Management Plan for Hilton Run

A Subwatershed of the St. Mary's River

Prepared for:

The Citizens of St. Mary's County,

Maryland

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1.0 Executive Summary

The St. Mary's River watershed encompasses almost a quarter of St. Mary's County, Maryland. Hilton Run, one of 16 subwatersheds leading to the St. Mary's River, occupies a critical portion of the County, containing over one quarter of its population. With this in mind, a dedicated and diverse group of local citizen volunteers formed the Watershed Legacy Coalition in September 2002. The Coalition consists of community stakeholders (developers, farmers, businesses, educators, and citizens) who worked together to complete this comprehensive management plan for Hilton Run.

This Plan describes how best management practices, public policy and community education can stimulate new efforts to protect and enhance the St. Mary's River watershed in ways that also revitalize the economic, social, and cultural health of the community. Development in Hilton Run has been intensive in recent years, with resulting threats to its environmental health, particularly as a result of a rapid increase in paved or otherwise impervious surfaces. Though the environmental quality of Hilton Run remains generally good, inappropriate management could lead to rapid deterioration with adverse economic as well as environmental consequences.

The Plan presents concrete ideas for businesses, government, schools, and local citizens wanting to improve health of Hilton Run, the St. Mary's River watershed, and the County as a whole. With this Plan, The Watershed Legacy Coalition, now known as The St. Mary's River Watershed Association, strives to establish win-win partnerships that guide growth and preserve the natural, cultural, and economic characteristics of value to all citizens in St. Mary's County.

2.0 List of Maps

(See Appendix A.)

3.0 Introduction

The 73.78 square mile St. Mary's River watershed encompasses almost a quarter of St. Mary's County's 296 square miles. From mid-county origins adjacent to Highway 235 in California and Lexington Park the river, divided into 16 subwatersheds, extends southward past St. Mary's College and St. George Island, and thence into the Potomac. The 3.5 square mile Hilton Run subwatershed, the particular focus of this document, occupies a critical portion of the region from its origin near the commercial heart of Lexington Park, then running through residential and mining areas, farmland, and forests.

Nearly half the St. Mary's County population—46,000 people—live within the St. Mary's River watershed, and of these 25,329 live in the Hilton Run subwatershed. Development in Hilton Run has been intensive in recent years, with resulting threats to its environmental health, particularly as a result of a rapid increase in paved or otherwise impervious surfaces making the river run faster and dirtier. Though the environmental quality of Hilton Run remains generally good, inappropriate management could lead to rapid deterioration with adverse economic as well as environmental consequences.

This draft management plan for Hilton Run is the result of a year's work by a dedicated and diverse group of County citizen volunteers recruited to form the Watershed Legacy Coalition. Generous support has come from the National Fish and Wildlife Foundation's Community Legacy program directed at protecting small watersheds in the Chesapeake Bay region.

For the past two years, the Coalition has stimulated new efforts to protect and enhance the St. Mary's River watershed in ways that also revitalize the economic, social and cultural health of the community. The Coalition was formed to establish a sustainable, reciprocally beneficial relationship between the ecology of the St. Mary's River and the communities that reside within the watershed.

With the help of stakeholders (developers, farmers, businesses, educators, and citizens) throughout the Lexington Park area, the Coalition completed this comprehensive management plan for Hilton Run, a subwatershed of the St. Mary's River (of which Lexington Park is a part). Our efforts are in direct line with the growth management strategy established in the St. Mary's County Comprehensive Plan. We strive to establish win-win partnerships that guide growth and preserve the natural, cultural, and economic characteristics of value to all citizens in the County.

Rooted in whole systems thought, this draft plan is presented to the community as a whole for review and discussion. The plan considers a wide range of factors including history, culture, politics and economics as well as ecology. It is far different in style and content than typical official planning documents. We show here how minor changes--

often ones that can be made at little or no cost to citizens of the community--can improve the health of Hilton Run, the St. Mary's River watershed, and the county as a whole without jeopardizing the development process. We offer these kinds of guidelines:

- How households and communities can minimize their contributions to air and water pollution in their neighborhoods.
- How landowners can make money and also contribute to County policies favoring protection for open space.
- How farmers can adopt best management practices, reducing their contributions of pollution into the aquatic system.
- How citizens, businesses, and County government can work together to slow or stop the dangerously growing rate at which the County's open land is being paved converted to other uses.
- How improvements in transportation policy can help keep Hilton Run cleaner.
- How better water management policies and practices can protect the aquifers and drinking water on which we all depend.
- How the more efficient management of Hilton Run can improve hunting, fishing, and shell-fishing conditions in the region.
- How improved programs of education and outreach into our schools, churches, and communities can help make Hilton Run healthier and no less economically viable.
- How a more stable Hilton Run can benefit the U.S. Navy and its many constituents in the region.
- How, in short, we can manage Hilton Run in a way that provides an array of economic and social benefits that could not be achieved via conventional development policies and practices.

Specific measures recommended cover a wide range of steps that could benefit Hilton Run both directly and indirectly. Although Hilton Run falls almost completely within the Lexington Park development district, broader watershed and County-wide steps to curb runoff, manage stormwater, improve the transportation system, heighten air and water quality, protect open space, and encourage cleaner farming practices in adjacent rural areas can all help revitalize the subwatershed. The intensification of development in downtown Lexington Park as well as improvements in household, neighborhood, construction and mining practices within Hilton Run can all contribute to the revitalization of the watershed as well. In this regard little is more important than increasing knowledge and awareness of opportunities among Hilton Run's people and especially among students at Great Mills High School, Carver Elementary, and other educational units in or near the subwatershed.

Members of the Watershed Legacy Coalition are conducting a widespread effort to acquaint citizens and County government with the ideas embodied in the plan that follows. The initial goal will be to get feedback and seek improvements in the quality and range of its ideas. Later on, once a critical mass of community support has been

achieved, the coalition will work to transform this document's recommendations into official policies governing Hilton Run, the entire St. Mary's River Watershed, and, where appropriate, St. Mary's County as a whole. All these measures will be undertaken by the St. Mary's River Watershed Association, a new non-profit citizen group with membership open to everyone.

4.0 Description of the Watershed

4.1 St. Mary's River Watershed

We tend to think of a watershed as a mechanistic transport system for water, delivering it where we need it and taking it, along with our wastes, far away. But when we regard a watershed as a living system, we see it in terms of its ability to enable life. We become less concerned with linear flow, more concerned about the circulatory exchange of life-giving nutrients. What follows considers the St. Mary's River watershed, and within it the Hilton Run subwatershed, from this holistic, whole-systems perspective.

The St. Mary's River is a tributary of the Potomac River, entering that larger watercourse not far from where it empties into the Chesapeake Bay. (MAP 1, Appendix A). The St. Mary's River watershed encompasses an estimated 73.78 square miles of land area and is contained entirely within St. Mary's County, Maryland. Along its eastern side, the watershed is flanked by the fast-growing Patuxent River Naval Air Station and the busy commercial and residential community of Lexington Park. Housing subdivisions are scattered throughout, but tend to be concentrated in the central and western portions of the watershed along the major arterial roads, but these areas also still contain substantial quantities of cropland and open space. About 58% of the watershed remains forested. Farming remains an important, though diminishing activity within it. (Between 1990 and 2000, nearly 2000 forest acres and 1500 agricultural acres in the watershed were converted to residential and commercial use.)

Because soil development is strongly linked to healthy forest structure, forest removal for agriculture and other purposes results in degraded soils. A long and destructive agricultural legacy coupled with relatively steep slopes prone to erosion has resulted in degraded watershed soil structure. While there is an impressive array of soil types in the St. Mary's River watershed, some soils do not allow precipitation to percolate down through soil pore (Gibson 1978). Rather water tends to run off the surface carrying sediments and nutrients with it. Over 70% of the soils in the watershed are either moderately or highly eroded or erodible and these are located on steep slopes where streams have incised deep channels. Historically in the St. Mary's River watershed, the forest and its associated wetlands have the role of absorbing, storing, and

releasing water slowly into the watershed's streams. This measured release maintained a high level of water quality, but this is no longer the case.

Development and hardened surfaces on the landscape also exacerbate soil degradation. Although much of the watershed remains wooded, a growing area is now covered by impervious surfaces such as roads, parking lots, and buildings. As a result, water moves out of the fabric of the land too rapidly, creating pulses of floodwater with strong erosion potential. As a consequence of hardened surfaces, nutrients are not being adequately absorbed and are leached or washed into the creeks, causing downstream pollution. Pollutants from landfills, agricultural operations, paved surfaces, and wastewater systems may enter groundwater and watercourses. Because imperviousness is reaching critical thresholds in many parts of the watershed, potential degradation of both soils and stream water quality are real concerns (KCI 1998).

4.2 Hilton Run Subwatershed

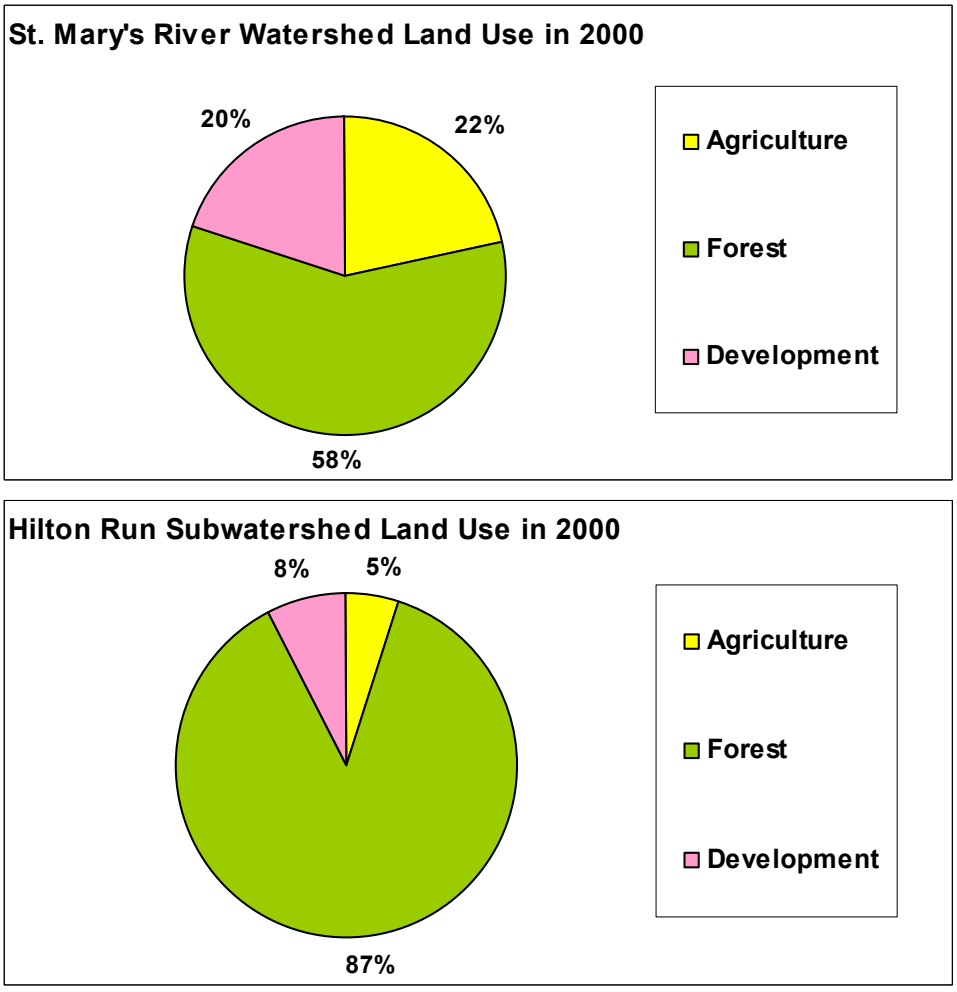
4.2.1 General Description

Hilton Run and its watershed are located in the middle portion of St. Mary's River Watershed. The watershed is roughly triangular and bounded by State Route 5, Great Mills Road, and Willows Road (MAP 2, Appendix A). The Hilton Run Subwatershed is one of the 16 subwatersheds in the larger St. Mary's River Watershed. It is the 6th largest subwatershed, medium-sized, 4% of the total St. Mary's River watershed, and encompasses about 3.5 square miles. Like many of the subwatersheds within the St. Mary's River watershed, Hilton Run features roads and development on the upland periphery of the watershed and a forested core that surrounds the stream and its tributaries. There are 12.8 miles of streams within Hilton Run (MAP 3, Appendix A). Its headwaters (small streams without tributaries themselves and classified as stream order 1) make up half of the stream miles in the watershed (Horton 1945). They are most susceptible to stress because of their small volume, influenced strongly by runoff, and that they lie closest to major traffic corridors and in close proximity to the commercial heart of Lexington Park, the principal community that supports the air station. A large salt marsh lies at the southern end of Hilton Run where it drains into the tidal St. Mary's River. The watershed is unusual and distinctive because it has a much higher percentage of forested acres compared to the watershed as a whole and also has highly concentrated development (See Figure 1).

4.2.2 Land Features

Land uses within the Hilton Run subwatershed include residential, commercial, farmland, forests, and wetlands (MAP 4, Appendix A). The northern edge of the Hilton Run subwatershed is bordered by both 8-lane State Route 235 and Great Mills Road, a busy 5-lane thoroughfare flanked by shopping strips and one of the county's principal high schools. A large and growing portion of the subwatershed's upstream section consists of medium and high-density residential and commercial use. Along Hilton Run's eastern, western, and southern borders lie housing subdivisions, most of them fairly new. One large farm (Flower of the Forest Farm) occupies 125 acres in the center of the subwatershed, where several large forested tracts and Stewart's Grant, a 500+-acre clear-cut area with very active sand and gravel mining operation.

Figure 1: Land use comparison in the St. Mary's River Watershed and Hilton Run Subwatershed in 2000.



There are 46 different soil types in the Hilton Run Watershed (MAP 5, Appendix A & Soil Types, Appendix B). Gibson (1978) gives the details of these different Atlantic Coastal Plain soils, but they are all derived from thick unconsolidated beds of sand, silt, clay, and gravel laid down as marine deposits. Hilton Run subwatershed lies in a transition zone from the upland plateau in the northern part of the subwatershed where elevations are over 100 feet to the low, flat coastal plain at sea level. Because of this slope and the erosion potential of the soils, over 17% of the soils are alluvial (soil types Aa and Ad) and made up of sediments washed toward the stream channels and St. Mary's River. These depositional soils are variable, and they are composed of silts and sands derived from the eroded upland soils.

Soils are classified into groups and soil types based on their origins, composition, slope, and erosion potential. Because water quality is really a measure of water's chemical (dissolved) and physical (particulate) composition, a watershed's soil characteristics are of central importance to a watershed's streams, rivers, and estuaries. In particular, soil erodibility is of special interest because these characteristics give an indication of the potential for suspended solids (sediments) and dissolved nutrients to enter receiving water courses through erosion. Two watershed characteristics, soil type and slope, are the primary determinants of whether a watershed will have water quality problems due to soil composition. In general, Hilton Run subwatershed soils are moderately eroded or erodible (MAP 6, Appendix A). Soils that have a low potential for yield sediments to Hilton streams are located on the flatter areas throughout the watershed. The soils that are classified as severely eroded or with strong erosion potential are generally located on steep slopes. These are concentrated in the upper part of Stewart's Grant, near the current mining operation, and in the lower third of the watershed where topography forces Hilton Run through a narrow valley with steep slopes. For the most part, soils within the watershed are deep and rich and this especially evident on the alluvial floodplain.

