Isle of Wight Bay
Watershed Restoration Action Strategy

Worcester County, Maryland

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January 2002

Financial assistance provided by the Coastal Zone Management Act of 1972, as amended, administered by the Office of Ocean and Coastal Resource Management, National Oceanic and Atmospheric Administration (NOAA). A publication (or report) of the Maryland Coastal Zone Management Program, Department of Natural resources pursuant to NOAA Award No. NA07OZ0118.

8-28-01

Isle of Wight Bay Subwatershed Plan Summary

Chapter 1 Introduction

- Chapter 1 includes introductory information regarding the subwatershed and the Plan.

Chapter 2 Goals and Objectives

The goals and objectives of the Plan were drafted by the Committee and cover a wide range of topics relevant to the protection of the economic, cultural and natural resources of the Isle of Wight Bay subwatershed. The overall goals are to:

- Accommodate future growth in a way that minimizes its impact and enables the watershed to continue as an excellent way to live, play and earn a living.
- Improve water quality and wildlife habitat to the highest level practicable and restore areas that are already degraded.

Chapter 3 Coastal bays Protection Area

Chapter 3 recommendations build upon Chapter 2 goals and objectives, existing water quality protection plans and laws adapted to the characteristics of the Isle of Wight Bay subwatershed and specific recommendations from Committee members. The following are the primary substantive recommendations of the Plan:

- ### The Coastal Bays Protection Area

  Establishes the Coastal Bays Protection Area (CBPA) as the Coastal Bays watershed. The CBPA is a planning and management tool used to enhance water quality and habitat by protecting coastal resources from land use impacts. The CBPA is a component of the Isle of Wight Bay Subwatershed Plan and will also be used as the planning process continues with the remaining coastal bays subwatersheds.

- ### Land Use Classifications

  Divides the land in the subwatershed into Development Areas, Transition Areas, and Resource Use and Conservation Areas. These areas are established based on the level of development and the predominant types of land uses. Through comprehensive planning, new development will be located in Development Areas, lower intensity development will be permitted in Transition Areas with practices to reduce negative impacts on water quality and habitat, and new development will be limited in the Resource Use and Conservation Areas. The Plan recognizes that new Development Areas will need to be created to accommodate future growth. These will be established as overlay zones that provide for planned communities incorporating all appropriate site design and best management practices.

- ### Land Uses of Special Concern

  Specifies five types of land uses that will only be permitted in the CBPA after careful review that demonstrates that there will not be a degradation in water quality in the adjacent body of water. These land uses are:
  - nonmaritime industry;
  - transportation facilities and utility transmission facilities;

- permanent sludge handling, storage, and disposal facilities except those required for agricultural operations;
- solid or hazardous waste collection or disposal facilities;
- sanitary landfills.

Existing Lots and Land Uses

Recommends the creation of specified exemption areas for the most developed parts of the subwatershed in the designated Development Areas. Exempts existing legally recorded lots in subdivisions and existing legal land uses. Existing lots that are in specified exemption areas or subdivisions will not be required to adhere to the provisions of the Plan or its implementing ordinance.

Reducing Development Impacts

Recommends the application of measures aimed at reducing development impacts through site planning, stormwater management and public education.

- **Site Planning**
  Recommends that conservation subdivision design techniques be incorporated into the site planning process for all new development. These techniques limit the creation of impervious surfaces and protect open space and natural areas that assist in stormwater retention and treatment.

- **Stormwater Management**
  Recommends the reduction of stormwater quantity and the improvement of stormwater quality through the protection of as much of the predevelopment hydrology as possible and the application of best management practices for on-site retention and treatment. Specifies that the County is implementing the state's improved stormwater management regulations.

- **Public Education**
  Reiterates the County's commitment to work with the Maryland Coastal Bays Program (MCBP) and other organizations to provide materials and programs to teach residents and businesses how to reduce the negative impacts of their actions on habitat and water quality.

Habitat Protection Areas

The Plan establishes several Habitat Protection Areas. These are:

- **A 100-Foot Buffer**
  Requires a 100-foot buffer of native woody vegetation on both sides of all tidal waterbodies and wetlands. No new development or redevelopment will be allowed within the buffer except for those necessarily associated with water dependent facilities. Nontidal streams are protected through buffers and other alternative methods providing for biological cleansing. Includes a provision that allows for a reduction of the setback requirement for parcels intended for single family purposes that have not been subdivided as of the adoption of the Plan's implementing ordinance if such parcels are unable to meet the full buffer requirement because of their physical characteristics. This sliding scale provision will create a reduced setback based on the dimensions of the parcel while requiring the maintenance of the 100-foot buffer to the maximum feasible extent.

- **Forest and Woodland Protection**

Recommends the adoption of policies aimed at maintaining and increasing the forest in the CBPA. These include:

- minimizing the removal of trees for development
- mitigating tree loss where removal cannot be avoided

- preservation of riparian and wetland forest habitat for wildlife corridors

Habitats of Species That Are Threatened, Endangered, Or In Need of Conservation

Recommends that impacts to the areas immediately surrounding the habitats of species that are threatened, endangered or in need of conservation be avoided to the maximum extent practicable.

Important Plant, Fish and Wildlife Habitat and Nontidal Wetlands Protection Areas

Specifies measures to protect important plant, fish and wildlife habitats including:

- A 100-foot buffer around all colonial water bird nesting sites in which all development activities will be prohibited.
- Locating new water dependent facilities in a manner that reduces impacts on important plant, fish and wildlife habitats.
- Preserving and establishing forested corridors between habitats of important plant, fish and wildlife.
- The prohibition on the installation of riprap or other artificial surfaces, channelization, and impoundments in streams used by anadromous fish for spawning purposes.

Water Dependent Facilities

Describes and recommends best management practices for marinas. Recommends that the County consider providing incentives for developers to establish community piers. Allows public beaches, recreation and education areas to be located within the buffer in Development Areas and in Transition Areas under certain conditions. Allows new or expanded water dependent facilities to be located within the buffer in Development Areas and Transition Areas if:

- the project meets a recognized private right or public need
- adverse effects on water quality and plant, fish and wildlife habitat are minimized
- associated nonwater dependent structures are located outside the buffer insofar as possible

Measures to Reduce Shoreline Erosion

Expresses a preference for "soft" vegetated stabilization methods over "hard" engineered methods.

Agriculture

Recommends best management practices for agricultural operations. Agricultural activities are permitted within the buffer if a nutrient management plan is in place or a minimum 25-foot vegetated filter strip is maintained between the activity and any body of water.

Surface Mining

Recommends the minimization of the negative impacts of surface mining on the CBPA by restricting mining from:

- important natural resource areas
- areas subject to heavy erosion
- areas where agriculture or forest productivity would be jeopardized
- areas within the buffer

Protected Natural Areas

Recommends that the County identify areas within the CBPA where protected natural areas could be established. Such establishment should take place through acquisitions, easements, designation or any other appropriate means.

Chapter 4 General Recommendations

Chapter 4 includes additional recommendations aimed at achieving the objectives of the subgoals established by the Committee.

- ## Wastewater Treatment
  Recommends providing central sewer service for the majority of the anticipated future growth through expansion of existing treatment plants or the creation of new ones. Recommends the assessment of the applicability of septic system alternatives.

- ## Monitoring
  Reiterates the County's commitment to work with the MCBP to implement the volunteer and standard monitoring program of the CCMP.

- ## Restoration
  Recommends that opportunities for restoration projects be identified and pursued.

- ## Coordination with Delaware
  Recommends that the County cooperate and coordinate with agencies and organization within Delaware in order to identify solve cross border problems in the subwatershed.

- ## Variances
  Includes variances for circumstances where strict adherence to the Plan's provisions create undue burdens on property owners.

Isle of Wight Bay Subwatershed Management Plan

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The Isle of Wight Bay Subwatershed Management Plan

Chapter 1 Introduction

This Plan provides a strategy for policies and actions to meet current and anticipated challenges in the Isle of Wight Bay Subwatershed (IOW). This 74 square mile watershed contains the County's most intense development both in terms of type and amount, substantial water and land based recreational assets, and over 24,000 acres of productive forest and farmland.[1] The Isle of Wight Bay subwatershed is the most complex subwatershed in the Coastal Bays drainage due to its physical configuration, existing land uses and expected future development pressure. The Isle of Wight area so far has received the bulk of Worcester County's recent growth. The future certainly will bring even more development and change.

The Isle of Wight Bay along with the Coastal Bays four other bays (Assawoman Bay, Sinepuxent Bay, Newport Bay and Chincoteague Bay) and our ocean beaches provide the bulwark for tourism, the County's economic engine. Additionally, the subwatershed contains significant agricultural and forestry resources. These land uses have provided the long standing economic, cultural and social backbone for the County. Protecting these assets while providing for their use is paramount to the County's quality of life and economic future.

Planning Strategy

With the above as backdrop, Worcester County participated in and supported the Maryland Coastal Bay's Comprehensive Conservation Management Plan (CCMP). This plan challenges the participants in its Community and Economic Development chapter to "[e]nhance the buffering capacity of the watershed's tidal and nontidal shoreline area"[2].

This plan goes beyond the CCMP's buffer challenge and addresses the watershed planning issues necessary for achieving a comprehensive and effective watershed management strategy. These issues include:

- Land use planning and growth management
- Land and natural habitat conservation
- Aquatic buffers (both tidal and nontidal)
- Site design for sustainable development
- Erosion and sediment control
- Stormwater management and treatment
- Other nutrient, toxic and sediment source mitigation
- Individual and collective stewardship actions

A primary component of the Plan is that it addresses the entire subwatershed and does not make the somewhat artificial distinction between tidal and nontidal water bodies. This is a recognition that from a water quality perspective the protection of the upper reaches or "headwaters" of waterbodies has the greatest potential for nutrient, sediment and other pollutant reduction. Also, tidal areas have

traditionally fallen under the greatest development pressure. At this time, it is clear that nontidal areas are coming under development pressure in the subwatershed and require suitable protection also if the subwatershed's integrity is to be maintained. Therefore, the Plan's recommendations include both the tidal and nontidal portions of the watershed for buffering and other measures.

This plan relies five basic guiding principles to serve as benchmarks against which all proposals have been judged. They are:

1. Fairness, in that all persons who live, own property, work or play in the watershed benefit from maintaining and improving the watershed's resources. Therefore, the plan attempts to distribute the benefits and tasks proportionately, asking all to do their part.
2. Growth will come to the Isle of Wight subwatershed and it should be accommodated in a way that preserves residents' current and future access to Worcester County natural resource oriented quality of life.
3. Reduce water quality and wildlife habitat impacts of new development and expansions of existing development through the use of best available management techniques. Such approaches should be judged on performance, safety, ease of maintenance, practicality of enforcement, community acceptance and longevity and environmental benefit.[3]
4. Existing land users should do their part; therefore they should be encouraged to reduce impacts of expansions and new developments of existing properties. Educational efforts and voluntary programs should provide information on and avenues for the many action opportunities for existing properties.
5. Restoration opportunities should be aggressively pursued as resources and site opportunities arise.

The objective is to provide a balanced approach to accommodate existing needs and meet our anticipated future development demands. This should be done while preserving the resources that have made Worcester County the second fastest growing County in Maryland.

Plan Organization and Development

This document has been kept concise to focus on policy and action items. The purpose is to deliver the Plan's recommendations in a clear and readily accessible format. Background and supporting documentation are provided, but they are contained in appendices and companion documents, primarily the Isle of Wight Bay Watershed Characterization. They are available on the County's website: http://www.co.worcester.md.us/iowpage.htm, or by requesting a hard copy from the Department of Comprehensive Planning (410.632.5651).

The Plan relied on existing and new data on: land uses, natural resources and demographics along with significant public input. This work was completed on an accelerated schedule and was intended to provide guidance not only for the Isle Wight Bay subwatershed, but also initial guidance for the interim measures for the remaining Coastal Bay subwatersheds.

Public involvement has been central to all stages of the Plan's development. In February of 2001, the Worcester County Commissioners appointed the Isle of Wight Bay Subwatershed Planning Committee. The Committee consisted of 18 members who represented a broad spectrum of community interests. Represented were:

- Worcester County Planning Commission
- Ocean City
- Ocean Pines

- Bishopville
- West Ocean City
- Agriculture
- Development
- Environmental
- Tourism/Hospitality
- Fishing/Boating
- Commercial/Retail
- Poultry Industry

The Committee assisted in the development of goals, objectives and management measures for the Plan, provided issue and solution recommendations, and reviewed and commented on the draft Plan. The Committee met nearly twice monthly from April through August. Appendix B provides a summary of the Committee's activities.

Plan Organization

This chapter introduces the subwatershed planning process and provides introductory material for the Plan. Chapter 2 contains the Plan's goals and objectives. Chapter 3 contains the provisions for the Coastal Bays Protection Area, classifies this area based on land use, recommendations about how to limit the land use impacts on water quality and wildlife habitat, and establishes a buffering strategy. Chapter 4 contains specific recommendations on wastewater treatment, water quality monitoring, point sources, restoration opportunities, and administrative issues.

