Today's Treasures for Tomorrow: Towards a Brighter Future

THE COMPREHENSIVE CONSERVATION
AND MANAGEMENT PLAN
FOR MARYLAND'S COASTAL BAYS

PREFACE

Today's Treasures for Tomorrow is the culmination of three years of technical investigation and community involvement to protect the future of the coastal bays. This effort is being facilitated by the Maryland Coastal Bays Program, which was established in 1996 to assist the region in developing a comprehensive plan to restore and protect Maryland's coastal bays. The Program is a partnership among the towns of Ocean City and Berlin, National Park Service, Worcester County, U.S. Environmental Protection Agency, and the Maryland Departments of Natural Resources, Agriculture, Environment, and Planning.

The following Action Plans have been developed with assistance from natural resource experts, advocates, and citizens. Since 1996, the Program has held a series of public meetings to solicit input in developing this plan and will continue to encourage community participation as the plan is implemented and revised in the coming years.

Today's Treasures for Tomorrow reflects significant contributions from individuals, community groups, and governmental agencies that share a common interest in a healthy environment and a prosperous region. Many thanks go to these participants for their substantial insights and contributions. This plan would not be possible without their ongoing support for the Program. As always, the Maryland Coastal Bays Program invites your comments and participation as we continue to fulfill a vision for the future of this coastal community.

How To Use
Today's Treasures for Tomorrow

The purpose of this document is to serve as a blueprint for the public agencies responsible for protecting the natural resources of the Coastal Bays watershed. The report is also a tool for citizens interested in the programmatic steps necessary to accomplish this broad goal. Citizens interested in a more concise description of the overall strategy contained in this plan should see the summary document, "Maryland Coastal Bays Watershed Conservation and Management Plan: Setting a Course for the Future of Our Community."

Today's Treasures for Tomorrow has been designed for easy access and review. A detailed summary of goals and solutions is located on pages 12 through 20. A glossary of terms can be found on page 143. The Introduction describes the region's way of life, industries important to the watershed, and how changing conditions may impact the coastal bays. The Management Conference list identifies those involved in the development of this plan and recognizes their commitment to this endeavor. (Note: the Management Conference list can be found in the paper version of this document, but is not listed in the electronic version). The State of the Coastal Bays summarizes the environmental condition of the bays and problems that should be addressed by this management plan. Other important points of information are provided below to further assist you in your review and understanding of this plan.

Action Plans for The Coastal Bays

Today's Treasures for Tomorrow contains four Action Plans for the long-term restoration and protection of the coastal bays: Water Quality (WQ), Fish and Wildlife (FW), Recreation and Navigation (RN), and Community and Economic Development (CE). Each Action Plan contains goals and actions presented as specific and attainable tasks, summarized both in text and table form. (Note: the tables can be found in the paper version of this document, but are not included in the electronic version). Together, these actions to restore and protect the bays constitute the program's proposals for managing these vital natural and economic resources.

Action Plans for the coastal bays present a range of strategies that ensure economic stability through environmental recovery and protection. Many actions achieve multiple objectives, such as pollution prevention and water conservation. Each of the four Action Plans begins with an introduction that summarizes the problems that need to be addressed and follows with goals to be accomplished by the Action Plans.

Specific challenge statements further characterize issues to be tackled. Solutions are then offered and supported by strategic actions that address these challenges. Tables provide pertinent information about who will implement the actions, the schedule for initiating the action, and how much they will cost. (Note: the summary tables can be found in the paper version of this document, but are not included in the electronic version). Some actions can be implemented by partner agencies with existing resources and others will require new funds or creative financing. It should be noted that the designation of "lead agency" in the summary

tables does not necessarily refer to the agency responsible for implementing an action (although typically this is the case). In some instances, "lead agency" refers only to the partner that volunteered to coordinate and facilitate implementation of a particular action.

Agencies have identified actions in the table that can be implemented with existing resources by marking them "WER." Some actions will require additional resources so the estimated cost is provided when available. (Costs and implementation schedules that have yet "to be determined" are marked "TBD" in the summary tables). It should be noted that the cost information provided does not reflect the total cost of an action, only any supplemental funds needed to complete the effort. An unprecedented number of organizations are involved in the development of this management plan as witnessed by the list of acronyms. Readers will need to familiarize themselves with the acronym list on page 149.

IMPLEMENTING THE PLAN

Actions in Today's Treasures for Tomorrow represent important measures to aid in the recovery and long-term protection of the coastal bays and focus resources to achieve significant strides in accomplishing environmental goals. Because of the number and complexity of actions being undertaken in the plan, as well as the plan's emphasis on long-term solutions, implementation of the plan is characterized in three phases. Activities identified in phase one focus on research needs, planning activities, educational efforts, and other actions that can be implemented in the first five years. The results of many phase one actions will be used to implement phase two actions in years six through 10 and phase three actions in years 11-16. For obvious reasons, most attention has been directed to phase one activities. We are pleased to report that many of the actions in phase one can be implemented with existing agency resources.

Every two years the program will reevaluate its progress in meeting identified goals. This process also provides an opportunity to redirect efforts if new technology, new management approaches, or new discoveries provide insight on current approaches. Through this process, commitments will be reaffirmed and budgets can be planned to accommodate desirable strategies. Tracking success will be supported by a long-term monitoring program measuring water quality, habitat, and living resource improvements in a process designed to measure programmatic success. A summary of the monitoring program is found on page 128.

The CCMP also includes an Implementation Strategy and Finance Plan describing a process for identifying and obtaining funding for actions that cannot be implemented with existing resources or is not likely to be proposed in agency budgets in the future. The Finance Plan and Implementation Strategy can be found on page 100.

Maintaining community involvement in program activities also is a key element to successful implementation. A summary of our Public Involvement Strategy is highlighted on page 132.

GETTING A HEAD START

Since the Maryland Coastal Bays Program was established in 1996, the program has assisted the community in securing more than $2 million in federal grants to develop and implement strategies for restoring and protecting the coastal bays. The Program has provided over $175,000 in community grants that range from schoolyard native vegetation plantings to seagrass recovery in the bays. These grants kick-start efforts to protect the coastal bays and provide invaluable outreach and public involvement opportunities. A summary of the early action projects can be found on page 139.

INTRODUCTION

MARYLAND'S COASTAL BAYS: MANAGING A COASTAL PARADISE

The Maryland Coastal Bays watershed is an impressive coastal resource. It supports abundant wildlife and a wealth of aquatic resources in a relaxing rural atmosphere unique to the mid-Atlantic region. Here, residents and tourists alike enjoy fishing, hunting, boating, sunbathing, and the natural serenity offered by the sea. Tourists from New York to Virginia and beyond spend millions of dollars to bring their families to the coastal bays in hopes of catching summer flounder, digging hard clams from the bay bottom, or enjoying blue crabs in their favorite local restaurant. As summer draws to a close, residents look forward to the "off-season" to enjoy brisk early mornings where migratory ducks and geese fill the sky. Now this coastal community is faced with important choices about its future.

As the area continues to grow, additional stress is being placed on this coastal ecosystem. The coastal bays watershed is one of the fastest growing areas in Maryland. Population trends suggest that Worcester County will see six more developments the size of Ocean Pines by the year 2020. That equals another 40,000 residents in 21 years, almost double the current population. Historically, growth and development has brought new roads, additional sewers, excessive land consumption, increased congestion, and demand for increased services such as police, fire, and schools. As the Coastal Bays community continues to grow, additional wildlife habitat will be lost, chemical contamination will increase, aquatic systems will be stressed, and demand for community services will increase. Without a coordinated effort, these consequences will ultimately translate into a less economically viable future and lower quality of life for residents.

More than 12 million seasonal visitors support the watershed's $2 billion tourism industry. Recreational attractions like swimming, boating, fishing, and birding are all dependent upon healthy natural resources. In Worcester County alone, there are over 3,000 registered boats not including the significant numbers of visitors who haul their boats to the coastal bays. Current vacation trends indicate that tourists are now looking for more unique and memorable vacations. Some of the most popular vacation packages include eco-tourism opportunities where families canoe and birdwatch in serene areas to learn about wildlife and ecosystems. Also popular are family visits to enjoy historic areas featuring native culture and traditions. Providing these services will require preserving open space and enhancing historic sites.

Nowhere is the county's cultural essence better manifest than in farming, including forestry, which has been a way of life in this community for over 200 years. Orchards of all types were once prevalent on the Eastern Shore and provided fruits and vegetables to major cities like Wilmington and Philadelphia. Today, farming primarily supports the poultry industry. Worcester County's 474 farms, along with its forest resources, contribute more than $200 million annually to the local economy and provide both open space and habitat for wildlife. Retaining a strong agricultural land base is important for maintaining a high quality of life in Worcester County. Farms and forests also demand few services for the amount of land managed, resulting in less community infrastructure costs. These lands will be an important component of tourism

trends in the future with tourists wanting to learn more about agriculture and desiring locally grown fruits and vegetables.

Although realizing a sustainable vision for the coastal bays is an ongoing challenge, preparing for the future is easier today than ever before. More information is available about tourism trends, growth and development tools, agricultural practices, and aesthetic values. By bringing this information to the forefront, local communities can make better decisions about their future. Since 1996, the Maryland Coastal Bays Program has been fostering consensus on these issues by uniting different segments of the community to produce the comprehensive management plan for the coastal bays found on the following pages.

Local residents and representatives from the development, agriculture, fishing, golf, forestry, and tourism industries authored this effort with help from planners and scientists from a host of local, state, and federal agencies. Worcester County residents, who own this plan, seek to protect and preserve this special part of Maryland by setting a course for the ecological and economic prosperity of this coastal paradise.

Today's Treasures for Tomorrow is the culmination of three years of technical investigation and community involvement to protect the future of the Coastal Bays. This effort is being facilitated by the Maryland Coastal Bays Program, which was established in 1996 to assist the region in developing a comprehensive plan to restore and protect Maryland's Coastal Bays. The Program is a partnership among the Towns of Ocean City and Berlin; Worcester County; Maryland Departments of Natural Resources, Agriculture, Environment, and Office of Planning; National Park Service; and the U.S. Environmental Protection Agency.

The following Action Plans have been developed with assistance from natural resource experts, advocates and citizens. Since 1996, the Program has held a series of public meetings to solicit input in developing this plan. Consequently, the plan reflects the comments and suggested revisions generated from such meetings, as well as the public release of the draft Comprehensive Conservation & Management Plan in February, 1999.

This plan reflects significant contributions from individuals, community groups, and governmental agencies that share a common interest in a healthy environment and a prosperous region. Many thanks go to these participants for their substantial insights and contributions. This plan would not be possible without their ongoing support for the Program.

The Maryland Coastal Bays Program invites your comments and participation as we continue to fulfill a vision for the future of this coastal community.

STATE OF THE COASTAL BAYS

Maryland's coastal bays - Assawoman, Isle of Wight, Sinepuxent, Newport and Chincoteague Bays, along Maryland's Atlantic coast, behind Assateague Island and Ocean City - are a study in contrasts. As one of the most ecologically diverse regions in the state, the collective watershed of these bays encompasses approximately 175 square miles of Maryland's coastal plain. It supports numerous rare and threatened plant and animal species, forests and wetlands vital to migratory songbirds and waterfowl, and numerous important commercial and recreational fin and shellfish species. This region also is experiencing the most rapid population increases in the entire state. A countywide population of some 40,000 is expected to almost double by the year 2020. Close to seventy-five percent of these residents will live in the coastal bays watershed, which represents less than half of the county's land area. The region's economy depends largely on agriculture (including livestock production and silviculture) and tourism. However, maintaining the watershed's rural character, exemplified by its agricultural production, often has conflicted with the development of seasonal and year-round residential and commercial properties. Managing simultaneously both natural resources and future regional growth presents a variety of challenges. Yet citizens, local, state and federal agencies, businesses, environmentalists, farmers, foresters, fishermen, boaters and a host of other stakeholders spent three years combining their efforts to create a comprehensive management plan for everyone who treasures the coastal bays watershed.

THE ENVIRONMENTAL CONDITION OF THE BAYS

During this period of planning and evaluating, program partners identified five basic problems in the coastal bays: degraded water quality, chemical contamination, loss of habitat, changes in living resources, and unsustainable growth and development. Many of theses problems vary in intensity between the bays, particularly from north to south. Environmental problems are most prevalent in the northern bays, where human activity and environmental impacts are greatest; the southern bays, still largely rural and undeveloped, are considered to be relatively pristine. Below is a summary of the priority problems - more information on the environmental condition of the bays can be found in Today's Treasures for Tomorrow: An Environmental Report on Maryland's Coastal Bays.

Degraded Water Quality

Degraded water quality was identified as the most pressing environmental problem facing the coastal bays. Nutrients from definitive point sources and diffuse nonpoint sources contribute to higher than natural concentrations of nitrogen and phosphorus in the coastal bays. Excessive nutrients impair water quality by stimulating the growth of algae in the water column. These "algal blooms" block sunlight from submerged aquatic vegetation. The algae also deplete oxygen in the water when they die and decompose, reducing the amount of oxygen available to sustain healthy fish populations and other marine life. Most nutrient inputs to the coastal bays come from nonpoint sources such as agricultural and urban runoff. Estimates of nutrient contributions to the bays and tributaries have shown that more than 50 percent of nitrogen and more than 60 percent of phosphorus inputs may come from animal feeding operations (primarily

poultry) and other agricultural sources. In addition to agricultural sources, excessive nutrients in the coastal bays also come from atmospheric deposition, inadequate or failed septic systems and other sources of groundwater contamination, as well as from developed areas. Although developed areas may contribute more nutrients per area, agriculture is a major source of nutrients in the coastal bays watershed because it is the dominant land use. Excessive sediment inputs also contribute to the degradation of the bays' water quality, particularly through their reduction of water clarity. In addition to blocking light for submerged aquatic vegetation, excessive sediments impair the filtering abilities of many shellfish species and smother bottom-dwelling animals. Changes in land uses, soil disturbance and topsoil loss from un-vegetated surfaces, accelerate the transport of sediment into the bays. Human activities such as boating, dredging, shoreline stabilization, and land disturbing activities, further contribute to sedimentation and water clarity problems by exacerbating natural shoreline erosion and sediment resuspension from winds and waves. In addition, sediment enters the bays through the Ocean City inlet as a result of the inlet's stabilization with jetties and beach nourishment activities. This increased sediment input does not apparently have any detrimental water quality impacts. Results of extensive studies of sediment movement are contained in appendices of Ocean City, Maryland, and Vicinity Water Resources Study Final Integrated Feasibility Report and Environmental Impact Statement, June 1998.

Chemical Contamination

Chemical contamination from a variety of residential, agricultural and commercial activities has impacted the coastal bays, primarily in the more intensely developed northern bays. Such contamination includes oil; heavy metals from batteries, wood preservatives, and galvanized and chrome finished metals; automobile brake pad copper; and compounds from home and farm pesticides, as well as antifouling boat paint. In some cases these chemical pollutants threaten fish and other aquatic organisms but do not cause harm to humans. Some organic pesticides and metal compounds no longer are used in the United States, yet applications of these persistent chemicals decades ago still impair water and sediment quality. Other contaminants impact water and sediment through spills, leaching from underground storage tanks, and improper residential and commercial uses.

In the northern bays, where development, bulkheading for shoreline stabilization and dead-end canals are most common, the potential for chemical contamination is highest. Developed lands are more likely to contribute chemicals to the bays due to increased impervious surfaces (which contaminates water and allows it to move quickly to the bays) and the higher concentration of industry, automobiles and other human related sources (e.g.,oil, batteries, pesticides, wood preservatives, paints & finishes). Bulkheading can increase chemical contaminants in the bays because wood materials used for bulkheading typically have been treated with wood preservatives that leach into the surrounding environment. Lastly, dead-end canals receive excess chemicals from stormwater runoff (including pesticides and herbicides sprayed around homes, lawns and gardens, as well as runoff from roads, parking lots etc.), boat engines and paints, and other residential and commercial sources. Since the canals are not naturally flushed and often are deeper than the adjoining bays, they may represent contaminant "sinks" that pose an additional problem of how to safely decontaminate the canals without further impacting surrounding bay waters.