Small, headwater (stream order 1) streams with origins in Lexington Park drop to sea level as Hilton Run merges with Pembrook Run and becomes tidal in an extensive salt marsh near the confluence with the St. Mary's River (MAP 7, Appendix A). The drop in stream elevation is not uniform, however, because Hilton Run's channel and the channels of its tributaries are relatively flat in the upper two-thirds of the subwatershed. In the central part of the watershed, an extensive freshwater marsh with active beaver colonies is characterized by soft alluvial soils as sediments being carried downstream are trapped settling out on the flood plain. Hilton Run at this point is a slow-moving, meandering third order stream with deeply incised, multiple, braided channels. Below Flower of the Forest Farm and the lower part of Stewart's Grant the watershed narrows, and the stream picks up speed as elevation drops and the gradient of the stream increases (as indicated by the red-orange segments of the stream channel seen in MAPS 7 and 8). Here the erosion potential for Hilton Run is higher than it is in the rest of the watershed.

4.2.3 Water Quality and Nutrients

The best water quality data for the Hilton Run comes from the St. Mary's River Project (2003) which sampled the 15 non-tidal watershed sites in the St. Mary's River Watershed on a monthly basis between June 1999 and May 2003. Hilton Run has been sampled near the lower portion of the subwatershed (MAP 2, Appendix A).

When the water quality data from Hilton Run is compared to the same data for the other streams sampled by the St. Mary's River Project (See Table 1), it is clear that water quality in Hilton Run is reasonably good. In general dissolved oxygen is very good. The average pH from July 1999- January 2003 was 6.42, which is consistent with nearby subwatersheds (Pembrook Run, 6.26 and Eastern Branch, 6.33). Nutrient levels are quite low in Hilton Run indicating that during routine prescribed sampling there is little runoff of excess nutrients entering Hilton Run. Sediments as measured by total suspended solids (TSS) levels are also relatively low in Hilton Run and these return to low levels quickly after storms indicating that export of suspended material is rapid (Brown 2001) and that Hilton Run quickly returns to normal conditions. Storms do, however, lead to increased erosion and sediment loads. These sediments, when they settle, smother aquatic life in the bottom of streams and estuaries (benthic organisms) and primarily impact their respiration.

Table 1. Comparison of water quality values for Hilton Run and all other non-tidal sampling sites in the St. Mary's River Project protocol. Mean values are for 1999-2003.

Water Quality Parameter	Average		Minimum/Maximum	
	Hilton Run	All Stations	Hilton Run	All Stations
Temperature (^{o}C)	14.46	14.71	26.38	26.12
PH	6.41	6.25	7.21	7.64
Dissolved Oxygen (mg/L)	9.67	9.58	5.09 (minimum)	3.87 (minimum)
Dissolved Oxygen (% Saturation)	90.69	90.71	61.70 (minimum)	45.83 (minimum)
Dissolved Organic Carbon (mg/L)	4.62	5.85	8.20	10.84
Ammonium (mg/L)	0.034	0.098	0.120	0.470
Nitrite and Nitrate (mg/L)	0.132	0.385	0.404	0.792
Total Dissolved Nitrogen (mg/L)	0.590	0.898	1.120	1.591
Phosphate (mg/L)	0.007	0.011	0.030	0.044
Total Dissolved Phosphorus (mg/L)	0.007	0.011	0.044	0.093
Sulphate (mg/L)	6.07	8.25	10.67	16.93
Total Suspended Solids	9.45	12.50	48.90	98.54

4.2.4 Air Quality

Air conditions matter to water quality and human health in the watershed, with smoke and smog contributing to nitrogen loading and injecting pollutants into the system. Aircraft flights at the naval air station may contribute to air pollution within the St. Mary's River Watershed. There is no automobile emission standard in the county. There are no open burning regulations in the county other than one that bans burning within 200 feet of a residence.

4.2.5 Groundwater

The Aquia and the Nanjamoy/Piney Point aquifers currently supply over 95% of the necessary potable water for the Lexington Park development district. Both aquifers are currently stressed by demand and the Aquia is approaching Safe Sustainable Yield (SSY) in the Lexington Park area (Maryland Geological Survey). A third series of sands known as the Patapsco Aquifer lies below the Aquia and Nanjamoy/Piney Point aquifers. At this time, the Patapsco SSY is largely unknown. Caution on its future potential yield should be exercised since this aquifer has reached maximum utility in LaPlata and is unproductive in near locations in Calvert County (Maryland Geological Survey). Forecasts suggest a possible water shortage in 2020 for the Lexington Park area (Maryland Geological Survey).

4.2.6 Biodiversity

In a stream survey (Brown 2001) conducted by the Center for Watershed Protection, Habitat condition was scored for the 3 catchments of Hilton Run (the two upstream tributaries and the downstream main stem of Hilton Run). Overall, the only area scored "poor" was in the upper northwest portion of the watershed near Great Mills Road. Most of the central areas of the subwatershed and stream channel where classified as "excellent". However, the lowest segment of Hilton Run, near the SMRP sampling site above the State Route 5 bridge was evaluated as "fair-good". These findings support the notion that the upper most portion of the watershed is being impacted by development in the Lexington Park area, that the middle portion of Hilton Run is relatively pristine, and that the lower portion is impacted by erosion.

Biological sampling has been conducted by the St. Mary's River project at the water quality sampling site and by the Maryland Biological Stream Survey (MBSS) at two locations in the upper part of the watershed (MAP 2, Appendix A). For fish, the two MBSS sites were ranked as fair (HR1) and good (HR2). The fair score was based primarily on a high percentage of pollution-tolerant fish (mud minnows) collected in the northwest tributary and attributed to the high percentage of impervious surface development and moderate bank erosion in this portion of the subwatershed. Fish collection at the SMRP site in the lower portion of Hilton Run took place in 1999 and

again in 2001. In both cases, using the same classification system as employed by MBSS, this site had 12 and 14 species, respectively, and IBI (Index of Biological Integrity) scores of 4.25 or "good" on both dates. Therefore, it seems that biological diversity in Hilton Run based, on fish presence, is good.

Aquatic insects are also used as biological indicators of stream health and samples have been obtained from Hilton Run at the SMRP site in April, 2000 and at the 2 MBSS (HR1 and HR2) sites (MAP 2, Appendix A). At the SMRP site, aquatic insect IBI was relatively high (IBI score = 25) and the site could be classified as "good" based on this score. A total of 17 different families were collected and of these, 6 families were positive EPT indicators (Ephemeroptera-mayflies, Plecoptera-stoneflies, and Trichoptera-caddisflies). A more detailed analysis of aquatic insects was performed on April 31, 2003, by Bob Paul of St. Mary's College. He identified insects to the genus level (Appendix C). The two MBSS sites were re-sampled and a new site was located approximately 2,000 feet downstream from the MBSS sites (MAP 2, Appendix A). Although the sample sizes were small (<100 individuals) for these 3 samples, the general tends were the same for the MBSS sites in terms of diversity, and the new site also had a fairly high diversity despite the small sample size. EPT percentage was high at HR1 and the new site (55 and 45%, respectively), but HR2, surprisingly, had a low (11%) percentage of these sensitive species and was probably due to the relatively large number of dragonflies and true flies collected at this site.

Overall, it appears that Hilton Run and its tributaries have fairly good biological diversity, and this diversity reflects the generally good water quality found in this watershed. These findings are somewhat anomalous because strong development pressure and impervious surface expansion are occurring at the fringes of the subwatershed. It is likely that the forested core of the subwatershed has protected water quality from serious deterioration and maintained high biological diversity. It also seems that the relatively flat and broad floodplain and the freshwater marshes that have developed in these upper and central portions of the watershed (MAP 9, Appendix A) are important in maintaining water quality and biological diversity. The expansion of development and impervious surfaces in the subwatershed has been singled out (KCI 1998, Brown 2001) as a major threat to Hilton Run, and this analysis shows that biological integrity has been maintained in spite of development, yet biological diversity seems to be reduced in areas closest to development (ie. Lexington Park). Should the subwatershed's forested core be removed and development allowed to proceed in these areas without adequate protection for the aquatic environment, then it is likely that water quality and biological integrity will be negatively impacted.

4.2.7 Population

Development in St. Mary's County, the St. Mary's River watershed and the Hilton Run subwatershed cannot be assessed without an underlying understanding of population growth in the county. In 1970 the county's population was 47,388 and it is projected to be 100,800 people in 2010. Between 1996 and 2001 the population in the county grew by 9.2%. Over the same period personal income in St. Mary's County grew

by 54.9%, substantially higher than Southern Maryland, the state, and the country. In May 2003 the County's unemployment rate was 2.4%; the lowest in Southern Maryland (St. Mary's County, Department of Economic Development 2003). MAP 10 (Appendix A) is based upon 2000 U.S. Census Data and local areas within the Hilton Run are census blocks (areas used to classify the national data). Nearly half the population of St. Mary's County lives in the St. Mary's River Watershed (46,000 people) and of these residents 25,329 live in Hilton Run subwatershed. Population density (people/square mile) was computed for the Hilton Run census blocks and MAP 10 (Appendix A) shows that the highest population density (almost 4500 people/square mile) is located in the northwest corner of the subwatershed in Lexington Park.

There are 20 land parcels in the Hilton Run subwatershed classified as residential (MAP 11, Appendix A). Of these residential land use classifications, 8 parcels are in the high density category, 7 parcels are low density and 5 parcels that are medium density). The low density parcels contain the least number of buildings, followed by high density (apartment buildings) and finally medium density has the largest number of structures. There are a total of 5,429 buildings in the entire St. Mary's River Watershed and 21% of these buildings (1135) are located in the Hilton Run subwatershed area (only 4% of the total St. Mary's River Watershed). This shows that residential housing is strongly concentrated in Hilton Run as 62% of the 1135 buildings are residences. These residences are concentrated along the major traffic routes (Great Mills Road and Willows Roads) that border the subwatershed.

5.0 Past, Present, and Future of Hilton Run

5.1 Positive and Negative Impacts/Threats

At the time of European settlement (beginning around 1634 AD), St. Mary's County, including Hilton Run, was densely covered with mature hardwood forests and thickly populated with wildlife. The Chesapeake Bay, the Potomac River and its tributaries teemed with life in what was one of the richest fisheries in the world. Streams and rivers ran clear and deep.

By the end of the 1700s, deforestation and plow-based agriculture had led to erosion and sedimentation. These sediments clouded the waters and silted up creeks and rivers. Nutrients carried with the sediments began to overwhelm the bay's ability to filter and assimilate, resulting in algal blooms. Tidal waters were being polluted as the nontidal upper watershed eroded.

In the late 1700s as well, important animal elements of the forest ecosystems—such as passenger pigeons, which played a necessary role in distributing seed of forest species, enabling the forests to regenerate themselves after disturbance—were becoming

extinct. Others, including bison, elk, mountain lion, and wolves, disappeared from the landscape. Still others, like once abundant beaver that still inhabit the middle and lower portions of Hilton Run, are now regarded as nuisances and are discouraged from performing their vital maintenance role in the watercourses.

Over the last 40 to 50 years, most of the degradation took place as undeveloped land was converted to urban uses and the subwatershed experienced increases in imperviousness, soil compaction, sedimentation, and the erosion of stream channels. Under these new conditions storm water is not absorbed into the ground as quickly as before, and travels with a greater velocity into the streams. Intense storms (which have become more frequent in recent years) and ongoing human impacts, which the system was previously better able to tolerate, now more quickly overwhelm its capacity to function efficiently, sending it into a downward spiral of deterioration.

5.2 Economics of Water Quality

Economics deals with the study of limited resources and the choices that people must make in order to maximize their satisfaction associated with using such resources. Markets are one way people efficiently allocate the use of these limited resources. However some resources, such as environmental quality are not typically bought and sold in a market place and thus a 'market value' does not exist. The sub-field of economics, known as environmental economics, studies these environmental goods or services that people value, even though they exist external to the market-place. Water quality is one such good. The value of the benefits from maintaining environmental amenities associated with water quality are not readily measurable, again due to the lack of a market for water quality. Environmental economists have developed analytical tools which can be used to indirectly measure the value of maintaining a pristine environment. One of these methods, known as the hedonic property value method, indirectly measures environmental quality through an analysis of residential property sales. This method assumes that people as willing to pay more to reside in areas where the natural environment in clean and aesthetically pleasing.

The St. Mary's River Watershed Project as previously discussed, has been monitoring water quality in the watershed since 1998. Using this data, a hedonic property valuation study was undertaken at St. Mary's College of Maryland in 2004 (Poor 2004) This study, using a sample of approximately 1,400 residential property sales from within the St. Mary's River Watershed, found statistically significant results for the water quality variables associated with impervious surfaces and runoff, namely dissolved inorganic nitrogen and total suspended solids. This particular study concludes that people within the watershed do place a positive and significant value on maintaining water quality. Good water quality is associated with numerous visible characteristics, including the presence of riparian buffers and the lack of impervious surfaces. To environmental economists the scientific water quality data proxies these land use issues that are directly associated with reducing run-off and thereby maintaining water quality. Given the sample of properties in this study, it appears that people within the watershed

do place positive and significant value on the benefits provided by maintaining water quality.

5.3 Development to Date: A Narrative from a St. Mary's County Native

Sixty years ago, St. Mary's County was very rural. There was no electricity south of Leonardtown or south of what is now Lexington Park. There were no refrigerators, air conditioning, or running water. The roads were mostly dirt and gravel. Some main roads were covered with a coating of tar over the gravel; many were almost impassable in the spring thaw. No family had more than one vehicle, many had none. It was not uncommon to see a tractor parked at a rural store or being used for local transportation. The roads to and from Baltimore were long and difficult.

Families got their water from springs or shallow wells and sometimes streams. Farmhouses were located near sources of fresh water and were abundant in St. Mary's as this is the last continental fall before sea-level. Many springs were located along this fall line. The springs also provided a source of water for the bootleg whiskey which was made in many parts of the county.

Families depended upon wildlife to support their diets. Squirrels, rabbits, raccoon, and quail were eaten. Guns were plentiful, shotguns for the harvesting of ducks and quail, .22 rimfires for the harvesting of the other game. Seafood played an important role in the farm families' diet; crabs, fish, oysters and clams were plentiful.

Tobacco was the cash money crop and each family would raise as much as possible to sell in the spring for much needed cash. Corn, wheat, barley, and oats were grown to support the farm animals and to sell for income. Tomatoes, melons, beans, and peas were used for the family's food supply and to share with the neighbors. Soybeans were not grown.

Today tractors have seat belts, air conditioning and stereo. A farmer is directed in each crop grown, from the use of fertilizers to the use of pesticides. His crops must meet standards before he can sell to buyers. There are few small family farms. On the tax rolls they exist but the family does not depend on the land. Today each family owns several vehicles, trucks vans and cars. People travel over roads that are paved and clean and free of ice and show in the winter. There are sidewalks and roadside parks and many gas stations.

With the decline in traditional farming has come a rapid upswing in business, commercial, and professional activities within the county. As of 1999, 35 businesses with 100 or more workers were operating in the County. The navy base employs some 18,000 people, and many of these families are resident in Hilton Run. The County is making an effort to concentrate development in the Lexington Park development district adjacent to the base and encompassing much of the land at Hilton Run's northern end.

Social security payments and other retiree remittances are another major factor in the County's economy. Average household income in the County is now $71,000, considerably higher than for the U.S. as a whole. Though no fine tuned calculation exists for county residents within Hilton Run, average family income there is doubtless far lower. Development has, in short, brought the people of Hilton Run to a point far away from this area's rural past and in far greater proximity to the mainstream of modern conveniences, traffic congestion, pollution, and sprawl. Such economic benefits as modern development has brought to them must be offset against the inconveniences that also form part of the package.