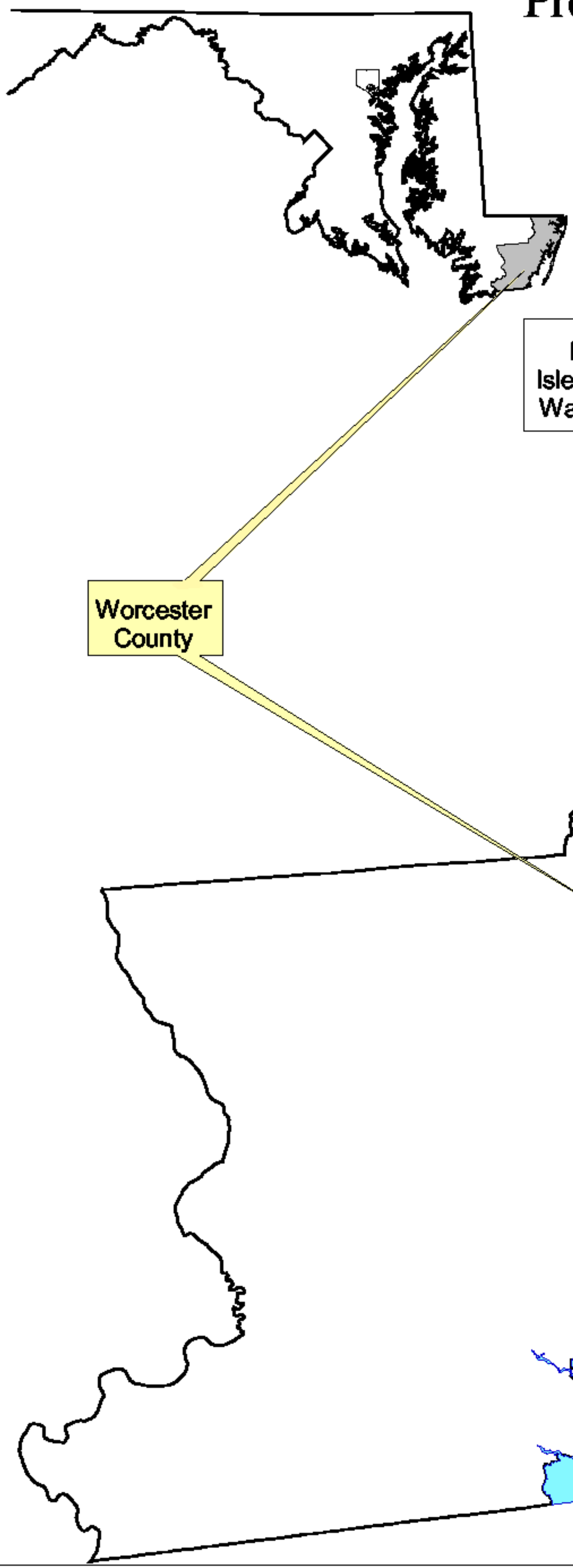
Existing Conditions

Below is a brief synopsis of the subwatershed's key features. For a more complete description of the Isle of Wight Bay Subwatershed existing conditions see the Isle of Wight Bay Subwatershed Characterization Report.

Physical Features

The Isle of Wight Bay subwatershed covers 74 square miles of land and water in Worcester County, Maryland (64 square miles) and Delaware (10 square miles). Map 1 locates the subwatershed within Worcester County.

Map 1
Isle of Wight Bay Watershed
Watershed Restoration Action Strategy (WRAS)
Project Area



The watershed drains a portion of southern Sussex County, Delaware in the Selbyville area and covers much of the northeastern segment of Worcester County. These waters move through the subwatershed and eventually drain into the Isle of Wight Bay and then through the Ocean City Inlet to the Atlantic Ocean. The major waterways in rough size order are:

1. St. Martins River
2. Herring Creek
3. Turville Creek
4. Shingle Landing Prong
5. Bishopville Prong
6. Manklin Creek
7. Church Branch
8. Middle Branch
9. Birch Branch
10. Windmill Creek
11. Perkins Creek
12. Carey Branch
13. Slab Bridge Prong
14. Buntings Branch

Land uses are a mix with agriculture and forest dominating while urban development is an increasing component. Map 2 shows land uses within the subwatershed.

Map 2

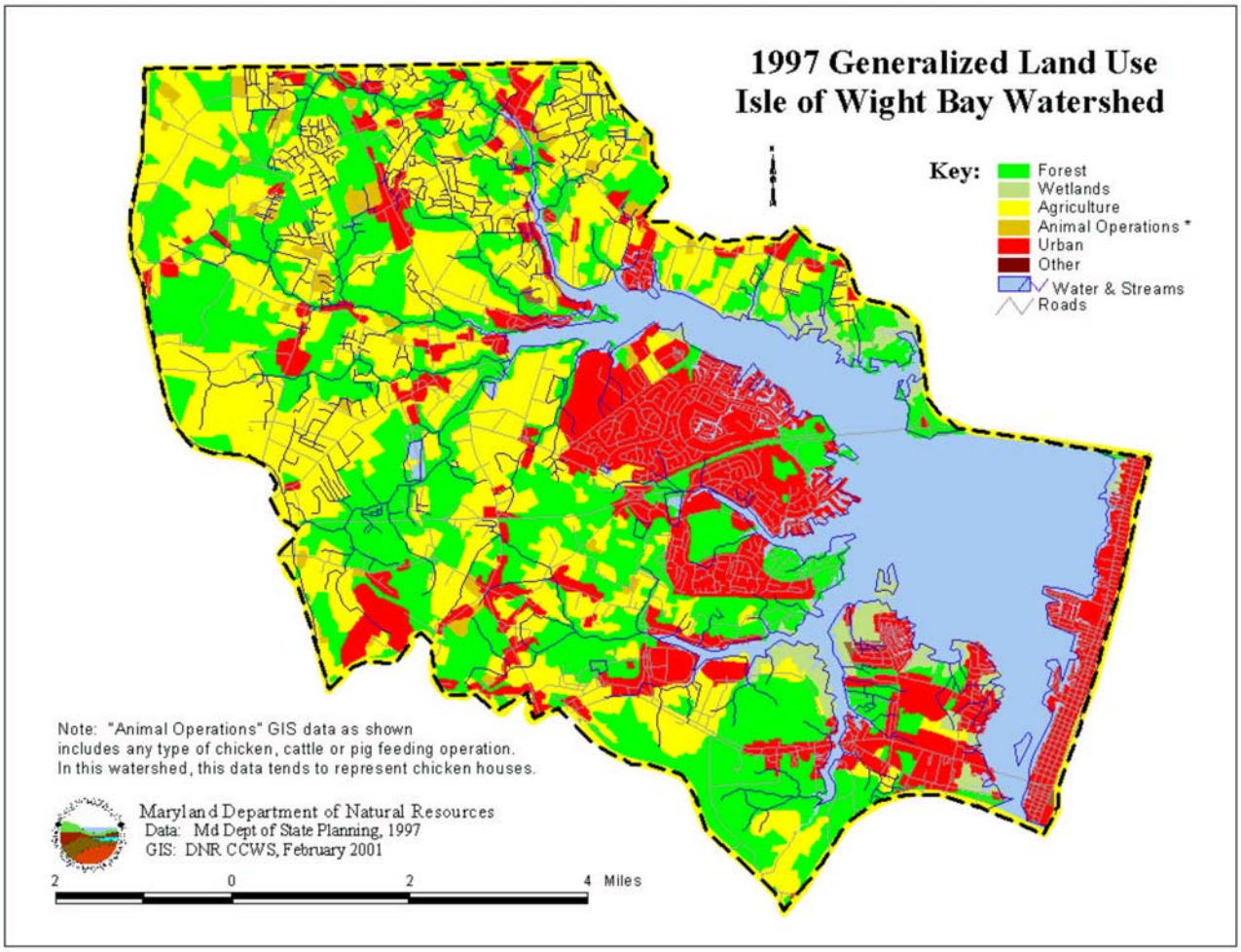


Table 1.1 Land Use In Maryland's Portion Of The Isle of Wight Bay Subwatershed

Category	Acres	Percent
Agriculture	12,463	37
Forest	12,310	37
Urban	7,830	23
Other	1,008	3
TOTAL	**33,611**	**100**

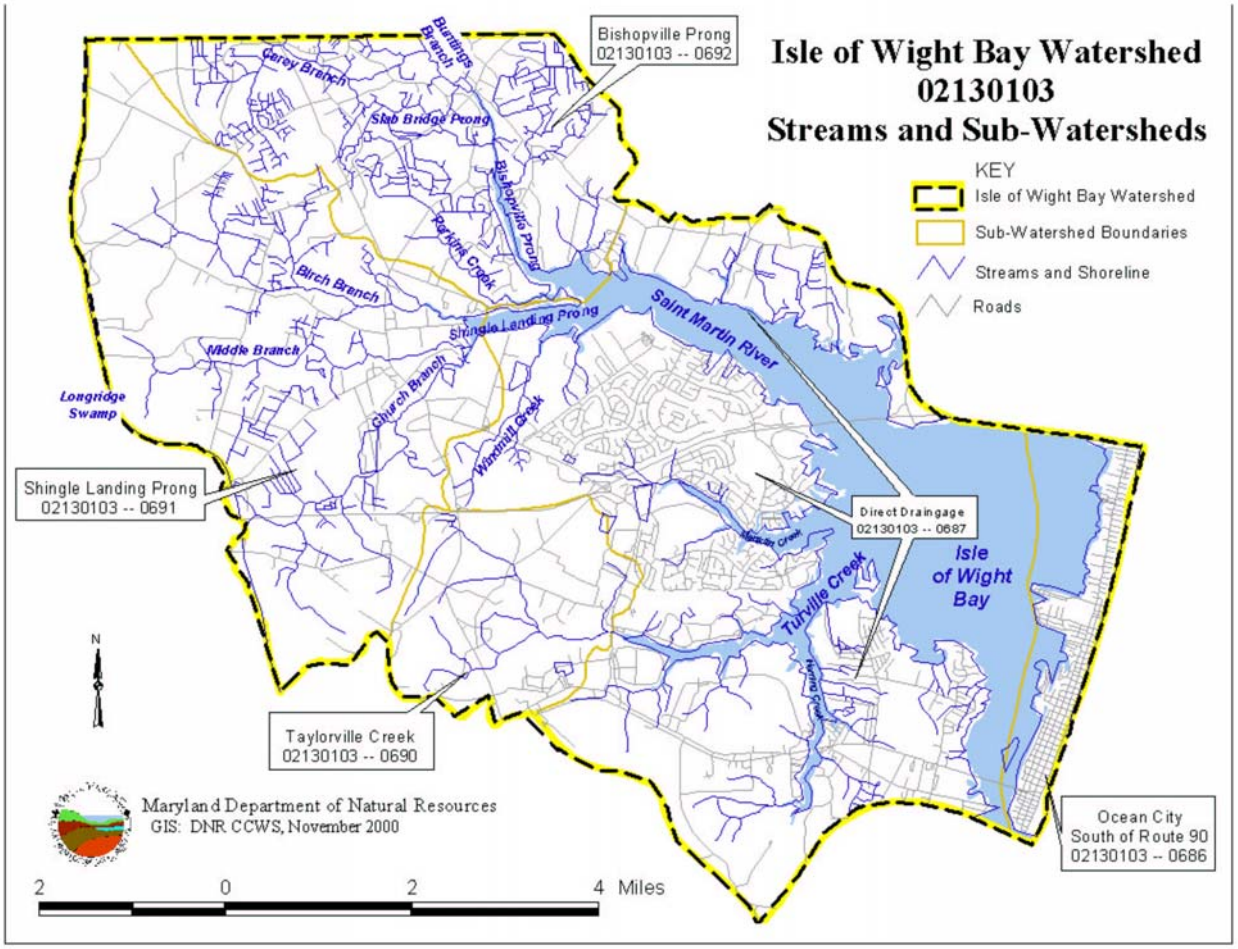
Hydrology and Water Quality

Like the rest of Delmarva, the subwatershed has little relief and therefore, its hydrology is dominated by small, shallow, and generally slow moving streams. Headwaters areas are dominated by agricultural ditches and wetlands that feed the creek and stream system which eventually reach the Isle of Wight Bay.

Excessive nutrients have been consistently measured in the St. Martin River and its tributaries, Herring Creek and Turville Creek[4]. These waterways, and the Isle of Wight Bay that receives their flow are all failing to meet state water quality standards due to excessive nutrients, low dissolved oxygen and fecal coliform bacteria.

Map 3 displays the subwatershed's hydrology.

Map 3



Development

Most of the subwatershed is zoned agricultural, particularly in the western portion. Residential zoning and therefore uses, dominate the subwatershed's eastern portion. Ocean Pines, Ocean City, and West Ocean City are the most rapidly developing areas within the subwatershed. Map 4 displays the zoning in the Isle of Wight Bay subwatershed. Table 1.2 compares the number of development permits issued in the County to those issued in the Isle of Wight Bay subwatershed.