Habitat Loss

Another important problem in the coastal bays watershed is the widespread loss of forests, wetlands, open marsh, and other vital habitats necessary for the survival of various animal species. Changes in land use, from forest and non-tidal wetland to agricultural production and development, have resulted in extensive losses since the 1930's. Hard shoreline stabilization and erosion has reduced natural shoreline habitat, including bay beaches, islands, and tidal wetlands.

Since the 1930's more than 1,500 acres of tidal and 25,000 acres of nontidal wetlands have been lost in the coastal bays watershed. An additional 26,000 acres of forested wetlands may have been hydrologically impacted by a variety of human activities (Final Ocean City, Maryland and Vicinity Water Resources Feasibility Report, ACOE, June 1998), altering the original functions of these important natural assets. Such impacts to coastal bays wetlands have reduced the land's nutrient and sediment filtration capacity, natural flood and rain water absorption potential, and have disturbed habitats for numerous plant and wildlife species, including migratory birds and waterfowl. Lost shoreline and island habitats have impacted horseshoe crabs and shorebirds, and loss of tidal wetlands has affected nursery areas for juvenile crabs, finfish, and other aquatic species.

Upland forests in the coastal bays have been reduced to approximately half their abundance prior to European settlement. Forest loss along creeks and other waterbodies has increased the stress on aquatic organisms by allowing water temperatures to increase, accelerating shoreline erosion, and providing pathways for nutrient runoff. Just as important as the watershed's loss of forest acreage has been forest fragmentation - the creation of edge when a forest is converted to another use or a portion of a forest is harvested. Reductions in contiguous stands of forest have decreased habitat for interior dwelling birds and other wildlife species, while increasing habitat for certain "edge-dwelling" species. Additional changes in forest character that have impacted wildlife populations include an altered natural fire regime (substantially reduced from frequency of pre-European settlement times); native forest communities replaced with monocultures of loblolly pine; and hydrologic regimes altered as a result of an extensive ditching network. At the same time, some forest land has been regained in the past century as a result of increased silviculture operations.

Changes in Living Resources

Loss of habitat, combined with degraded water quality, has changed substantially the watershed's living resources. Water quality degraded by nutrient enrichment, sedimentation and chemical contamination has reduced the abundance of several fish species in the northern bays; a subtle transition to more pollution-tolerant species appears to be occurring in the northernmost areas. Degraded water quality also has impacted juvenile fish and shellfish that rely on submerged aquatic vegetation for food and shelter from predators, and has contributed to historic losses of scallops and clams in the bays.

Other threatened living resources include several species of rare and endangered plants and animals in the watershed, including 19 animals and more than 75 plants that are classified as

endangered, threatened, in need of conservation, or extinct. Also threatened are the wintering, breeding, and staging areas for the watershed's more than 360 bird species, including 30 species of shorebirds and waterfowl. In addition, habitat disturbance and other human activities have contributed to increases in some non-native and nuisance species in the watershed. Non-native species often compete with native species for food and habitat and, lacking native predators, may significantly affect a natural ecosystem. Nuisance species, such as snow geese, and non-native species, such as nutria, often destroy habitats important to waterfowl and other native species like Canada geese, quail, and dove. The economic impacts of these changes are still unknown.

Unsustainable Growth and Development

Historically, most conversion of forests and wetlands facilitated the accommodation of agricultural production. However, in the past 25 years, the percentage of land held in agricultural production has remained relatively unchanged, while developed lands have increased. The most drastic changes have occurred in the northern bays, where most of the watershed's population resides. Residential and commercial development to accommodate increasing seasonal and permanent populations can degrade habitat (such as forested acreage), water quality and other natural resources. Increases in seasonal and year-round populations also increase recreational and commercial uses of the watershed's natural resources and increase the potential for conflicts among users. Transportation inefficiencies, boating congestion, recreational fishing pressures, and pollution on the beaches and bay waters may increase without well-planned regional growth and resource management.

Management Issues in the Coastal Bays

In addition to the priority environmental problems discussed above, the region's existing management structure was analyzed to identify specific areas where resources, funding, and program activities may need to be targeted or reallocated in order to respond to localized needs, disproportionate demand, or limited citizen involvement. The most pressing management issues that need to be addressed include: education, equity with the Chesapeake Bay Program, and enforcement.

Possibly the greatest need in the coastal bays watershed is education and public outreach. Many federal, state, and local programs do not reach the intended audience. Alternatives to traditional practices, innovative technologies, and the availability of incentives to foster behavior changes are often underutilized because they are not understood. The importance of protecting natural resources, conserving water, and implementing changes in regional planning and development in coastal bays communities needs to be addressed with participation by all stakeholder groups in the watershed. Citizens do not necessarily understand the importance of their contributions to such initiatives. Laws, regulations and programs developed to protect Maryland's water quality and natural resources do not always apply to the coastal bays. Though many of the environmental concerns are the same, legal and programmatic directives targeting the Chesapeake Bay unintentionally exclude the coastal bays from reaping similar benefits. Therefore, the application, enforcement, and availability of certain state and federal programs may need to be reassessed in order to improve the environmental condition of the coastal bays

(MCBP Base Program Analysis 98-01). In addition, a variety of Federal, State, local and non-governmental agencies and organizations have statutory, regulatory and programmatic responsibilities in the coastal bays watershed. Enforcement of existing laws and regulations to protect the coastal bays water quality and natural resources may not be adequate in many cases. Accelerated population growth and development have outpaced the availability of enforcement personnel and programmatic resources (MCBP Base Program Analysis 98-01).

The contrasts and challenges illustrated by the environmental and management problems in the coastal bays watershed have framed the development of this comprehensive set of actions to improve the condition of the bays and the structure within which they are managed and protected. This management plan presents a blueprint for action to be set in motion by resource agencies and citizens to protect the coastal bays for many years to come.

INDEX OF ACTION PLANS FOR MARYLAND'S COASTAL BAYS

WATER QUALITY

GOAL 1 DECREASE NUTRIENT INPUTS TO GROUNDWATER FROM RESIDENTIAL AND COMMERCIAL LAND USES.

Solutions

GOAL 2 DECREASE NUTRIENT INPUTS FROM STORMWATER RUNOFF.

Solutions

GOAL 7 DECREASE INPUTS OF CHEMICAL CONTAMINANTS.

Solutions

FISH AND WILDLIFE

GOAL 1 INCREASE FISH AND SHELLFISH SPECIES.

Solutions

RECREATION AND NAVIGATION

GOAL 1 REDUCE THE AMOUNT OF SAND AND SEDIMENT ENTERING THE COASTAL BAYS FROM THE INLET.

Solutions

GOAL 2 IMPROVE THE MANAGEMENT OF NAVIGATION AND DREDGING IN THE COASTAL BAYS.

Solutions

GOAL 3 BALANCE RESOURCE PROTECTION WITH RECREATIONAL USE.

Solutions

GOAL 4 IMPROVE BOATING SAFETY IN THE COASTAL BAYS.

Solutions

GOAL 4 ENHANCE THE LEVEL OF SUSTAINABILITY IN LAND USE DECISION MAKING.

Solutions

ACTION PLANS FOR COASTAL BAYS IMPROVEMENT

WATER QUALITY

Eutrophication is the most significant environmental problem facing Maryland's coastal bays. Eutrophication is a natural process that typically takes place over hundreds of years. However, various land use activities greatly accelerate this process, resulting in serious water quality problems and habitat degradation when the amount of nutrients and sediments entering a water body exceed its ability to process or adapt to such inputs. Today, the amount of nutrients and sediments entering the coastal bays is significantly higher than under natural conditions.
The natural sediments in the bays can be degraded through accelerated eutrophication or by increased chemical contamination. Excessive sediment inputs can fill in water bodies, cover organisms living on the bottom that cannot move, such as oysters, and change the character of the natural sediment (e.g., from sand to mud). Because chemical contaminants tend to bind to sediments, the impacts of such pollutants are most prominent in organisms living on or in the bottom of the bays. Chemicals, like those found in fertilizer and pesticides, which are associated with urban land uses, like housing developments and golf courses, are an especially important threat because their use tends to increase as resident and tourist populations expand. When contaminated sediments are re-suspended through storms and other natural events, or human activities like boating and dredging, their threat to water quality and aquatic living resources increases.

NUTRIENT INPUTS

Nutrients (primarily nitrogen and phosphorus) enter the bays and their tributaries from both point and non-point sources. Point sources, such as waste water treatment plants, have a direct pipe discharging to the bays. Non-point sources pollute the bays with nutrients through diffuse inputs, such as surface runoff and groundwater infiltration, resulting from rainfall in urban and agricultural areas, as well as from atmospheric deposition of nutrients (associated with emissions from sources such as automobiles and power plants). Most nutrients enter Maryland's coastal bays through non-point sources.

The amount of nutrients from non-point sources generally depends on land use. Agriculture is a major land use in our area, and therefore, a primary source of total nutrient loading (from fertilization) to the bays. Agricultural land, however, also provides critical habitat for many species and provides considerable economic benefits to the watershed. A particular concern in the coastal bays watershed is the amount of nutrient contamination resulting from poultry manure used as fertilizer on agricultural lands. However, when compared on an acre-by-acre basis, agriculture may not generate as much nutrients in runoff or groundwater as the less prevalent land uses associated with urban development, such as personal lawns and gardens, commercial grounds, and golf courses. Whatever the land use, nutrients reach the bays and their tributaries more quickly in the form of runoff generated by rainfall, while contamination occurs

more gradually and steadily through groundwater flow to the bays. The proportion of nutrients entering the bays via surface runoff versus groundwater depends on weather, soil type, history of application, and use of best management practices.

Groundwater is rainwater that has seeped through the ground to aquifers that run like rivers under land (the deeper the water the older it is). Safe and abundant groundwater is essential to the health and economic vitality of the coastal bays community. Groundwater is the only source of drinking water, the primary source of irrigation water and the major source of freshwater to the coastal bays. The risk of groundwater contamination by nutrients is high due to the watershed's sandy soils, high water table, and relatively unconfined layers of groundwater that provide easy access for contaminants. High levels of certain nutrients (e.g.,nitrate) in the groundwater we drink can have serious human health impacts as well as contribute to eutrophication in the coastal bays. Sources of excess nutrients in groundwater include old or improperly maintained septic systems, over-application of fertilizers, and improperly designed stormwater retention devices. Drainage ditches (both public and agricultural) also may serve as an avenue for nutrients to enter the coastal bays (when the ditches are in contact with shallow groundwater). In addition to the impact of contaminated groundwater on the coastal bays, another important source of nutrient pollution is stormwater, including discharges from commercial and residential developments. In short, between groundwater and surface runoff, anything that is leaked, spilled, dumped or placed on land eventually makes its way to the bays.

Atmospheric deposition is another source of nutrients in the coastal bays. The burning of gasoline, oil, and coal releases nitrogen into the air which later is deposited into the bays through rain and settling. Major sources of atmospheric phosphorus include soil particles and dust that contain phosphorus. It is likely that sources outside the watershed and even outside the state of Maryland contribute significantly to such deposition.

Point sources include any discharge of pollution directly into a waterway from a clearly defined location. There currently are seven point source discharges directly to the bays, including four waste water treatment facilities and three industries. Combined, these seven point sources are estimated to contribute less than five percent of total nitrogen and phosphorus inputs to the coastal bays. Additionally, however, there are many localized and indirect sources of pollutants (e.g.,carwashes, shopping centers, granaries, and sludge application) that are not officially considered point sources, but are included in this section because they discharge below ground or onto land. These dischargers are permitted under the State Groundwater Discharge Permit Program. The net nutrient contribution of groundwater discharge permits to the coastal bays is difficult to estimate because these nutrients become mixed with those from nonpoint sources.

SEDIMENT INPUTS

Adequate water clarity is essential to a healthy coastal bays ecosystem. Sufficient light must reach bottom sediments to allow for growth of submerged aquatic vegetation (SAV), which in turn serves as critical food and nursery habitat for many coastal bay organisms. Poor water clarity results from a number of factors, including shoreline erosion, resuspension of bottom sediments by wind, tide and boating activities, loss of wetlands and filter feeders, phytoplankton blooms, and sediment runoff from ground-disturbing activities in the watershed.

Poor water clarity is a pervasive problem in the coastal bays and their tributaries. Whole sections of the bays, including Trappe Creek, Newport Bay, St. Martin River and Assawoman Bay have water clarity insufficient to meet the SAV restoration goals used in the Chesapeake Bay. Overall only 22 percent of the coastal bays have water clarity that satisfies this target, primarily in Chincoteague Bay.

CHEMICAL INPUTS

Chemicals such as metals and pesticides occur in some bay sediments at levels likely to cause harm to living organisms. The greatest concentrations and potential risks are found in association with the muddy sediments of the northern bays, tributaries, and artificial canals. Measurable levels of persistent pesticides exist in bay sediments despite the fact that these chemicals have been banned for years. Chemicals associated with urban development, such as pesticides and lawn fertilizer, are a particular threat since they are likely to become more abundant as resident and tourist populations increase. However, because information is so limited much remains to be learned regarding the distribution, specific concentrations, and adverse effects of these pollutants in the coastal bays watershed.

CONCLUSION

The following water quality actions rely heavily on existing technology and resource management programs to meet current environmental protection standards and requirements. While these actions are being implemented, new requirements are under development, which will call for additional management strategies (such as Total Maximum Daily Load and Source Water Assessment initiatives) as well as modifications in existing programs. To remain a viable tool for protecting the environment and managing the resources of the Coastal Bays, the CCMP will undergo updates every two years to reflect these new programmatic challenges and opportunities.

GOAL 1: DECREASE NUTRIENT INPUTS TO GROUNDWATER FROM RESIDENTIAL AND COMMERCIAL LAND USES

WQ 1.1 ***Challenge: Reduce failure rate and inefficiency of on-site waste water treatment***

Many on-site waste water treatment systems in the watershed (including septic systems, cesspools, tanks, privies, and drain fields) are several decades old, and although designed and built to meet the best information and technology available at the time, are no longer adequate. Antiquated systems include those with overflow pipes and those installed into groundwater. Unless retrofitted, these old systems will continue to contribute excessive amounts of nutrients to the groundwater, and ultimately, to the coastal bays. Failing septic systems include systems whose effluent protrudes through the ground surface as well as those located in areas that are frequently flooded. Tank failures also may result from poor maintenance by homeowners, who

need more information about the proper maintenance of waste water treatment systems and the positive impacts of alternative systems. Current state guidelines recommend pumpout every two to three years, but the actual need is dependent on septic tank size, materials placed in the system and the amount of flow (i.e., number of people in the household).

Solution: Develop incentives, advanced technologies, and pretreatment options to mitigate failing or antiquated waste water treatment systems and to properly maintain existing systems.

Actions:

1. WC will implement a program to identify systems operating improperly.
2. WC and MDE will promote the pretreatment of waste before it enters the drain field (e.g., through peat and sand filters) as a cost efficient option to improving nutrient treatment.
3. WC, municipalities, and MDE will promote participation in existing cost-share programs (such as the state's Linked Deposit Program) to assist homeowners in retrofitting older systems. Implementation should be phased as repairs are necessary and allow the owner a choice of pretreatment options from several deemed acceptable.
4. WC, municipalities, and MDE will devise incentives in addition to the Linked Deposit Program as necessary to further promote the retrofitting, maintenance, and monitoring of all septic systems.
5. MCBP will develop educational materials for the public on the relationship between ground-water protection and proper septic system siting, design, installation, use, and maintenance.
6. MCBP and WC will develop a program to encourage homeowners to regularly have their waste water treatment systems pumped out based on site specific needs.
    A. WC will mail notices to homeowners when it is estimated time to pump, using a septic tracking system based on household size, type/size of septic system, estimated use, etc.
    B. WC and MCBP will send educational materials to new owners when properties with septic systems change ownership. WC and MCBP will educate banks and lending institutions about the value of proper waste water treatment system maintenance.
    C. WC will seek the necessary authority to use either state or local tax incentives (e.g., an income tax reduction with proof of septic pumpout on a recommended three-year interval) to encourage proper maintenance.
7. WC and municipalities will investigate whether septage disposal at permitted treatment plants will be sufficient to meet increased waste volume resulting from more frequent maintenance.
8. MCBP will encourage local banks to be certified for handling of loans through state revolving loan funds to facilitate homeowner's installation of septic pre-treatment.

