish harvesting.

Water Quality

The 1998 Clean Water Action Plan classified this watershed as "Priority" Category 1, a watershed not meeting clean water and other natural resources 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 "Selected" Category 3, a pristine or sensitive watershed most in need of protection. Failing indicators include a high modeled phosphorus loading, a low non-tidal benthic IBI and low non-tidal instream habitat index, high historic wetland loss (17,867 acres), high soil erodibility (0.30), and being on the 303(d) List for water quality impairment. Indicators of Category 3 include a high tidal fish IBI, high imperiled aquatic species indicator, a migratory fish spawning area, and a high anadromous fish index.

According to the 2002 Maryland Section 305(b) Water Quality Report, portions of the tidal Wye River and tributaries fail to support all designated uses (7.3 $mi.^2$ fail to support; 2.6 $mi.^2$ inconclusive) due to bacteria from nonpoint, failing septic systems, and natural sources. Nontidal wadeable tributaries fully support all designated uses (25.6 mi. support, 12.9 mi. inconclusive). Wye Mills Community Lake fails to support all designated uses (61.5 acres) due to nutrients and low oxygen from nonpoint, upstream, natural, and sediment oxygen demand.

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:

- *Wye River* (tidal); fecal coliform, nutrients, suspended sediments.
- *Unnamed tributary to Wye East River* (021305030436 non-tidal); poor biological community.
- *Unnamed tributary to Wye East River* (021305030437 non-tidal); poor biological community.

The one MBSS site had FIBI and BIBI of fair.

Restoration/Preservation

There are several small State-designated Green Infrastructure hubs and corridors spread throughout the watershed (DNR, 2000-2003). A few parcels are protected by private conservation or METs.

The Conservation Fund also designated some areas within this watershed as Green Infrastructure.

- *Miles/Wye East River Peninsula*: This area has high ecological value, including large forests and wetlands and significant Miles River waterfront.
- *Wye Mills*: This important ecological area contains habitat for rare, threatened, and endangered species.

There is one State designated Nontidal Wetland of Special State Concern (WSSC) within the Talbot County portion of the watershed. *Mill Creek Wildlife Sanctuary* is part of a 160-acre forest preserved by the MD Ornithological Society. It contains ideal habitat for forest interior dwelling species and along with the upland section, contains several RTE plant and animal species (DNR, 1991). This site is partially protected by MD Ornithological Society.

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.
- Protect tidal wetlands used as reference sites in the DNR tidal wetland vegetative community studies, since they are high-quality systems (Harrison, 2001; Harrison and Stango, 2003).