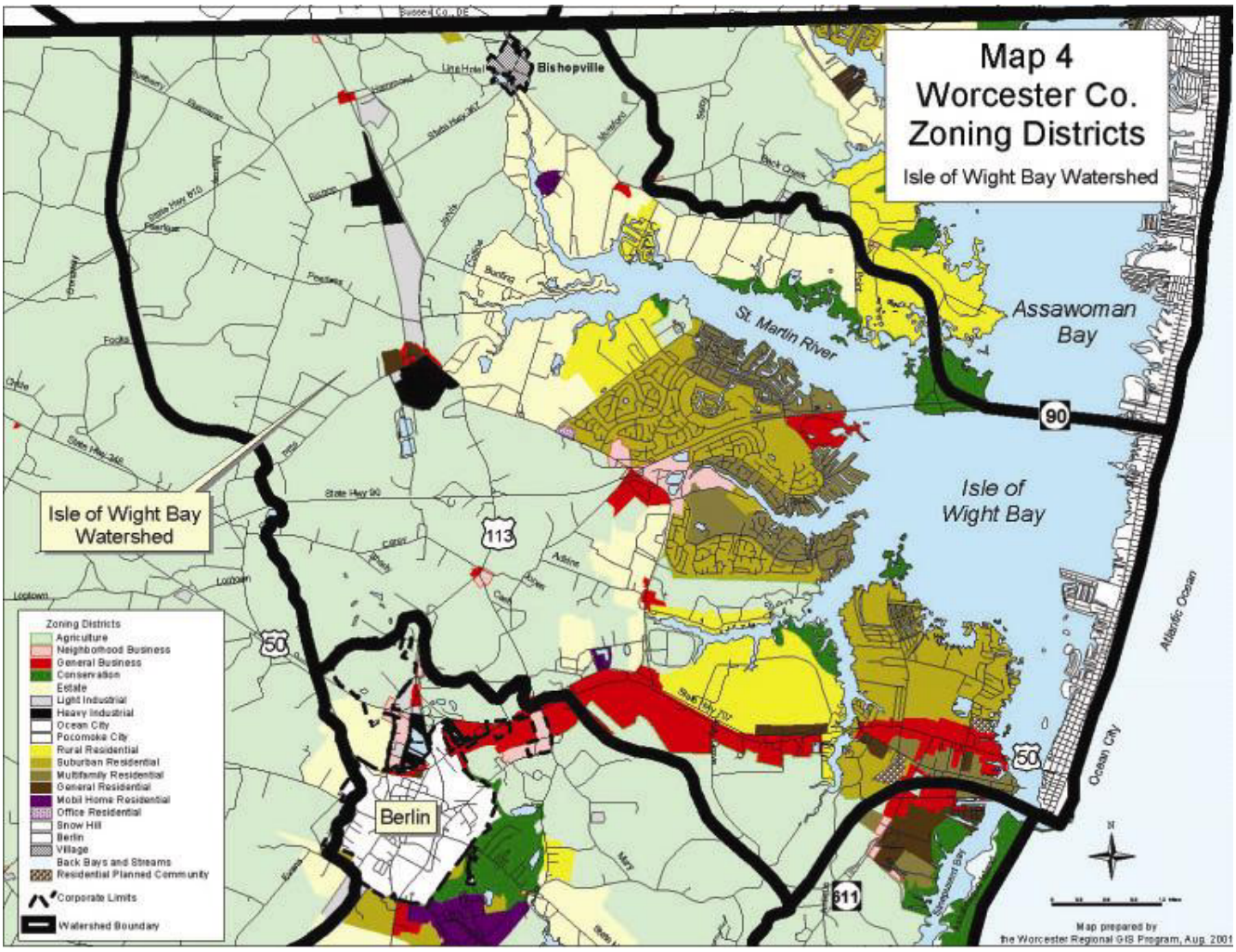


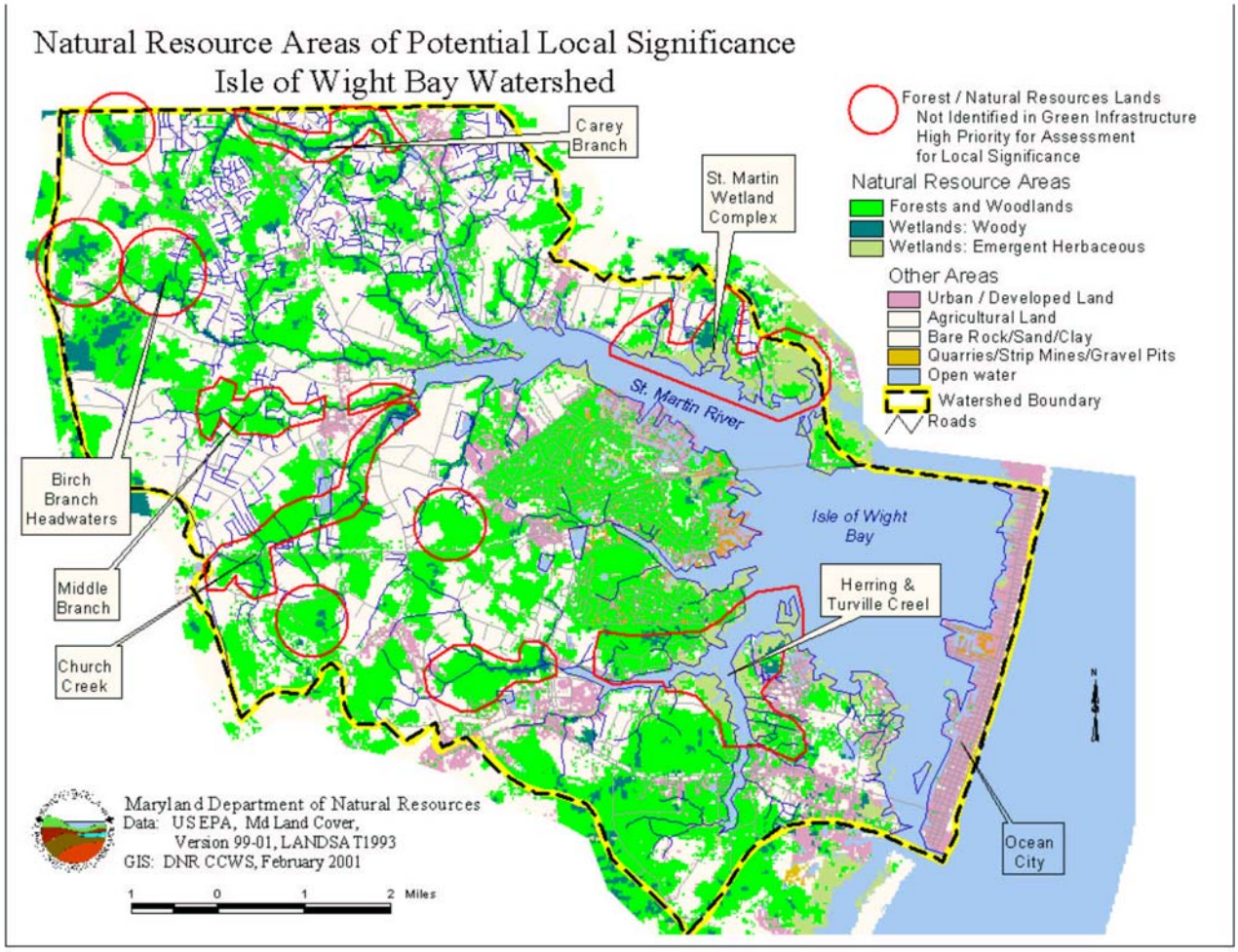
Table 1.2 Development Permits in County and Isle of Wight Bay Subwatershed[5]

Year	Total New Lots	IOW New Lots	Total Commercial Permits	IOW Commercial Permits	Total Subdivisions	IOW Subdivisions	Total New Dwelling Permits	IOW New Dwelling Permits
1999	663	425	96	57	150	56	476	321
2000	609	533	99	68	135	63	575	317

Sensitive Areas

The subwatershed contains many areas of ecological and/or biological significance. These include large forested areas, tidal and nontidal wetlands, and habitats for rare, threatened, or endangered species of plants and animals. Map 5 displays wetlands, forest cover and natural resource areas of potential local significance.

Map 5



Water Quality Issues

The waters of the Isle Wight Bay are listed by the state as a Priority I, in need of restoration.[6] Water quality is impaired by:

- high nutrients (ammonium, nitrogen, phosphorous)
- low dissolved oxygen
- fecal coliform bacteria

Nutrients result from stormwater runoff from urban developed and agricultural areas, atmospheric deposition and a variety of other sources. Nutrients fuel excessive algae growth, which results in low dissolved oxygen when it decomposes. Low dissolved oxygen affects fish and other life forms decreasing their diversity and in the extreme, fish kills. Fecal coliform bacteria results from human and animal waste in the water; its serves as an indicator of potential human health problems. Fecal coliform sources include pet and wild animal waste in stormwater runoff and septic tanks leaching into groundwater.

These problems resulted in the failure of the waterbodies within this watershed to meet their designated uses under the state's Clean Water Action Plan. The Characterization Report indicates the primary cause of these problems to be nonpoint source pollution. Nonpoint source pollution impacts are exacerbated by limitations on the buffering capacity of the Isle of Wight Bay and its tributaries.

To address these issues, the Plan provides for substantially increased tidal water body buffers, enhanced design standards for development affecting nontidal water bodies and the implementation of best management practices through new stormwater regulations and a variety of initiatives to use current planning practices to mitigate new development impacts while encouraging existing land uses to reduce their water quality impacts.

Demographics

Worcester County is experiencing rapid growth, particularly in the Isle of Wight Bay subwatershed. Census 2000 data support this trend.

Population of the Isle of Wight Bay Subwatershed[7]

Location	**1990 Population**	**2000 Population**
Ocean Pines	4,251	10,496
Ocean City	5,146	7,173
Subwatershed Total	11,470	19,595
County Total	35,028	46,543

Economy

The economy of the Isle of Wight Bay subwatershed is based primarily on tourism, retail and services, and agriculture. Timbering, fishing, real estate and construction are also very important to the economy.

Tourism and hospitality are the focus of the economy because of the recreational opportunities and amenities of the Isle of Wight Bay, the Atlantic Ocean and Ocean City. Worcester County has over 3,000 hotels and motels, 700 amusement and recreation establishments, and 3,500 restaurants.[8] Most of these are located within the Isle of Wight Bay subwatershed and cater to seasonal tourists that number on average, 300,000 on weekends.[9]

The subwatershed's agricultural products include row crops of corn and soy beans with numerous chicken operations that are supported by a hatchery and a processing facility. Agriculture, a major component of the economy, has also shaped the social and physical landscape.

This economy is dependant upon the maintenance of good water quality. As long as people can swim in the water, catch edible fish, and relax on beaches free from pollution, they will continue to visit, thereby providing income and employment. At the same time, agriculture should be encouraged to fill its traditional role of providing a major economic, cultural and land use influence. Any negative impacts on water quality, whether they are from agriculture, tourism, or any other industry, could potentially change the economy substantially if recreational uses are impeded. Therefore, one of the major thrusts of this Plan is to encourage all aspects of the economy to continue to thrive in a sustainable manner.

Chapter 2 Goals and Objectives

The Plan's goals and objectives were drafted by the Committee to guide the subwatershed planning process towards achieving its overall goal. The goals and objectives touch on a wide variety of conditions and activities and, even considered in isolation represent a significant degree of consensus on major issues impacting the subwatershed. As components of the Plan, the goals and objectives form the foundation for the policy decisions and provide a direction for the Plan and any future implementing legislation.

Overall Goal

The Isle of Wight Bay Subwatershed has been degraded by human activity and is expected to experience substantial future growth. The goal of this plan is to accommodate this growth in a way that minimizes its impact and enables the watershed to continue as an excellent place to live, play, and earn a living. In addition, measures should be taken to improve the water quality and wildlife habitat to the highest level practicable and to restore areas that are currently degraded.

Subgoals and Their Objectives

1) **Maintain and improve ground and surface water quality** to support water contact recreation; fishing; propagation of fish, other aquatic life, and wildlife; and agricultural, industrial, and residential water supply. See Appendix C for a detailed list of water quality standards.

- Surface water quality should meet or exceed state standards.
- Groundwater quality should meet or exceed state standards.
- Pollution from septic systems should be treated to prevent contamination.
- Aquatic insect sampling should indicate species abundance and diversity characteristic of a healthy aquatic ecosystem.
- Opportunities for the further reduction of the amount of point source effluent released into the watershed should be explored in order to achieve the water quality goals listed in Appendix C.
- Measures to improve flushing of the Bay should be explored, particularly for the Route 50 bridge area.

2) **Foster responsible development** within the watershed in a manner that protects water quality, sensitive areas and quality of life for all living resources.

- Worcester County government and citizens should take responsibility to establish, protect and improve riparian, wetland, and shoreline buffers.
- "Soft" stabilization methods (live staking, live fascines, brushlayering) should be encouraged for shoreline construction and/or stabilization projects.
- Suitable revisions in siting, design and construction practices that protect water quality and natural resources should be implemented.
- Options for development of a central sewage treatment plant should be explored for the northern County to decrease reliance on on-site disposal systems, foster clustering of new development and protect valuable open space.
- Applicable County regulations should be reviewed for consistency with the "1997 Sensitive Areas Supplement" to the Comprehensive Plan, and the Comprehensive Conservation and Management Plan and revised where necessary.

3) **Enhance natural habitat** in order to support healthy and diverse populations of native plants, animals and aquatic organisms.

- The amount of protected open space should be increased.
- Natural terrestrial and aquatic habitat corridors should be established, maintained and restored in order to provide protected pathways for wildlife.
- Agricultural and rural areas which are not planned for development should be protected through the maintenance of the minor subdivision regulations of the A-1 Agricultural district, and the consideration and adoption of other suitable implementation measures such as transfer of development rights.

4) **Stormwater from existing and new development should enter stream systems more gradually**, with lower peak flows and pollutant loads.

- Implement the new stormwater management regulations using stormwater best management practices and proper site designs.
- Impervious cover should be reduced in new developments.
- Stormwater management practices should meet performance criteria as outlined in the 2000 Maryland Stormwater Design Manual for total suspended solids and total phosphorus.
- Existing developments should strive to meet the same performance criteria wherever possible.
- A County program should provide technical assistance to those seeking to comply with stormwater regulations.
- Retrofits, grant availability, cost-share assistance, and other incentives to meet performance criteria in existing developments should be investigated.
- Monitor water quality changes to determine the effectiveness of actions taken.

5) The **tourism industry should be sustainable** so that its important role in the economy can continue without impairing other watershed values.

- Low impact recreational access to natural areas within the watershed should be increased.
- Personal watercraft use should be managed to sustain a healthy and safe watershed.
- Boating access and quality should be enhanced and maintained.
- Appropriate sites in the watershed for more parks and open space should be found.

6) The **agricultural industry should be sustainable** so that its important role in the economy, culture and landscape can continue with minimal impacts on other watershed values.

- The largest and most practical percent of agricultural land should be maintained through zoning and other protective programs.
- Voluntary programs should be developed to prevent the conversion of agricultural land to developed land (*e.g.* land banks, Rural Legacy, transfer of development rights, open space programs).
- Nutrient inputs to surface and groundwater should be reduced through the implementation of best management practices.

7) Watershed **residents should take more action to protect, restore and steward** the environment.

- Through education and awareness, residents should learn about the natural resources around them, the susceptibility of those resources to degradation by human activities, and how such degradation can be avoided.
- Everyone should accept responsibility for care of waterways.
- More residents should participate in monitoring and restoration events.
- An education program explaining the benefits of watershed protection and the appropriate actions required should be implemented.

8) Natural **resource harvesting should be sustainable** and equitable.

- There should be a healthy and stable forestry industry in the watershed.
- There should be healthy and stable sport and commercial fishing industries in the watershed.
- Fishing and hunting activities should continue to take place where they are allowed presently as long as harvests are sustainable. This policy may be need modification if conditions change.
- Fishery management plans should be developed to maintain healthy and stable stocks of fish and shellfish.
- Clamming should be regulated in the watershed so as not to disrupt environmentally sensitive areas. Harvesting techniques should be studied to determine their appropriateness.
- Adopted fishery management plans should be followed.

9) There should be a significant **reduction in the amount of solid waste generated, stored and dumped**.

- Encourage recycling by showing its environmental and economic benefits.
- There should be more opportunities for recycling a wider variety of wastes.
- Education and outreach should help citizens find ways to reduce waste flow.
- The County should develop a pollution prevention plan and should require that, at settlement, new property owners receive and sign for the MCBP homeowner's manual.
- The County should consider implementing a mandatory recycling program.