5.4 Development Outlook

As long as the air base maintains at least its current level of activity, it will continue to be the dominant economic engine in the County and the principal factor governing the pressures on Hilton Run. A continuation of current development trends and prosperity would be likely. This scenario is, of course, constantly in jeopardy because of the ongoing possibility that in a future round of congressionally mandated military base closings the Patuxent River Naval Air Station might abruptly cease to exist or diminish in size. In this instance, economic planners would have to fall back on alternative strategies to counter the threat of a severely depressed local economy. Tourism, recreation and leisure activities would loom as more prominent in the mix. From a long range planning standpoint, consideration of both scenarios would be prudent.

5.5 Consequences of No Change in Management

By investing in the terrestrial systems, the original people Native Americans of this region developed the natural capital of the watershed as a whole, simultaneously growing the social capital (the intelligence about how to work appropriately within this system) that enabled them to be an integral part of their environment. As long as the natural, social, and economic systems of the St. Mary's River watershed continue to be seen as separate, they will continue to decline overall. Local ecosystems will continue to suffer from inappropriate management decisions. The region faces a number of problems having to do with quality of life—affordable housing, costs of health care, drinking water quality, education, etc. The tendency has been to see these problems as separate and hence as potentially overwhelming costs.

When a system becomes more than 15% impervious—its land covered by pavement or buildings—it severely degrades. Watersheds with imperviousness of 10-15% are classified as impacted (Schuler and Holland 2000). Imperviousness in Hilton Run has been studied carefully by the Center for Watershed Protection (Brown 2001). The two upper tributaries, catchments closest to Lexington Park- Catchments 101 and 102, have impervious surfaces of 13.2% and 16.7%, respectively. But the lower segment of Hilton Run has a very low impervious value of 1.5% (MAP 12, Appendix A). There are 1,279 acres or 61% of Hilton Run subwatershed that is potential area to be developed. If developed, it would place the impervious cover between 20.4% and 28.7%, well above

the classification for impacted and nearing the classification of non-supporting stream quality.

Consequently, Hilton Run while still relatively healthy is also extremely vulnerable to the ecological effects of past and current land use decisions and practices. Existing zoning, unless changed, allows for a significant increase in development in the ecologically sensitive headwaters region. With the exception of Flower of the Forest Farm, which is protected from development, all the subwatershed north of State Route 5 is in the Lexington Park Development District (MAP 13, Appendix A). Given the highly erosive nature of the soil (Map 7, Appendix A), any development of slopes presents an increased threat to water quality. Superficially, the fact that the amount of vegetation has actually increased over the last fifty years seems a sign of increasing health, but even this is misleading. An immature forest lacks the size and biomass to store and pump large volumes of water and thus to play the full role that the original forests performed in a healthy hydrological system. Projected imperviousness and new sand and gravel mining operations suggest that without buffers, Hilton Run would become biologically degraded and more prone to erosion.

Even where greater understanding of ecosystem dynamics begins to inform planning decisions, the cost of reversing ecological decline problem by problem will be too great for small rural communities like St. Mary's to sustain. To be able to afford the investments in natural and social infrastructure, we need to understand their inherent relatedness and tie their regeneration to economic growth. The challenge is to grow an economy whose byproduct is increasing ecosystem health.

5.6 Advantages of New Approaches

The systems of the St. Mary's River watershed are fragile and poorly equipped to handle significant shifts in their environment. Fortunately, this fragility also provides an opportunity for people to seek creative new ways to cooperate with nature in regenerating the life of the watershed. As compromised as the situation of the St. Mary's River has become in relation to its historic health, it is still in far better shape than most of the rivers that contribute to the Chesapeake Bay. The resource and cultural base is relatively intact, the forests are rebounding, and the community shares a desire to preserve and enhance its own unique culture and landscape. It therefore has the rare opportunity for growing one of those places where the bonds between people and between people and the natural world create a pattern of connectedness.

6.0 Goals and Actions

6.1 Best Management Practices (BMP's)

Homeowners, businesses and other institutions all have the opportunity to make a positive difference in the Hilton Run watershed by voluntarily implementing best management practices both inside and outside their structures, landscapes, and neighborhoods. Shifting to such practices is often cost-effective as well as beneficial to the environment.

Goal: To cultivate a mind-set, a sense of stewardship, that enables a broad variety of the subwatershed's users to manage the natural and built environment in ways that impose new stresses on the system to the least degree possible, even as population and development pressures continue to mount.

6.1.1 Households

There are numerous ways homeowners can minimize their impact on the surrounding watershed through the use of best management practices. Residents living within the Hilton Run watershed can beautify their landscaping *and* save time and money, while mitigating negative impacts on the nearby streams and wildlife. Following is a list of practices to help watershed residents achieve this goal. (See Appendix D for helpful contact information related to this topic.)

- **Control erosion and improve soil**: High sedimentation rates negatively impact biodiversity and the overall health of waterways. Controlling erosion helps reduce the amount of sediment washed into local streams. Keeping soil covered with leaves, mulch, compost, or cover crops (winter rye and oats grow well in southern Maryland) enriches the soil and prevents erosion. Constructing terraces on steep slopes and planting gardens in raised beds are attractive and effective approaches to reduce soil loss (Home and Garden Information Center 1998).

- **Composting:** This practice involves the controlled decomposition of organic material such as yard trimmings, kitchen scraps, wood shavings, cardboard and paper. The decay of these materials yields compost, a humus-rich substance that contributes nutrients to the soil, improves soil structure and helps reduce runoff. Composting enables the homeowner to save time and money normally spent on fertilizer, pesticides and water. Compost acts as a natural fertilizer, providing organic material that helps plants flourish. It increases the soil's ability to retain water, reducing the need for supplemental watering by the homeowner. The compost material also contains beneficial microorganisms that protect plants from diseases and pests and reduces/eliminates the need for chemical pesticides (Texas Natural Resources Conservation Commission 1998).

- **Nutrient Management:** Applying the correct amount of nutrients to encourage plant growth helps both the plants and the homeowner. Over-application causes nutrients to leach through soil into groundwater or local waterways. The use of native plants in a landscape cuts down on the need for nutrient applications, as these plants thrive in the existing soils (USDA 1999). 'Grasscycling' is a way of adding nutrients to a lawn, naturally. It involves mowing a lawn to the proper height and leaving grass clippings on the lawn to decompose into the soil. It benefits the homeowner by saving him time and money, due to reduced lawn fertilizer requirements. Grasscycling also results in a greener, tougher turf, prevents common turf diseases, eliminates disposal of grass clippings, diminishes watering needs, and reduces the total time spent mowing and maintaining a lawn. It benefits the watershed by cutting down on the amount of chemicals and nutrients running off of lawns and entering the local water (Texas Natural Resource Conservation Commission 1998).

- **Water Conservation:** This practice, like others mentioned previously in this report, saves homeowners time and money. The use of mulch and/or fiber cloth helps retain moisture in gardens. Watering in the early morning gives plants a chance to absorb the water before it evaporates during the hottest parts of the day. Drip irrigation systems use less water overall and bring the water directly to the plant. Use of native species in the landscape also promotes water conservation as-these species require little to no additional water beyond normal rainfall (USDA 1999).

- **Planting Native Species:** Native plants require less maintenance by the homeowner and are beneficial to local wildlife. Homeowners who use native plants in their landscape find that their landscaping need less trimming, watering and fertilizing. Because of this, the resident saves time, labor and money. The US Fish and Wildlife Service has compiled lists of native plants for landscaping within the Maryland coastal plain, including Hilton Run (U.S. Fish and Wildlife Service 2001).

- **Rain Gardens:** Anyone from the do-it-yourself homeowner to the large corporation can help reduce and virtually eliminate the amount of stormwater running off their property through the use of rain gardens. These gardens not only reduce the runoff into local streams, rivers and lakes: they also help recharge ground water, reduce flooding, and add precious greenspace to developed regions. The landowner can direct runoff water from the roof, driveway or other impervious surfaces to create his/her rain garden. A variety of native wildflowers, grasses, shrubs and trees may be planted in this type of habitat and will do well without the use of chemical fertilizers or pesticides.

- **Mulching:** Mulch is organic material that decomposes and adds nutrients to the soil. It enriches the soil and protects it from erosion. Homeowners can use available grass clippings, leaves or compost for mulch. By doing this they

significantly cut down the amount of such materials being added to local landfills. As the mulch naturally decays it provides added nutrients to help enrich the soil and strengthen the plants. Homeowners often find mulching quite effective in suppressing weeds in their landscape as well (USDA 1999).

- **Pest Management:** Regular monitoring of lawn and garden for unwanted insects, weeds, and diseases is the best way for homeowners to stay abreast of potential plant health and pest problems. Homeowners can prevent pests by selecting hardy plants and providing habitat for beneficial insects that prey on pests. They can use physical pest control through the use of physical barriers, traps, and hand removal of pests. If these methods fail and the homeowner must use chemical pesticide, he should use them with caution. These substances can be washed into the local Hilton Run watershed. Using chemicals of low toxicity and rapid decomposition mitigate the risk of watershed contamination. Also, when using chemical applications, homeowners are advised to follow the directions carefully and to use spot applications only in needed areas (USDA 1999).

- **Minimize Paved Surfaces:** As mentioned in other parts of this report, increased amounts of impervious surface in a watershed can have significant negative impacts on the integrity of the watershed. Paved surfaces increase the rate, volume and temperature at which water enters the watershed. The water that does enter the local waters contains a greater amount of contaminants than if the water had traveled through large amounts of soil or vegetation. Homeowners and business should take every effort to minimize the amount of paved impervious surface on their property. Homeowners could use brick or stoner pavers with sand as opposed to tradition patios or driveways. Business also have many alternatives available to replace traditional asphalt parking lots and sidewalks.

- **Bayscaping:** Throughout the Chesapeake Bay Watershed, including Hilton Run, a program called Bayscaping, presented by the US Fish and Wildlife Service, promotes environmentally sound landscaping techniques that benefit people, wildlife and the Chesapeake Bay region. The program includes workshops to educate local homeowners on the use of native plants and other techniques for mitigating human effects on the Watershed. One such workshop, specifically designed for residents and educators in the Hilton Run Watershed, should soon be held.

6.1.2 Neighborhoods

Landscaping practices recommended for households can be applied on a larger scale to the areas around commercial businesses, schools, and public buildings. While each of these parties can reduce their impact on the watershed by following the recommendations mentioned above, they can also mitigate human impacts on the local

environment and watershed through measures taken *inside* their buildings. Homeowners, business, schools and other public buildings can:

- cut down on energy usage
- reduce chemical outputs
- use natural daylighting
- use low-flow toilets and shower heads
- use compact fluorescent bulbs
- buy energy efficient appliances and computers with the US Department of Energy's Energy Star label
- turn down the temperature on the hot water heater
- only run full loads in dishwasher and washer
- buy only essential household chemicals
- take shorter showers
- recycle antifreeze, oil filters and oil from vehicles
- have HVAC systems inspected annually for efficiency
- buy products with less packaging
- recycle cardboard, aluminum, glass and plastic
- be sure hazardous wastes are disposed of properly.

6.1.3 Sustainable Building Design

Homeowners, government, and businesses all desire buildings that are less expensive to heat and cool, and pleasant to live or work in. Such structures also have less impact on the surrounding environment. In the construction of a new structure, there are many opportunities to satisfy these desires through the use of sustainable building design. Under ideal circumstances such a building would:

- make appropriate use of land
- use water, energy, lumber, and other resources efficiently
- enhance human health
- strengthen local economies and communities
- conserve plants, animals, endangered species, and natural habitats
- protect agricultural, cultural, and archaeological resources
- be nice to live in
- be economical to build and operate

Such buildings usually cost the same as conventional structures. However, the improvement in aesthetics, comfort and performance all translate into a higher sales price and lower operating costs. They are cheaper to heat, cool and light and more affordable due to lower utility bills. The Green Building Council is leading a national consensus for producing a new generation of buildings that demonstrate this type of high performance inside and out. They have developed a list of LEED (Leadership in Energy and

Environmental Design) products and resources. The Green Building Council recommends the following regarding new construction:

- the installation and use of solar panels
- 24" on center construction with 2 x 6's- increases insulation and energy efficiency
- the use of pre-constructed I beams- as a replacement for traditional support structures. Using these reduces total wood consumption by 400%, doubles insulation, increases strength & reduces cost.
- buy reused and recycled construction materials

These and other best management practices for new construction will help mitigate the effects of the structure on its surrounding environment and watershed.

Many businesses have implemented the recommended environmental strategies through employee-led 'environmental teams.' Some have made a significant difference with small, simple changes such as the alteration of cafeteria and mailroom procedures. Others have led entire 'wildlife teams' in habitat enhancement projects involving acres of native meadow plantings and nature trails on corporate property. All of the efforts have improved the quality of life for the wildlife, waterways and people of the local watershed.

Some corporations have taken their environmental programs a step further by partnering with local schools to provide needed environmental education resources. Businesses can, among other things:

- provide funding for computers
- donate land for outdoor classrooms and nature trails
- host environmental education workshops for teachers. A program called Corporate Lands for Learning^{SM} (CLL), developed by the Wildlife Habitat Council, helps corporations and local schools develop a mutually beneficial program in environmental education.

6.1.4 Open Space

One frequently used tool for focusing development is through **transferable development rights**. With these rights, developers can swap rights to build some sort of facility, such as a house on one parcel of land in exchange for the right to build more intensively on some other parcel. Such an exchange can in some instances work because there is money to be made by doing so. Recently a developer bought a large parcel that cuts across the watershed from Willows Road to Route 5, only to perform such a swap so he could increase the housing unit density in a development he is building in Northern Virginia. There is the possibility that more such deals could be made for land within the watershed.

Other landowners might want to maintain the rural character of their property or prevent the family farm from being carved into tract housing. "Sale" of the development

rights is an option to them. Grants from the state's Rural Legacy program are not an option for land in the Hilton Run watershed, since almost all of this area is zoned as part of the Lexington Park development district. Still, waiving development rights might still be attractive because of income tax and property tax reductions. Owners can work through their estate planners to work such exchanges. Note that the owner might only wish to restrict development on only part of their property. The Patuxent Tidewater Land Trust (www.patuxent-tidewater.org), is a local non-profit organization that can work with government agencies and the owner/estate planner team to set up easements and monitor the property (generally on a yearly basis) to make sure that easement terms are met.

6.1.5 Mining

Sand and gravel surface mining is an important economic resource in our region. It is a necessary resource for transportation and development purposes. The Hilton Run watershed contains valuable sand and gravel resources which are/have been extracted in at least four locations. Two locations are very active - Sanner's Lake and Stewart's Grant, and two are currently dormant - Willows Road adjacent to the Facchina preserve and Rte. 5 near the Park Hall/Great Mills border. The exact number of extraction sites is unknown.

Active mining operations of this type do have the potential to adversely affect surface waters (Kitsap County 1997) and to increase use of confined aquifers. These operations frequently use large quantities of ground water from aquifers that are currently under demand pressure. These same aquifers supply potable water to the general population of the watershed as well as a greater surrounding area.

Forecasts suggest a possible water shortage in 2020 for the Lexington Park area (St. Mary’s County, Commission on the Environment 2002). Therefore, increasing withdrawal for an industry which does not require potable aquifer water would further limit this resource for other development needs such as residential, commercial, and light industrial. Until reasonable and sufficient resources are identified to increase the sum-total local SSY of all the aquifers, careful consideration of water use from confined aquifers is essential (St. Mary’s County, Commission on the Environment 2002).