Expected Benefits:

- improved fisheries and water-based recreation
- extended system life span and improved system function that reduces cost to property owners for maintenance and replacement
- enhanced property values and aesthetics

Related Actions: WQ 1.2, WQ 1.3, WQ 1.5

WQ 1.2 ***Challenge: Update septic system designs***

Traditional septic systems cannot treat waste water as effectively as advanced treatment at centralized, well maintained treatment plants. Nutrient inputs to groundwater from septic systems may be even greater in the coastal bays watershed than elsewhere in the state due to sandy soils, high groundwater levels, and a lack of compact soil such as clay that water cannot penetrate. Innovative and proven designs for septic systems need to be promoted in favor of traditional designs less suited to the unique soils and hydrologic conditions of the coastal bays watershed. At the same time, it is critical that these new technologies shall not set a precedent for promoting development inconsistent with WC zoning and subdivision regulations, nor with the county comprehensive plan.

Solution: Designate the coastal bays watershed as an "Area of Special Concern" to better manage existing on-site sewage disposal systems.

Actions:

1. WC will request and MDE will designate the entire coastal bays watershed an "Area of Special State Concern." This designation will allow greater flexibility to prohibit on site sewage disposal systems that are not appropriate to the unique conditions of the coastal bays watershed. The goal shall be to protect surface and ground water and implement policy consistent with WC's Master Sewer and Water Plan. The plan resulting from this designation will consider the following:
    A. WC will adopt state sand line trench guidelines for systems located on lots of record platted as of 1985.
    B. WC will allow use of 60-minute percolation rate tests to allow the design of a new system (modified sand mound 0-30; 1.2 gallon per square foot per day 30-45 .75 45-60 application rate .5 gallons per square foot per day), taking advantage of slower impermeable soils to decrease nutrient inputs to groundwater.
2. UMCE and MCBP will educate homeowners and builders on the benefits of alternative septic systems.
3. WC, municipalities, and MDE will devise appropriate incentive or other programs to encourage the use of innovative or improved on-site waste water treatment systems in new home construction. (Note: the state's Linked Deposit Program may be appropriate, but new programs also may be needed.)
4. WC, municipalities, and MDE will determine the feasibility of developing a monitoring program and maintenance schedule for all septic system owners (to avoid unfairly charging those who use innovative systems).
5. MCBP and MDE will collect information on European methods of waste management such as the Clevis composting toilet and peat filter systems from Sweden.
6. WC will revise its master water and sewer plan so that it better reflects the intent of state law to require that future development be consistent with the plan's projections.

Expected Benefits:

- improved fisheries and water-based recreation
- extended system life span and improved function

- reduced costs to property owners for maintenance and replacement
- enhanced property values and aesthetics
- reduced nutrients to groundwater

Related Actions: WQ.1.1, WQ 1.3, WQ 1.5

WQ 1.3 ***Challenge: Improve understanding of groundwater resource***

The coastal bays region is solely dependent on groundwater for public drinking water supplies. Groundwater also is the source of much of the freshwater that flows into the coastal bays. The shallow, unconfined groundwater aquifer of the coastal bays watershed is very susceptible to both point and non-point source contamination from fertilizers, pesticides, septic effluent, and other sources. Unfortunately, very little is known about the types, sources, spatial extent, and concentration of groundwater contaminants in the coastal bays. State and local officials need this information to properly manage and protect both drinking water supplies and the environment.

Solution: Perform studies to determine the types, sources, spatial extent, and degree of groundwater contaminants and make the information available to the public through education and outreach.

Actions:

1. USGS and NPS will conduct a survey of groundwater movement and nutrient inputs to the coastal bays.
2. MCBP will educate the public on findings from the groundwater survey and on actions the public can take to protect groundwater.
3. MDE, with assistance from WC, will produce an assessment of current risks to groundwater posed by improper use of existing and abandoned wells. This should be coordinated with MDE's Source Water Assessment and Source Water Protection programs.
4. MDE will notify WC of any abandoned wells found in source water assessment areas and request they be properly sealed.
5. To extent possible, WC will identify abandoned wells in other areas and require proper sealing.

Expected Benefits:

- identification of areas vulnerable to specific contaminants
- comprehensive groundwater data results in more efficient planning and zoning decisions which prevent contamination, reducing tax expenditures needed for more expensive future restoration activities

Related Actions: WQ 1.1, WQ 1.2

WQ 1.4 ***Challenge: Reduce excessive fertilization by turf professionals***

Excessive or improper use of fertilizer by private homeowners contributes a disproportionate amount of nutrients to the bays relative to the land area occupied by residential properties. This problem is a particular concern in the northern bays.

Solution: Implement program to educate public on lawn and garden practices that reduce nutrient contamination of groundwater and the bays.

Actions:
1. Based on its record keeping requirements, MDA will require grounds managers to apply nutrients in accordance with Cooperative Extension recommendations, based on soil tests for site specific conditions and fertilizer needs.
2. WC will use the Voluntary Golf Course Guidelines to help coordinate with all partners to ensure integration of golf courses into requirements of WQIA of 1998.
3. WC will work with golf courses to establish voluntary nutrient and pesticide monitoring of groundwater and adjacent surface waters to ensure effectiveness of implemented nutrient management plans.
4. UMCE will work with MCBP to educate professional grounds managers in developing fertilizer reduction programs and complying with the provisions of the State Nutrient and Commercial Fertilizer Application Requirements.

Expected Benefits:
- reduced expenditures on lawn and turf maintenance
- decreased eutrophication of tributaries and bays
- better assessment of nutrient and pesticide sources

Related Actions: WQ 1.5, WQ 4.1, WQ 4.2

WQ 1.5 ***Challenge: Reduce excessive fertilization by homeowners***

Excessive or improper use of fertilizer by private homeowners contributes a disproportionate amount of nutrients to the bays relative to the land area occupied by residential properties. This problem is particular concern in the northern bays.

Solution: Implement program to educate public on lawn and garden practices that reduce nutrient contamination of groundwater and bays.

Actions:
1. UMCE will implement "master gardener"-like courses.
2. MCBP will produce additional pamphlets, brochures, fact sheets, newsletter articles, etc., as necessary to supplement UMD CES information. MCBP will assist with wide distribution to residential landowners to encourage proper fertilizer application and facilitate participation in programs such as BayScapes.

Expected Benefits:
- reduced expenditures on lawn and turf maintenance
- increased public appreciation of relationship between land use and water quality

- decreased eutrophication of tributaries and bays

Related Actions: WQ 1.4, WQ 4.1, WQ 4.2, WQ 7.1, FW 2.5

GOAL 2: DECREASE NUTRIENT INPUTS FROM STORMWATER RUNOFF

WQ 2.1 ***Challenge: Reduce water quality impacts from stormwater discharges***

In naturally vegetated areas, the flow of runoff from storm events is slowed by vegetation, allowing water sufficient time to infiltrate the soil and be biologically treated (e.g., through nutrient consumption by plants) before reaching the bays. In developed areas, impervious surfaces (roads, parking lots, rooftops, etc.) prevent infiltration, contributing both to flooding and the direct input of untreated runoff into water bodies. Stormwater management devices are structures designed to collect runoff from developed land in order to reduce the potential of flooding and provide water quality treatment. They also can be designed to biologically treat the runoff to reduce water quality impacts. Although WC regulations encourage the use of stormwater designs that protect groundwater quality in addition to control flooding, most designs submitted to the county are for wet ponds. Although wet ponds require retaining stormwater on site for treatment, often they are connected hydrologically with groundwater (because they are dug deep to retain volume and take up less space), and therefore, act as direct conduits of nutrients to groundwater. More attention needs to be given to treating stormwater discharges in a shallow wetland system, instead of a deep pond, to provide better water protection. Finally, the cumulative impact of runoff from many small properties in municipalities may be significant and should be considered more often.

Solution: Ensure that (1) new stormwater management devices are designed to address water quality as well as flood control needs, (2) impacts to on-site waste water treatment systems on adjacent properties are considered, and (3) the cumulative impact of runoff from many small properties is treated.

Actions:

1. WC will update county stormwater management plan to coincide with proposed State Regulations and Stormwater Design Manual, including impacts to upstream, downstream, and adjoining properties.
2. WC will enforce stormwater regulations to comply with the proposed State Regulations and Stormwater Design Manuals.
3. MCBP will promote use of design standards by:
    A. Providing workshops for designers, architects
    B. Working with planning commission and staff to incorporate innovative stormwater management strategies in possible code updates to conform to new state manual; and
    C. Encouraging multiple resource development with stormwater treatment.
4. MCBP will encourage residential buffers to help reduce sediment, pesticides, and fertilizer runoff from lawns.

5. MCBP will promote retention of wetlands and their buffers in significant riparian zones and the preservation of existing stream contours.
6. MCBP will promote minimal use of impervious surfaces by:
    A. Encouraging adoption of new road and parking lot standards to reduce road width in subdivisions where applicable.
    B. Promoting use of porous pavements where appropriate.
7. MCBP and WC will encourage innovative stormwater management in new developments and re-development projects by promoting and encouraging use of incentives and credits for environmental site design as provided for in the proposed Maryland Stormwater Design Manual.
8. Ocean City, the Town of Berlin, and WC will take a unified approach to treating the cumulative stormwater runoff from small properties that meets the new state Stormwater Management Guidelines.

Expected Benefits:
- reduced tax expenditures on impervious surfaces and structural controls
- reduced flood damage to private property
- enhanced aesthetics and real estate values

Related Actions: WQ 2.2, WQ 2.3

WQ 2.2 ***Challenge: Improve stormwater quality from existing development***

Development projects built prior to July 1, 1984 were not required to incorporate stormwater management devices. Stormwater management devices required since July 1, 1984 often control flooding but do not protect water quality. Finally, the cumulative impact of runoff from many small properties in municipalities may be significant.

Solution: Build new (or retrofit) stormwater management devices in existing developments and municipalities.

Actions:
1. NRCS will work with municipalities and MDE to review all development properties in the watershed and identify those that need retrofitting. This identification should include developed areas (primarily within municipalities) where cumulative impacts of runoff from many small properties are not addressed.
2. MCBP and NRCS will investigate cost-effective and innovative stormwater treatment systems for addition and retrofitting in areas identified above (e.g., shallow wetland practices, filtration and infiltration practices, vegetated swales, etc.)
3. WC, Town of Ocean City, and Town of Berlin will work with owners of identified properties to add stormwater management devices or retrofit existing ones. Municipalities and MDE will work together to investigate existing mechanisms and encourage such communities to utilize MDE's "Stormwater Pollution Control Cost-Share Program" to implement stormwater management devices.

Expected Benefits:

- improved fishing and swimming in coastal bays
- reduced tax expenditures on structural controls
- reduced flood damage to private property
- enhanced real estate values

Related Actions: WQ 2.1 WQ 2.3

WQ 2.3 ***Challenge: Reduce ground-water contamination from roadside ditches***

Roadside ditches are currently managed primarily for flood control and do not to meet water quality standards.

Solution: Establish policies for managing roadside ditches to protect water quality from both point and non-point sources. Maintenance of public roadside ditches should be designed to protect water quality and some policies should be modified (such as the use of curb and gutter requirements as opposed to open grass swales) to avoid conflicting with water quality protection goals. State, county, and municipal highway maintenance crews should be educated about ditch management techniques that protect water quality.

Actions:

1. WC, SHA, and municipalities will follow policies outlined in new state Stormwater Maintenance Guidelines (open channel practices and non-structural practices) for maintaining public roadside ditches for water quality and sediment control including:
    A. Requiring the retention of vegetation:
        i. Grass filter strips are mowed during the growing season to maintain grass heights of 4-6 inches.
        ii. Wet swales do not require mowing.
        iii. Sediment build-up within the channel or filter strip shall be removed when 50% of the original water quality volume has been exceeded.
    B. Maintaining shallow depths and small slopes - 2:1 or flatter (e.g., do not dig too deep).
    C. Encouraging vegetative buffers using proper grass species and wetland plants based on specific site, soil and hydric conditions.
    D. Improve the practice of herbicide application by State and County road crews to minimize impacts to natural resources (e.g., reduce unnecessary and excessive applications)
2. SHA and WC will educate appropriate state highway and county employees on the ditch maintenance practices listed above.

Expected Benefits:

- reduced public and private expenditures for structural management of roadside ditches
- cost-effective approach to improving water quality in tributaries and coastal bays
- reduced chemical contamination

Related Actions: WQ 2.2

WQ 2.4 ***Challenge: Improve coordination of stormwater and septic systems***

Groundwater levels are the primary factor influencing the design and effectiveness of drain fields for on-site waste water treatment systems. Stormwater management devices can significantly influence groundwater levels in their immediate vicinity, and therefore, can negatively impact the waste water treatment capacity of nearby treatment systems. Although Worcester County currently considers the impact of proposed Stormwater management devices on waste water treatment systems on the same parcel, more consideration should be given to the impact of systems on adjacent parcels. New Stormwater management devices, therefore, can promote movement of nutrients into groundwater by negatively impacting the effectiveness of on-site waste water treatment systems on adjacent parcels.

Solution: Modify practices to ensure that stormwater management devices on adjacent developments do not negatively impact on-site waste water treatment systems. Location of septic systems must take priority over stormwater location.

Actions:

1. WC will increase coordination via greater discussion of stormwater issues at Technical Review Committee stage for stormwater approval of alternative systems (review and design).
2. WC and municipalities will revise the stormwater review process so that the appropriate local Environmental Programs offices will review stormwater management plans before WSCD approves the plan.
3. WC will add into county code minimum separation distance (100 feet) between septic systems and stormwater management devices and require site visits during design period, as necessary to ensure that stormwater management devices do not negatively impact drainage fields. Minimum separation distance will apply to systems on adjacent parcels as well.

Expected Benefits:

- improved fisheries and water-based recreation
- reduced government waste due to conflicting county requirements
- improved aesthetics and property values

Related Actions: WQ 2.1

GOAL 3: DECREASE NUTRIENT INPUTS FROM THE ATMOSPHERE

WQ 3.1 ***Challenge: Improve understanding of atmospheric deposition of nutrients***

Atmospheric deposition is a source of nutrients to the coastal bays. The burning of gasoline, oil and coal and the decomposition of animal manure release nitrogen into the air which later is

deposited into the bays through rain and settling. Sources and amounts of atmospheric deposition of nutrients are unclear.

Solution: Perform study to identify sources (local and non-local) of atmospheric deposition of nutrients to the coastal bays and identify actions to decrease these inputs.

Actions:
1. MCBP will work with Chesapeake Bay program to identify atmospheric nutrient sources impacting the coastal bays airshed.
2. MCBP will investigate methods to decrease local sources of atmospheric inputs.
3. MCBP will explore feasibility of improved transportation systems such as 24-hour mass transit for county, satellite parking for Ocean City, and tour buses between municipalities and museums.

Expected Benefits:
- improve potential of coastal bays fisheries and water-based recreation by reducing sources of nutrient contamination from air deposition.