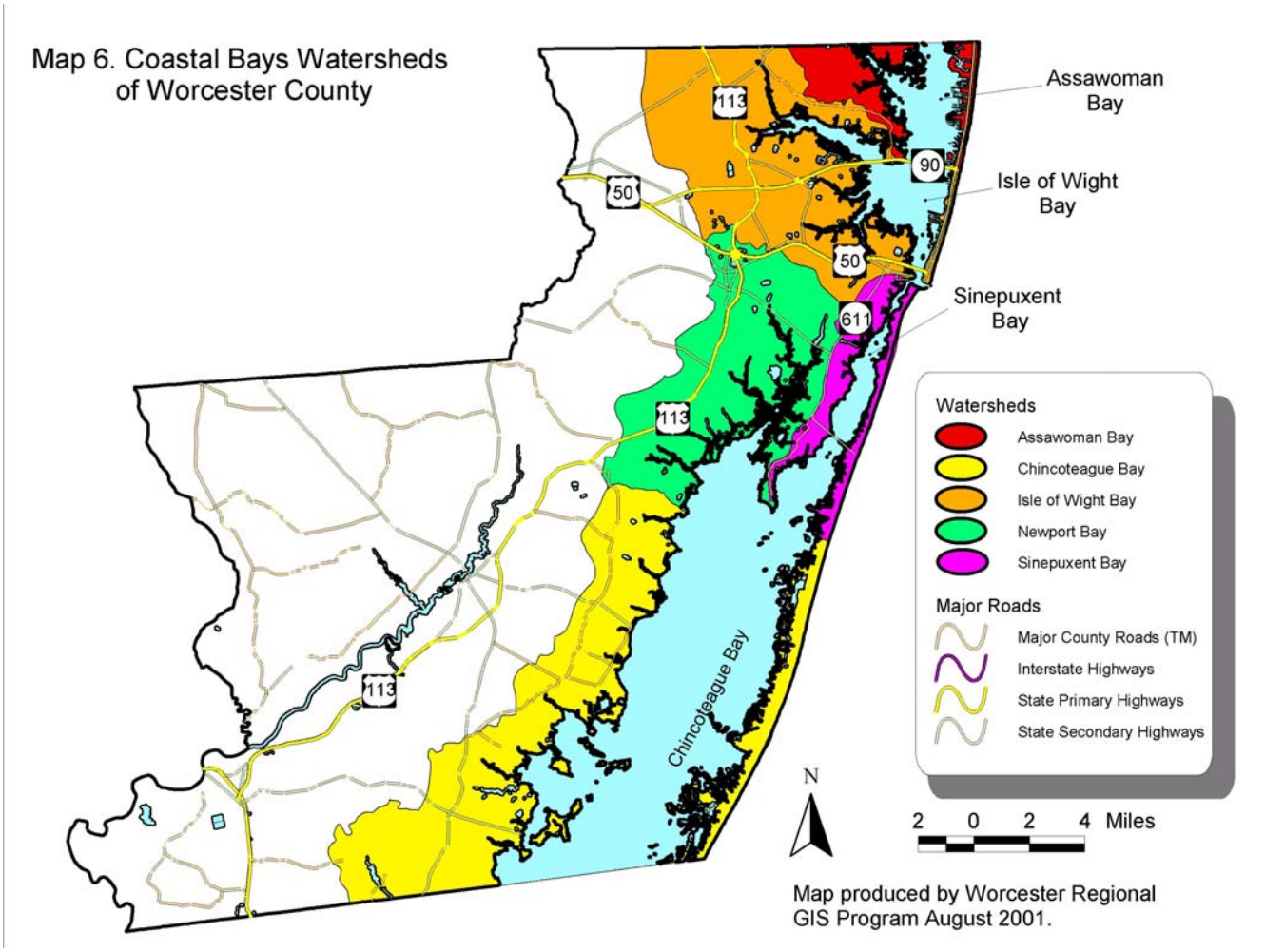
10) Agencies and other groups should **work together in the identification and resolution of water quality problems.**

- An ongoing sampling and monitoring program should be in place and the results should be readily available to the public.
- Agency roles should be defined for responding to concerns.
- There should be active resident involvement in identifying and reporting water quality concerns and in certain aspects of Plan implementation.
- Regular reports on the progress of Plan implementation should become part of the Comprehensive Plan update process.
- A strong working relationship between all interest groups should be fostered.
- Worcester County should be the keeper of the plan (i.e., the lead organization).
- The County, municipalities and homeowners associations should lead by example and aggressively provide demonstration projects and practices.

The above goals and objectives cover a variety of issues. Those appropriate to watershed planning have been addressed by this Plan. Others more appropriate to the comprehensive planning process will be addressed during the update of the County's Comprehensive Plan which is currently underway.

Chapter 3 The Coastal Bays Protection Area

The Coastal Bays Protection Area (CBPA) is established to protect coastal resources from land use impacts. This will protect and enhance water quality and wildlife habitat. The intent of this action is to maintain and improve the area's quality of life. The Coastal Bays Protection Area consists of the Coastal Bays watershed and all waterbodies and submerged lands within it. The Coastal Bays watershed consists of the Assawoman Bay, Isle of Wight Bay, Newport Bay, Sinepuxent Bay, and Chincoteague Bay subwatersheds. Map 6 displays the Coastal Bays Protection Area.



Although this Plan specifically addresses the Isle of Wight Bay subwatershed, the CBPA defined and contained in this plan is adopted as an effective course for addressing the watershed planning issues in the Isle of Wight Bay, as well as the remaining Coastal Bay subwatersheds.

Existing Lots and Land Uses

It is the policy of this plan to provide specified exemption areas in the designated Development Areas and to grandfather existing legally recorded lots, existing legally recorded parcels used for a single, single family use and existing land uses. This provision shall apply to all such lots, parcels and uses as of the effective date of this Plan's implementing ordinance. This policy means that such properties shall not be required to meet this Plan's provisions or its implementing ordinance during their development or a use's expansion.

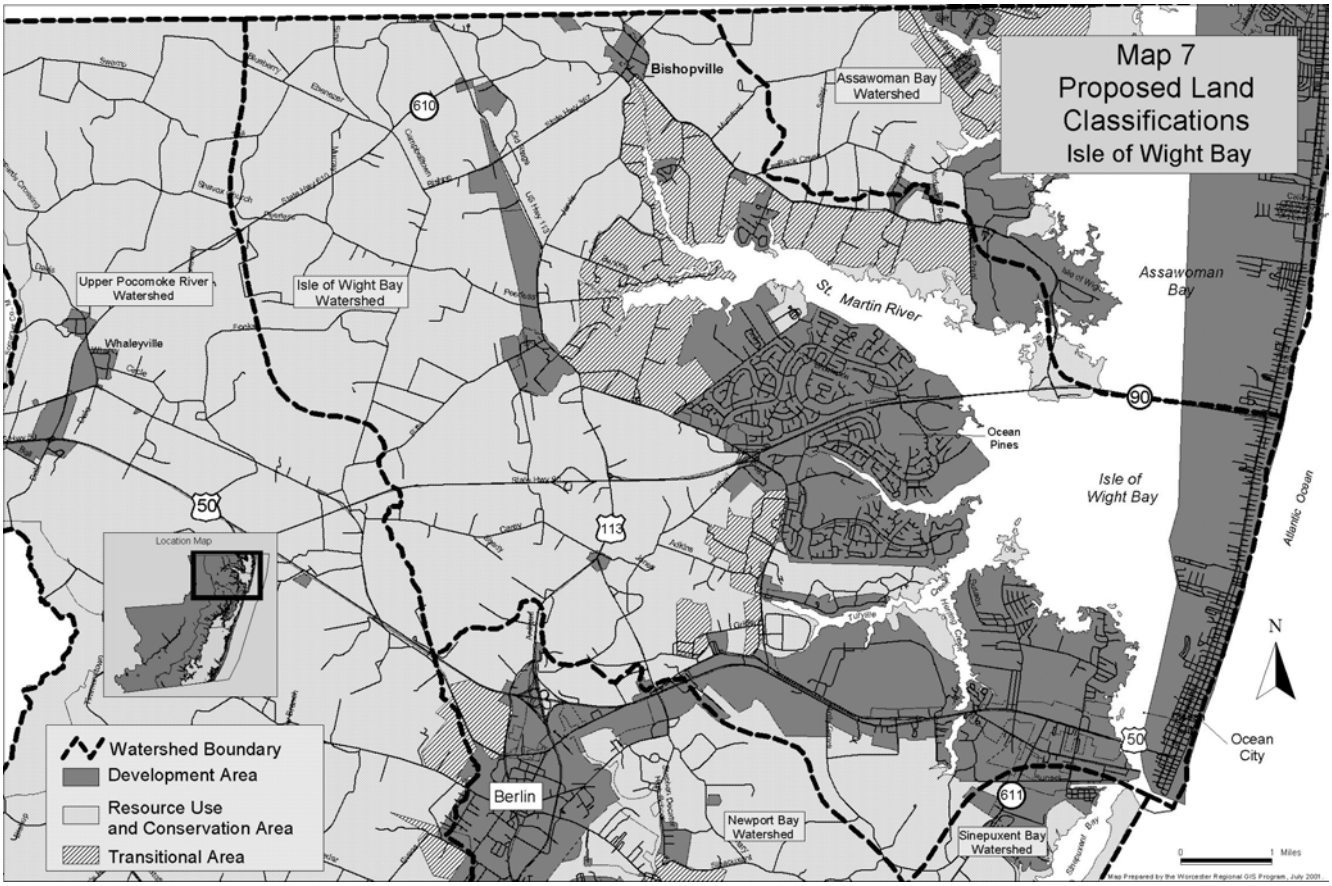
Land Use Classifications

The land in the subwatershed is divided into the following categories for purposes of this Plan:

- Development Areas--Areas of 20 or more adjacent acres where residential, commercial, institutional or industrial land uses predominate. These areas are of two types. The first identifies existing developed areas and the second identifies future planned growth areas.
- Transition Areas --Areas of low to moderate development intensity.
- Resource Use and Conservation Areas--Areas dominated by agriculture, forestry and conservation land uses.

New development will be directed by the County's comprehensive planning process and will be located in to be designated Development Areas. Lower intensity development will be permitted in transition areas with appropriate practices required to minimize negative impacts to the CBPA. New development will be limited within the conservation and resource use areas, which will have the primary land uses of open space/habitat protection, agriculture, forestry, and other resource utilization activities.

During the comprehensive planning process, new Development Areas can be designated to address identified and planned land use changes. This anticipates expected growth demands. It is recommended that such growth areas be designated as overlay zones. Such zones should provide for planned communities incorporating all appropriate improved site design and best management practices. Map 7 displays proposed land classifications for the Isle of Wight Bay subwatershed.



Land Uses of Special Concern

The following new developments or conversions to these type uses will only be permitted after careful review. There must be demonstration that there will not be a degradation in water quality in the adjacent body of water for:

- nonmaritime industry;
- transportation facilities and utility transmission facilities;
- permanent sludge handling, storage, and disposal facilities except those required for agricultural operations;
- solid or hazardous waste collection or disposal facilities;
- sanitary landfills.

Reducing Development Impacts

Site Planning

The practice of conservation subdivision design can be used to reduce negative impacts on water quality from development and should be incorporated into the site planning process for all new development. In conservation subdivisions the following precepts are followed:

- Land analyses are conducted to determine and locate key natural, cultural and historic features
- Features are mapped and priorities are set

- Identify conservation area within the development site
- Locate home sites
- Locate street alignments and trails
- Add lot lines
- Identify potential conservation links to nearby developments

The purpose of this approach is to limit the amount of impervious surface, reduce other impacts on natural resources and provide a viable and livable community. Appendix D lists and describes some conservation subdivision design techniques as they apply to streets and parking lots, lots, and natural areas. These techniques focus on limiting impervious surface creation and retention of existing features that assist in retention and filtering of stormwater.

Stormwater Management

Development by its nature, changes hydrology through grading, removal of vegetation and increased imperviousness. This increases stormwater volume which in turn affects water quality. Stormwater not retained on site quickly runs off assembling a wide array of pollutants (e.g., trash, oil, fertilizer, pet waste, gasoline, pesticides, and an assortment of other household and industrial chemicals). These pollutants are then delivered to the nearest waterbody or are absorbed into the groundwater. This efficient pollutant pathway must be managed as part of a comprehensive water quality maintenance and improvement program.

The overall goals of stormwater management are to reduce the quantity, and improve the quality of the water that runs off the land. To achieve this, as much of the predevelopment hydrology as possible is preserved and best management practices for on-site retention and treatment are used. Maryland has substantially improved stormwater management regulations which the County is currently implementing.

The state's stormwater management program is based on fourteen basic standards. The first standard is to reduce the amount of impervious surface and thereby, the amount of stormwater in need of treatment. The standards go on to prescribe treatment, maintenance and administrative measures necessary to effectively address stormwater pollution.

The new regulations are designed to protect water quality, but also allow great flexibility in the selection of stormwater practices. These practices are included in the 2000 Maryland Stormwater Design Manual and representative sample measures are highlighted in Appendix E.

Public Education

As noted in the in Chapter 1 of this Plan all who benefit from maintaining water quality should participate in its maintenance. However, for individuals to be active in this process they must be aware of their opportunities for action. Therefore, the County should continue to work with the Maryland Coastal Bays Program and other organizations to provide the necessary educational materials and programs to meet this need. See Appendix F for a listing of potential public education strategies.

Habitat Protection Areas

The 100-Foot Tidal Buffer

This buffer provision applies to all new subdivisions. The buffer is an existing, natural area consisting of native woody vegetation, or an area established in such vegetation. This area is managed to protect aquatic, wetlands, shoreline, and terrestrial environments from human disturbance. This plan establishes a buffer of 100 feet on both sides of all tidal waterbodies and wetlands from human disturbances. Further it provides for protection of nontidal streams through buffers and other alternative methods providing for biological cleansing. New development or redevelopment activities, except those necessarily associated with water dependent facilities, will not be permitted within the buffer. Map 8 displays the proposed buffer area.