Since daily withdrawals of fresh water within the Hilton run watershed is widely variable due to seasonal surface water availability and resource demand, more scientific statistics are the county-wide totals and yearly averages collected by the Maryland Geological Survey and the United States Geological Survey. According to this data, mining operations in St. Mary's County withdraw 200,000 gallons per day from surface waters and 240,000 gallons from confined aquifers (US Geological Survey). Within St. Mary's County, mining withdrawal amounts to about 4.5% of total withdrawals and over 20% of all non-residential-use withdrawals (US Geological Survey).

Sand and gravel operations utilize ground and/or surface water to wash gravel which result in a turbid affluent which is usually dispersed into settling ponds and subsequently into infiltration pits (St. Mary's County Board of Appeals 2001). Threat to the surface waters comes from spilled fuels and lubricants, waste fill and contaminated fills during reclamation, suspended solids in effluents, and alteration of surface water flows and levels (Kitsap County 1997). Waste fill and contaminated fills are prohibited by the Maryland Department of the Environment (MDE) and the Environmental Protection Agency (EPA). Oversight is minimal and under the jurisdiction of MDE. Once in the surface water, chemicals are free to move about with the flow of the water (Kitsap County 1997). Ideally, suspended solids would be removed in settling ponds prior to discharge. Surface water flows and levels are essentially not monitored nor regulated in Maryland. Ongoing scientific analysis in the San Juan Islands of Washington State reveals that impacts to surface waters can be significant and even detrimental to the overall flows and levels (Washington State Department of Ecology 1999). Further study is needed in this area since it is hypothesized that mining in the Hilton Run watershed (and other watersheds) may significantly impact the river's flow. Aquatic life as well as riparian visitors such as birds and mammals are dependent on river flow.

Typical reclamation practices utilize significant amounts of sludge, also known as bio-solids (processed animal and/or human waste), to replace lost topsoil. Due to the odor during and immediately after sludge application, this process is not compatible with residential and commercial neighborhoods. Odor complaints make up the majority of complaints from the public (St. Mary's County Department of Planning and Zoning 2000). Additionally, the Center for Disease Control and the EPA have suggested that current sludge products and application methods are flawed and that a significant threat to public health exists from direct contact with or aerosols emitted from sludge (Centers for Disease Control and Prevention 2000).

Sand and gravel miners should be mindful of opportunities to widen stream buffers beyond legal limits, especially in areas that are especially prone to erosion and sedimentation.

6.1.6 Air Quality

There are several local sources of poor air quality and some categories of impact, such as soot and fugitive dust, where much of the contribution is local. Current outdoor burning regulations forbid burning within 200 feet of residences. Better enforcement is needed. The county should also discourage or ban uncontrolled burning in waste piles or burn barrels, a principal cause of dioxins in the air. Absent regulatory action, voluntary compliance would lessen the severity of the problem.

Uncontrolled spread of dust, for example from County road work, can be a vector for the spread of pathogens. Dust can be controlled if sprays of water are directed on

operations such as road grading that would otherwise produce dust. Leaf blowers spread copious amounts of dust and mold, aggravating allergies in the general population.

Major contributors to smog are volatile organic compounds (VOC). Examples of VOC sources are early generations of dry erase markers, oil-based paints, and gasoline. Citizens need to limit their use of these products or find safer alternative products. Improved dry erase markers (such as Expo II markers) emit limited amounts of VOCs. Low odor paints release a reduced amount of toxic vapors. Citizens can help by using milk and clay-based paints, which have no VOC emissions. Limiting use of volatile chemicals indoors also reduces respiratory problems among the general public. Gasoline station owners can help by equipping pumps with special nozzles that capture most of the escaping vapors.

Common household products can release a wide variety of poisonous gases including toluene, chlorine gas, and benzene. Retailers can help inform the public about what hazardous materials are present in consumer products they purchase, and what the consequences are of improper use and disposal. Release of these substances into the air, on the ground or into the water pose a danger to the public, to the watershed and to the Bay. The County is already helping this cause through its Hazmat collection program.

6.1.7 Solid Wastes

Yard waste can be a significant component of household waste. Residents should be encouraged to use mulching lawnmowers and to compost grass clippings and leaves. (See section on Household Best Management Practices- earlier in this report.) For those who do not want to compost in their yards, the county could provide community composting facilities. The County could also offer support for tree trimming companies to chip limbs and brush that would otherwise go to the landfill. A service that would match householders who need brush chipped with those who could chip it is another option.

Many items that get thrown out could possibly get a new life if they were to be refurbished. The Penny Saver performs a valuable service of finding homes for used merchandise that would otherwise be thrown out. An on-line version of this would help spread the word.

Buildings are constantly being upgraded or demolished in the county. Building waste adds significantly to the waste stream. Reuse/recovery of building materials should be encouraged. (e.g. Used barn boards are premium products in the building market.)

6.2 Recommended Changes in Pubic Policy

What follows are proposals for regulatory changes, or the creation of incentives and disincentives, that would benefit the health of Hilton Run and other parts of the watershed. All these recommendations are for consideration by the Board of County Commissioners, County staff, and other governmental jurisdictions in the County including the US Navy.

Goal: For public policy at the local level to become fully consistent with the objective of stabilizing and revitalizing the subwatershed.

Some of the proposals that follow relate to lands beyond the borders of Hilton Run. Other recommendations apply specifically to the subwatershed itself. All, if adopted, would arrest the system's decline.

6.2.1 Stormwater

With the adoption of the Maryland Department of the Environment's 2000 Maryland Stormwater Design Manual in July 2001, new standards for the treatment of runoff generated by development were established. Five sizing criteria were adopted, with the objectives of meeting pollutant removal goals, maintaining groundwater recharge, reducing channel erosion, preventing overbank flooding, and passing extreme floods. All non-exempt development is required to address these sizing criteria. While some of the best management practices (BMPs) can remove a higher percentage of pollutants than other, all approved BMPs can meet the State's pollution goals when properly designed. Since no specific pollution problems have been identified in the watershed, no particular BMPs are preferred over others within the watershed.

As to water quantity control, the Manual requires that development address channel protection volume, overbank flood protection volume (10 year storm), and extreme flood volume (100 year storm). All development generating more than 2 cubic feet per second (cfs) must provide 24 hour extended detention of the one-year storm. This requirement will help to protect against erosion in the areas of highly erodible soil and steep slopes, as well as minimizing stream bank erosion.

With regard to management of the overbank and extreme flood volumes, the flood plain maps reveal that the area of Hilton Run from the vicinity of the Route 5 crossing to the area of tidal influence has three structures within the 100-year flood plain. Two of those structures on the south side of Md. Route 5 appear to be in close proximity to the banks of the stream. There are several other structures in the adjacent Pembrook Run watershed which may also be influenced by the Hilton Run watershed. No non-localized flooding of structures or roadways has been identified within the middle and upper areas of the watershed. Based on the flooding potential within the lower watershed, each development in the watershed will need to address the potential increase in frequency and

severity in flooding in the watershed. The impact on the timing of the peak flows must be considered to avoid coinciding peaks.

In the light of the foregoing, it is recommended that the Board of County Commissioners adopt and uphold the following standards and methods to achieve better stormwater management:

- New development must not allow for any increase in runoff for a ten-year storm (that storm standard is set as just under 2-inches of rain in any 24-hour period). Also, the first 1-inch must be dealt with by infiltration (bio-retention being the most recognized method).
- Move to a higher storm event (e.g. 25-year storm) standard in sensitive areas or whenever certain percentages of impervious surface are reached for a subwatershed. e.g. When Hilton Run watershed reaches 12% impervious surface - mandate "no increase in runoff for a 25-year storm."
- Develop incentives for friendly alternatives such as water gardens, recycling run-off water for other uses, etc.
- Develop incentives and grant support for retrofits, especially where regional retrofits needed due to existing high density development
- Increase the budget for stormwater management to increase the frequency of inspections to assure compliance.

In addition, builders should be required, after construction, to restore runoff levels to those that would occur on grassy meadows--not the looser standard called for in the current Comprehensive Zoning Ordinance.

6.2.2 Mining

Sand and gravel mining is permitted in rural areas of the county where impacts to high-density neighborhoods are greatly reduced. The nature of the industry poses challenges in areas with high-density residential and commercial neighborhoods. As a result, the current zoning ordinance permits sand and gravel mining and regulates this land use under terms of "conditional use". Typical "conditions" are to restrict number of vehicle trips daily and hours of operation and hauling. While this industry is an asset to the county as a whole, restriction of its activity in the Hilton Run (and the county development districts) should be considered. The Coalition makes the following recommendations for the benefit of the Hilton Run subwatershed and its community:

- Prohibit any increase in withdrawal of water from confined aquifers for the purpose of sand and gravel mining within a 2-mile radius of the Lexington Park Town Center.

- Monitor Hilton Run stream flow and determine whether the sizable mining operations within the watershed are negatively impacting flow.

- Continue suspended solids, macroinvertibrate, and fish stream surveys with emphasis on tracking overall stream health.

- Implement unannounced inspections of mining sites with special attention to community health and safety, fuel and lubricant spills, and waste and contaminated fills.

- Prohibit the use of sludge in that portion of the Hilton Run watershed which is within the Lexington Park Development District.

- Restrict mining trucks from residential neighborhoods and restrict trucking hours so as to minimize coexistence of school buses and heavy trucks - prohibit trucking on weekends and holidays.

- Identify roadway maintenance costs related to mining activities and assess an impact fee to any approved new applications or altered applications.

6.2.3 Site Design

The County should:

- Set more restrictive setbacks from areas such as Hilton Run with sensitive soils and wetlands, or denote preservation areas within the subwatershed.
- Identify resource protection zones such as wetlands where particular restrictions would apply.
- Establish floor-area ratios, 200 foot setback requirement, and residential density limits for such protection areas.

6.2.4 Building codes

The County should provide:

- Incentives for green building (waiver of fees for green building, fast track permitting).
- Increased standards for sensitive or resource protection areas.
- Recognition of 'green' builders.
- County authored grant support.

6.2.5 Concentrating Development

County agencies could work with the developers to allow them to increase development in one area of a parcel while not developing a more sensitive part of that parcel at all. To make such development more attractive to the developer, the county might:

- Permit more buildout on the parcel (more houses or square feet of office space) than if the entire parcel were to be developed. Such a financial inducement should be attractive to a developer.
- In the Rural Preservation District, establish a mandatory clustering regulation such as that which has long been in place in Calvert County.

Development impact on the watershed can also be reduced by focusing development on sites where older buildings and parking lots have become underused or abandoned (Brownfields). Examples of properties in the watershed that are now underused are Saint Mary's Square and Millison Plaza. The empty building next to Queen Anne Apartments, also on Great Mills Road, formerly a gym, should be adapted for reuse. County government should take actions to encourage redevelopment of these infill parcels.

Development impacts on county watersheds can also be reduced if the County were to encourage greater mixed use of the land. Apartments can be located over stores or offices. Parking could be under buildings rather than beside them. Many people enjoy the convenience of shopping and other conveniences near their homes. They miss a "downtown" to live in. This type of development will reduce the need for multiple cars in a family, which will also reduce the need for parking spaces.

Many studies have shown that each car a consumer buys requires the development of as many as 6 to 10 parking spaces. A very effective way to reduce the size of needed parking lots (and the attendant runoff from impermeable surfaces) is to reduce the number of cars people own. Office workers would like mixed-use development--there would be the possibility to walk to restaurants or stores at lunch rather than the hassle of fighting Route 235 traffic to do an errand.

Trends will favor more intensive use of industrial and commercial real estate parcels in the county. The recent influx of population coupled by land being set aside for open space are causing property values to go up. If the county:

- **holds the line on rezoning land for commercial or industrial** use, this run-up will be accentuated. Property taxes will also go up. Economics will no longer favor single story buildings and acres of parking lots as they do now. As long as the Navy base is a major employer, the property prices will not drive this type of development out of the county. Businesses and employees will want to be close to the job opportunities.

Other recommended measures:

- Identify **resource protection zones** with the focus on greenways enhancement -- this area might be subdivided into areas of no development (preservation) and areas of limited removal of trees, etc.

- **Fee for non-green development** that would be used to mitigate and/or support other programs (grants, land acquisition, retrofits).
- **Fast-track mixed use** or "green" development proposals.
- Allocate **more open space monies** (State & Federal monies) in areas where impacts are greatest (e.g. development district/Hilton Run watershed).
- Combine greenways with non-motorized **hiker/biker trails** "through the woods";
- Consider future needs for **ground discharge of sewage treatment plant outflow** - set aside for permanent greenways.
- Explore ways to **strengthen the County's Transfer of Development Rights** program, which in effectiveness lags behind Calvert County's highly successful effort.
- Help preserve open space, and strengthen the local economy by providing **incentives to patronize local farmers** and by encouraging money to recirculate within the County.

6.2.6 Transportation

Transportation is a major source of locally generated air pollutants. Any actions that serve to reduce the impacts of transportation-generated air pollutants will serve to improve the quality of life and reduce adverse impacts on the watershed. Proper maintenance of motor vehicles is important (such maintenance will also result in improved performance and reduce fuel consumption which will save the owner in fuel costs). Improved highway design will ease congestion and resulting fuel waste. Route 235 "improvements" have been ineffective in reducing traffic delays; a different highway design philosophy could be considered. Any actions that result in reduced use of motor vehicles will also help.

Trucks and trucking are a tool of industry and an asset to the economic well being of Lexington Park. Collector streets and arteries should be wide enough to allow trucks and school buses to pass safely. Residential neighborhood roads currently are not required to be wide enough to allow for safe passage. Likewise, building line setbacks on non-arterial roads in the watershed are minimal, leading to close proximity of houses and yards to unfriendly truck noise and exhaust. Heavily loaded dump trucks can have a negative impact on smaller roads. The resultant wear and tear impacts the safety of local residents as well as the expense to maintain private and public vehicles. Routine truck traffic will increase the maintenance cost of public roadways (Levins and Ockwell 2002).

A major component of commuting traffic in the county is related to the air base and its contractors. There has been no effort to assist commuters in reducing their driving except for providing subsidies for buses and vans for long distance commuters such as those from Virginia. The subsidized Keller bus service is only a rush hour service and snakes slowly to several stops within the city. Few provisions for hikers and bikers exist,

and no local controls are in place to decrease emissions from vehicles and increase gas mileage. In the light of the foregoing, we propose:

- The Navy and its contractors could pool their resources to have regular bus service to principal buildings on the base (and Webster Field) and up the length of Route 235 to the Higher Education Center.
- Day care service for civil servants and contractors on base, in order to reduce demand for single driver cars on the base.
- The NAVAIR Headquarters (IPT) and North Engineering Building are very close but the road pattern is such that travel from one to the other is over a mile. A direct road connector or foot trail from the back of the IPT parking lot to the other building would reduce driving needs and ease parking.
- The Keller commuter bus service should include a few buses throughout the day and into the evening hours and some service on weekends.
- Students who drive themselves to school should pay parking permit fees.
- Neighborhood linkages are another need. There are scores of neighborhoods in the County (including a few in the watershed) that back up to each other with no connection. Connect them.
- In addition, we need a trail network throughout the County. A start will be development of the Three Notch Trail along the old rail right-of-way. County and state policy should be changed to include development of hike/bike trails beside highways to be modified. This does not mean a combination of three-foot bike lanes at the side of the pavement and narrow sidewalks. Rather it is to have a single 8- to 10-foot wide paved surface physically separated from traffic lanes by a grass verge and curbing.
- High fuel efficiency and emissions standards should be set for the acquisition of most County-owned and operated motor vehicles.
- Dedicated bike/walkways can offer an alternative transportation option if they are provided. Existing bicycle lanes along the sides of roadways see little use because it is simply too dangerous to use them. These lanes cease near any intersection, and drivers often stray into them where they do exist. Needed are paved lanes that are physically separated from traffic lanes. The county should make it a standard practice to develop such lanes whenever they upgrade any county road, and should request that they be provided by the state whenever it upgrades any of its highways within the county.