Related Actions: CE 4.4

GOAL 4: DECREASE NUTRIENT INPUTS FROM AGRICULTURAL SOURCES

WQ 4.1 ***Challenge: Reduce nutrient pollution from farming***

Agriculture is an important industry in the coastal bays watershed. Although there are many environmental and economic benefits provided by agricultural land (such as important habitat for many species), farming also is a source of nutrients to the bays. Poultry manure used as fertilizer is a particular concern in the watershed. Poultry manure frequently is applied at levels that meet the crop's nitrogen needs but greatly exceed the crop's phosphorus requirements. Fertilizer (either chemical or manure) applied to farmland in excess of a crop's nutrient needs may impact the bays via either direct runoff or groundwater.

Solution: Increase financial, educational, and technical resources necessary to assist farmers in nutrient reduction.

Actions:
1. MDA will (a) inform poultry farmers about opportunities to adopt new nutrient management strategies and (b) educate farmers about the provisions of the Water Quality Improvement Act of 1998 for cost-sharing to complete nutrient management plans.
2. MCBP will work with the Nutrient Reduction Oversight Committee to (a) learn about alternative animal waste technology development and demonstrations being funded by the state and (b) determine how successes could be transferred to the coastal bays.
3. MDA, WSCD, and MCBP will work with farmers to facilitate implementation and reduce the economic hardships of the WQIA and work to encourage greater participation by farmers

in the voluntary aspects of the act. This will be accomplished by partners (MCBP, MDA, WSCD, MDE, UMCE) pursuing additional resources to provide financial, technical, and educational support to coastal bays farmers. Agricultural operations in the coastal bays will be used to demonstrate advantages of participating in incentive programs available to assist with implementation of WQIA requirements.

4. MCBP will work with MDE, MDA, DPI and Farm Bureau to convene a workshop to evaluate the recommendations of EPA's ongoing poultry dialog and proposed NPDES regulations.
5. MCBP will inform the general public about positive changes farmers are implementing to manage nutrients and protect water quality.

Expected Benefits:

- less expensive form of nutrient reduction than structural approaches
- reduced degradation of fisheries

Related Actions: WQ 1.4, WQ 1.5, WQ 4.2

WQ 4.2 ***Challenge: Improve efficiency of fertilizer application rates***

WC farmers calculate nutrient needs based on the previous crop, soil tests, current crop needs, and yield expectations. A field, however, rarely contains uniform nutrient concentrations or needs. Thus, when a uniform concentration of fertilizer is applied to a field some parts of it are over-fertilized while others are under-fertilized. This results both in a loss of productivity (and, hence, revenue) and nutrient runoff from the over-fertilized areas.

Solution: Take greater advantage of recent technological advances, such as Precision Farming Techniques.

Actions:

1. NRCS and MDA will investigate methods to promote economic use of precision farming practices by facilitating the availability of low interest loans, such as the state's Linked Deposit Program and State Revolving Fund.
2. MCBP, MDA, and WSCD will develop lease options and create a regional program for the "loaning" of precision farming equipment (e.g., GPS) for farmers who cannot afford units on their own.
3. MCBP will investigate partnerships with corporations to provide farmers with precision farming equipment at reduced cost.

Expected Benefits:

- less expensive nutrient reduction than structural approaches
- reduced degradation of fisheries
- reduced spending on chemical fertilizers
- higher agricultural production with less impact

Related Actions: WQ 1.4, WQ 1.5, WQ 4.1

WQ 4.3 ***Challenge: Improve management of drainage systems***

Ditching of agricultural fields in the coastal bays watershed is necessary in order to drain enough water from the fields to allow for farming. Agricultural ditches, however, also transport nutrients to the bays both directly and via groundwater.

Solution: A comprehensive approach to reducing the adverse environmental impacts of agricultural ditches is needed to minimize nutrient transport to the bays.

Actions:

1. MDA and MDE will encourage the use of state and federal cost-share programs and Water Quality State Revolving Fund to make water control structures and sediment basins in existing agricultural drainage systems eligible for funds based on water quality benefits.
2. MDA and MDE will conduct a technical review to determine potential water quality benefits, management requirements (including liability concerns for up-ditch property owners), and eligibility criteria for financial assistance, of installing control structures and basins in agricultural ditches.
3. MDE, NRCS and MDA will investigate recent agricultural ditch management practices to benefit water quality in Delaware and consider using this information to set standards and eligibility requirements.
4. NRCS, MDE and MDA will establish eligibility criteria for individual cost share on a project by project basis and, as appropriate, through the use of design standards.
5. MDA, MDE, and MCBP will encourage grant funding for demonstration projects and investigate long-term funding through other programs (EQIP, SRF).
6. NRCS will evaluate drainage alterations to enhance land use efficiency and production and to reduce pollution beyond just property lines. NRCS will consider.
    A. Cooperative partnerships between adjacent landowners.
    B. Implications for future subdivision and precision farming.

Expected Benefits:

- improved fisheries habitat
- less costly management of agricultural drainage systems and ditches
- improved crop yields and increased efficiency of other land uses through better water table management

Related Actions: WQ 6.2, WQ 6.3

GOAL 5: REDUCE NUTRIENT INPUTS FROM POINT SOURCES

WQ 5.1 ***Challenge: Reuse more waste water***

Effluent from waste water treatment plants, although treated, is still relatively high in nutrients. Reuse of waste water on farms (where appropriate), golf courses, etc., as nutrient rich irrigation water could be a viable alternative to discharging waste water into the bays. Such re-use is

beneficial for many reasons: decreased nutrients entering the bays, decreased fertilizer costs, and decreased ground-water use for farms and golf courses. If applied appropriately, sludge from waste water treatment plants and industrial sources also can be used beneficially. However, any re-use of waste water or sludge must be coordinated with existing nutrient management plans.

Solution: Encourage waste water reuse and sludge application as appropriate.

Actions:

1. WC will revise county zoning regulations relative to map amendments to stipulate that the presence of waste water conveyance lines for treated waste water shall not be accepted as evidence of either change in the character of the neighborhood or mistakes in existing zoning.
2. MDE will bring potential waste water/sludge users and generators together to explore mutual benefits by:
    A. Identifying areas within the watershed that have the capability for waste water re-use and sludge application (e.g.,coordinate sources and potential users).
    B. Ensuring that various permitting branches within MDE responsible for sludge and waste water treatment and re-use are coordinated in their approach and promote state re-use policies.
    C. Making industrial and municipal facilities aware of MDE's pollution prevention initiatives by distributing information during site inspections.
3. MDE and WC will continue to work together to ensure that sludge applications from all sources are regulated to protect water quality.

Expected Benefits:

- reduced costs associated with wasting groundwater resources
- reduced nutrients to groundwater and coastal bays

Related Actions: WQ 5.4

WQ 5.2 *Challenge: Improve understanding of tertiary sewage treatment needs*

Current technology provides three levels of nutrient reduction in waste water treatment plants. The first level (primary treatment) removes most large particles and solids. The second level (secondary treatment) reduces the biochemical oxygen demand of the effluent, leaving more oxygen for fish and wildlife in the receiving waterbody. The most advanced level (tertiary treatment) removes most nutrients. The most common form of tertiary treatment in Maryland involves biological nutrient removal (BNR), which typically utilizes bacteria or plants to absorb nutrients. Currently waste water treatment plants (WWTPs) that discharge directly into the coastal bays watershed include Berlin (five months per year), Ocean Pines, Perdue, Assateague Island, and Newark (these latter two plants only provide secondary treatment). Permitted sub-surface discharges include Assateague Point, Beach Club Golf Links, Berlin (part of the year), Green Field Golf Course, Lighthouse Sound Development, Mariners Country

Downs, Mystic Harbor, Quality Inn, Riddle Farms WWTP, River Run WWTP, The Bay Club and the Landings.

Although current water quality impacts from these facilities may be moderate or even minimal, it is important to assure that they provide appropriate treatment levels. In addition, determinations regarding any treatment plant upgrades and expansions should reflect updates to the county's master water and sewer plan.

Solution: Determine adequacy of existing systems and implement corrective actions as necessary.

Actions:
1. Municipalities will work with WC and MDE to determine the adequacy of treatment facilities for protecting water quality in the coastal bays watershed and require additional treatment if needed.
2. MDE, through its permit review process, WC and municipalities will work with WWTPs to encourage spray irrigation of forested lands to permit year-round, wet weather application of treated waste water.

Expected Benefits:
- improved fisheries and water-based recreation in coastal bays

GOAL 6: IMPROVE WATER QUALITY BY REDUCING SEDIMENT INPUTS

WQ 6.1 ***Challenge: Improve efficiency of sediment and erosion control program***

Current sediment control efforts are frequently inadequate. Sediment and erosion control plans are approved for construction projects but they are not regularly inspected after installation to determine if they are functioning properly. In many cases sediment control structures are disrupted by weather and never repaired to maintain function.

Solution: Consistent with the recommendations in CE 4.3 and CE 4.5, use an integrated enforcement strategy and expand the use of vegetated buffers to reduce sediment loading and turbidity from development.

Actions:
1. MDE, WC, OC, and Berlin will use an integrated enforcement strategy to reduce sediment loading and turbidity from development as outlined in CE 4.5.
2. MDE, WC, OC, and Berlin will promote the use of vegetated buffers and examine other practices that protect water quality beyond traditional silt fences, such as designated undisturbed areas and protection zones.

Expected Benefits:
- reduced sediment deposition into waterways

- improved fisheries habitat

WQ 6.2 ***Challenge: Reduce shoreline erosion rates***

Shoreline erosion leads to higher turbidity (cloudiness) in the water and can change the bottom sediment type from sand to mud. These factors can limit the growth of seagrasses, which are important habitat for fish and crabs. Causes of shoreline erosion include waterfront development, boating activities, as well as the loss of wetlands and other riparian areas. Soft methods of stabilization (i.e., non-structural methods such as natural vegetation and marshes) are much preferred over hard methods (i.e., structural methods, such as rip-rap and bulkheading) because soft shorelines absorb wave energy rather than reflecting it and disturbing bottom sediments.

Solution: Encourage limited shoreline development and make soft shoreline protection methods the preferred approach in highly erodible areas.

Actions:

1. MDE, ACOE, DNR, OC, and WC will give preference to soft protection of the shoreline, promote use of alternative materials when bulkheads are needed, and provide incentives to re-establish native vegetative buffers (e.g., wetlands, riparian buffers, shore grasses) where they have been removed or lost. Additional guidance will be gleaned from DNR's "Shore Erosion Control Guidelines to Waterfront Property Owners" and MDE's shore erosion manual.
    A. WC will form a local workgroup to coordinate with the newly established Maryland Shore Erosion Task Force charged with developing a comprehensive plan for prevention of shoreline erosion.
    B. The County workgroup will propose recommendations from the Shore Erosion Task Force Plan that are appropriate for County application as well as recommendations of their own deemed applicable.
2. MDE, ACOE, and WC will encourage alternative wetland designs for new shoreline stabilization sites.
3. MCBP will begin program for restoration of shoreline marshes in degraded areas.
4. DNR will conduct a shoreline erosion survey to determine current extent, historic rates, and projected loss. This information will be used to target landowners whose property is experiencing severe erosion.
5. WC will discourage development activities in areas that are considered highly erosive.
6. DNR will promote stream restoration projects.
7. MCBP and DNR-MGS will publish a shoreline change map to help prioritize eroded areas and show the public what natural shorelines looked like.

Expected Benefits:

- improved riparian and fisheries habitat
- enhanced eco-tourism opportunities through improved habitat and shoreline aesthetics

GOAL 7: DECREASE INPUTS OF TOXIC CONTAMINANTS

WQ 7.1 ***Challenge: Reduce runoff of toxic chemicals***

Pests can cause significant economic loss to agricultural, private property, and public lands, but the pesticides used to control them can have devastating environmental, as well as economic, impacts. Best Management Practices are a variety of alternative techniques to control pests while minimizing damage to the environment. Many such practices have been used for years on agricultural lands but elsewhere have gained limited acceptance.

Solution: Increase the use of best management practices on commercial and residential properties as well as in state-run programs to control gypsy moths and mosquitoes in order to reduce negative environmental and economic impacts.

Actions:

1. MCBP and UMCE will encourage all farms, golf courses, recreation areas, and community organizations to have integrated pest management plans (IPM) and will sponsor a demonstration site (golf course) and awards program for IPM.
2. MCBP will target cemeteries, parks, highway rights of way, and private homes for natural plantings (e.g.,BayScapes).
3. MCBP and UMCE will follow, as appropriate, the Chesapeake Bay Program's urban recommendations and methods.
4. MCBP and UMCE will promote educational opportunities, e.g., bird/ bat house designs, and encourage homeowners to foster purple martins and bats.
5. MCBP will conduct a literature review on efforts in other states to control mosquitoes and gypsy moths and will provide results to the community.
6. MDA will investigate biological control options (including their cost effectiveness) for mosquitoes and gypsy moths and provide information to the public.
7. MCBP will sponsor a public forum to present the findings of actions 5 and 6 to the public.
8. ACT will promote existing literature on alternatives to traditional mosquito and gypsy moth control methods.
9. WC will encourage less toxic aerial spraying for adult mosquito control and concentrate more on larvacides.

Expected Benefits:

- reduced pest management expenditures
- less potential for toxic spills and poisonings
- healthier wildlife populations

Related Actions: WQ 4.3, WQ 6.1, WQ 6.2

WQ 7.2 ***Challenge: Better management of household and farm hazardous waste***

Current hazardous waste disposal in the county needs improvement. The collection, appropriate disposal, and recycling of hazardous wastes such as batteries, antifreeze, used oil, paints, and chemical solvents should be promoted as a means of preventing harmful chemicals from entering the bays. Proper disposal of these wastes is needed to decrease the amount of contaminants entering the coastal bays.

Solution: Reduce the use and improper disposal of household hazardous wastes through education, promotion of alternatives, and additional collection sites.

Actions:

1. UMCE, MDE and MDA will educate the community about safe disposal of household and farm hazardous wastes (including old gasoline). MDE and MDA will sponsor hazardous waste collection days (possibly in connection with Coast Day events or Earth Day).
2. MCBP, WC, and MDE will distribute the MES publication (updated as appropriate) for lower shore businesses that informs them of waste disposal options, emphasizing county-sponsored household hazardous waste collection services and recycling opportunities.
3. MES will research and promote alternatives for waste reuse (e.g., using grease to make diesel fuel).
4. MCBP will promote use of safe alternatives to household chemicals.

Expected Benefits:

- reduced risk of toxic explosions, spills, and poisonings
- enhanced eco-tourism opportunities
- increased local awareness of environmental protection activities

FISH AND WILDLIFE

After the turn of the century, conversion of wetland habitats began to accelerate to accommodate agriculture and development in the coastal bays region. Large scale forest clearing intensified in the 70's and 80's. With the completion of the Chesapeake Bay bridge in 1952, land use changes have continued to eliminate habitats vital for migratory birds, waterfowl and shorebirds, threatened and endangered species, and other wildlife species. Changes to shorelines and pollution of near shore habitats also threatens many fish and shellfish species as well as the diamond back terrapin, shorebirds, horseshoe crabs etc. which rely on the coastal bays for all or part of their life.

The coastal bays and offshore waters support a variety of shellfish and fish species of commercial and recreational value (the state controls waters to 3 miles offshore and federal waters are from 3-200 miles). Most species spend only part of their life cycle in the coastal bays. Therefore, many species are managed at the regional level through cooperative efforts among states, the National Marine Fisheries Service (NMFS), the Mid-Atlantic Fisheries Management Council (MAFMC), and the Atlantic States Marine Fisheries Commission (ASMFC). The state of Maryland also manages fisheries resources within the coastal bays and other waters of the state. Management controls include commercial quotas, permit and license requirements, gear and time-of-year restrictions, and size and catch limits.

Blue crabs, summer flounder, hard clams, and other species support substantial commercial and recreational activities in the coastal bays. In order to determine the health of these important species, reliable catch and effort data need to be collected. Currently, commercial catch and effort data is routinely compiled from licenses, catch reporting, and other regulated limits on the commercial fishery. Although recreational surveys are conducted in Maryland waters by NMFS and MD DNR, recreational catch and effort still represents a gap in information which must be closed in order to determine sustainable yields and modify management policies to protect species of concern in the coastal bays.