Nontidal Wetlands and Ditches

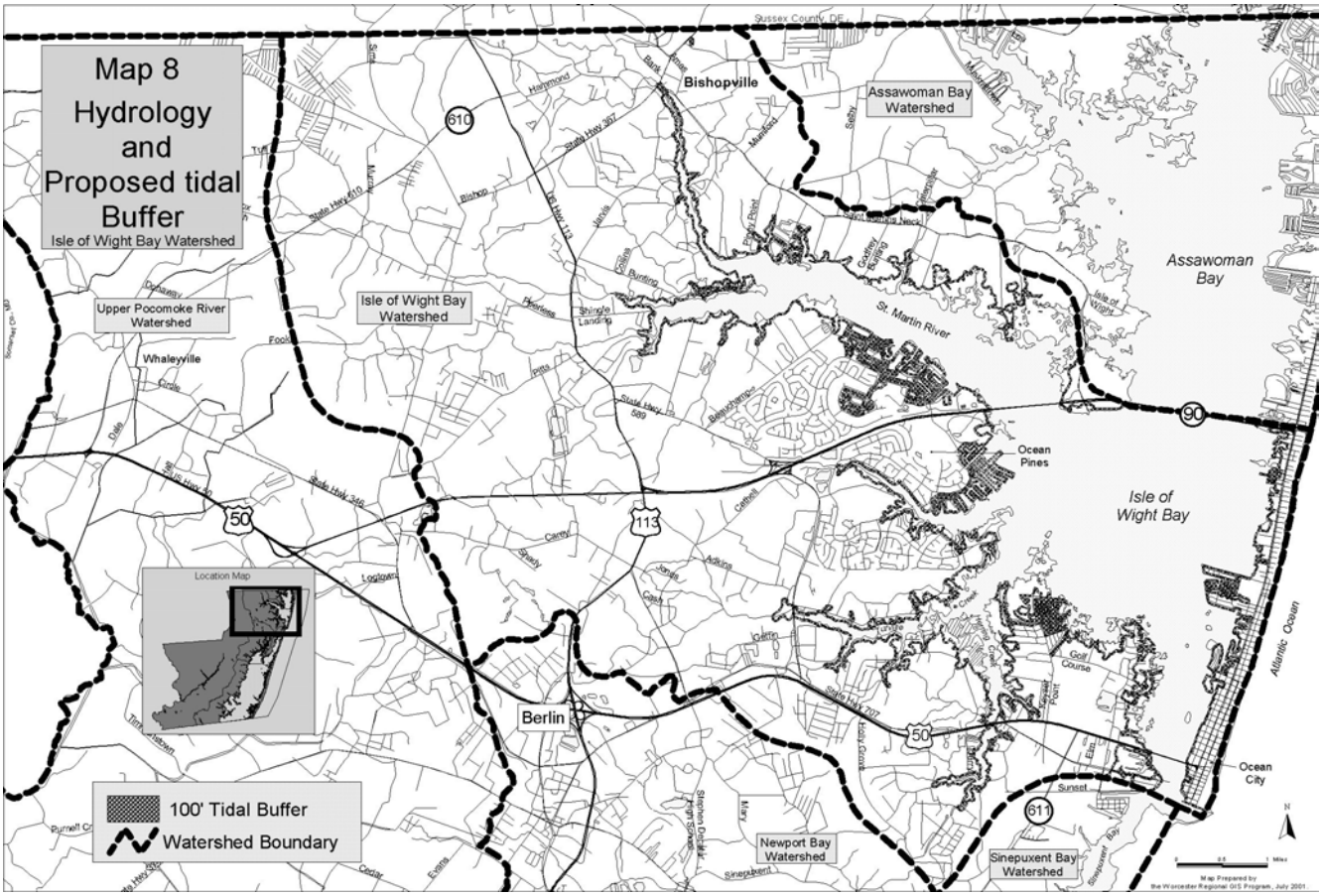
Water bodies beyond the influence of the tides are critical to maintaining the Coastal Bays' water quality. Typically the nontidal or "headwater" areas incorporate the majority of the subwatershed's drainage network. These waterbodies are crucial because what occurs on the land is directly translated to them.[10]

Additionally, the bulk of anticipated development is expected to occur within the upstream portions of the subwatershed. For these reasons this plans provides for additional options for protecting these streams' water quality and habitat value. Currently under the nontidal wetland regulations, all such wetlands and some ditches are required to have a 25-foot buffer. By adding a flexible mitigation component to all wetland and ditch buffers, the following can be accomplished:

1. Reduce stormwater flow rates
2. Increase biological contact and treatment
3. Increase instream habitat
4. Provide for greater compliance and additional flexibility in regulating development along nontidal water bodies

To achieve these objectives:

1. Provide a suggested 50% reduction of the regulated area if ditches are widened and allowed to regenerate with natural vegetation.
2. Buffer width can be adjusted as needed for development provided the amount of buffer impacted is replaced elsewhere along the ditch or wetland.
3. Allow for reconfiguring of ditches for a more serpentine pattern.



Forest and Woodland Protection

Forested land is recognized for its water quality and habitat protection benefits along with its value to provide forest resources. The following policies for forest and woodland protection should be adopted:

- Maintain and increase forest in the CBPA
- Conserve forests and developed woodlands and provide for expansion of forested areas
- Removal of trees for development activities should be minimized and mitigated
- Manage forest lands to maximize their values for wildlife, water quality, timber and recreation
- Riparian forest and forested wetland habitat should be left in their natural condition to provide wildlife corridors

In the buffer, individual trees may be cut for personal use providing that this cutting does not impair the water quality or existing habitat value or other functions of the buffer as set forth in the policies of this Plan, and provided that the trees are replaced on an equal basis for each tree cut in accordance with a buffer management plan.

In the buffer, individual trees may be removed which are in danger of falling and causing damage to dwellings or other structures, or which are in danger of falling and thereby causing the blockage of streams, or resulting in accelerated shore erosion.

Threatened and Endangered Species, and Species In Need of Conservation

In addition to compliance with state and federal law regarding activities within the habitats of threatened and endangered species, any impacts to the areas immediately surrounding the habitats of species that are threatened, endangered, or in need of conservation shall be avoided to the maximum extent practicable.

Important Plant, Fish and Wildlife Habitat and Nontidal Wetlands Protection Areas

The following plant and wildlife habitats shall be identified in the Coastal Bays Protection Area:

- colonial water bird nesting sites,
- historic waterfowl staging and concentration areas,
- existing riparian forests,
- forest areas used as breeding areas for forest interior dwelling birds and other wildlife,
- other designated wildlife and natural heritage areas,
- non-tidal wetlands

The following measures should be used to protect important plant and wildlife habitats:

- A 100-foot buffer around all colonial water bird nesting sites. All development activities will be prohibited within this buffer.
- New water dependent facilities will be located so that their impacts on important plant, fish and wildlife habitats are reduced.
- When development or timber harvesting activities occur in forested areas, corridors of existing forest will be maintained to the maximum extent practicable to provide connections between wildlife habitat areas.
- In streams used by anadromous fish for spawning purposes, installation of riprap or other artificial surfaces onto the stream bottom, channelization and impoundments are prohibited.
- Appropriate restoration projects should be pursued as resources become available.

Water Dependent Facilities

"Water-dependent facilities" mean those structures or works associated with industrial, maritime, recreational, educational, or fisheries activities that require location at or near the shoreline within the buffer. An activity is water-dependent if it cannot exist outside the buffer and is dependent on the water by reason of its operation’s intrinsic nature. These activities include: ports, power plant intake and outfall structures, water-use industries, marinas and other boat docking structures, public beaches and other public water-oriented recreation areas, and fishery activities.

New or Expanded Development Activities Within the Buffer

New or expanded development activities may be permitted within the buffer in development areas and transition areas under the following conditions:

- the activities are water-dependent;
- the project meets a recognized private right or public need;
- adverse effects on water quality and fish, plant, and wildlife habitat are minimized;
- insofar as possible, nonwater dependent structures or operations associated with water dependent projects or activities are located outside the buffer.

Public Beaches, Recreation and Education Areas

Public beaches or other public water based recreation or education areas including publicly owned boat launching and docking facilities and fishing piers may be permitted in the buffer in development areas. Such facilities may be permitted within the buffer in transition areas if:

- adequate sanitary facilities exist;
- service areas are located outside the buffer;
- permeable surfaces are used to the extent possible; and
- disturbance to natural vegetation is minimized.

Areas for passive recreation and for education may be permitted in the buffer within conservation and resource use areas if associated service facilities are located outside the buffer.

Best Management Practices for Marinas

In order to reduce the negative impacts of marinas on water quality, any new construction of or improvements to marinas within the CBPA should be carried out in accordance with the best management practices listed in Appendix G.

Community Piers in Subdivisions

The County should consider providing incentives for developers to establish community piers instead of individual piers for each waterfront lot in a subdivision. Lots should be arranged to foster community access. Community piers are preferred over individual piers because interference with the buffer and negative impacts to water quality would be reduced.

Measures to Reduce Shoreline Erosion

With sea level rise, tidal and wave action, coastal areas tend to erode. Erosion can significantly contribute to nonpoint source pollution by adding nutrients and sediment to water bodies.[11] Approximately twenty-five percent of the County's coastline is eroding.[12] Riparian areas that are excessively eroding should be stabilized, preferably, with "soft" stabilization methods. "Hard" stabilization methods should be used only where soft methods would be ineffective.

Shoreline Stabilization Methods

Soft shoreline stabilization methods, as their name implies, rely on vegetation and other similar materials to buffer shorelines from wave action. These methods can use live vegetation or trimmings that are placed on the shoreline to absorb wave energy. For example, small rootable cuttings are planted on the shoreline or branches can be fashioned as a fascine or long sausage bundle placed along the shore. These structures' advantages include providing temporary or longer-term protection along with habitat values and can enable a natural plant community to establish itself. Additionally these protection measure biodegrade providing organic matter further aiding development of a natural plant community.

Also important is the fact that soft approaches absorb rather than reflect wave energy. Reflecting wave energy can cause erosion or scouring to occur seaward of bulkheading, and rip-rap and other structures. See Appendix H for descriptions of stabilization methods.

Hard stabilization methods rely on engineered structures to buffer shorelines from wave action and prevent erosion. Properly designed and constructed hard stabilization structures should only be used in areas where higher wave energy makes soft stabilization methods ineffective. Where these methods must be used, measures to insure against failure should be applied (toe protection to reduce scouring, return walls to avoid flanking, and regular maintenance). The preferred hard stabilization methods are also described in Appendix H.

Agriculture

Existing farmland within the CBPA should remain in agriculture. Best management practices for the control of nutrients, pesticides and sediment should be used to minimize the adverse effects on plant, fish and wildlife resources, and enhance water quality. If any of the agricultural operations within the coastal bays protection area have not developed nutrient management plans, they shall do so by 2002 as required by State law.

Agriculture Within the Buffer

Agricultural activities are permitted within the buffer as long as, at a minimum, either a farm management and nutrient management plan is in place or a 25-foot vegetated filter strip is maintained between such activities and any body of water. The filter strip may be composed of either trees with dense ground cover or a thick sod of grass and shall be managed to minimize nutrient, pesticide, and sediment entry into the adjacent waterbody. Clearing of natural vegetation within the buffer is not permitted. Where agricultural use of lands within the area of the buffer ceases and the lands are proposed to be converted to other uses, the buffer shall be established. See Appendix I for a list of agricultural best management practices.

Surface Mining

Measures must be used to minimize negative impacts of surface mining on the CBPA. All possible reclamation of surface mining locations should take place immediately after the cessation of mining operations. Surface mining should not take place in:

- important natural resource areas
- areas subject to heavy erosion
- areas where agriculture or forest productivity would be jeopardized
- areas within the buffer.

Protected Natural Areas

The County should identify areas within the CBPA where protected natural areas could be established. Such establishment should take place through acquisitions, easements, designation or any other appropriate means. Programs that foster the protection of natural areas should be coordinated so that greenway nodes and corridors are maintained and/or created.

Chapter 4 General Recommendations

Wastewater Treatment

Wastewater treatment has been the impediment to concentrated growth in areas beyond central sewer service areas. Additionally, on-site septic systems have resulted in groundwater pollution problems due to inappropriate location, improper design or poor maintenance. To address these issues this Plan recommends that central sewer service be implemented to serve the majority of anticipated growth in the Isle of Wight subwatershed.

Currently, the Ocean Pines Waste Water Treatment Plant (WWTP) is being studied by private interests to assess its potential for expansion. This plant may, if capacity exists, be used to serve new development along areas of failing/inappropriate on-site septics. A comprehensive examination of the use of central sewer system for this and other subwatersheds should be undertaken as part of the Comprehensive Plan and Water and Sewer Plan updates.

In areas planned for lower densities, and where soil percolation allows, on-site septic systems (OSSS) can provide effective wastewater treatment. The County is currently working with a consultant to study the Coastal Bays Watershed as an area of special state concern. The purpose of this work is to provide specific recommendations for ensuring OSSS's are designed, located and maintained properly.

The County has begun to create a database of information on all septic systems in the County (SepTrak). This effort will inventory and provide a data base management system. This system will be used to monitor and provide automatic reminders for property owners when system maintenance is needed.

Use of innovative systems and practices should be assessed for their applicability. Appendix J describes some of the more common practices.

Monitoring

The Plan's effectiveness can be judged by water quality monitoring. The County should continue to work with the Maryland Coastal Bays Program to implement the CCMP's volunteer and standard monitoring program.

The results of the state's macroinvertebrate survey are forthcoming. This work was designed to measure the diversity and abundance of macroinvertebrates in nontidal waters. When this data is obtained, it will provide a baseline for future monitoring efforts. Macroinvertebrate sampling should become a part of the ongoing water quality monitoring efforts.

Restoration

Opportunities for restoration projects should be identified and pursued as resources become available.

Coordination with Delaware

Because the Isle of Wight Bay subwatershed spans the border between Maryland and Delaware, the County should cooperate and coordinate with agencies and organizations within Delaware to identify cross border problems and solutions in the subwatershed. The following organizations should be contacted and memoranda of understanding should be implemented where appropriate.