6.2.7 Incentives

The County should pursue all opportunities to provide economic advantages for green design and construction, and for the protection of open space. Fiscal policy should be structured in ways meant to achieve desirable outcomes rather than simply generate

income for the County. In this regard, income derived from the newly increased Recordation Tax on real estate transfers should go to open space protection and not allowed to be used for general purposes.

The County should be commended for creating new incentives for builders to use green methods, such as those embodied in the new Comprehensive Zoning Ordinance, and steps should be taken to emphasize and reinforce these.

6.2.8 Watershed Commission

A St. Mary's County Watershed Commission exists on paper, but has not been active. The County should take firm steps to make this Commission an active force in shaping plans and policies that affect the watershed.

6.2.9 Riparian Buffers

County Commissioners should be alert for opportunities to maximize protection for Hilton Run, and the watershed's other streams, by means of enforcing the 50-foot setback requirement. In parts of the watercourse that are especially subject to threats from erosion and runoff, the riparian buffer should be widened.

6.2.10 Land Acquisition

Because of Maryland's current financial condition and its current government's disinterest in moving forward with the previous regime's Smart Growth and Rural Legacy programs, few immediate opportunities for state-financed open space protection currently present themselves. Under these circumstances, the County should improve its development rights transfer program, and encourage the efforts of the Patuxent Tidewater Land Trust. Looking ahead to the possible future revival of the Rural Legacy program, the County should work now to establish priorities and designate specific properties for inclusion in future rounds of selection and funding.

6.2.11 Energy

The County should be alert for opportunities to participate in federal programs operated by such agencies as the Department of Energy and EPA that, in return for reductions in energy use and emissions, proving funding and technical support for state and local agencies.

6.3 Community Awareness and Education

Goal: For citizens, neighborhoods, libraries, and schools to take the fullest possible advantage of opportunities to help stabilize and restore the subwatershed through educational and outreach activities.

6.3.1 Schools

There are four schools within the Hilton Run subwatershed: Great Mills High School, The Lexington Park Christian School, Carver Elementary School, and the Bay Montessori School. The opportunities for Green School program participation are particularly strong in the local high school.

Watershed Legacy Coalition members have begun discussions with county representatives of the School Board in hopes of integrating an environmental mediation program into the high school curricula. The ultimate objective is to generate dialogue amongst a diverse group of students about whole systems thinking. This would entail building dialogues between public high school students who would, in turn, mentor students from the elementary school. Course materials include information unique to the subwatershed, as well as lessons in problem solving and stewardship. This program is designed to foster interaction between a diverse set of students using the subwatershed as a common ground to solve current and future environmental issues. The County's school system should provide the fullest possible support for this prototype venture with the goal of eventually expanding the model to the County as a whole.

One incentive for development of such programs is state recognition. The Governor's Green School Awards program celebrates schools that combine classroom studies with best management practices and involve the community in their program. (See Appendix D for helpful contact information regarding this topic). The award program is non-competitive and designed to celebrate schools meeting strict environmental education criteria. All public and non-public schools in Maryland are eligible and must demonstrate:

- The school uses the environment as an integrating context or as an integral part of the school's instructional program.
- Best environmental practices are modeled in the operation and design of the school facility.
- The school extends its learning into the community through a variety of projects which address local environmental issues.

For the future, the Community Legacy Coalition envisages further major steps having to do specifically with the school system:

- partnership with county grant writers and Board of Education
- programs that bring higher education students to other schools

- emphasis on in-school programs that address homeowner impacts -- possibly open houses and art shows depicting good homeowner stewardship, etc
- student and citizen volunteer programs in the field -- cleanups, stream surveys, nature hikes, etc.
- Recruit a team of Great Mills High School students to prepare and employ a 30-minute Community Video on managing Hilton Run, with support from the Orton Family Foundation

6.3.2 Other Public Outreach

All of the above is predicated on public outreach, beyond the school system and into the community at large, designed to familiarize those residing or doing business in the Hilton Run watershed with their surroundings. To do so the following steps are already being taken:

- An exhibition in the public library, also located in the Hilton Run subwatershed, acquaints students and homeowners with their own surroundings. Take-away materials include Best Management Practices and information on the impacts of the homeownership, as well as an information packet on indigenous flora and fauna.
- The exhibition is a precursor to a public celebration known as StreamFest during which residents, business owners, students, and the general public will gather to learn more about Hilton Run.

Extensive further community outreach activities are specified in the following section of this document.

7.0 Implementation and Evaluation

In sum, the foregoing draft is presented for consideration, amendment, and refinement by the citizens and leaders of the community. Only their endorsement and support will make this document into a fully articulated community-based plan. It is the new St. Mary's River Watershed Association's intention to carry out the following steps as the initial portion of the implementation phase.

7.1 General Overview of Implementation

- Solicit comments on and evaluations of the Management Plan
- Solicit *Enterprise* coverage
- Engage community in dialogue beginning with "Streamfest" celebration

- Deliver **general** presentation to:
  National Fish & Wildlife Foundation
  Center for Watershed Protection
  Hilton Run landowners
  Potomac River Association
  Lower Potomac DNR Tributary team
  Chesapeake Bay Program
  1000 Friends of Maryland
  DNR
  Farm Bureau
  Ag Land Preservation Board
  Ag Seafood and Forestry Commission
  Board of County Commissioners
  Maryland Center for Agro-Ecology
  Washington College Center for Environment & Society
  Nonprofit Roundtable of Greater Washington
  University of Maryland Ctr. For Environmental Economics

- Deliver presentations regarding **best management practices** (BMP's) to:
  Neighborhood associations, PTA, etc
  County Chamber of Commerce
  St. Mary's County Watershed Commission
  St. Mary's College administrators
  Superintendent of Schools
  Pax River NAS administrators
  Tri-County Council
  Rotary
  League of Conservation Voters
  Patuxent Tidewater Land Trust/American Farmland Trust/Maryland Environmental Trust
  Chesapeake Bay Program

- Deliver presentations regarding **public policy** and engage in dialogue with:
  County Planning and Zoning staff
  County Dept. of Public Works
  Metcom
  County Dept. of Economic and Community Development

7.2 Benchmarks / Indicators / Evaluation

Once the management plan is fully agreed upon and implementation is under way, there will be at least the following ways to measure progress, or lack thereof, toward its goals:

- Monitor water quality data being accumulated by St. Mary's College. Measurement of storm event impacts will become especially useful.
- Monitor sub-aquatic vegetation losses or gains, and impact of new restoration initiatives
- Monitor impervious surface coverage and effects of increases
- Record changes in policy/practice per plan's recommendations

8.0 Conclusion: Economic/Social Benefits

Hilton Run is the St. Mary's River watershed in microcosm, and the entire watershed mirrors the values and pressures that apply to the County as a whole. At all three levels, those who influence the region's future directions (as well as those who will be affected by its course) face two sharply contradictory scenarios.

The first of these assumes that the Naval Air Station remains the County's major economic engine, and that the County and Southern Maryland's population continues its rapid growth. Under these assumptions, a continuation of policies and practices currently in force leads toward ongoing financial well-being for substantial percentages of those resident in the county and most of its neighborhoods. A steady decline in the region's quality of life could also be safely forecast, with further increases in all forms of pollution, mounting traffic and transportation problems, and checkerboarding of the landscape involving significant losses in traditional values, biodiversity and natural resources.

Under the second scenario, the air station closes and the County loses its principal economic focus. In order to preserve the region’s status as an emerging “technoburb,” local officials strive to develop economically viable alternative civilian uses for the airfield and the surrounding infrastructure. Many Navy-related workers and families depart, leaving behind many vacancies in housing subdivisions hastily and poorly built during the boom times. Gradually, high-tech companies attracted to the region because of proximity to the air base cut back, shut down or move to other locations. Retail businesses suffer major attrition. The number of ghost stores and shopping centers rises rapidly. Pressure on land, biodiversity, and natural resources diminishes while interest in innovative forms of sustainable agriculture increases. County fathers look toward revived farming and harvesting of aquatic resources, recreation, the arrival of retirees and commuters to the Washington/Baltimore metropolitan area as anchors for a new, diversified local economy.

Whichever of these scenarios comes to pass, the trends forecast within each of them highlight the importance of achieving greater *efficiency* and *coordination* in the management of the county, its systems and services. In neither case can the County afford to pay the price for wasting either the quality of life that has sustained the Navy and its civilian periphery, or the natural resources that would become the economy's principal driver if the Navy were to leave. This plan has attempted to set forth assorted economically viable means for the County to achieve environmentally sound development, ways for people to achieve the maximum possible economic gain while minimizing their footprint upon a fragile habitat. In summary, here are the principles on which this plan is based:

8.1 Sustainable Agriculture

We have emphasized ways for existing farmers, or landholders with conditions viable for farming, to achieve sustainable agriculture, defined by USDA as "a means that will help the farmer produce a viable product, while at the same time protecting and enhancing the environment." The internationalist George F. Kennan once put it well: "If you're going to change a civilization, it can only be done as the gardener does it, not as the engineer does it. It's got to be done in harmony with the rules of nature, and it can't all be done overnight."

8.2 Building Design

The building design criteria outlined above all lead toward the construction of buildings that, according to authors Paul Hawken and Amory Lovins, grow out of "a new design thinking that emulates the airy strength of spiderwebs and feathers, enclosing the most space with the least structural materials." Such design, the authors continue, "can actually *decrease* construction costs, chiefly by saving infrastructure expenses and by using passive heating and cooling techniques that make most costly mechanical equipment unnecessary." The principle can apply to any kind of building. Advantages vary. Children score better if they study in well-daylit schools. In many communities resale prices for homes embodying those values have exceeded those for comparable conventional homes. The authors quote Winston Churchill: "We shape our buildings, and then our buildings shape our lives."

8.3 Money

Capitalism, as the distinguished Oberlin College professor David Orr put it, “is no more likely to transform itself into ecotopia than lions are to become vegetarians.” Given that reality, however, there is one step that even hardened anti-environmentalists can painlessly take to strengthen the local economy: buy more from local sources. At present, a dollar spent within it is not likely to get recycled locally very many times before it emigrates into the hands of a faraway merchant or corporation. In the pre-development

era, just about everything people in St. Mary's County ate was grown or harvested locally. On the average today, wrote the late Donella Meadows, U.S. food travels 1,300 miles from where it is produced to where it is eaten. Our habits are consistent with this standard. A shift back toward greater reliance on local sources, for food and many other household products, not only has the benefit of keeping dollars in local pockets. It also cuts back on the number of 18-wheel tractor-trailers crowding local highways.

8.4 Incentives

To make them happen, many of the ideas featured in this plan require regulatory action. But many of its goals can be achieved not by making and enforcing new rules, but rather by giving citizens opportunities to benefit economically from taking actions that are in the common good. Officials and citizens in the County can help by using and advocating the use of existing federal and state incentive programs, such as those in place for buying energy-efficient appliances or placing conservation easements on open land. In this plan we also recommend incentives that could apply locally, for example the reduction or waiver of building permit fees for construction projects employing environmental BMPs. Incentive programs can be far less costly to operate than regulatory mechanisms requiring inspection procedures, and have the political advantage of being voluntary. They can be structured to create efficiency and avoid waste while also benefiting important sectors of the local economy such as the construction industry.

8.5 Recreation

Whether or not the air base remains open, a principal economic driver for the region is already the revenues that derive from the recreational opportunities it offers. Protecting them is a theme that runs through this plan. Boat charter companies will be far less successful if fish and or crabs become harder to find because of pollution or overharvesting or both. Hotels that depend on Navy-related business traffic during the working week need other kinds of guests to fill their beds on weekends. Boaters, golfers, birders, and hunters are good bets to fill them if the water remains clean and natural resources available. It hardly needs saying that resorts fare far better in a healthy environment than in one beset by pollution and clutter.

8.6 History and Culture

The structures, institutions, and values that derive from the region's past constitute another prime and enduring asset for the County. The area's cultural and historical assets—Historic St. Mary's City, Sotterley Plantation, St. Clement's Island-Potomac River Museum, Piney Point Lighthouse Museum & Park, and several historic churches—already constitute a critical mass of attractions and opportunities for visitors to the region as well as its residents. Given the holistic nature of the thought governing the production of this document, the importance of preserving and showcasing the County's culture and its cultural institutions cannot be overestimated.

8.7 Overall

What we propose here is not massive change in how the County's citizens and leaders do their business. It constitutes no more than tweaking the system at some leverage points where relatively slight adjustments can make a big difference. We base our recommendations on nothing more radical than common sense, and on the simple idea that waste is a commodity than none of us can afford any longer. Making the adjustments recommended here can do much to help the County avoid the headlong descent into needless sprawl toward which it is now pointed. Whatever happens to the air station, putting into practice the ideas presented in this plan will lead us all toward a brighter future.

9.0 Sources of Scientific Data

Data are compiled from St. Mary's River Project (SMRP), GIS data collected by Dr. Robert Paul, and Maryland Biological Stream Survey (MBSS). A watershed assessment plan by KCI technologies and a report by U.S. Army Corps of Engineers are also used, as is the St. Mary's River Watershed Site Assessment prepared in October 2002 by the firm of Regenesis, Inc. under contract to the Sustainable Development Institute. Another document heavily relied upon is an unpublished paper by April Mason, St. Mary's College 2004.