Other factors important to the health of coastal bays fish and shellfish populations are habitat and water quality. Degradation of benthic habitat from eutrophication, reduced light penetration, chemical contamination and impacts from boating activities including commercial harvest operations affect shellfish and some juvenile finfish species. Chemical contamination in dead-end canals, which receive contaminated runoff from developed areas, pilings, and boats, also contributes to degraded sediment quality. Shoreline erosion due to sea level rise, hard shoreline stabilization methods, increased sediment runoff, tidal action, and boat wakes degrade water quality and aquatic habitat. In addition, hard shoreline stabilization methods reduce the amount of natural shoreline habitat, which is essential habitat for small fish and other aquatic resources.

Submerged Aquatic Vegetation (SAV) is an important resource in the coastal bays, providing habitat for fish and shellfish and food for aquatic species and water birds. The dominant species of SAV, eel-grass, was eliminated in the 1930's due to an eelgrass blight. Between 1986 and 1996 seagrass populations increased, primarily in the southern bays, but SAV has not made a

similar recovery in the northern bays due to a combination of variables including heavy boat use, hydraulic clam dredging, propeller scarring, degraded water quality and lack of seed plants.

In addition to fish and shellfish, the coastal bays are home to a variety of rare, threatened and endangered species; 19 animal and 89 plant species are listed (MD DNR Natural Heritage Program list which includes federally listed species) as being threatened or endangered primarily due to habitat loss. Habitat essential for threatened and endangered species is often vital for other species in the coastal bays watershed, including migratory songbirds, waterfowl and shorebirds.

Loss of forested lands disrupts habitat corridors for many bird and wildlife species and can impact water quality in the coastal bays. Forests filter sediments from water, limit erosion by protecting soils and take up nutrients. The character or composition of a forest—its individual tree and shrub types, their sizes, ages, and population densities—also affect the forested habitat for many species of plants and animals. Forest character and functions are altered when forest areas are cleared for agriculture and development. Storms, disease, pest infestations, and reduction of natural fire frequency can also alter forest character and functions.

Timber production plays an important role in the regional economy and in the overall protection of the watershed. However, forest character may also change due to some management practices related to the forest products industry. It is possible with appropriate management of forested lands, to retain large forest tracts that will support wildlife habitat needs, as well as a viable, sustainable industry. Additional forest management options may promote old growth timber, increased hardwood protection, and eco-tourism activities.

In addition to forest losses due to changes in land use patterns in the coastal bays, tidal and nontidal wetlands have decreased substantially, especially in the northern bays. Wetlands drained and cleared for agriculture, development, and other human uses decrease habitat for wildlife and adversely affect the land's nutrient and sediment absorbing potential (e.g., buffering capability). Although slowed considerably by federal and state laws restricting impacts to wetlands (e.g., changes in the federal tax code had the single greatest effect on slowing loss of wetlands and clearing of forests in the last 25 years), losses still occur from man-induced changes in land use. Additional salt marsh losses are occurring because landward migration of wetlands have been prevented by development and shoreline hardening (e.g., bulkheads and revetments). An increase in the amount of wetlands is necessary to maintain habitat for waterfowl and fish, buffer coastal storms, absorb flood waters, and maintain adequate water quality for all coastal bays inhabitants

GOAL 1: INCREASE FISH AND SHELLFISH SPECIES

FW 1.1 *Challenge: Accurate fish harvest information*

Many marine fish species are migratory along the Atlantic Coast. This makes managing for sustainable harvests difficult because the political jurisdictions on the migratory routes do not gather or collate and analyze catch and effort data in the same way. The Atlantic Coastal Cooperative Statistics Program (ACCSP) has developed a new East Coast data program to unify

all existing state and federal data-collection programs into a single coast-wide system and produce higher quality information collected in a more timely manner.

Under this plan, commercial fishermen will report catch and effort data under a new mandatory system that includes vessels and dealers reporting separately to double check landings data. Recreational fishermen will operate under the old survey system but with numerous improvements. Survey sample sizes will be enlarged to monitor fishing in tidal areas for anadromous species and to cover out-of-state anglers who travel to the coast to fish. The plan also tracks catches made at night and landings from private access areas. Monitoring recreational catch from such a dispersed angling community is a particularly tough challenge. Telephone and dockside surveys are hit-and-miss, and many fishermen and their catch can slip through the cracks. ACCSP's long-range goal is to institute a universal sampling system, which will require a better means of identifying anglers fishing in both state and federal waters.

The ACCSP also will collect standardized social and economic information, which is useful for assessing the impact of regulations on fishermen and fishing communities. Anglers can benefit from this effort because fishery managers routinely under-value their "industry" as compared to commercial fishing when making critical decisions.

Solution: Seek funding to Implement the Atlantic Coastal Cooperative Statistics Program (ACCSP) recommendations to increase the quality of commercial/recreational fishing catch and effort data, as well as the collection of economic information to support fishery management decisions.

Actions:

1. DNR will obtain reliable catch and effort data from the recreational and commercial fisheries.
    A. DNR, NOAA and NMFS will increase surveys of local, recreational fishermen.
    B. DNR will implement ACCSP recommendations to obtain reliable catch and effort data from the commercial fishery. Explore concept of a coastal bays or saltwater fishing license.
2. DNR will report on the economic importance of commercial and recreational fishing in the coastal bays.
    A. DNR will review VIMS data collection to determine feasibility of use for data collection methods in MD.
    B. DNR will explore the possibility of conducting a pilot study with Atlantic States Marine Fisheries Commission (ASMFC).

Expected Benefits:

- reduced economic and environmental waste through more informed, targeted, and efficient regulatory decision making
- increased income from more stable, better managed, and appropriately valued fisheries, as well as from lower compliance costs
- increased fish populations

Related Actions: FW 1.5

FW 1.2 ***Challenge: Manage for optimum sustainable fish populations and harvests consistent with other goals of the coastal bays***

Solution: In order to maintain optimum fish and shellfish stocks, develop a comprehensive plan for fish and shellfish populations that establishes harvest levels, as well as protects and improves habitat and water quality.

Actions:

1. DNR will establish a Coastal Bays Fishery Advisory Board specifically for the coastal bays. The Coastal Bays Fishery Advisory Board will provide DNR with advice on recreational and commercial fisheries matters.
2. DNR will designate a coastal bays administrator to staff the advisory board, develop fishery management plans, recommend research, and analyze data.
3. DNR will develop, with the Coastal Bays Fishery Advisory Board, coastal bays fishery management plans for clams, crabs and finfish (See FW 1.3, 1.4 and 1.5 for preliminary recommendations/ suggestions). The plans will:
    - A. Evaluate sustainable yield, and establish population/biological target goals.
    - B. Determine stock management strategies for optimum sustainable population.
    - C. Determine habitat enhancement and restoration needs.
    - D. Determine issues to be resolved, especially allocation, and identify research needs.
    - E. Recommend enforcement and education strategies.
4. DNR, with the advice of the Coastal Bays Fishery Advisory Board, will investigate the concept of water zoning and sanctuaries to manage resources. The water zoning concept may include a resource replenishment zone, commercial fishing zone, recreational fishing zone, and mixed use zone.
5. DNR, with the assistance of the Board and local government, will seek/commit funding for:
    - A. Habitat improvement.
    - B. Education (e.g., make regulations easily available in a printed format similar to hunting regulations).
    - C. Research and data needs.
    - D. Stock assessments (collection and analysis of data).
    - E. Enforcement of conservation laws and regulations in the coastal bays. Options to investigate include:
        - i. More officers for conservation.
        - ii. Additional conservation training in the natural resources police training program.
        - iii. Use of volunteers in NRP Reserve to increase “conservation officers.”
        - iv. A non-DNR “river/bay watcher” position for the coastal bays.

F. Additional DNR Fishery staff for the coastal bays to analyze data and write fishery management plans.

6. DNR will determine whether existing hatcheries can be used to improve finfish and shellfish abundance in the coastal bays.
7. DNR will assist MDA to promote responsible aquaculture by developing incentives to assist fishermen to change to aquaculture where practical and establishing environmentally sound procedures and protocols.
8. Develop estuarine study center (Coastal Bays Laboratory).
9. DNR and MCBP will protect horseshoe crab populations by promoting the protection of bay beaches and other bottom habitats and promote volunteer monitoring of spawning populations throughout the coastal bays.

Expected Benefits:

- increased fish and shellfish populations
- increased income from improved fisheries

Related Actions: FW 1.3, FW 1.4, FW 1.5

FW 1.3 ***Challenge: Maintain optimum sustainable clam and shellfish abundances***

Trends in clam abundance are lower than recorded historical levels in the 1960s and early 1970s. Public perception is that intense harvest pressure has lead to a depleted resource. Although clam populations are highly variable due to recruitment (addition of juveniles into the population), data shows that population levels seem to have dramatically dropped off around the time the use of hydraulic dredges began. Biologists believe hard clam recruitment is generally not limited by the abundance of brood stock. Predation plays a major role in recruitment success. Hard clam population enhancement should be mediated through habitat improvement (e.g., providing suitable substrate for protecting young of the year clams).

Variability in clam set is not necessarily related to brood stock, but may be more related to habitat availability (hard shell and SAV) which provide cover from predation (e.g., crabs). The impacts of hydraulic dredging need further research regarding its effects on water quality, SAV beds, bottom dwelling animals (including shellfish, worms, overwintering blue crabs) and spawning horseshoe crabs.

Solution: Protect and enhance clam and shellfish populations by preparing a shellfish fishery management plan for the coastal bays, researching the effects of hydraulic clam dredging, re-establishing bay scallops, and promoting aquaculture.

Actions:

1. DNR with advice from the Coastal Bays Fishery Advisory Board will prepare a shellfish fishery management plan for the coastal bays. The plan will consider, but is not limited to, the following potential management actions and will determine the best options to help manage for long-term sustainable population.
    A. Fishery Management strategies to be considered include:
        i. increase allowable size to 1 inch (legislative issue)

ii. reduce season to mid-October through the end of April
iii. limit days of week for harvesting - eliminate Saturday
iv. reduce daily limit from 8,000 / day
v. increase natural shoreline buffer (County consideration)
vi. limit number of commercial licenses or number of boats allowed
vii. stop allowable 10 percent "tolerance" for undersize clams (make 5 percent?)
viii. consider eliminating hydraulic dredging for razor clams in summer (to stop "incidental" catch of 1 bushel hardshell clams when harvesting)
ix. review questions concerning allowable gear types
x. DNR will investigate why other states do not allow hydraulic clam dredging

B. Investigate and develop some type of zoning (fixed vs. rotating) and/or sanctuary area strategies to help maintain sustainability.
C. Consider habitat / stock enhancement.
i. start habitat restoration program - increase shell bottom areas
ii. encourage / make commitment to mariculture development
iii. investigate costs and benefits of "seeding"
D. Determine enforcement needs.
i. increased enforcement by NRP (to determine, e.g., whether clams are being sold to approved buying sites)
ii. DNR to include in budget funds for stock assessment / young of year index
iii. National Park Service areas need adequate protection

2. DNR will investigate the effects of hydraulic clam dredging on the coastal bays environment. Research needs may include:
A. Water quality, benthic community issues
i. direct impacts through increased suspended sediments, re-suspension of toxic chemicals
ii. indirect impacts by decreasing the number of filter feeders in the bays
B. Habitat: SAV beds
i. direct impacts by physical disruption
ii. indirect impacts by lowering available light through increased suspended sediments
C. Benthos (e.g., overwintering blue crabs as well as other shellfish, worms, etc.)
i. direct impacts through physical disruption
ii. indirect impacts through increased sedimentation
D. Spawning horseshoe crabs (May and June especially)
3. DNR will continue to monitor the progress of bay scallops in the coastal bays:
A. DNR will review historic accounts to help determine best potential areas for reestablishment.
B. DNR will integrate all habitat variables into site selection process.
C. DNR will determine where and when any fishery activity would be permissible.

4. UMD will investigate use of disease-resistant oysters and establish where economically sound and environmentally safe.

Expected Benefits:

- a Shellfish Management Plan (with emphasis on hard clams), unique to the coastal bays, will balance commercial fishing and environmental interests.

Related Actions: FW 1.2

FW 1.4 ***Challenge: Maintain optimum sustainable crab populations***

Blue crab populations have natural population cycles due to a large number of environmental factors (e.g., weather offshore that pushes larvae into bays as well as food abundance and habitat). Generally, data shows that there is a relatively stable blue crab abundance in the coastal bays. Although abundance has fluctuated widely, this is a normal occurrence that has been documented in the Chesapeake Bay. Crabs are short lived and available to the commercial fishery for only about one year before they die. This means that when there is a poor larval survival or heavy winter mortality, there is no buffer to prevent fluctuations. In addition to natural causes of variability, fishing pressure, parasites, and habitat loss can cause populations changes.

Analysis of commercial catch data shows the population to be fairly constant (fluctuating without trend). However, anecdotal information indicates that in 1997-8, crab size and catch per unit effort has decreased and peeler crab populations in the spring shedding season have diminished.

Furthermore, it is believed that increased commercial pressure, especially in the early spring, results in the fishery being fished out early, leaving a depleted recreational catch. In addition to conflicts between commercial and recreational catch, user conflicts exist among the commercial sectors (local vs. non-local) due to earlier availability of crabs in the spring and season differences in the fall (season in the coastal bays is from April 1 through October 31 while the Chesapeake season is from April 1 through November 30).

Although there are no apparent impacts to humans, a parasite (dinoflagellate Hematodinium) is believed to be causing a large mortality of crabs in the coastal bays especially in the summer. The parasite appears to be widespread. It has been found in other crustaceans along the west coast and is found along the east coast bays and the gulf coast. In July many crabs are caught live but die on the way to the market. This might be caused by the infection. Information on the parasite and its effects on blue crabs is currently insufficient and needs further study.

Habitat protection is another important issue for maintaining blue crab populations. Seagrasses are critical habitat for blue crabs and need to be protected and increased to sustain populations. Furthermore, the potential impacts of hydraulic clam dredging on overwintering crabs needs to be investigated and overwintering areas for crabs might need protection. Additional issues concerning crabs include user conflicts and enforcement of current regulations. A vast majority of the spring harvest pressure is for peeler crabs (crabs that are shedding their shell in order to

grow larger; these crabs will become 'soft crabs') and Jimmys (male crabs). It is believed that some watermen are taking green peelers (crabs that will be shedding their shell soon but have not begun the process) which are attracted by fish bait. Enforcement of green peelers, undersized crabs (illegal 4" crabs going to packing houses) and number of pots may be a problem due to lack of personnel and non-conservation priorities during the summer season. There also is some public perception that the ratio of male/female crabs may be changed due to early season pressure on Jimmys & "peeler potting" (using illegal bait such as sponge crabs —female crab with eggs— in crab pots to attract) and that this may affect their reproductive success. Furthermore, knowledge of the current regulations are not known (e.g., current cull ring regulations).

Solution: Protect and enhance sustainable blue crab populations by developing a blue crab fishery management plan for the coastal bays and continuing research on the crab parasite.

Actions:

1. DNR, with advice from the Coastal Bays Fisheries Advisory Board, will develop a blue crab fishery management plan for the coastal bays that considers but is not limited to the following suggested changes in harvest practices:
    - A. Develop an enforceable time limit. For example, have commercial fishermen check pots every 24 hours (e.g., Use orange clothes pins).
    - B. Change beginning and/or end of seasons (legislative action).
    - C. Decrease effort (commercial pressure).
        - i. Limited entry by:
            - a. limited number of licenses (regional & designated areas)
            - b. enforcement of only ONE license per boat
            - c. not allowing pot haulers
        - ii. Investigate setting daily time restrictions.
        - iii. Develop an enforceable pot limit of 150-300 pots per license.
    - D. Modify equipment requirements.
        - i. Review cull ring regulations. For example, should cull ring dimension be changed to accommodate local crab body shape?
        - ii. Require terrapin exclusion devices on all pots within a set distance from shoreline or in tidal tributaries.
        - iii. Restrict bait in Jimmy pots (no fish bait) to limit capture of green peelers.
    - E. Water zoning concepts.
        - i. Investigate limiting use of crab pots in tributaries.
        - ii. Closure of overwintering areas to hydraulic clam dredging.
    - F. Increase Enforcement/Education.
        - i. Better education on current regulations. (e.g., current regulations require a 2 5/16 inch cull ring, on all pots not made from unstretched mesh measuring less than 1 inch or at least 2 inches on each side, from June 1 through April 22).
        - ii. Increase enforcement personnel to ensure conservation needs are met in addition to boater safety (include locals through NRP auxiliary “reserve” program).

iii. Have a check-in station at Public Landing and Georges Island Landing that could check for undersized crabs and green peelers.