- Delaware Department of Natural Resources and Environmental Control, Division of Soil and Water Conservation
- Delaware Department of Natural Resources and Environmental Control, Division of Water Resources
- Delaware River Basin Commission
- Center for the Inland Bays
- Sussex County Office of Planning and Zoning

Variances

While the recommendations of this Plan provide appropriate guidance for most circumstances, situations will arise where strict adherence to these provisions will create undue burdens on property owners. To address these individual situations, a process to vary or waive the provisions of this Plan should be established. The following elements should be shown for a variance to be granted.

- Special conditions or circumstances unique to the land or structure in question would result in unwarranted hardship if the Plan's provisions were literally applied.
- A literal interpretation of the Plan and/or related ordinances will deprive the applicant of rights commonly enjoyed by other properties in similar areas within the CBPA;
- The granting of a variance will not confer upon an applicant any special privilege that would be denied by this Plan to other lands or structures within the CBPA;
- The variance request is not based upon conditions or circumstances which are the result of actions by the applicant, nor does the request arise from any condition conforming on any neighboring property;
- The granting of a variance will not adversely affect water quality or adversely impact fish, wildlife, or plant habitat within the CBPA, and the granting of the variance will be in harmony with the general spirit and intent of this Plan or related regulations.

The Plan recommends that the County establish an ad hoc committee for the purpose of hearing CPBA variance cases. This committee should be comprised of members with expertise in development, water quality and other environmental issues.

Appendix A
Plan Authority

The Plan is the result of several related programs with overlapping and complimentary elements.

The Comprehensive Conservation and Management Plan for Maryland's Coastal Bays

In June 1999, the Maryland Coastal Bays Program produced the Comprehensive Conservation and Management Plan for Maryland's Coastal Bays (CCMP). The CCMP contains four action plans that specify programmatic goals and actions that seek to restore and protect the coastal bays. The action plans are Water Quality, Fish and Wildlife, Recreation and Navigation, and Community and Economic Development.

Goal 4 in the Community and Economic Development chapter seeks to "enhance the level of sustainability in land use decision making". The chapter includes specific challenges aimed at achieving this goal. Challenge CE 4.3 is to "enhance the buffering capacity of the watershed's tidal and nontidal shoreline areas." The solution specified is to "[p]romote water quality, habitat protection and creation, resource conservation, and economic viability by enhancing the buffering capacity and function of the Coastal Bays' tidal shoreline". Action 4.3.1 provides a means for realizing this solution:

"Employing a holistic approach, Worcester County, with assistance from various other agencies, will conduct a series of focused, small area analyses to develop specific recommendations for mechanisms to enhance the buffering capacity and function of the coastal bays' shoreline in order to protect water quality, enhance and protect habitat, conserve resources, and promote the economic interests of the various subwatersheds."

The action item goes on to explain how the County might go about this process. For the complete text of CE 4.3, see Appendix A. The Isle of Wight bay Subwatershed Management Plan is the first of the "small area analyses" called for in the CCMP. It may also serve as a template for similar plans for the rest of the coastal bays watershed.

Watershed Restoration and Action Strategies

The 1998 Maryland Clean Water Action Plan (CWAP) is the State element of a combined federal, state, and local initiative "to restore those watersheds not meeting clean water and other natural resource goals". To do so, Maryland engaged in a Unified Watershed Assessment that classified all of the State's watersheds based on their general ecological conditions and whether or not water quality goals were being met. The classification of "Category 1" includes "[w]atersheds not meeting clean water and other natural resource goals and needing restoration." All five of the subwatersheds within the coastal bays watershed are included in the category 1 list. Of these, Assawoman, Isle of Wight, and Newport Bays are included in a "Category 1 Priority" list indicating watersheds "most in need of restoration during the next two years".

To restore the impaired watersheds the State hopes to have a Watershed Restoration Action Strategy (WRAS) for each one. "A WRAS will provide information and guidance that will help public, watershed organizations, and federal, state and local agencies focus their staff and monies in areas and on issues important to the public that will result in measurable environmental improvement."

Worcester County applied for and received a grant from the State to support the creation of a WRAS for the Isle of Wight Bay. The Isle of Wight Bay Subwatershed Management Plan is the direct result of that grant and has the two-fold purpose of meeting the goals of both the CCMP and the CWAP with respect to the Isle of Wight Bay subwatershed. It is important to keep in mind that the Isle of Wight Plan is a prototype that will be adapted to the needs and characteristics of the other Maryland coastal bays subwatersheds.

Appendix B
Summary of Committee Meetings

April 5
- overview of subwatershed planning process
- discussion of the Draft Isle of Wight Bay Watershed Characterization
- process and schedule for the Plan
- discussion of the role of the Committee and meeting administration

April 19
- Characterization questions and further discussion
- discussion of existing programs
- discussion of goals and objectives / issue survey exercise

May 3
- presentation and discussion of Critical Area Program (Critical Area Commission)
- review and discussion of results from issue survey
- development of draft goals and objectives

May 11
- field trip - a boat and bus that looked at some of the actual conditions in the watershed

May 17
- presentation on watershed planning and best management practices (Center for Watershed Protection)
- review of draft goals and objectives

May 31
- review and revision of draft goals and objectives
- introduction to buffer analysis

June 14
- review and discussion of Committee's draft goals and objectives
- application of goals and objectives to management units
- discussion of best management practices

July 26
- comments on draft plan

August 9
- comments on draft plan

August 20
- comments on final draft plan

Appendix C
State Water Quality Standards

The established State water quality standards should be used as a guideline for monitoring efforts within the watershed. Water quality should meet or exceed the following standards.

Surface Water Quality

Use I Waters - Water Contact Recreation

Bishopville Prong and its tributaries above the confluence with the St. Martins River, Shingle Landing Prong and its tributaries above the confluence with the St. Martins River at Piney Island, Herring Creek and its tributaries above Route 50, and Ocean City Harbor above the entrance to West Ocean City Harbor are all designated as Use I for water contact recreation and protection of aquatic life. These waters should meet the following numerical criteria:

bacteria
No pathogenic or harmful organisms in sufficient quantities to constitute a public health hazard. Furthermore, fecal coliform density should remain below 200 per 100 milliliters (5 samples per 30 day period).

dissolved oxygen
Should remain above 5 milligrams per liter.

temperature
Outside of mixing zones, should remain below 90 degrees Fahrenheit or the ambient temperature of the surface waters, whichever is greater.

pH
Should be between 6.5 and 8.5.

turbidity
Should not exceed levels harmful to aquatic life; turbidity in the surface water resulting from a discharge should not exceed 150 units at any time (Nephelometer Turbidity Units).

toxic pollutants - See COMAR 26.08.02

Use II Waters - Shellfish Harvesting

All portions of the territorial seas and estuarine portions of bays and tributaries are designated as Use II, for shellfish harvesting and should meet the following criteria:

bacteria
No pathogenic or harmful organisms in sufficient quantities to constitute a public health hazard. Fecal coliform most probable number (MPN) should remain below 14 MPN per 100 milliliters.

dissolved oxygen
same as Use I

temperature
same as Use I

pH
same as Use I

turbidity
same as Use I

toxic pollutants - See COMAR 26.08.02

Groundwater Quality

inorganic chemicals - SEE TABLE, COMAR Pg. 166-3

organic chemicals - SEE TABLE, COMAR Pg. 166-5

turbidity
Should not exceed 1 turbidity unit (TU), as determined by a monthly average from a sample taken at the same location every day, except that 5 or fewer turbidity units may be allowed if this higher level of turbidity does not: interfere with disinfection, prevent maintenance of an effective disinfectant agent throughout the distribution system, and interfere with microbiological determinations.

radioactivity
Should not exceed the following maximum contaminant levels:
- combined radium-226 and radium-228 --5 pCi/liter
- gross alpha particle activity (including radium-226) --15 pCi/liter
- gross beta particle activity --50 pCi/liter
- tritium concentration--20,000 pCi/liter
- strontium-90 concentration--8 pCi/liter

bacteria
The maximum contaminant level for coliform bacteria is exceeded if:
- more than 5 percent of the samples collected in any month are positive for total coliform where 40 or more samples are taken a month;

- two or more samples collected in any month are positive for total coliform where less than 40 samples are taken a month;
- a total coliform repeat sample is positive following a fecal coliform-positive or E. coli-positive routine sample; or
- any repeat sample is positive for fecal coliform or E. coli.

Appendix D
Site Planning Techniques

The following practices, refined by the Center for Watershed Protection as part of a national workshop on watershed-friendly site planning techniques, should be incorporated into the site planning process for all new development.

Streets

- Design residential street for the minimum required pavement width needed to support travel lanes; on street parking; and emergency, maintenance, and service vehicle access. These widths should be based on traffic volume.

- Reduce the total length of residential streets by examining alternative street layouts to determine the best option for increasing the number of homes per unit length.

- Wherever possible, residential street right-of-way widths should reflect the minimum required to accommodate the travel way, the sidewalk, and vegetated open channels. Utilities and storm drains should be located within the pavement section of the right-of-way wherever feasible.

- Minimize the number of street cul-de-sacs and incorporate landscaped areas to reduce their impervious cover. The radii of cul-de-sacs should be the minimum required to accommodate emergency and maintenance vehicles. Alternative turnarounds should be considered.

- The standard approach of using curbing on streets and parking areas impairs natural drainage systems. Because curb and gutter streets trap runoff in the roadbed, storm inlets and drains are logical solutions to providing good drainage for the roadbed. Where density, topography, soils, and slope permit, vegetated open channels should be used in the street right-of-way to convey and treat stormwater runoff.

Parking Lots

- The required parking ratio governing a particular land use or activity should be enforced as both a maximum and a minimum in order to curb excess parking space construction. Existing parking ratios should be reviewed for conformance taking into account local and national experience to see if lower ratios are warranted and feasible.

- Parking codes should be revised to lower parking requirements where mass transit is available or enforceable shared parking arrangements are made.

- Reduce the overall imperviousness associated with parking lots by providing compact car spaces, minimizing stall dimensions, incorporating efficient parking lanes, and using pervious materials in the spillover parking areas where possible.

- Provide meaningful incentives to encourage structured and shared parking to make it more economically viable.

- Provide stormwater treatment for parking lot runoff using bioretention areas, filter strips, and/or other practices that can be integrated into required landscaping areas and traffic islands.

Lots

- Advocate open space design development incorporating smaller lot sizes to minimize total impervious area, reduce total construction costs, conserve natural areas, provide community recreational space, and promote watershed protection.

- Relax side yard setbacks and allow narrower frontages to reduce total road length in the community and overall site imperviousness. Relax front setback requirements to minimize driveway lengths and reduce overall lot imperviousness.

- Promote more flexible design standards for residential subdivision sidewalks. For example, where applicable, consider allowing the locating of sidewalks on only one side of the street, providing common walkways linking pedestrian areas, and not requiring sidewalks around the entire perimeter of a cul-de-sac.

- Alternative driveway surfaces and shared driveways that connect two or more homes together should be promoted.

- Clearly specify how community open space will be managed and designate a sustainable legal entity responsible for managing it.

- Direct rooftop runoff to pervious areas such as yards, open channels, or vegetated areas and avoid routing rooftop runoff to the roadway and stormwater piping.

- Maintain natural buffers and drainageways. Natural buffers located between development sites and wetlands infiltrate runoff, reduce runoff velocity, and remove some suspended solids. Natural depressions and channels act to slow and store water, promote sheet flow and infiltration, and filter pollutants.

- Minimize placement of new structures or roads over porous or erodible soils. Porous soils provide the best and cheapest mechanism for infiltrating stormwater and reducing runoff volume and peak discharge, as well as providing ground water recharge and treatment by infiltration and adsorption through the soil strata. Disturbance of unstable soils should be avoided due to their greater erosion potential.
- Establish Cluster Developments through zoning that clusters or groups buildings closer together to maximize the amount of undisturbed open space.

- Reduce the horizontal footprint of buildings and parking areas. Foot-print size can be reduced by constructing a taller building or including parking facilities within the building itself.

- Use “turf pavers,” gravel, or other porous surfaces when possible for sidewalks, driveways, and transition areas between pavement edge and swales.

- Maintain pre-development vegetation to the extent possible, especially larger trees. Vegetation absorbs water, which will reduce the amount of stormwater runoff. Vegetation also provides

habitat and reduces the amount of nutrients in stormwater runoff. Proposed structures should be sited to minimize shading effects on vegetation and roots should be protected from damage during the construction phase.

- Preserve and Use Natural Drainage Systems and Depressional Storage Areas. Natural drainage features should be preserved as development occurs because of their ability to infiltrate and attenuate flows and filter pollutants. Depressional storage areas serve the purpose of reducing runoff volumes and trapping pollutants. Such areas are usually filled and graded as a site is developed.

- Reproduce Pre-development Runoff Conditions. Peak discharges, runoff volume, infiltration recharge, and water quality are directly related to the amount and location of impervious area required by development plans. Pre-development hydrologic conditions can be retained through site planning. Hydrologic conditions (*i.e.* peak discharge, runoff volume, infiltration capacity, base flow levels, groundwater recharge, and maintenance of water quality) can be examined through a comprehensive approach involving the entire site and even offsite areas contributing runoff to the site.

Conservation of Natural Areas

- Create a variable width, naturally vegetated buffer system along all perennial streams that includes critical environmental features such as the 100 year flood plain; steep slopes; wetlands; habitats of species that are threatened, endangered, or in need of conservation; and important plant, fish and wildlife habitats as indicated on Map #5.

- The riparian stream buffer should be preserved or restored with native vegetation. The buffer system should be maintained through the plan review delineation, construction, and post-development stages. Lot lines should not go into the buffer.

- Clearing and grading of forests and native vegetation at a site should be limited to the limited amount needed to build lots, allow access, and provide fire protection. A fixed portion of any community open space should be managed as protected green space in a consolidated manner.

- Conserve trees and other vegetation at each site by planting additional vegetation, clustering tree areas, and promoting the use of native plants. Wherever practical, manage community open space, street rights-of-way, parking lot islands, and other landscaped areas.

- Incentives and flexibility in the form of density compensation, buffer averaging, property tax reduction, stormwater credits, and by-right open space development should be encouraged to promote conservation of stream buffers, forests, meadows, and other areas of environmental value.

- New stormwater outfalls should not discharge untreated stormwater.