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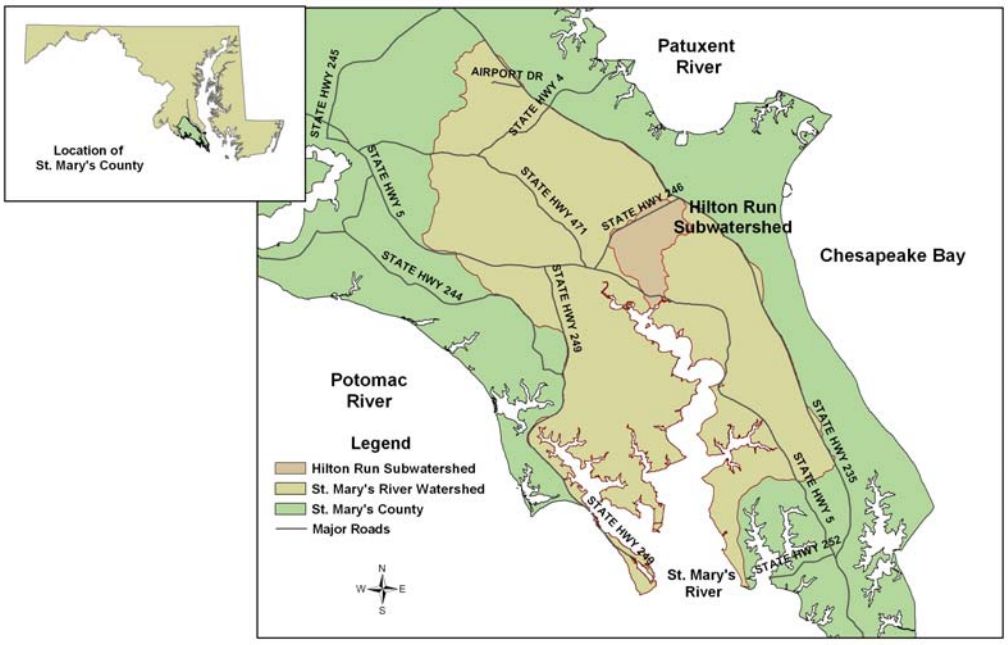
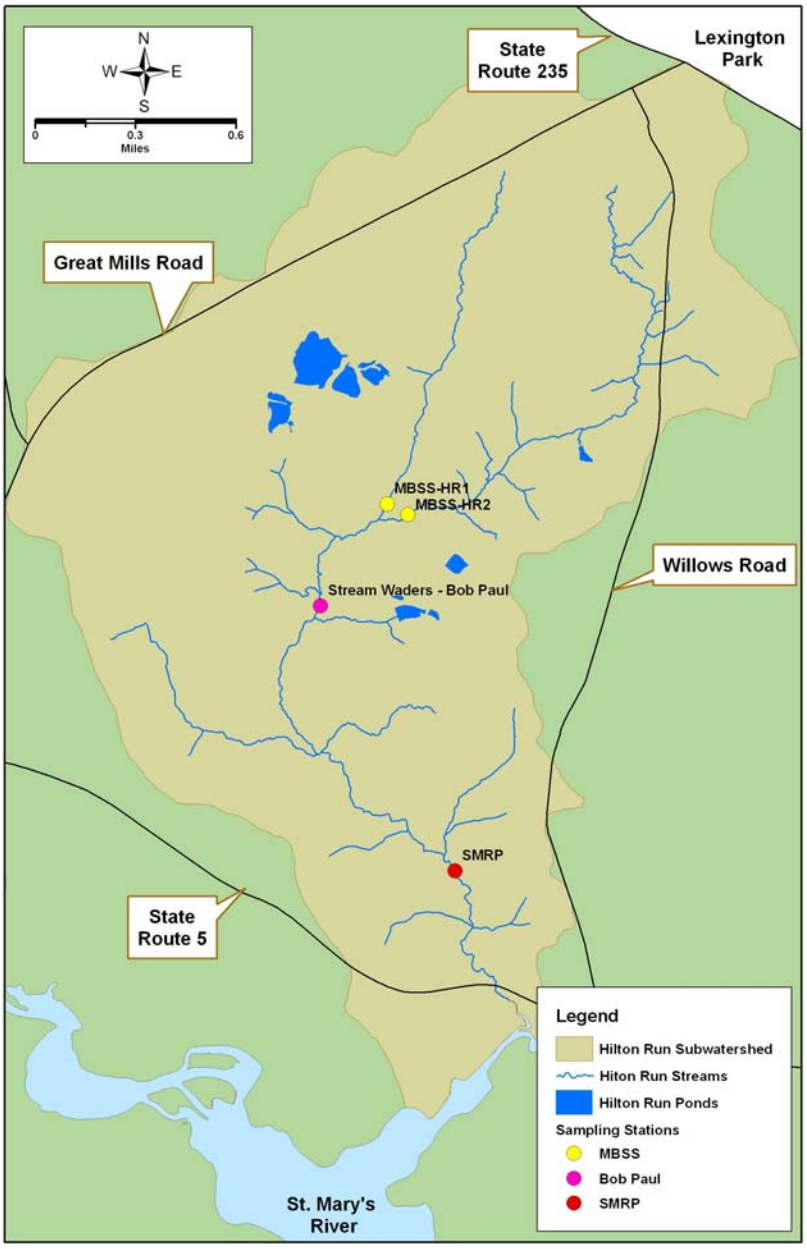
11.0 Appendicies

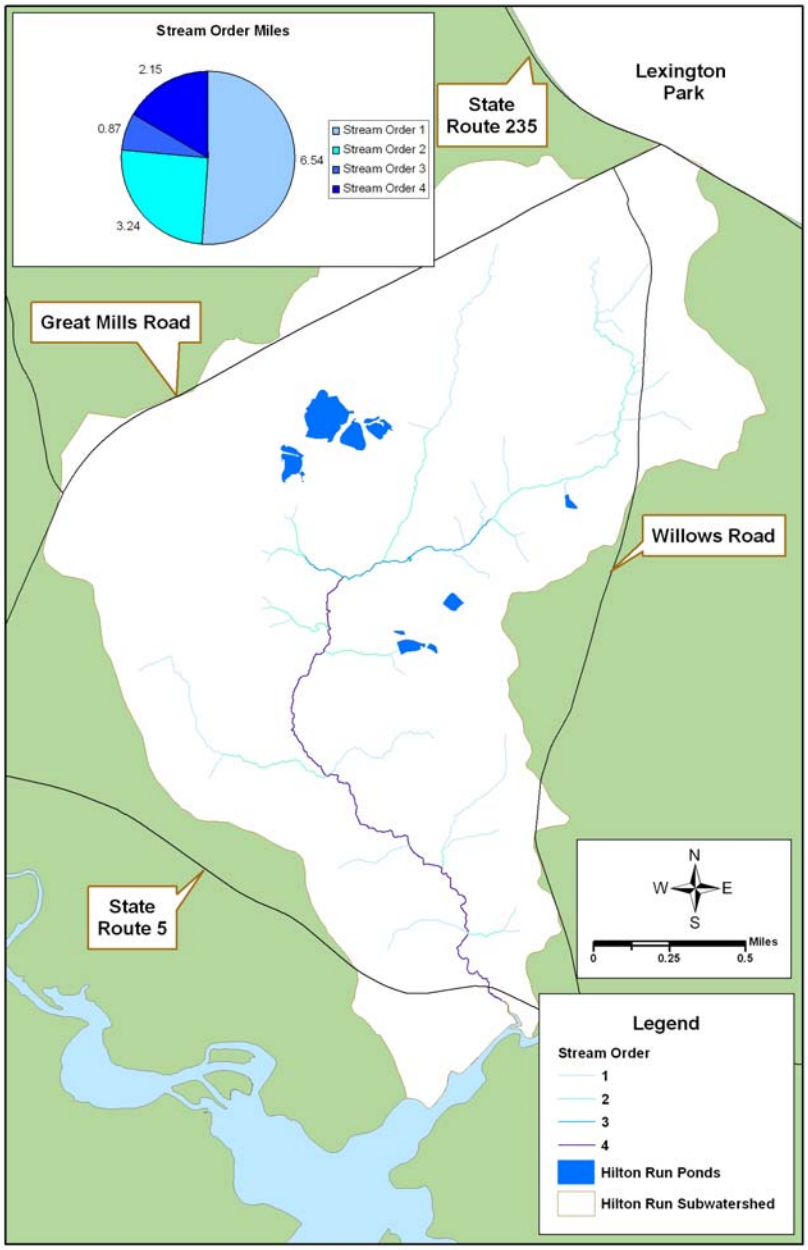
11.1 Appendix A: Maps



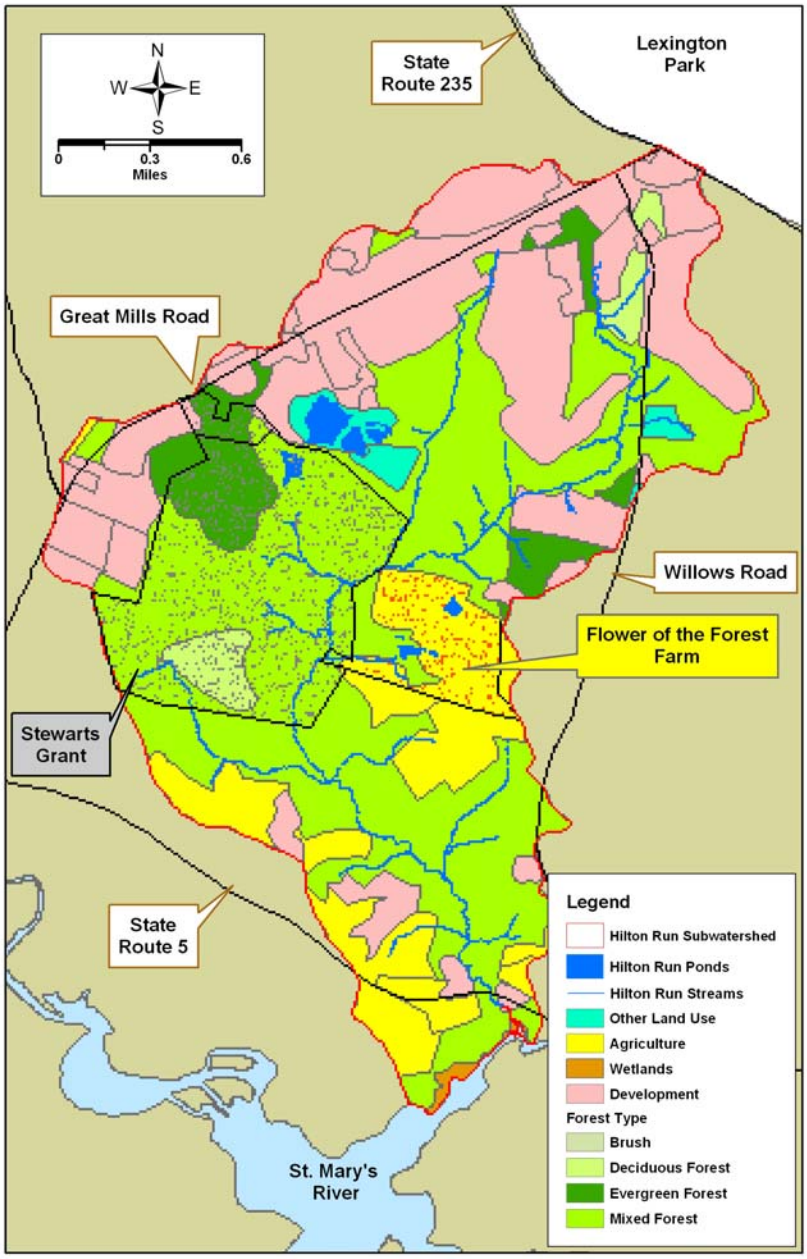
Map 1. Location of St. Mary's County and Hilton Run Subwatershed's location in the St. Mary's River Watershed.



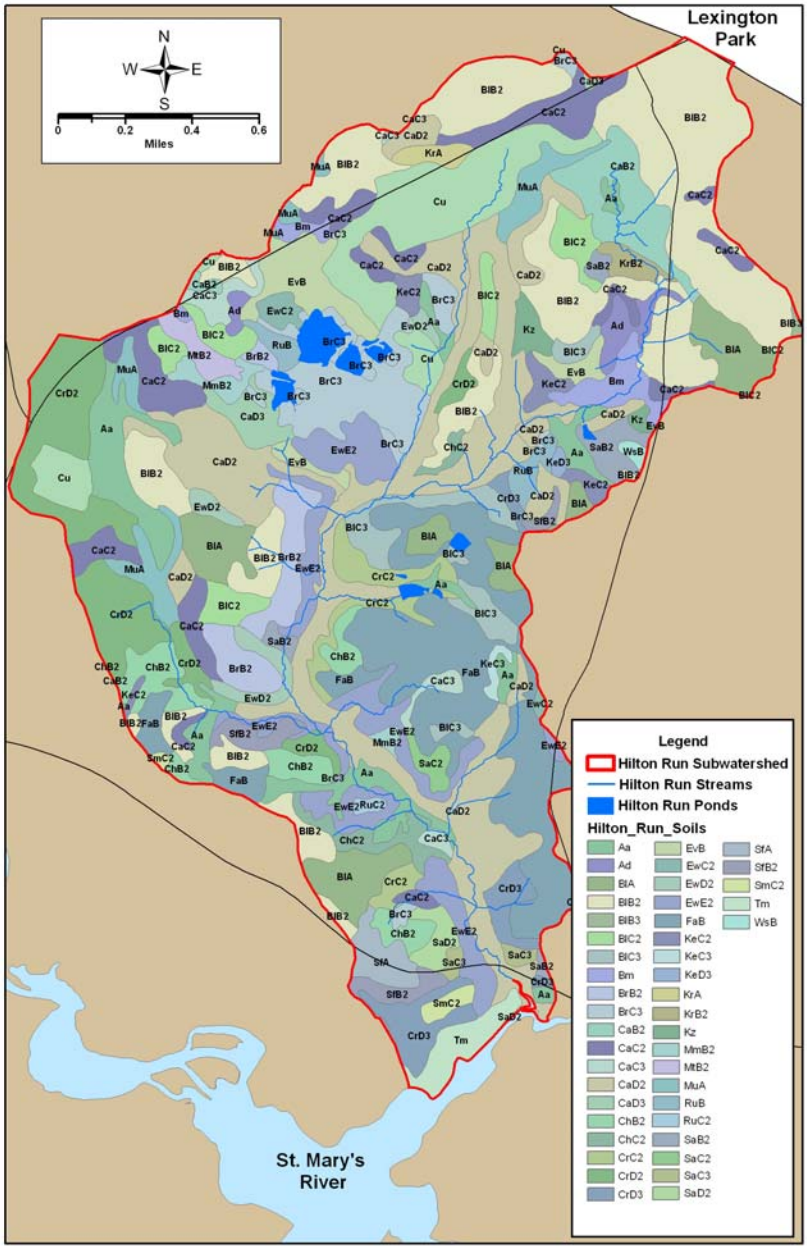
Map 2- Hilton Run Subwatershed, major roads, streams, ponds and sampling sites.



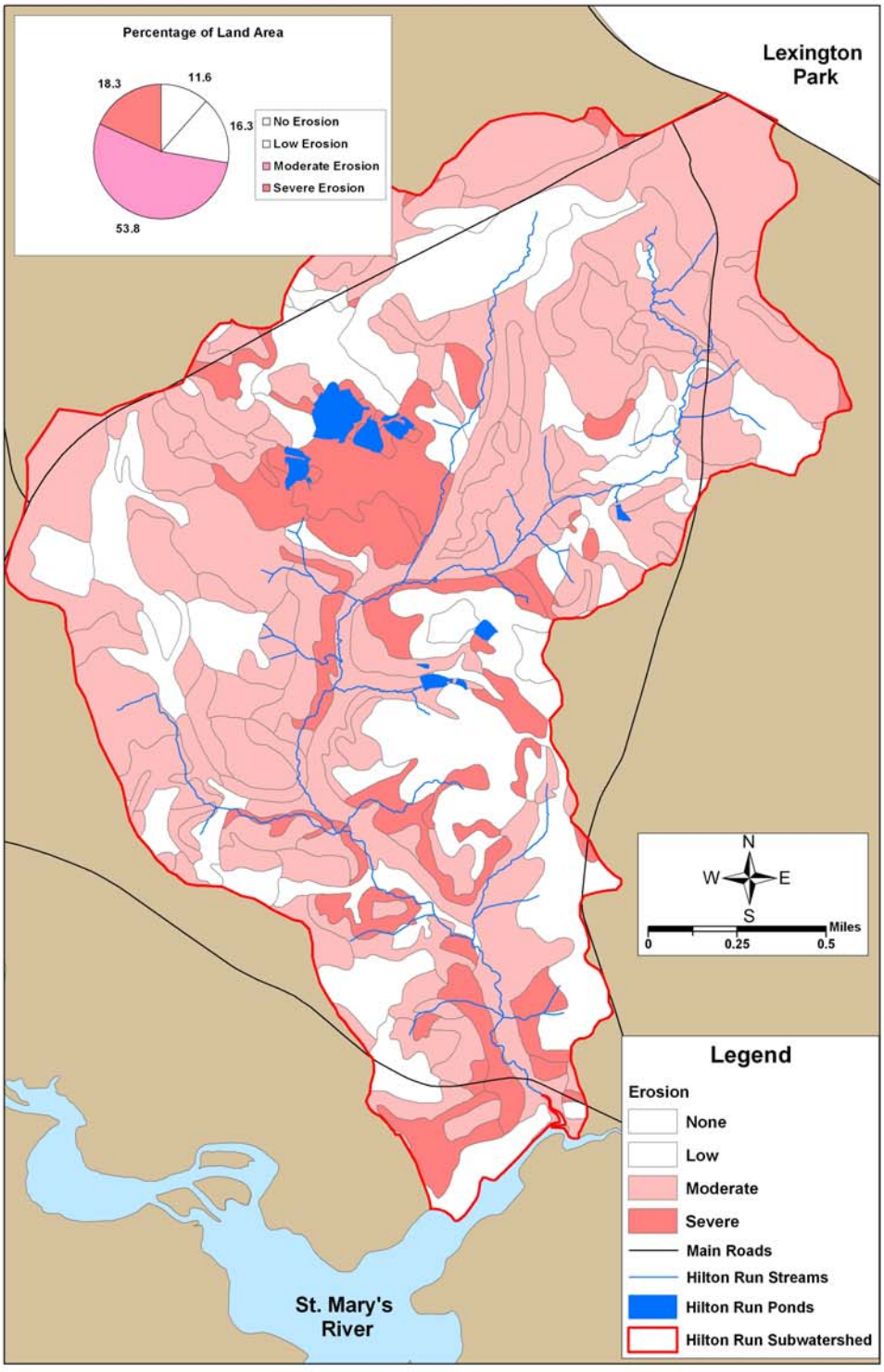
Map 3- Hilton Run and its tributaries classified according to the Horton (1945) Index of Stream Order.