G. Determine recreational catch.

2. Collect and analyze relevant information.
   A. Research parasite further.
   B. Analyze independent fishery data for population information.
   C. Investigate abundance and impacts of green crabs.
   D. Investigate whether the early season pressure on Jimmy's and "peeler potting" has an impact on the ratio of male/female crabs and thus reproductive success.

Expected Benefits:

- a Blue Crab Management Plan, unique to the coastal bays, will protect the resource and balance commercial fishing and environmental interests.

Related Actions: FW 1.2

FW 1.5 ***Challenge: Maintain optimum sustainable finfish fisheries***

Populations of some finfish have been stressed or reduced due to a variety of factors, including natural cycles, availability of food (including forage fish and viability of the benthic community), abundance of habitat (sedimentation), over fishing, and water quality degradation, including light attenuation. To better manage the coastal bays ecosystem there is a need to understand the differences in natural environmental changes and those changes caused by man.

The forage index (species richness index of juvenile menhaden, spot, Atlantic silverside and bay anchovy) has decreased in the coastal bays since 1989. The exact reason for this decrease is not known but is possibly related to decreases in spot. There are many possible factors impacting forage species, including natural causes, personal water craft, poor water quality, over-harvesting, lack of food, predation, decrease of suitable habitat, and land use practices. The abundance of these species may be used as a long-term indicator for monitoring the fish community structure and overall health of the coastal bays. The most abundant species in coastal bay samples since the 1970's are spot, bay anchovy, Atlantic silversides, and Atlantic menhaden. Delaware has seen a decrease in menhaden, spot, and bay anchovy.

The abundance of summer flounder, weakfish, and Atlantic croaker have been on an upward trend since the early 1990s. These trends are most likely due to strict recovery programs which have been mandated by the Atlantic States Marine Fisheries Commission and enacted by the states, including Maryland. Menhaden as well as spot reproduction is down throughout their whole range. Anchovy and silversides reproduce here so there might be something in the coastal bays affecting their reproduction and abundance (predation).

The community's economy is primarily based on tourism and the ability of tourists to enjoy the bays. Therefore, commercial catch vs. recreational pressure and economics needs to be

analyzed and used in determining catch allotments. There is a lack of information on the effects that recreational fishing has on fish population.

There also is a lack of information on habitat requirements for finfish. Poor water quality frequently decreases available fish habitat, thus contributing to decreasing fish numbers. Low oxygen levels are especially harmful to bay life and are a standard indicator of degraded water quality. There are currently several monitoring efforts in the coastal bays (MCBP volunteer water quality monitoring, DNR monitoring, and the NFS water quality monitoring) but the conclusions from the studies have not been determined.

Solution: Develop a finfish management plan that investigates stock management practices, habitat improvement (especially for flounder), and education opportunities that protect and restore sustain-able finfish populations in the coastal bays, while enhancing fishery-dependent economies.

Actions:

1. DNR, with advice from the Coastal Bays Fishery Advisory Board, will investigate but is not limited to the following suggested stock management practices.
    A. Establish entry, gear, and limit restrictions on commercial sector.
    B. Determine recreational catch. Investigate establishing a saltwater fishing license with proceeds being used for research. License should have several categories like 5-day, month, season, etc. This would give a data base of names and addresses for conducting surveys.
    C. Re-examine recreational and commercial catch allocation issues.
    D. Re-examine size limits including consistency with surrounding states.
    E. Obtain MD Coastal Bays catch data (commercial vs. recreational).
    F. Investigate by catch issue for gill nets. Consider an "attend-a-net" policy.
    G. Further investigate the forage index (natural, personal water craft, over-harvesting, not enough food, birds, lack of habitat). Need to address the issue of forage fish and maintaining quality of their habitat.
    H. Need to determine what each finfish needs to live and eat.
2. DNR will investigate but is not limited to the following habitat improvement recommendations:
    A. Improve water quality by reducing sedimentation from agriculture, development, and dredging (See Water Quality section).
    B. Collate information obtained from the volunteer monitoring program, DNR monitoring, and the NFS monitoring efforts and release results to the public (See Monitoring Plan).
    C. Investigate the influence of jet ski noise on scaring fish away. Contact Florida on their studies on jet skis vs. fish (See Recreation and Navigation).
    D. Restore and protect finfish habitat.
    E. Investigate effects of habitat loss, including wetlands, and sediment contaminants from uncontrolled growth. Also investigate algae beds as potential habitat.
    F. Investigate forage fish habitat requirements.

G. Adopt a reduced speed limit to reduce the impacts of boat operation in shallow water, reduce prop scarring, and decrease the impact of wave action (See Recreation and Navigation).
H. Investigate and create, if needed, the following resource protection areas.
    i. Expanded no trawl zone near inlet that is consistent with neighboring states.
    ii. Areas where all boating activity must stay clear.
I. Separate natural environmental changes brought about by the aging of the system and deal with only those things that man can affect (sedimentation is natural, that the East Coast is sinking, and that sea level is rising).

3. MCBP and DNR will encourage responsible fishing practices such as catch-and-release, innovative hook designs, and crab traps with terrapin exclusion devices.
4. DNR and MDE will investigate the utility of creating artificial reefs in the coastal bays to enhance tautog and seabass populations. If feasible, DNR will develop artificial reefs (e.g., creation of hard bottom habitat by planting shells, stone or other substrate).
5. MCBP and DNR will educate fishermen on size and creel limits.
6. DNR will:
    A. Review state and federal data and determine appropriate biological reference points for each important commercial and recreational species of concern.
    B. Implement appropriate control measures if sustainable yields are exceeded or other problems are identified within a fishery.

Expected Benefits:

- a Fishery Management Plan, unique to the coastal bays, will protect the resource and balance commercial fishing and environmental interests.

Related Actions: FW 1.2

FW 1.6 ***Challenge: Seagrass protection and expansion***

Seagrasses are valuable habitat for fish, shellfish and other wildlife such as waterfowl. Seagrasses are considered essential habitat for summer flounder and scallops and critical habitat for blue crabs. Although the distribution of seagrass has been increasing in the coastal bays, many factors, such as water quality and bottom type, limit it from expanding to its fullest potential. Other factors, like hydraulic clam dredging and prop scarring from boats, can decrease the density within a bed.

Currently, photo interpretation may not be sufficient to document the location and distribution of all seagrasses due to the time of the aerial flights (early May), depths of beds, density of beds, and limits of photography equipment.

Solution: Identify, protect, enhance, and promote natural recovery of seagrass beds in order to improve water quality and fish habitat.

Actions:

1. DNR will alleviate the impact of clam dredging and prop scarring to SAV and other benthic organisms by:
    A. Annually documenting the areas and extent of impact.
    B. Researching seagrass recovery time.
    C. Investigating use of buoys to mark beds, SAV setbacks, depth restrictions, GPS equipment to identify boundaries, and education as tools to protect beds from damage.
    D. Implement and enforce necessary regulations to protect SAV from clam dredging.
2. MCBP will explore feasibility of an SAV sanctuary (including needed legislation/regulations), identify species needing protection and activities needing restriction.
3. MCBP will expand surveys/citizens monitoring to groundtruth species composition and determine accuracy of photo interpretive maps.
4. DNR and NRCS will develop habitat requirements for the growth of seagrasses in the coastal bays:
    A. DNR will develop water quality requirements for seagrasses (work with University of Delaware).
    B. DNR will identify areas that are meeting the required water quality once water quality data is available (e.g., areas that have the greatest likelihood of SAV expansion).
    C. NRCS will compile data relating bay soil types to bottom communities and identify other variables having effects on seagrass establishment and maintenance.
    D. NRCS will complete soil mapping effort for entire coastal bays.
5. DNR will transplant or reseed seagrasses to appropriate areas where restored beds are likely to naturally recover in bays by:
    A. Identifying unvegetated areas that meet water quality and sediment requirements and prioritizing sites based on appropriateness and need.
    B. DNR and MCBP carrying out citizen and school-based restoration projects.

Expected Benefits:

- improved recreational and commercial fishing opportunities
- cost-effective measure to promote fisheries
- promotion of tourism

Related Actions: WQ, FW 1.2

FW 1.7 *Challenge: Improve water quality in dead end canals*

Dead-end canals are major storehouses of chemicals and other pollutants because of poor flushing. Studies have shown that dissolved oxygen (vital to sustain aquatic life) in dead-end canals was half that found in non-canal sites. Certain nutrients were twice as high in these canals (causing growth of algae). Pesticides and other toxic chemicals were also significantly higher in canals, and biotic communities in the sediment (important fish food) were profoundly degraded (95 percent consisted of pollution-tolerant worms instead of crabs, clams, mussels, shrimp and

immature insects). Storm water runoff from adjacent land, bulkhead materials, boats, and maintenance dredging/canal construction all contribute to these impacts. Storm water carries nutrients, chemicals, sediment, and organic matter to the canals as a result of the adjacent land practices. Bulkhead materials also can contribute to the degradation of canals through the introduction of chemicals used to preserve bulkhead material. Boats contribute to the deteriorated conditions in the canals through motor and wake agitation of the sediments and from boat maintenance, including the use of anti-fouling paints. Maintenance dredging also re-exposes pollutants and accelerates their detrimental effects. The fact that canals are artificially dredged deeper than surrounding bay waters compounds water quality problems due to decreased flushing and stratification of the water.

Solution: Investigate options for environmental enhancement in dead-end canals.

Actions:

1. Retrofit all drainage into canals. Options include installing stormwater management facilities and devices (especially systems containing tiles or ditches) and other methods to slow storm water flow. Alternative bulkhead materials should be promoted.
2. MCBP will target property owners along canals for education and implementation of best management practices for backyard management. Techniques such as proper fertilizer application, controlling or removing animal feces, stopping trash inputs (including removing cut grass, dead flowers and leaves from surrounding areas), limiting crop irrigation or lawn watering, and encouraging native species planting "BayScapes," etc. should be promoted.
3. Interconnect canals to increase flushing (need to use 8 ft. diameter pipes).
4. The MCBP Navigation and Dredging Advisory Group (See Recreation and Navigation section) will develop canal maintenance dredging plans that recommend dredging only when absolutely necessary and that consider all habitat restoration potential.
5. Investigate alternatives for undeveloped canals.
6. MDE will continue to enforce their policy of not approving new dead-end canals.
7. Develop canal stormwater management plan requirements.

Expected Benefits:

- improved water quality
- improved aesthetics

Related Actions: FW 2.4

FW 1.8 *Challenge: Reduce trash in the coastal bays*

Trash is one of the first indicators that most people associate with degraded water quality. Trash such as plastic bags, balloons, fishing line, cigarette butts, plywood in marshes, etc. can injure and kill fish, wildlife and other marine life.

Solution: Support "Trash-Free Bays" events and ideas that involve students and citizens to help keep the bays clean.

Actions:
1. MCBP will develop events to educate public on impacts of trash, including tributaries and bridge areas where the problem is most severe.
2. MCBP will support events such as: Adopt-A-Shoreline, Coast Day, canoe cleanups, roadside trash cleanups, teacher training, and field trips for classes.
3. OC will improve trash management on beaches by placing lids on trash cans and emptying them more frequently where deemed necessary and feasible.
4. WC and MCBP will organize effort to clean up trash from dead-end canals.
5. MCBP will educate public and organize events to pick up plywood and debris from abandoned duck blinds in marshes where plywood and boards smother marsh grasses.

Expected Benefits:
- improved aesthetics and habitat quality
- reduced costs for trash removal

FW 1.9 *Challenge: Reduce loss of shoreline habitat*

Loss of shoreline habitat due to hard shoreline protection methods (e.g., bulkheading) is prevalent in the coastal bays. Because shoreline habitats are very important for many reasons (horseshoe crabs, waterfowl, birds, reptiles, water quality and clarity), alternative methods of shoreline protection that provide habitat should be encouraged where practical. According to scientific estimates, sea level is expected to rise by 6 to 37 inches by 2100. One effect of rising sea level will be landward migration of coastal wetlands as shorelines are eroded and low-lying areas inundated. Bulkheads and other shoreline armoring techniques that are used to halt erosion also prevent wetland systems and sandy/muddy beaches from migrating inland.

Solution: Protect and enhance natural shoreline in order to preserve habitat for fish and other bay life.

Actions:
1. DNR and MDE will encourage use of alternative shoreline stabilization methods (e.g., non-structural), both for new and retrofitted shoreline stabilization applications and provide information and technical support to decision makers to ensure permit applications for new shoreline stabilization promote essential wildlife and fish habitat through alternative designs which favor the environment.
2. DNR will identify and encourage retrofits through incentives for existing structures that have deteriorated and promote the use of salt marsh, artificial habitat features (e.g., planter box, Spartina) or riprap where appropriate.
3. DNR will provide incentives for use of more environmentally sensitive practices.
4. WC will identify situations where sensitive habitats are not protected by the existing zoning and subdivision laws and consider implementing incentives for activities that protect these areas. For example, maintenance of allowable density on a parcel where a developer agrees to preserve a vegetated shoreline buffer that exceeds the legal requirement. The county may begin by reviewing the criteria and checklist accounting system developed by the American Planning Association.

5. WC will continue to work with existing programs (such as Rural Legacy, Forest Legacy, Program Open Space, and CREP) to protect natural shoreline and adjacent landward areas through the purchase of development rights or shoreline easements (or fee simple purchase).
6. WC will investigate the use of 'rolling easements' in other jurisdictions that are highly susceptible to sea level rise and investigate the feasibility of purchase of 'rolling easements' from tidal shoreline developers on a voluntary basis.

Expected Benefits:
- lower shoreline stabilization costs
- improved estuarine habitat
- improved aesthetics and eco-tourism opportunities

Related Actions: WQ 6.2

GOAL 2: ENHANCE FOREST HABITATS TO PROTECT SONGBIRDS, OTHER WILDLIFE POPULATIONS, AND AQUATIC RESOURCES

FW 2.1 ***Challenge: Improve songbird populations and forest habitat***

Many songbirds have declined in population due to changes in land cover. A significant portion of the migrating birds from eastern North America use habitats along the coastal bays as staging areas prior to flying over water to the Caribbean and South America. Identifying forest structural diversity, migration corridors and other habitat distribution information and acreage needs of select migratory species will allow for targeted habitat restoration and management.

Solution: Determine the extent, spatial distribution and composition of forested habitat needed for neotropical and migrating birds.

Actions:
1. USDOI and DNR will compile information on forest interior songbirds in the watershed from existing databases and develop preliminary watershed-scale assessments of status and trends in relation to land use/land cover information.
2. DNR and USDOI will conduct field studies in the watershed to test hypotheses about the relationships of particular species to certain kinds of habitat conditions.
3. DNR and WC will develop a total forest management strategy that incorporates, where appropriate, habitat requirements of identified species in the WC comprehensive plan and zoning and subdivision code.
4. DNR will encourage the conservation/protection of habitat used by neotropical migrants during migration and breeding season.
5. DNR will investigate alternative protection and management strategies for forests along streams and wetlands.
6. WC will encourage retention of large tracts of hardwood and mixed forests.