Appendix E
Stormwater Management Practices

The stormwater best management practices from the 2000 Maryland Stormwater Design Manual should be used within the CBPA. Some of the more commonly-used practices are described here.

Structural Practices

Constructed Wetlands
Intentionally created from non-wetland sites for sole purpose wastewater or stormwater treatment. Types include: 1) free-floating macrophyte, 2) emergent macrophyte 3) submerged macrophyte.

Drainage Channels
Drainage channels are designed to have sufficient capacity to safely convey runoff during large storm events without causing erosion. Drainage channels typically have a cross-section with sufficient hydraulic capacity to handle the peak discharge for the 10 year storm event. Channel dimensions (slope and bottom width) should not exceed a critical erosive velocity during the peak discharge. Drainage channels should maintain some type of grass or channel lining to maintain bank and slope integrity.

Dry Wells
Dry wells are small excavated pits, backfilled with aggregate, and used to infiltrate “good quality” stormwater runoff, such as uncontaminated roof runoff. Dry wells are not to be used for infiltrating any runoff that could be significantly contaminated with sediment and other pollutants.

Extended Dry Ponds
Outlet structure of dry pond is modified as a "retention outlet" that
provides slow release of runoff from a 1-year design storm, moderate to higher removal rates for particulates (40-70%), very low for dissolved pollutants.

Grassed Swales
Shallow, vegetated ditch above water table. It is used as an infiltration/filtration method to provide pretreatment before runoff is discharged to other treatment systems. Vegetative cover should never be shorter than 3-4 inches.

Infiltration Basins
Impoundments that store runoff temporarily until it gradually infiltrates into the soil surrounding the basin. Infiltration basins should drain within 72 hours to maintain aerobic conditions. Runoff is pretreated to remove coarse sediment and prevent clogging.

Infiltration Trenches
Shallow excavated ditches with coarse substrate (sand, gravel) to allow infiltration to subsoil and groundwater. Some facilities are lined with fine fabric to prevent infiltration to groundwater.

Porous Pavement
Thin layer of open-graded asphalt mixture on top of a deep-based filled with large-size crushed stone aggregate to serve as reservoir to detain stormwater. Stored runoff exfiltrates from the reservoir into the soil. A fine filter fabric may be used to prevent infiltration to groundwater. Limited data available on performance.

Sand Filters
Also known as filtration basins, sand and organic filters consist of self contained beds of sand or peat (or combinations of these and other materials) either underlain with perforated underdrains or designed with cells and baffles with inlets/outlets. Stormwater runoff is filtered through the sand, and in some designs may be subject to biological uptake. Runoff is discharged or conveyed to another BMP for further treatment. Where the potential for groundwater contamination is low and proper soils are present, the treated runoff may be allowed to exfiltrate into the subsoil.

Sediment Traps
A sediment trap or forebay is an excavated pit or cast structure designed to slow incoming stormwater runoff and settle suspended solids. Stormwater is routed through the sediment trap before continuing to the primary water quality and quantity control BMP. Typically, sediment forebays are components of effective stormwater pond and wetland designs. Cast sediment traps may also be used in connection with water quality swales. Designs incorporate simple access and other features for ease of accumulated sediment removal.

Tide Gates
Structure installed at the outlet of a sewer system that discharges into tidal waters to prevent the backflow of the receiving water into the conduits.

Vegetated Filter Strips
Areas of vegetated cover designed to strictly treat low to moderate overland sheet flow. Used as pretreatment for other structural practices such as infiltration basins and trenches.

Vegetated Swales
A natural depression or wide, shallow vegetated ditch used to temporarily store, route, or filter runoff.

Water Quality Inlets
Underground retention systems designed to remove solids. A basin is constructed 2-4 feet deep below an outlet pipe to collect sediment. Multiple-chamber systems may include an additional basin to filter fine sediment. Oil/grit separators can provide additional treatment.

Wet Ponds
An area surrounded by an embankment, or an excavated pit, designed with a permanent pool of water. Runoff entering the wet pond displaces the water already present in the pool and remains there until displaced by the next storm event. Detention of the runoff in the pool allows for settling of solids and reduces local and downstream flooding.

Non-Structural Practices

Street and Parking Lot Sweeping
The ability of street sweeping efforts to remove pollutants which accumulate on road and parking lot surfaces varies according to frequency, type of sweeping equipment, and the amount of pollutants present.

Catch Basin Cleaning
Both private development managers and local public work managers should incorporate catch basin cleaning into BMP maintenance and source reduction efforts. Street sweeping and catch basin cleaning (or other similar BMP maintenance) often may be required as part of stormwater management or pollution prevention plans.

Appendix F
Public Education Concepts

The following public education elements are recommended to be directed at reducing the impact of development.

Lawn and Garden Activities

Proper pesticide and fertilizer application should be encouraged. Buffer areas (preferably natural vegetation) between surface waters and all lawn and garden activities should be encouraged. Limited lawn watering and climate-suitable landscaping should be encouraged. Guidelines for what to expect from landscaping and lawn care professionals should be provided. Composting guidelines, if not covered elsewhere under solid waste efforts, should be given.

Turf Management on Golf Courses and Parks

Many of the same guidelines described above are applicable to turf management but need to be targeted to caretakers responsible for golf courses and parks and recreation areas (municipal employees, in some cases). See also Voluntary Environmental Guidelines Recommended for Golf Courses In Worcester County & The Delmarva Peninsula.

Pet Waste Management

Laws requiring the removal and proper disposal of pets waste need to be established. Priority resource areas, such as swimming beaches and shellfish beds, may need to exclude pets at least for summer months or other critical use times. Specific controls for horses and the control of manure may be needed.

Hazardous Chemical Handling

Education should be provided regarding the proper storage, use, and disposal of household hazardous chemicals, including automobile fluids, pesticides, paints, solvents, etc. Information should be provided on chemicals of concern, proper use, and disposal options. Household hazardous waste collection days should be sponsored whenever feasible. Recycling programs for used motor oil, anti-freeze, and other products should be developed and promoted. Also, techniques such as stenciling the street by a ditch or other conveyance with the name of the receiving wetland or waterway may increase public awareness.

Proper Operation and Maintenance of Septic Systems

Knowledge of proper operation and maintenance (regular pump-outs) of septic systems should be promoted to avoid serious failures. The public should also be educated about pretreatment alternatives.

Chemical and Waste Handling for Commercial Operations

For operations such as parking lots, gas stations, and other local businesses, recycling, spill prevention and response plans, and proper material storage and disposal should be promoted. Using dry floor cleaners and absorbent materials and limiting the use of water to clean driveways and walkways should be encouraged. Care should be taken to avoid accidental disposal of hazardous materials down floor drains. Floor drains should be inventoried.

Appendix G
Best Management Practices for Marinas

Any new construction of or improvements to marinas within the CBPA should be carried out in accordance with the following best management practices:

Marina Flushing
The siting and designing of marinas such that tides and/or currents will aid in flushing of the site or renew its water regularly.

Water Quality Assessment
Assessing water quality as part of marina siting and design.

Habitat Assessment
The siting and designing of marinas to protect against adverse effects on shellfish resources, wetlands, submerged aquatic vegetation, or other important riparian and aquatic habitat areas.

Stormwater Runoff Control
Implement effective runoff control strategies which include the use of pollution prevention activities and the proper design of hull maintenance areas.

Fueling Station Design
Design fueling stations to allow for ease of cleanup of spills.

Sewage Facility Availability and Design
Install pumpout, dump station, and restroom facilities where needed at new and expanding marinas to reduce the release of sewage to surface waters. Design these facilities to allow ease of access and post signage to promote use by the boating public.

Solid Waste Management
Properly dispose of solid wastes produced by the operation, cleaning, maintenance, and repair of boats to limit entry of solid wastes to surface waters.

Fish Waste Management
Promote sound fish waste management through a combination of fish cleaning restrictions, public education, and proper disposal of fish waste.

Liquid Material Management
Provide and maintain effective storage, transfer, containment, and disposal facilities for liquid material such as oil, harmful solvents, antifreeze, and paints, and encourage recycling of these materials.

Petroleum Control
Reduce the amount of fuel and oil from boat bilges and fuel tank air vents entering the marina and surface waters.

Boat Cleaning Management

For boats that are in the water, perform cleaning operations to minimize, to the extent possible, the release to surface waters of harmful cleaners and solvents and paint from in-water hull cleaning.

Appendix H
Shoreline Stabilization Practices

Soft Stabilization Methods

Live Staking
The insertion and tamping of live, rootable vegetative cuttings into the ground. Stabilizes the soil by reinforcing and binding soil particles together and extracting excess soil moisture.

Live Fascines
Long bundles of branch cuttings bound together into sausage-like structures.

Brushlayering
Placing live branch cuttings in small benches excavated into the slope. The portions of the brush that protrude from the slope face assist in retarding runoff and reducing surface erosion.

Brush Mattressing
Involves digging a slight depression on the bank and creating a mat or mattress from woven wire or single strands of wire and live, freshly cut branches from sprouting trees or shrubs

Branchpacking
Alternating layers of live branch cuttings and compacted backfill to repair small localized slumps and holes in slopes.

Joint Planting
Tamping live cuttings of rootable plant material into soil between the joints or open spaces in rocks that have previously been placed on a slope.

Live Cribwalls
A hollow, box-like interlocking arrangement of untreated log or timber members. The structure is filled with backfill material and layers of live branch cuttings which root inside the crib structure and extend into the slope.

Hard Stabilization Methods

Seawalls
A structure separating land and water areas. Primarily used for protection from wave action, but also retain soil.

Revetments
A facing of stone or concrete built to protect a scarp, embankment, or shore structure against erosion by wave action or currents. Usually consists of several layers of randomly shaped and randomly placed stones protected with several layers of armor units or quarry stone.

Groins
Structures built perpendicular to the shore and extending into the water. Usually built in series along the area needing protection. Groins trap sand in littoral drift and halt its longshore movement along beaches. The collected sand takes the majority of erosive force produced by waves.

Breakwaters
Wave energy barriers designed to protect the land or nearshore area behind them from direct wave action. Segmented breakwaters can be used to provide protection over longer sections of shoreline than is generally possible with bulkheads or revetments.

Riprap
A protective layer or facing of quarrystone randomly placed to prevent erosion, scour, or sloughing of an embankment.

Appendix I
Agricultural Best Management Practices

Conservation Cover
Establishing and maintaining perennial vegetative cover to protect soil and water resources on land retired from agricultural production.

Conservation Cropping Sequence
An adapted sequence of crops designed to provide adequate organic residue for maintenance or improvement of soil tilth.

Conservation Tillage
Any tillage or planting system that maintains at least 30% of the soil surface covered by residue after planting to reduce soil erosion by water; or, where soil erosion by wind is the primary concern, maintains at least 1,000 pounds of flat, small-grain residue equivalent on the surface during the critical erosion period.

Contour Farming
Farming sloping land is such a way that preparing land, planting, and cultivating are done on the contour. This includes following established grades of terraces or diversions.

Cover Crop
A crop of close-growing grasses, legumes, or small grain grown primarily for seasonal protection and soil improvement. It usually is grown for 1 year or less, except where there is permanent cover as in orchards.

Critical Area Planting
Planting vegetation, such as trees, shrubs, vines, grasses, or legumes, on highly erodible or critically eroding areas.

Crop Residue Use
Using plant residues to protect cultivated fields during critical erosion periods.

Delayed Seed Bed Preparation
Any cropping system in which all the crop residue and volunteer vegetation are maintained on the soil surface until approximately 3 weeks before the succeeding crop is planted, thus shortening the bare seedbed period on fields during critical erosion periods.

Diversion
A channel constructed across the slope with a supporting ridge on the lower side.

Field Border
A strip of perennial vegetation established at the edge of a field by planting or by converting it from trees to herbaceous vegetation or shrubs.

Filter Strip
A strip or area of vegetation for removing sediment, organic matter, and other pollutants from wastewater.

Grade Stabilization Structure
A structure used to control the grade and head cutting in natural or artificial channels.

Grassed Waterway
A natural or constructed channel that is shaped or graded to required dimensions and established in suitable vegetation for the stable conveyance of runoff.

Grasses and Legumes in Rotation
Establishing grasses and legumes or a mixture of them and maintaining the stand for a definite number of years as part of a conservation cropping system.

Sediment Basins
Basins constructed to collect and store debris and sediment.

Contour Stripcropping
Growing crops in a systematic arrangement of strips or bands on the contour to reduce water erosion.

Field Stripcropping
Growing crops in a systematic arrangement of strips or bands across the general slope (not on the contour) to reduce water erosion.

Nutrient Management
The application of fertilizers by the optimal method and at the optimal time for increased production and minimal runoff.

Terrace
An earthen embankment, a channel, or combination ridge and channel constructed across the slope.

Water and Sediment Control Basin
An earthen embankment or a combination ridge and channel generally constructed across the slope and minor watercourse to form a sediment trap water detention basin.

Appendix J
Septic System Enhancements and Alternatives

Intermittent or Recirculating Sand Filters
An enhancement method for use with traditional septic system. Treats effluent from the septic tank before it flows into the drain field. In a recirculating sand filter, the effluent is cycled back through the septic tank for retreatment before going into the drain field.

Anaerobic Upflow Filters
An enhancement method for use with a traditional septic system. Treats effluent through anaerobic denitrification before it enters drain field.

Constructed Wetlands
Most commonly used as an enhancement method for a traditional septic system. Effluent is routed through the wetland and retained for a period of time before being released to the drain field.

Evapotranspiration Systems
Used as a replacement for a traditional drain field but still requires a septic tank for initial treatment. Useful for areas where soils are not conducive to adequate drainage. Removal of effluent is accomplished through transpiration of plants growing in a gravel-filled trench.

Fixed Film Systems / Aerobic Treatment Units
An enhancement for use with traditional septic systems. This practice passes effluent from the septic tank through a film matrix or other structure which serves as substrate for populations of aerobic denitrification bacteria. The effluent flows into the drain filed after this treatment. Many of these systems require frequent and regular maintenance.

Sequencing Batch Reactors
Can be used as either a replacement for or enhancement of a traditional septic system. Similar to activated sludge systems common in municipal wastewater treatment facilities, the sequencing batch reactor accomplishes aeration, sedimentation and clarification in a single tank. These are most useful in areas of poor soil percolation.