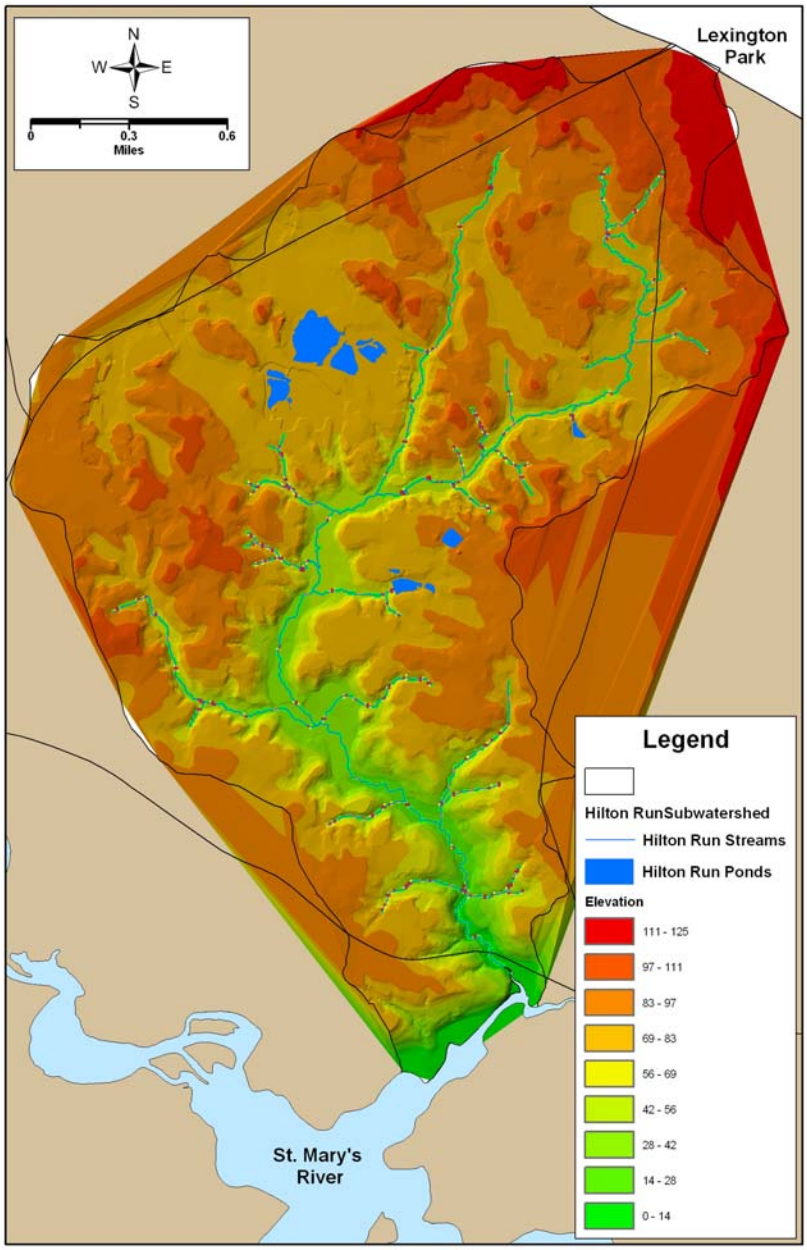
Map 4- Primary Roads and land use in 2000 for the Hilton Run Subwatershed.



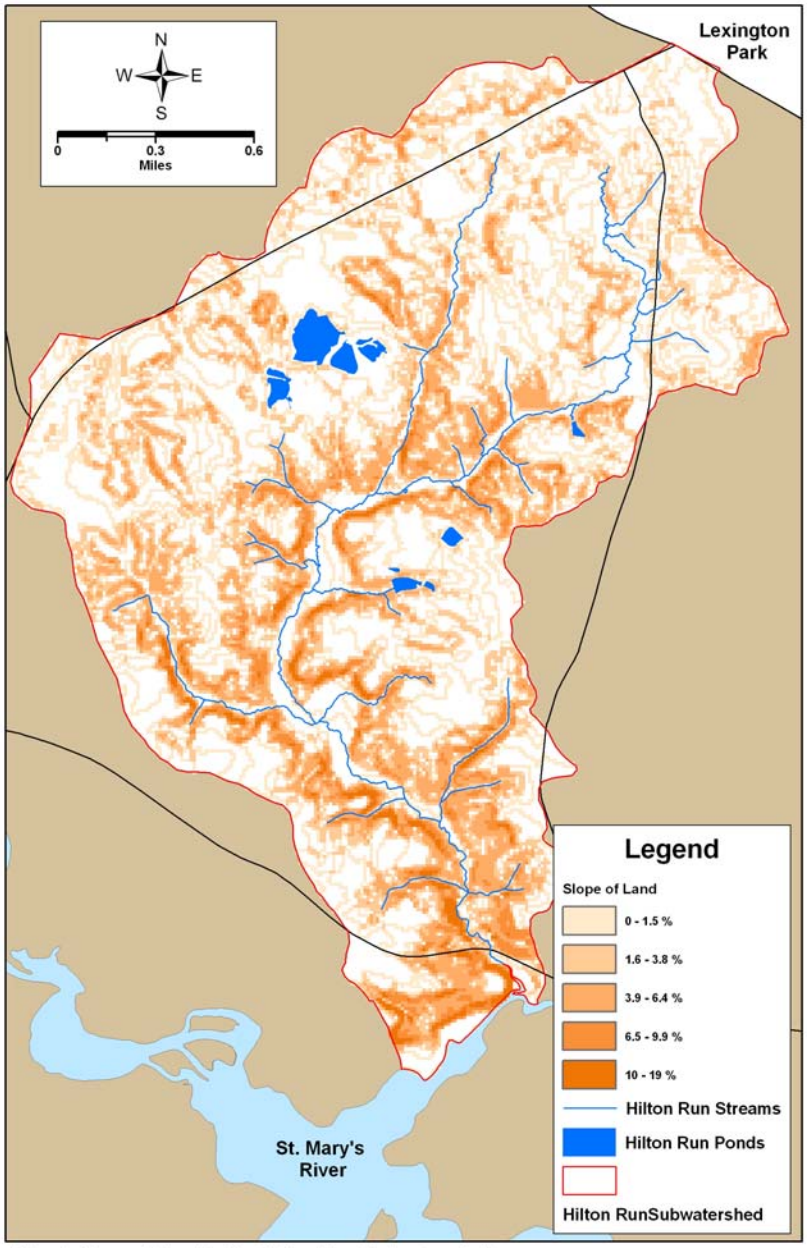
Map 5- Soil types in the Hilton Run Subwatershed.



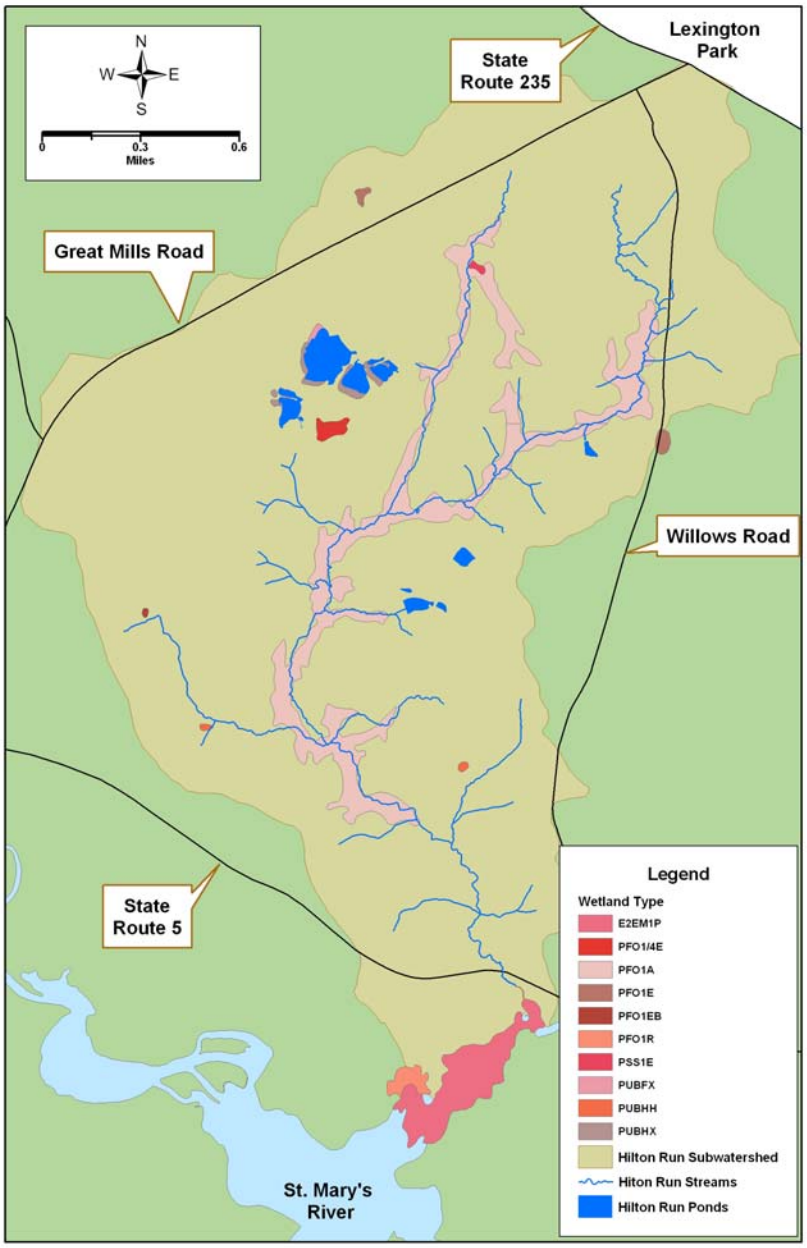
Map 6- Soil erodibility in the Hilton Run Subwatershed.



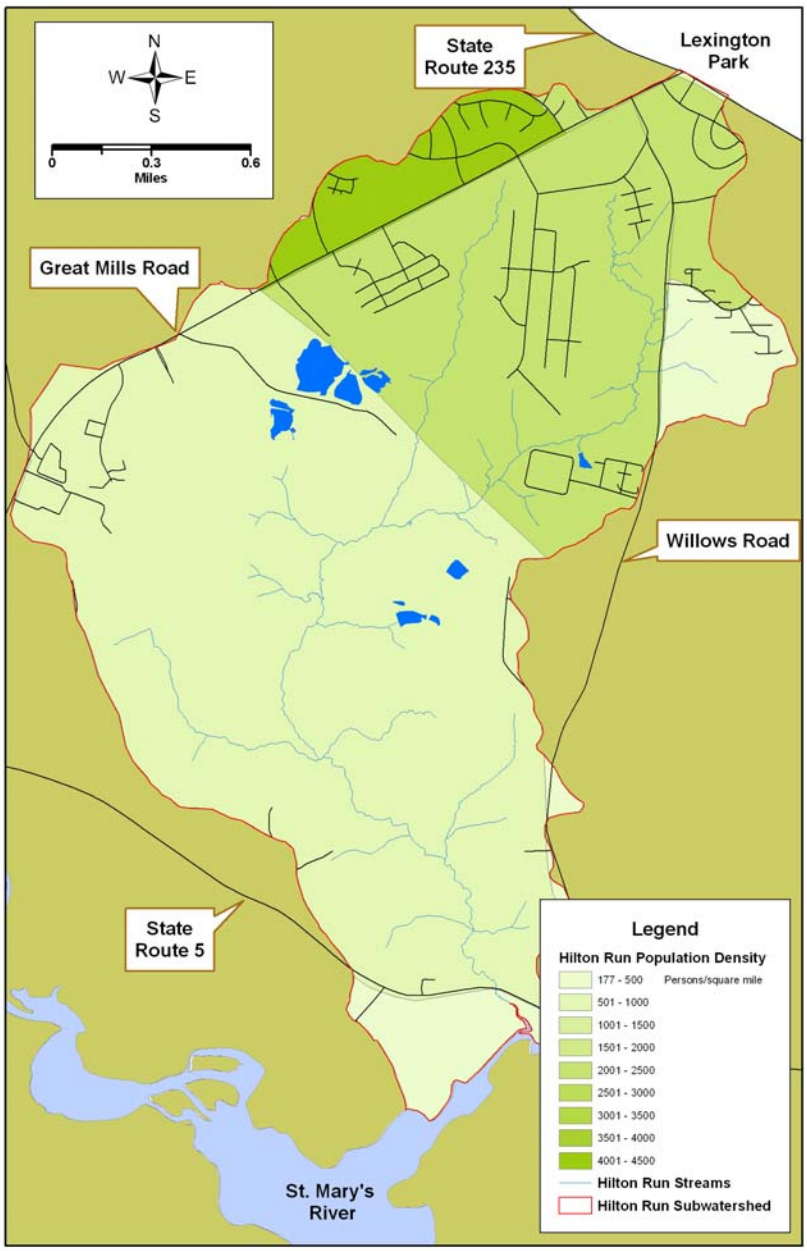
Map 7- Topography in the Hilton Run Subwatershed, showing the subwatershed's landform relief and the channel slope for Hilton Run's tributaries.