Expected Benefits:
- enhanced eco-tourism opportunities
- decreased trend towards conversion of agricultural land and forests

Related Actions: FW 2.2, CE 4.4

FW 2.2 ***Challenge: Conservation of forests***

Loss in tree cover has serious implications not only for urban areas and the land but especially for the health of the bays. Although it is known that native plant and animal species (including aquatic species) are reduced by forest loss and fragmentation, little is known about the condition of forest resources in the coastal bays watershed. Here, as in the rest of the country, polluted runoff from developed and agricultural land is the primary threat to water quality. Restoring tree cover has been identified as one of the most cost-effective ways to improve water quality. While forest conservation programs exist, landowners often are not aware of them or, as with Worcester's Forest Conservation Law, such programs are in need of improvement to ensure that forest conservation goals are met.

Forest losses have mainly resulted from urban expansion and clearing for agriculture over the past 20 years. Land use laws and conservation programs are currently being put into place to slow this trend. A current need is to educate the public and support local enforcement of these new laws and programs. One recent state law that was enacted to slow this trend is the forest conservation law which promotes the retention and/or establishment of forests when development occurs. When determined by the county that on-site retention or planting constitutes a hardship, off-site retention or planting, or payment in-lieu of mitigation is permitted. Currently, the fees-in-lieu collected are not sufficient to cover the costs of labor, land and materials necessary to complete the required mitigation. This lack of mitigation contributes to the overall loss of forested land. In addition, changes to the State Forest Conservation Act made in 1998 are not reflected in the county law.

Solution: Develop a comprehensive county forest conservation strategy to enhance forests and other critical habitats in order to protect water quality, wildlife populations and improve the stability of the forest products industry.

Actions:
1. DNR will investigate methods to better track forestry resources, e.g., expanding the USDA Forest Service forestry inventory in order to provide better information on a watershed scale or inventorying forest land utilizing GIS.
2. DNR and WC will improve forest character by utilizing ongoing natural resource conservation programs (e.g., Rural Legacy, Forest Legacy, Stream Relief) and developing an educational outreach program to disseminate this information to forest landowners in the coastal bays watershed.
    A. Encourage preservation of existing forest through use of planning tools, such as design standards and public open space acquisition.
    B. Identify and promote programs to protect these areas.

3. WC will encourage retention of large tracts of hardwood and mixed forests under FCA within developed sites.
4. WC will adjust forest mitigation rate fees to cover actual costs (at least 10 cents/square foot) to encourage efficient and appropriate private mitigation.
5. WC will give highest priority to mitigation in the same sub-watershed where impacts occurred. If that is not possible, WC will require that impacts be mitigated elsewhere in the coastal bays watershed. To help implement such mitigation WC will utilize local forest/landowner organizations to locate and establish mitigation sites.
6. WC will conduct a full review of Worcester's Forest Conservation Law and Program to identify any inconsistencies between the intent of the Act and the local law. WC will change county FCA to:
    A. Reflect 1998 COMAR changes (COMAR 08.19.04.07(C)(1) and G(l)) recognizing the shorelines of the Coastal Bays as a priority area for retention/protection and Natural Resources Article 5-1607 which identifies priority aforestation and reforestation areas.
    B. Establish a hierarchy for priority forest retention and open areas that should be reforested. On any given site, retention of sensitive areas and riparian forested buffers should be considered first.
7. WC will use the Forest Conservation fund that has accumulated to mitigate loss of forest to development.

Expected Benefits:
- retention of high priority forests
- reduced government waste from programs working at cross purposes
- improved terrestrial and aquatic habitat
- helps maintain watershed's rural character

Related Actions: FW 2.1, FW 2.3, FW 2.6, WQ, CE 3.3

FW 2.3 ***Challenge: Improve forest diversity***

Not all individual landowners are aware of the variety of forest programs and financial resources available to help manage their land. Landowners desiring greater species diversity on their property should be made aware of programs that offer technical and economic incentives. Environmental and economic management should be given equivalent consideration under assistance programs. Existing technical, financial and educational programs also should be better coordinated.

Solution: Promote diverse forests by providing funding, consolidating overlapping programs and educating public on options.

Actions:
1. DNR will investigate need for variable cost-share rates for species-specific management goals.

2. DNR will encourage funding of state and private nursery production to assure, through partnerships, that sufficient low-cost and diverse seedlings are available to achieve all program applications.
3. MCBP and DNR will review county, state and federal programs, regulations, public/private partnerships and other forestry related issues in order to better coordinate technical and funding opportunities.
    A. DNR will seek funding for different management options and improve delivery of funds and implementation.
    B. MCBP will ensure coordination with other programs, such as FIP, WHIP, SIP, and CREP.
4. DNR will investigate the opportunities to more closely coordinate and assimilate programs that are under-utilized and fragmented.
    A. Increase cost share options (e.g., for management plans and tree shelters).
    B. Educate public on what programs are available.

Expected Benefits:
- improved public responsiveness to landowner requests
- greater diversity of plant and animal species

Related Actions: FW 2.2, FW 2.6, CE 3.3

FW 2.4 ***Challenge: Promote backyard habitats***

Turf grass or lawns provide little or no wildlife habitat. Techniques and guidance programs, like BayScapes, DNR's Wild Acres, and Florida Yards need to be employed to improve backyard habitats unique to the coastal bays region.

Solution: Develop backyard habitat management techniques that protect wildlife species by taking full advantage of existing programs.

Actions:
1. UMCE and MCBP will implement a "Master Gardener" program to educate homeowners.
2. MCBP and MDA will work with nurseries to ensure reasonable prices and availability of native plant species.
3. MCBP will establish demonstration projects.
4. DNR will identify and implement appropriate enhancement techniques for landowners interested in providing habitat for migratory songbirds by educating landowners on keeping lawns in a natural state (e.g., native trees, tall grasses and wildflowers).
5. WC will review all county-owned lands, including grounds of public facilities such as schools, to determine areas where native habitat enhancement is feasible through alternative management practices and/or by planting native vegetation.

Expected Benefits:
- enhanced public awareness and appreciation of area flora and fauna
- greater diversity of plant and animal species

Related Actions: WQ, FW 2.5

FW 2.5 Challenge: Enhance agricultural habitats

As wildlife habitat declines, agricultural lands hold great potential for providing habitat for a wide variety of plants and animals. Existing programs, including WHIP, WRP, CRP, CREP, SIP, Partners for Wildlife, provide financial and technical assistance for the establishment of habitat on agricultural lands.

Solution: Increase or enhance habitat on agricultural lands to protect wildlife and provide economic benefits to landowners.

Actions:
1. WSCD and MDA will encourage use of habitat enhancing BMPs in management plans (buffers, grasslands, etc.).
2. WSCD, MDE, DNR, and MDA will encourage restoration of riparian and wetland areas on previous crop or pasture land through existing programs and innovative funding sources.
3. UMCE will promote agricultural techniques or alternative crops that provide habitat.
4. DNR and MDA will hold seminars to educate landowners on existing programs and demonstrate uses on enrolled lands.
5. DNR will identify wildlife and plant species which may benefit from enhancements on agricultural lands.
6. DNR will coordinate programs and techniques to focus on select wildlife species needs (e.g.,grassland nesting songbirds, migrating songbirds, shorebirds, etc.).

Expected Benefits:
- cost effective means of providing habitat

Related Actions: FW 2.4

FW 2.6 ***Challenge: Conversion and use of forested land***

The potential for losing large amounts of forestland in the region is high. Forests often are converted to other land uses designed for short-term financial gains. There is increasing recognition throughout the state that sound forestry practices, including the use of BMP's, help protect water quality and wildlife diversity. However, excessive restrictions on the management of forest land may complicate efforts to maintain the forestry products industry.

Solution: Promote forest products industry by providing economic incentives and improving management strategies that decrease conversion of forest land to other land uses.

Actions:
1. WC and DNR will work with the Maryland Forestry Task Force to examine potential incentives to facilitate development or retention of selected forest types and/or selected management practices.
2. DNR will encourage insect/disease management options to help maintain healthy forests.

3. MCBP will form a workgroup with the MD Forestry Task Force to develop financial incentives such as property tax reductions for forestland managed under priority management goals (e.g., creation of forested wetlands, creation of high production timber forests), cost-share options, or other potential state and federal incentives.
4. DNR will compare currently recommended forestry BMP's with other state and federal guidelines and revise where needed.
5. DNR will utilize the TEAM program to provide technical assistance and help monitor implementation and review compliance and effectiveness of BMP's for forest harvest and other silvicultural activities.
6. MCBP will educate the public regarding the compatibility and desirability of silviculture, as traditionally and responsibly practiced, with conservation easements to save open space.

Expected Benefits:

- financially stable forestry industry
- maintenance of watershed's rural character
- improved stream and tributary habitat
- richer species diversity

Related Actions: FW 1.1, FW 2.2, FW 3.4, CE 4.6

GOAL 3: PROTECT AND ENHANCE WETLANDS TO BENEFIT WATER QUALITY, WATERFOWL, AND OTHER WILDLIFE

FW 3.1 ***Challenge: Conservation of wetland resources***

It is estimated that over 1,500 acres of tidal wetlands (salt marshes) have been lost in the coastal bays watershed due to shoreline development and stabilization techniques. Approximately 51,000 acres of forested wetlands have been lost in the coastal bays watershed. Of this total, 24,700 acres of forested wetlands have been converted for agriculture and development since the 1930's and up to an additional 26,300 acres of forested wetlands have been hydrologically impacted by a variety of activities (such as drainage of forested wetlands to upland forests), impairing their function and value to the ecosystem (Final Ocean City, Maryland and Vicinity Water Resources Feasibility Report, ACOE, June 1998). Furthermore, current policies allow unintentional wetland losses. For example, the current allowable building area in the county is so small that in many instances it results in encroachment into wetlands.

Solution: Protect existing and new wetlands and increase the amount of wetlands by 10,000 acres in order to improve water quality, replace lost function of wetlands, and improve habitat for living resources.

Actions:

1. WC will generate a list of private restoration sites by educating and polling landowners. The coastal bays will be included in existing multi-agency landowner registration program for wetland restoration and creation.
2. MDE, ACOE, DNR, and SHA will target wetlands restoration and creation to where historic losses have occurred (e.g., northern bays), and provide financial and technical assistance in these areas.
3. Identify and promote economical management techniques to preserve existing wetlands.
4. MDE and WC will adopt policy that encourages the creation of wetlands to treat waste water (both urban and agricultural), retain sediments, aid storm water management, and provide wildlife habitat.
5. WC will work with the Wetlands Planning Group to identify a strategy that ensures wetlands in minor subdivisions are protected during the minor subdivisioning process. Strategies to consider include modifying local laws to ensure wetland evaluations are done prior to site plans being submitted and exploring increases in the allowable contiguous buildable area for all new lots.
6. ACOE and MDE will continue to work with WC to investigate and develop methods/guidelines to assist property owners in avoiding and minimizing wetland disturbances to existing lots of record that contain wetlands. These methods/guidelines will be considered by federal and state regulatory agencies during the permit review process.
7. WC will work with federal, state and local regulatory personnel to develop a comprehensive wetlands plan for the coastal bays region to provide additional guidance for wetlands protection.
8. Provide clear determinations where and when wetlands can be created without complex permit procedure.

Expected Benefits:

- reduced tax expenditures needed for expensive structural waste water treatment and stormwater management (both for flood control and water quality protection)
- increased wildlife habitat
- water quality improvement

Related Actions: FW 3.3, FW 3.4, WQ - surface runoff/stormwater actions

FW 3.2 ***Challenge: Improvement of staging, wintering, and nesting areas***

Many bird species require wetlands for nesting sites, staging areas, and migratory stopover habitat. Loss or degradation of these habitats may result in species decline.

Solution: Identify and protect staging (e.g., flyway stopovers), wintering, and nesting areas, and other critical habitats to promote healthy and diverse waterfowl, waterbird, neotropical songbird, and migrant butterfly populations.

Actions:

1. DNR will determine habitat needs for selected waterfowl (e.g., black duck, Atlantic Brandt) and waterbird species (already done for colonial nesting birds).

2. DNR and WC will develop and implement plans to protect, enhance and restore habitats (including bay islands). For example, map wildlife migratory corridors, using GIS, and develop plan for preserving corridors.

Expected Benefits:
- enhanced eco-tourism opportunities
- increased wildlife diversity

Related Actions: FW 3.1

FW 3.3 ***Challenge: Facilitate wetlands mitigation***

Although mitigation should not replace appropriate avoidance and minimization sequencing, mitigation is necessary to offset losses. Federal and state wetland programs (regulated by the ACOE under Clean Water Act Section 404 and by MDE under state nontidal wetlands, tidal wetlands, and waterway construction statutes) require individuals to avoid impacts to wetlands. Impacts that cannot be avoided must be minimized to the greatest extent possible. Mitigation is then required for all unavoidable impacts authorized under a wetland permit or license. Such compensatory mitigation may be accomplished by the creation of a new wetland, restoration of a wetland, enhancement of a degraded wetland, or payment into a statewide compensation fund for the establishment of larger parcels of wetlands.

Contribution to the state compensation fund is the major form of mitigation in the coastal bays watershed. However, the majority of authorized impacts to nontidal wetlands in the coastal bays watershed are under 5,000 square feet, and therefore do not require permittee mitigation. The state's wetland compensation fund mitigates for these types of impacts.

Mitigation sites for nontidal and tidal wetlands are difficult to locate, which can result in significant delays in the establishment of mitigation sites and the replacement of lost wetland functions and values. The high costs of land can exacerbate the problem. A private/public mitigation program may create a pool of suitable mitigation sites and facilitate the economical establishment of productive wetlands.

Solution: Protect existing wetlands. Where impacts cannot be avoided or minimized, encourage effective private wetland mitigation.

Actions:
1. MDE and ACOE will develop a comprehensive wetlands mitigation master plan for the coastal bays watershed that focuses mitigation where losses occur, targets types and functions lost for replacement and requires that impacts in coastal bays watershed be mitigated in the watershed.
2. MDE and ACOE will work with appropriate federal and state agencies to outline potential mitigation programs, long-range management procedures, and goals for mitigated wetlands.
3. WC GIS program will compile and distribute maps of public and private mitigation/restoration activities annually to provide public with information and generate more public interest in mitigation issues.

4. MDE and ACOE will develop new opportunities for wetland creation and restoration.
5. WC will generate a list of private mitigation restoration sites by educating and polling landowners and include the coastal bays in the existing multi-agency landowner registration program for wetland restoration and creation.
6. ACOE and MDE will investigate options for leveraging existing creation and mitigation programs and fostering new ones.

Expected Benefits:
- enhanced eco-tourism opportunities
- increased wildlife diversity
- improved water quality

Related Actions: FW 3.1

FW 3.4 ***Challenge: Coordination of wetlands regulations***

A substantial body of law and regulation governs wetland management. The type of activity proposed by an applicant dictates the level of oversight provided by the state and federal regulatory programs. In addition, "wetlands of special state concern" have been designated in state regulation and provide additional protection. Activities eligible for federal general permits (i.e., a Nationwide Permit, a State Programmatic General Permit, or a regional permit) or a state letter of authorization (LOA) have been determined to have "minimal" impact on the resource. Although program statistics currently show a net loss of 7.5 acres of nontidal wetlands in the coastal bay area during the period 1992-1997, the State is obligated to mitigate for these impacts and is searching for appropriate mitigation sites within the watershed. Some citizen groups and local agency staff believe the loss is much greater and that the program has major deficiencies. No comprehensive analysis of the issue has been made in the coastal bays and therefore there is no agreement on problems or necessary changes.

Solution: Evaluate wetland management in the coastal bays area to determine if state and federal programs are being carried out in accordance with existing law and regulations and identify methods that reduce disturbance.