Composting Toilets
Composting toilets are used to replace septic systems. Waste falls to a composter placed a level below the toilet and compost is periodically removed. In Maryland, composting toilets are only allowed on lots where traditional sewage treatment is not available. Because there are lots in the watershed that currently have failing septic systems and lack sewer connections, composting toilets may be a useful alternative.

[1] Maryland Department of State Planning data (1997).
[2] Maryland Coastal Bays Program, *Today's Treasures for Tomorrow: Towards a Brighter Future, The Comprehensive Conservation and Management Plan for Maryland's Coastal Bays*, 110 (1999).
[3] Maryland Department of the Environment, *2000 Maryland Stormwater Design Manual*, 1.1 (2000).
[4] Maryland Department of Natural Resources and Worcester County, *Isle of Wight Bay Watershed Characterization*, 16 (2000) [hereinafter *Characterization*].
[5] Worcester County Department of Development review and Permitting data (2001).
[6] Clean Water Action Plan Technical Workgroup, *Maryland Clean Water Action Plan*, Table 6 (1998).
[7] U.S. Census 2000
[8] Ibid.
[9] Nelesson, *Envisioning Worcester's Tomorrow*, 2.4 (2000)
[10] Schuler and Holland, *The Practice of Watershed Protection*, 147 (2000).
[11] *Characterization*, *supra* note 4, at 17.
[12] Ibid.

Potential Restoration Sites for the Isle of Wight Bay Watershed

The sites that have been selected here are all preliminary and should be considered a starting point to the restoration process. The County is currently working with the Maryland Department of Natural Resources (DNR), the U.S. Army Corps of Engineers and the Natural Resources Conservation Service to acquire funding and technical assistance for restoration projects in this watershed. The site selections and the watershed plan that have been developed as WRAS components will serve as guidance for the restoration projects that result from these multiple efforts.

A total of five general areas were selected based on criteria included in the Isle of Wight Bay Watershed Characterization (Watershed Characterization). These criteria are soil type, nutrient retention ability, adjacent land use and proximity to known wetlands. A preliminary site selection process was enhanced and informed by water quality data included in *Characterization of Nitrogen and Phosphorus Loads, Macroinvertebrate Communities and Habitat in the Non-tidal Portions of the St. Martins River*, a DNR report completed in 1999 and amended with additional data in 2001.

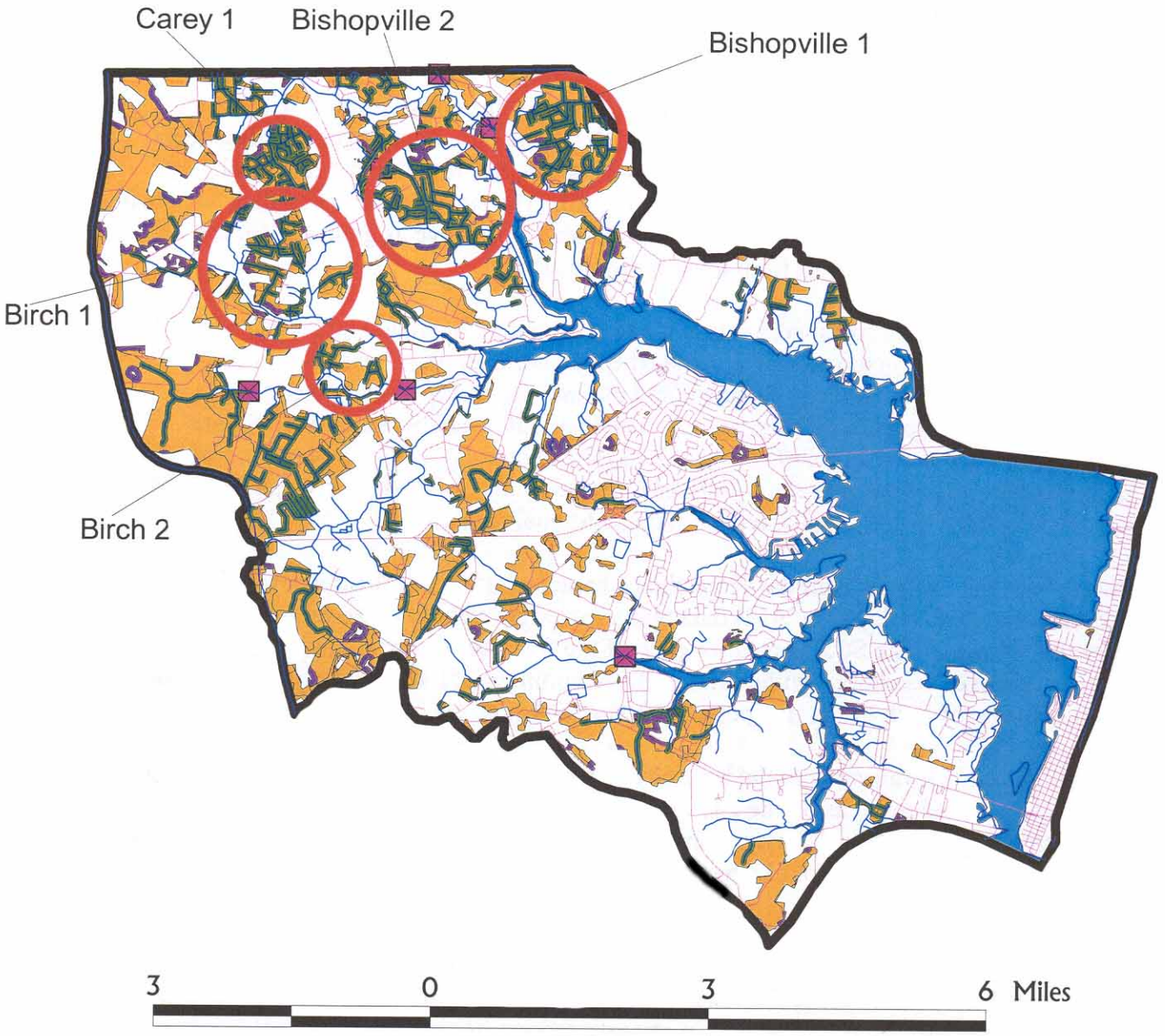
Along with the analysis from the Watershed Characterization, 2001 Stream Corridor Assessment Methodology (SCAM) data was used extensively to make preliminary site selection choices. The SCAM data for each of the five general areas can be considered representative of conditions within that area. A summary of these results is included in the discussion of each of the five potential restoration areas.

We are currently awaiting nontidal benthic macroinvertebrate sampling data. Sampling sites were selected to focus on the Isle of Wight Bay watershed, particularly the headwaters of the St. Martin River. Once these results are obtained, they may be used to provide additional refinement of sites selected for restoration activities.

Each of the five areas contains multiple potential restoration opportunities for both riparian buffer enhancement and wetland restoration projects. Because all of the areas contain ideal restoration sites, the final choice will be based on landowner interest and/or other property constraints. Private property information has been preliminarily considered but has not been included in this report. Owner assessment and outreach will be an ongoing part of the process of site selection.

The potential restoration sites are grouped in five general areas: Bishopville 1 and 2, Carey 1, and Birch 1 and 2. Each of these areas can be located on the overall map of the watershed shown in Map #1 and each area is shown in detail in Maps 2-6. These selections are not exclusive and additional areas may be added as required by new data and property research results. While the areas included here are all agricultural, we will continue to work with communities within the watershed on smaller urban restoration projects.

Map #1
Potential Restoration Sites in the Isle of Wight Bay Watershed



Bishopville 1 (Map #2)

There is a highly branched network of streams located north of St. Martins Neck Road between Route 367 and Mumford Road. These streams drain into Bishopville Prong just north of Shell Mill Road. The streams are designated as high priority on the Prioritizing Streams Scenario map in the Watershed Characterization and are rated as high for potential nutrient retention efficiency. Land use within the immediate area surrounding these streams is cropland. The portion of this stream network that is closest to Bishopville Prong is within 300 feet of wetlands. This area contains the highest concentration within the watershed of streams that are ideal for restoration. The 2001 SCAM results are summarized below.

Channel Alteration

Site #	Severity	Width (in)	Length (ft)
005204	Severe	48	44050
011101	Severe	72	14104
011203	Severe	54	8593

Inadequate Buffers

Site #	Severity	Length (ft)
005202	Very Severe	44050
011101	Very Severe	14104
011202	Very Severe	8593

Erosion Sites

Site #	Severity	Possible Cause	Length (ft)	Height (ft)
011207	Minor	Bend at steep slope	50	2.5

Unusual Conditions

Site #	Problem	Comment
005208	lateral ditching	mainstem ditch with 3 offshoots
005203	lateral ditching	more than 10 offshoots, all without buffers, 6700 feet total length
011101	lateral ditching	approximately 5000 feet in length, 6 feet wide; do not enter at owner's request
011205	other	stream section dried up; wetlands potential very good

Map #2
Bishopville 1 Area

0.6 0 0.6 1.2 Miles

streams
watershed boundary
hydric soil between stream and cropland
roads
Isle of Wight Bay and major tributaries
fish blockage
hydric soil within 300 feet of wetland
hydric soil and open land

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Bishopville 2 (Map #3)

Another area of streams in need of restoration can be found between Jarvis Road and Hammond Road to the west of Bishopville Prong. These enter Bishopville Prong through Slab Bridge Prong to the north and Perkins Creek to the south. These streams are designated as high priority on the Prioritizing Streams Scenario map in the Watershed Characterization and are rated as high in their potential nutrient reduction capability. Land use adjacent to these streams is primarily cropland with some forest. Many of the streams that are tributaries of Slab Bridge prong are within 300 feet of wetlands. 2001 SCAM results are summarized below.

Channel Alteration

Site #	Severity	Width (in)	Length (ft)
003102	Severe	48	44050
009103	Severe	60	3411
009106	Moderate	36	787
009105	Severe	72	6166
009104	Severe	36	7347
016204	Severe	36	14792
010205	Severe	30	25092
010204	Severe	60	3214
010103	Severe	36	1115
010104	Severe	72	1640
004101	Severe	42	4493
004103	Severe	48	1148
004104	Severe	24	2214

Inadequate Buffers

Site #	Severity	Length (ft)
010204	Severe	2952
010103	Very Severe	1115
010104	Very Severe	1640
004103	Moderate	984
016203	Very Severe	14792

Unusual Conditions

Site #	Problem	Comment
010104	lateral ditching	mainstem ditch with 3 offshoots; width of 6 feet, 2500 feet total length
016205	lateral ditching	mainstem ditch with 6 offshoots

Map #3
Bishopville 2 Area

0.6 0 0.6 1.2 Miles

- streams
- watershed boundary
- hydric soil between stream and cropland
- roads
- Isle of Wight Bay and major tributaries
- fish blockage
- hydric soil within 300 feet of wetland
- hydric soil and open land

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Carey 1 (Map #4)

The headwaters of Carey Branch include another highly branched network of agricultural ditches. This area is also high priority on the Prioritizing Streams Scenario map in the Watershed Characterization and are rated high in potential nutrient reduction capability. Land use is agricultural and some of the northernmost ditches are within 300 feet of wetlands. This particular portion of the watershed is notable for its high concentration of ditches in a relatively small area, all having characteristics that make them ideal for restoration. 2001 SCAM results are summarized below.

Channel Alteration

Site #	Severity	Width (in)	Length (ft)
008201	Severe	48	26764
008202	Severe	48	24600

Inadequate Buffers

Site #	Severity	Length (ft)
008201	Very Severe	26764
008202	Moderate	6560
008203	Very Severe	26240

Unusual Conditions

Site #	Problem	Comment
008201	lateral ditching	network with at least 12 offshoots, total 10,000 feet in length
008202	lateral ditching	network with two mainstems and 10 offshoots; total 10,000 feet in length

Map #4
Carey 1 Area

0.4 0 0.4 0.8 Miles

- streams
- watershed boundary
- hydric soil between stream and cropland
- roads
- Isle of Wight Bay and major tributaries
- fish blockage
- hydric soil within 300 feet of wetland
- hydric soil and open land

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Birch 1 (Map #5)

The Birch 1 area of Birch Branch is just west of Route 113 and lies immediately south of the Carey 1 area. It includes many streams that are rated high priority on the Prioritizing Streams Scenario map in the Watershed Characterization and are high in potential nutrient reduction capability. Some of these streams are within 300 feet of wetlands. Land use is agricultural with some urban development. 2001 SCAM results are summarized below.

Channel Alteration

Site #	Severity	Width (in)	Length (ft)
014101	Severe	96	15842
015201	Severe	120	1180
105101	Severe	30	8101
023306	Severe	18	7347

Inadequate Buffers

Site #	Severity	Length (ft)
014101	Very Severe	15842
015201	Very Severe	1180
023306	Very Severe	8200
023305	Very Severe	6133
023302	Very Severe	6691
022303	Very Severe	10660
014206	Moderate	8856

Unusual Conditions

Site #	Problem	Comment
014101	lateral ditching	500 feet in length; do not enter at owner's request

Map #5
Birch 1 Area

0.6 0 0.6 1.2 Miles

streams
watershed boundary
hydric soil between stream and cropland
roads
Isle of Wight Bay and major tributaries
fish blockage
hydric soil within 300 feet of wetland
hydric soil and open land

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Birch 2 (Map #6)

The Birch 2 area is just south of Peerless road and it is the southernmost area considered for potential restoration. Most of the streams included in this area are rated high priority on the Prioritizing Streams Scenario map in the Watershed Characterization and are high in potential nutrient reduction capability. While there are extensive hydric soils, much of which is on open land, there are no streams in this area that are known to be within 300 feet of wetlands. Adjacent land use is agricultural. 2001 SCAM results are summarized below.

Channel Alteration

Site #	Severity	Width (in)	Length (ft)
031101	Severe	36	6363

Inadequate Buffers

Site #	Severity	Length (ft)
031101	Very Severe	6232

Unusual Conditions

Site #	Problem	Comment
031101	lateral ditching	2500 feet in length, most without buffer

Map #6
Birch 2 Area

0.4 0 0.4 0.8 Miles

- streams
- watershed boundary
- hydric soil between stream and cropland
- roads
- Isle of Wight Bay and major tributaries
- fish blockage
- hydric soil within 300 feet of wetland
- hydric soil and open land

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