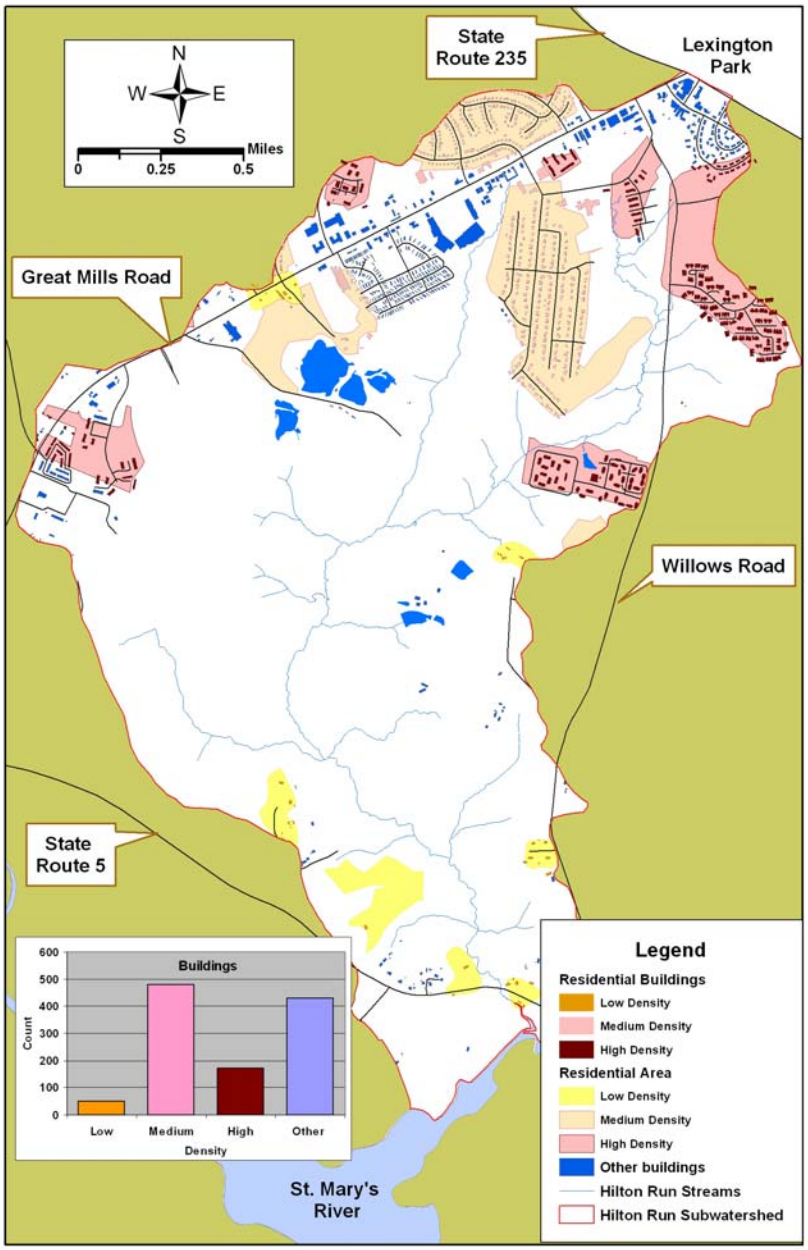
Map 8- Slope of land in the Hilton Run Subwatershed.



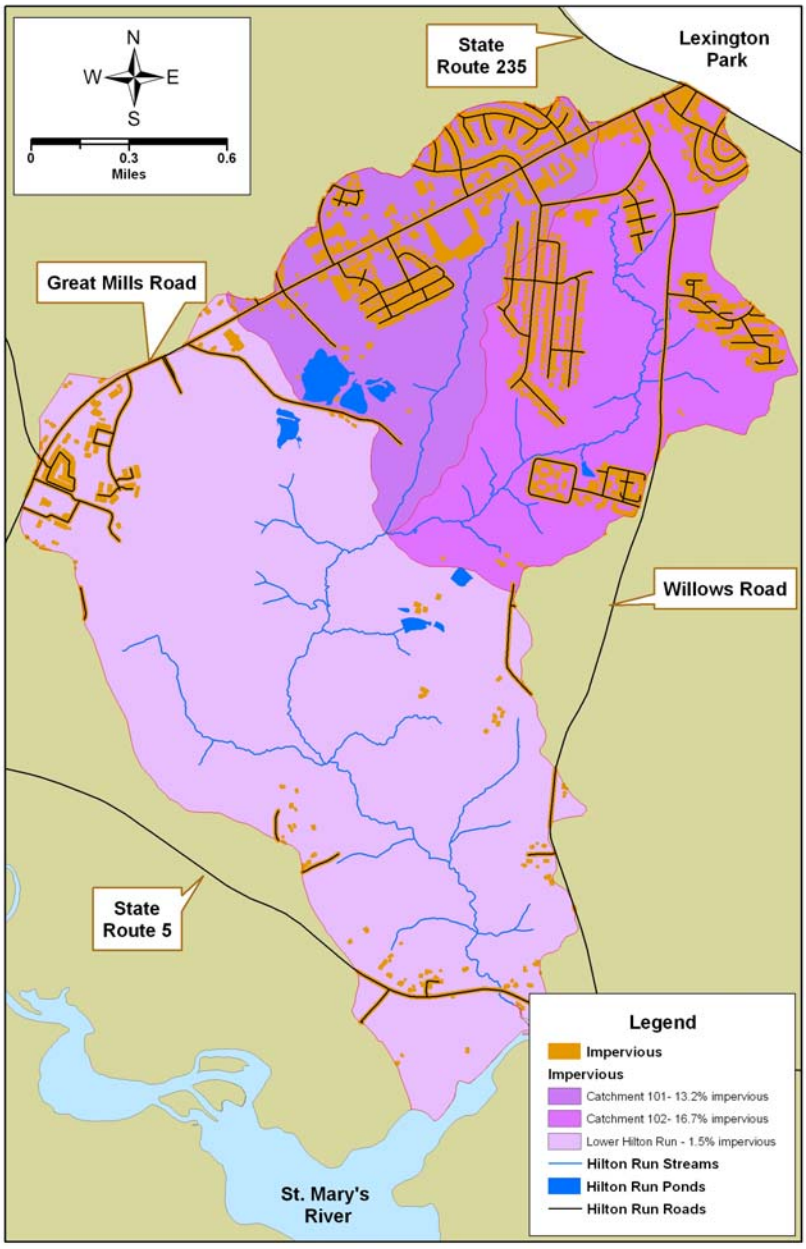
Map 9- Wetlands located in Hilton Run Subwatershed (classification by the National Wetlands Inventory).



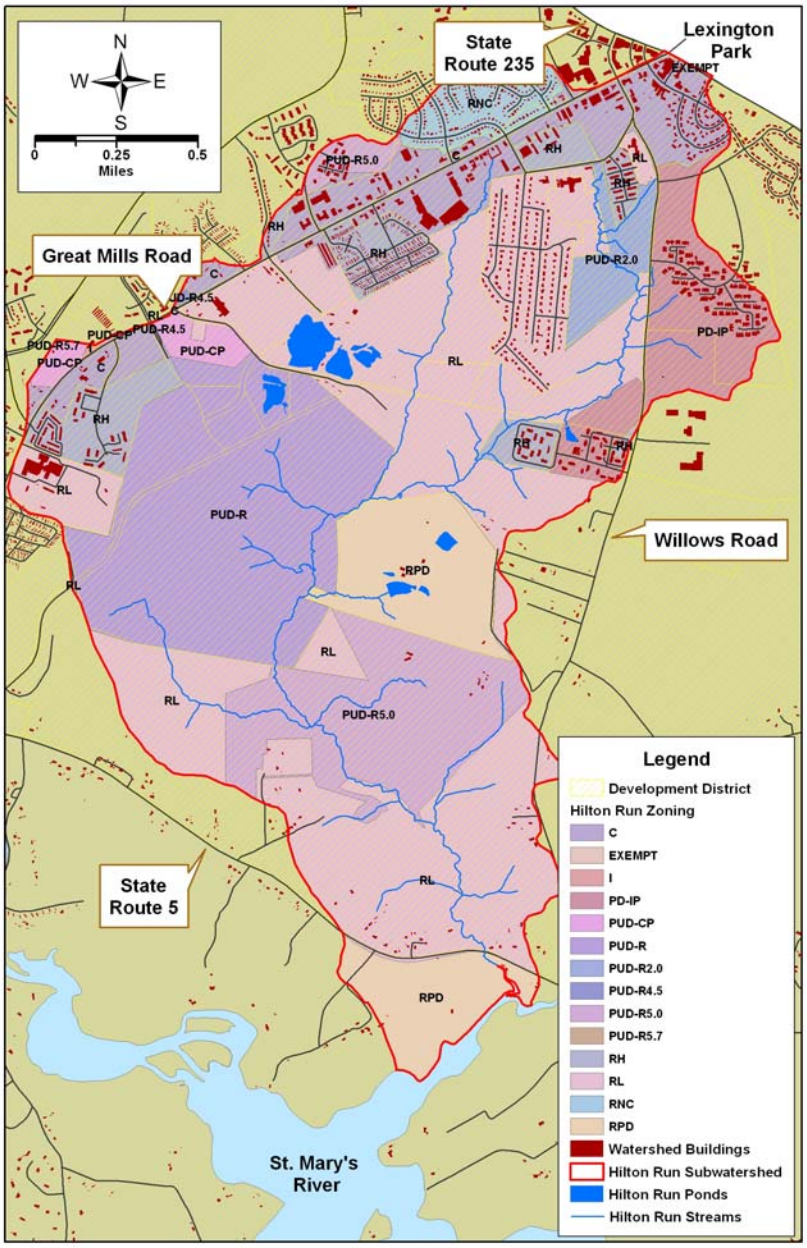
Map 10- Population didensity (persons per square mile) in the Hilton Run Subwatershed.



Map 11- Residential development in the Hilton Run Subwatershed with buildings and zoning classification.



Map 12- Impervious surface map for Hilton Run Subwatershed.



Map 13- The Lexington Park Development District with land use classification and all buildings shown.

11.2 Appendix B: Soil Types in Hilton Run

Soil Types in Hilton Run sorted by decreasing percentage

Count	Soil Type	Acres	%	Slope	Eroded
1	Aa	98.9	10.4	0	Low
2	Ad	17.2	7.0	0	Low
3	BlA	50.7	6.5	0-2	Low
4	BlB2	159.1	6.4	2-5	Moderate
5	BlB3	1.8	5.4	2-5	Severe
6	BlC2	83.2	5.3	5-10	Moderate
7	BlC3	20.9	4.6	5-10	Severe
8	Bm	25.1	3.6	0	none
9	BrB2	22.7	3.5	2-5	Moderate
10	BrC3	39.6	3.3	5-10	Severe
11	CaB2	9.8	3.2	2-5	Moderate
12	CaC2	106.5	2.6	5-10	Moderate
13	CaC3	35.5	2.4	5-10	Severe
14	CaD2	81.4	2.3	10-15	Moderate
15	CaD3	18.9	2.3	10-15	Severe
16	ChB2	49.0	2.2	2-6	Moderate
17	ChC2	20.7	2.0	6-12	Moderate
18	CrC2	36.4	1.9	5-10	Moderate
19	CrD2	28.2	1.8	10-15	Moderate
20	CrD3	53.8	1.7	10-15	Severe
21	Cu	69.7	1.6	0	none
22	EvB	29.7	1.6	0-8	none
23	EwC2	13.1	1.5	6-12	Moderate
24	EwD2	20.6	1.5	12-20	Moderate
25	EwE2	97.7	1.4	20-45	Moderate-Severe
26	FaB	35.3	1.4	0-5	none
27	KeC2	24.3	1.3	5-10	Moderate
28	KeC3	3.7	1.2	5-10	Severe
29	KeD3	2.1	1.1	10-15	Severe
30	KrA	8.1	1.1	0-2	none
31	KrB2	9.0	0.9	2-5	Moderate
32	Kz	11.5	0.8	0-5	Low
33	MmB2	12.5	0.8	2-5	Moderate
34	MtB2	13.0	0.7	2-5	Moderate
35	MuA	54.6	0.6	0-2	Low
36	RuB	16.2	0.6	0-5	Low
37	RuC2	2.6	0.6	5-10	Moderate
38	SaB2	30.6	0.5	2-5	Moderate
39	SaC2	7.5	0.5	5-10	Moderate
40	SaC3	6.0	0.5	5-10	Severe
41	SaD2	23.7	0.4	10-15	Moderate
42	SfA	2.2	0.2	0-2	None
43	SfB2	33.3	0.2	2-5	Moderate
44	SmC2	25.5	0.1	6-12	Moderate
45	Tm	7.6	0.1	0-2	None
46	WsB	8.5	0.1	2-5	Moderate

11.3 Appendix C: Aquatic Insect Sampling Data from Hilton Run

Detailed aquatic insect sampling done by Dr. Robert W. Paul on 4/31/03 at three Hilton Run Sites (MBSS sites HR1 and HR2, New Site)

Order	Suborder	Family	*Genus*	Count HR1	Count HR2	Count New Site
Coleoptera		Dryopidae	*Helicus*		3	
Coleoptera		Dytiscidae	*Laccophilus*	3		
Coleoptera		Dytiscidae	*Oreodytes*		1	
Coleoptera		Gyrinidae	*Dineutes*	1	5	3
Coleoptera		Gyrinidae	*Gyrinus*	3	3	
Coleoptera		Elmidae	*Ancyronyx*		3	14
Coleoptera		Elmidae	*Dubiraphia*		2	
Coleoptera		Elmidae	*Stenelmis*		6	3
Coleoptera		Halipidae	*Peltodytes*			1
Coleoptera		Noteridae	*Hydrocanthus*		2	
Diptera		Chironomidae			10	8
Diptera		Simuliidae	*Prosimulium*		2	
Diptera		Tipulidae	*Tipula*	1		
Ephemeroptera		Baetidae	*Heterocleon*		2	
Ephemeroptera		Emphemerellidae	*Emphemella*			20
Ephemeroptera		Heptageniidae	*Stenonema*	7	1	10
Ephemeroptera		Leptophlebidae	*Leptophlebia*	2	2	
Hemiptera		Corixidae	*Hesperocoxia*		1	1
Hemiptera		Mesoveliidae	*Mesovelia*	2		
Megaloptera:		Sialidae	*Sialis*		1	
Odonata	Anisoptera	Aeshnidae	*Boyeria*			1
Odonata		Cordulegastridae	*Cordulegaster*	1		
Odonata		Gomphidae	*Arigomphus*		13	5
Odonata		Gomphidae	*Hagenius*		1	
Odonata		Libellulidae	*Perithemis*	1	1	
Odonata	Zygoptera	Calopterygidae	*Hetaerina*	1	2	1
Odonata		Coenagrionidae	*Argia*		5	1
Odonata		Coenagrionidae	*Ischnura*	4	3	8
Plecoptera		Chloroperlidae	*Haploperla*			1
Plecoptera		Perlidae	*Agnetina*			1
Trichoptera		Hydropsychiidae	*Cheumatopsyche*	8	3	4

Trichoptera	Philopotamidae	*Chimara*	3		
Trichoptera	Polycentropodidae	*Polycentropus*			1
Trichoptera	Odontoceridae	*Psilotreta*	1		
			38	72	83
Total EPT Count			**21**	**8**	**37**
% of Total			**55.3**	**11.1**	**44.6**

Hilton Run - New Site- located between MBSS and SMRP sites- at the end of dirt road from Flower of the Forest Farm.

11.4 Appendix D: Helpful Contact Information

Center for Watershed Protection
8390 Main Street, Second Floor
Ellicott City, MD 21043-4605
Phone: (410) 461-8323
Fax: (410) 461-8324
E-mail: center@cwp.org

Maryland Association for Environmental and Outdoor Education
(MAEOE)
PO Box 57
Queenstown MD 21658
410.827.7614
www.maeoe.org – click on Green Schools for information on Governor's Green School Program

National Wildlife Federation
11100 Wildlife Center Drive
Reston, VA 20190-5362
Tel: 1-800-822-9919
www.nwf.org/backyardwildlifehabitat/

St. Mary's River Watershed Association
PO Box 94
St. Mary's City, MD 20686
E-mail: smwatershed@yahoo.com

St. Mary's River Project
St. Mary's College
18952 East Fisher Rd
St. Mary's City, MD 20686
Tel. 240.895.4361
Fax. 240.895.4996
E-mail: hbbush@smcm.edu

United States Fish and Wildlife Service
177 Admiral Cochrane Drive
Annapolis, MD 21404
Tel: 410-573-4573; school habitat projects- 410-573-4545
http://chesapeakebay.fws.gov/bayscapes.htm

Wildlife Habitat Council
8737 Colesville Road, Suite 800
Silver Spring, MD 20910
Tel: 301-588-8994
Fax: 301-588-4629
E-mail: Whc@wildlifehc.org