Actions:
1. MDE will evaluate the implementation of current state and federal laws by reviewing authorizations and exemptions. MDE will also evaluate the adequacy of BMP's (especially those required for agricultural and silvicultural activities such as buffers), compliance with BMPs, and letters of authorization (e.g., small acreage authorization of cumulative 5,000 ft.), and determine by activity or area if current programs provide adequate protection.
2. MDE will include a Coastal Bay Area component in its statewide wetland conservation plan.
3. MDE and WC will determine alternatives for additional wetlands protection where needed and consider
    A. Designation of additional areas as "wetlands of special state concern" in state regulations.

B. Investigation of more restrictive local requirements for problems unique to the coastal bay area; and
C. Amendment of state regulations and statutes to address programmatic problems identified during the evaluation (e.g., small acreage authorization now allowed under state law).

5. WC will modify local law to require a wetland delineation with the submission of all site plans (including minor subdivisions).
6. MDE, DNR, MDA and WC will jointly determine and implement procedures that would prohibit for a minimum of a 5-year period, change in the use of the land from agriculture or forestry on which conversion of wetlands has taken place under exemption in the law.

Expected Benefits:

- more consistent and efficient wetlands program implementation
- prioritization of most important wetlands for increased protection activities as designated under "wetlands of special state concern" and by requiring wetlands delineation with all site plans

Related Actions: FW 3.1

FW 3.5 ***Challenge: Comprehensive marsh management policy***

The extent of impacts from mosquito ditching in marsh lands is unclear; however, impacts include changing the function of the wetland and hence, altering habitat for many species. Approximately 18,000 acres of marsh land in Worcester County are already covered with a mosquito ditch grid system (many ditches were dug on Assateague Island). Most of the system has not been maintained. Therefore, 1,000 acres of open marsh water management are proposed to be constructed in the areas that had ditch systems. The open marsh water management, OMWM, concept restores drained ponds and incorporates wildlife management, marsh ecology, as well as mosquito control. The purpose of OMWM is to incorporate biological control of mosquitoes, thus reducing the use of insecticides in addition to restoring drained ponds.

Solution: Synthesize and evaluate information on the impacts of mosquito ditching and existing ditches on tidal wetlands and make recommendations for use in coastal bays.

Actions:

1. MDA will map all existing mosquito ditches and DNR will assist with identifying sensitive species and other habitats needing specific consideration.
2. MDA will evaluate results of studies outside of Worcester County on mosquito control, open marsh water management, and other mosquito management techniques and develop an approach which includes a combination of management systems applicable to certain sites and dependent on the needs and goals in Worcester.
3. MDA will develop informational brochures and other materials on mosquitoes (life cycle & control options), alternative management opportunities and benefits for landowners.

4. WC and DNR will assess impacts (negative and positive) of mosquito ditching on plant and wildlife species (e.g., black rail, clapper rail, sharp-tailed sparrow) and other environmental conditions.

Expected Benefits:
- inexpensive means to increase wildlife habitat
- economically and environmentally less costly approach to managing mosquito infestation

Regulatory Needs: After guidelines and program objectives are clearly defined, provide for authority to administer program free of time-consuming regulations.

Related Actions: WQ 4.3, WQ 7.1

GOAL 4: PROTECT THREATENED AND ENDANGERED SPECIES

FW 4.1 ***Challenge: Conservation of threatened and endangered species habitat***

Many threatened and endangered species live in the coastal bays watershed. Landowners should be able to continue to use their land even though threatened and endangered species habitat is found on their property.

Solution: Time, money and political action should be used to assist private management efforts that protect particular habitats including tidal freshwater areas, barrier and bay islands, wetlands and swamps.

Actions:
1. MCBP will advertise benefits of existing programs.
2. DNR and USFWS will assist landowners in developing specific management plans for their land.
3. DNR and USFWS will provide technical assistance to landowners interested in managing for threatened and endangered species.
4. LSLT will assist landowners with options such as easements, donations and purchasing.
5. DNR will identify financial incentives for landowners and adjacent landowners, which may be economically impacted, to protect threatened and endangered species.

Expected Benefits:
- enhanced eco-tourism opportunities
- richer species diversity
- cost-effective approach to protecting threatened and endangered species

FW 4.2 ***Challenge: Coordinate species protection efforts***

Creating habitats for threatened and endangered species can enhance species protection and restoration efforts. This effort should focus on conservation, restoration and enhancement of

existing habitats. Select habitats for specific species, such as island nesting habitat for threatened and endangered waterbirds, should be targeted.

Solution: Enhance coordination among State Heritage Program, Worcester County and landowners to identify threatened populations in order to retain, restore, and create habitats needed to preserve and enhance populations.

Actions:
1. DNR will identify habitat requirements for rare and endangered species and identify potential areas where it may be suitable to establish new habitats.
2. DNR and WC will complete habitat inventory for coastal bays and incorporate findings in new County Comprehensive Plan.
3. WC will utilize County Forest Conservation Fund, Rural Legacy, POS and other programs to create, restore, manage or acquire habitat and will identify new programs that may fund habitat protection.
4. MDE will target use of any mitigation funds to complement protection of adjacent habitats to the extent possible.

Expected Benefits:
- prioritization and coordination reduces waste of resources targeted for species protection
- enhanced eco-tourism opportunities
- richer species diversity

Related Actions: FW 4.1, FW 4.3

FW 4.3 ***Challenge: Need for species reintroduction***

Some threatened or endangered species will not recover without reintroduction efforts. Supplements to the existing reintroduced Delmarva fox squirrel populations are ongoing and introductions of orchids and sedges into created wetlands have proved successful. Although this does not work for all species, reintroduction of select species can successfully reestablish populations and lead to delisting rare and endangered species.

Solution: In order to reduce decline of select populations, reintroduce select threatened and endangered species as feasible.

Actions:
1. USFWS and DNR will identify target species and habitat needs for reintroduction.
2. USFWS and DNR will locate sites which can be managed for reintroduction process.
3. DNR and USFWS will investigate mechanisms to protect adjacent landowners (e.g., compensation process as found in the Delaware agreement).

Expected Benefits:
- enhanced eco-tourism opportunities
- richer species diversity

Related Actions: FW 4.2

GOAL 5: LIMIT IMPACTS TO NATIVE PLANTS AND ANIMALS FROM NON-NATIVE AND NUISANCE SPECIES

FW 5.1 ***Challenge: Controlling invasive/exotic species***

Invasive/exotic species are non-native species that, when introduced to an area, may grow uncontrollably, thus displacing native species and decreasing habitat value for native plants and wildlife. Currently, phragmites, mute swans, nutria, green crabs, and the Pacific crab are known to exist in the coastal bays watershed. However, population levels have not been studied. Phragmites is an extremely invasive wetland plant typical of disturbed wetland areas. Phragmites provides poor habitat and nutrition to local wildlife. Mute swans are an introduced species that displaces other waterfowl and can significantly destroy seagrass beds which are very important to young fish, crabs, clams, and migratory waterfowl.

Solution: Reduce and control invasive/exotic species (such as phragmites, mute swans, nutria, green and Pacific crabs) and reduce further introductions to protect native species habitat.

Actions:

1. DNR/MDA will decrease the unintentional introduction of invasive/exotic species by:
    A. Working with local nurseries and bait shops to stop sale of invasive exotic species (e.g., Kudzu, Purple Loosestrife and green crabs).
    B. Using appropriate chemical, mechanical, or biological control agents.
    C. Working with local nursery industry to do general education/outreach.
2. DNR will educate the public about the detrimental effects of exotic/invasive species and steps they can take to reduce unintentional transport and introductions.
3. DNR will prohibit the intentional introduction of exotic/invasive species into the area when appropriate.
4. WC Feral Cat Society will promote feral cat control through education of residents.
5. DNR will implement management recommendations developed by mute swan advisory committee.
6. DNR will assess feasibility of eradicating nutria.

Expected Benefits:

- enhanced opportunities for eco-tourism
- richer species diversity

Related Actions: FW 2.5

FW 5.2 ***Challenge: Managing "nuisance" species***

Nuisance species are typically native to an area but for some reason have either extended their populations or their season due to human impacts. Overabundance of macroalgae (seaweed) in the Delaware Inland Bays is a nuisance and has had impacts on water quality and living resources. The impact of macroalgae in Maryland's coastal bays is unknown. Increases in the resident (non-migratory) Canada goose population are causing nuisance problems in suburban areas from their fecal droppings which may have local impacts on water quality. Additionally, damage to agriculture habitats is occurring due to the presence and increase in resident Canada geese. They are depredating crops in the spring by pulling up seedling corn and soybeans. This is a growing problem.

Another challenge is the overabundance of snow geese populations. The number of greater snow geese wintering in the coastal bays has increased dramatically during the past decade. Improved annual survival is due to an adaptation of feeding on agricultural waste grains. Increased gosling production due to favorable climatic changes on their arctic breeding grounds has outpaced the ability of hunters to harvest geese. Concentrations of snow geese are causing severe damage to coastal islands in Chincoteague Bay and in salt marshes in the Newport Bay vicinity. Canada is currently implementing strategies that will contribute to the overall management goal of doubling the harvest of greater snow geese. This in effect will reduce survival and stabilize the population at 1 million birds by 2002. There are no immediate plans to limit reproduction on the breeding grounds of greater snow geese. Modifications of hunting methods will be attempted first before more socially unacceptable approaches are used.

Solution: Reduce impacts to water quality, native plant and animal habitats, and agriculture from "nuisance" species like macroalgae, resident Canada geese, and snow geese.

Actions:

1. DNR will discourage human activities and land management practices that promote undesirable species by educating the public (e.g., negative impacts of feeding waterfowl populations and providing 'sanctuary' ponds for geese to roost).
2. DNR will promote enhanced control of undesirable species (e.g., increasing hunting opportunities for greater snow geese and resident Canada geese on private lands).
3. DNR and USFWS will form a task force (including the Farm Bureau, UMCE and others) to investigate options to control damage to marshes by snow geese, nutria, and others.
4. DNR will provide landowners with technical assistance to resolve nuisance and depredation problems caused by resident Canada geese.
5. DNR will propose non-traditional hunting techniques (e.g., use of electronic calls, unplugged shotguns, and conservation hunts) for increasing the harvest of greater snow geese.
6. If appropriate, golf courses, municipalities, and state and federal parks should provide opportunities for resident Canada goose hunting.
7. DNR and USDA Wildlife Services will provide technical assistance to help harass geese, modify existing habitats, and plan landscapes to discourage goose use.
8. Landowners, local governments, corporations, etc. should obtain state and federal permits to addle Canada goose and mute swan eggs and destroy mute swan nests in order to limit reproduction.
9. DNR will work with Delaware to investigate the relationship between eutrophication and macroaglae abundances.

Expected Benefits:

- enhanced opportunities for eco-tourism
- richer species diversity

Regulatory Needs: Elimination of the lengthy federal and state permit process to enable landowners to addle Canada goose eggs and to take a limited number of geese during times when they are doing damage. Institution of a Federal Depredation Order to legalize the taking of resident geese during a closed season to limit reproduction and resolve depredation problems.

RECREATION AND NAVIGATION

Due to the relatively shallow nature of the coastal bays, the maintenance of navigable waterways to support recreational and commercial boating is a critical regional need. A number of maintained waterways currently exist, including channels established by federal, state, and local interests. Effective management of these waterways requires balancing the economic and recreational benefits of maintaining viable navigation channels with the adverse effects on the aquatic environment.

Historically, sand and sediment have entered the coastal bays through a variety of natural sources including erosion, storm-induced natural inlets, barrier island wash-over and runoff through tributaries. From an ecological perspective, the natural inflow of sand and sediment is important to the creation and maintenance of estuarine habitats. Human activities on land, such as agriculture and residential and commercial development, have changed the patterns and extent of sedimentation. This has resulted in water quality and habitat degradation (see Water Quality and Fish and Wildlife sections) and changes in bay hydrodynamics.
In addition, human-induced sediment loading into the coastal bays through the Ocean City Inlet has caused widespread problems including shoaling, both in and outside of channels, and habitat degradation. Successfully resolving this issue will both improve navigation and enhance the conservation of natural resources.

Another opportunity to create multiple benefits lies in expanding the use of dredged materials in the restoration or creation of wildlife habitat.

Other navigation issues include: the adequacy of channels markers and navigation charts; a lack of clear-cut responsibility for, and public understanding of, the dredging permit process; and the potential need for channel improvements and/or new channels.

RECREATIONAL USE

Maryland's coastal bays provide a myriad of recreation opportunities, ranging from "active" pursuits such as hunting and motor boating to more "passive" activities like swimming and birdwatching. As recreational use of the coastal bays grows and diversifies, balancing resource protection with public use will become increasingly complex. Sensitive areas such as submerged aquatic vegetation, bird rookeries and nesting grounds, and aquatic species nursery areas provide unique recreational experiences, yet can be significantly impacted by certain activities.

Boating in the coastal bays is a very popular activity, particularly during the summer months. Many of the primary waterways, especially in the northern bays, are often congested. Recreational boating concerns include unpredictable boating conditions caused by strong currents, congestion and overcrowding near the Ocean City inlet and Route 50 bridge, non-compliance with existing operational, safety, and resource protection regulations, and direct resource impacts.

There is also concern that opportunities for eco-tourism and non-traditional activities are short of demand. Additional passive use facilities and bay access points on the mainland, as well as increased publicity for existing ones, may be needed.

HARBORS, MARINAS, AND RELATED ACTIVITIES

Harbors, marinas, and related facilities are an integral component of the local economy, supporting a wide variety of recreational and commercial activities in the coastal bays. While the value of these facilities is significant and growing, inappropriate location and management practices can result in serious environmental impacts, such as the loss of wetlands during initial construction, introduction of toxic contaminants from bulkheading and bottom paints, and water pollution from fuel and oil spills.

Priority issues related to harbors and marinas target unsustainable management practices at existing facilities, including inadequate and/or improper sewage pump-out facilities, waste disposal (e.g., used oil, solid waste, maintenance waste), and pollution response capabilities. Another emphasis is on the real and perceived inadequacy of existing facilities such as inadequate trailer parking at popular launch sites, a perceived lack of facilities in certain areas, and a lack of public awareness about existing facilities. One of the most significant issues is the need to better coordinate federal, state, and local guidelines for new facilities to ensure that future development is compatible with resource protection goals.

GOAL 1: REDUCE THE AMOUNT OF SAND AND SEDIMENT ENTERING THE COASTAL BAYS FROM THE INLET

RN 1.1 ***Challenge: Reduce unnatural sedimentation due to Ocean City inlet***

The construction of jetties to stabilize the Ocean City Inlet in 1934-35 coupled with routine nourishment of Fenwick Island (Ocean City) beaches has resulted in large volumes of sand and sediment entering the coastal bays through the inlet. Extensive shoals have formed, resulting in decreased water depth for navigation in the adjacent bays and ocean. Sediment losses to the inlet also have resulted in unnaturally high rates of erosion and landward migration of Assateague Island.

The US Army Corps of Engineers/Ocean City Water Resources Study (OCWRS) is a recently completed study by the Corps of Engineers, National Park Service, State of Maryland, Worcester County, and Town of Ocean City to investigate several water resource-related problems in Maryland's coastal bays. The study addresses four primary issues, including impacts to Assateague Island from the stabilized inlet, long-term sand management, navigation, and environmental restoration.

The OCWRS has recommended several actions to address existing problems, including a long-term program to routinely remove sand from the inlet and adjacent areas for use in

nourishing Assateague Island. If initiated, the "bypassing" program is expected to reduce shoaling and related navigation problems in the vicinity of the inlet.

Habitat restoration projects have also been proposed that will use dredged materials from maintenance dredging projects undertaken by the ACOE, WC and OC. The proposed projects include the beneficial use of dredge material to restore habitat by creating and maintaining island habitats for colonial nesting water birds.

Solution: Through outreach activities publicizing existing problems, develop public and political support for implementation of the Army Corps of Engineers/Ocean City Water Resources Study (OCWRS) recommendations which are related to inlet problems, long-term sand management, and habitat restoration.

Actions:

1. MCBP, WC and ACOE will develop public and political support for the OCWRS-recommended habitat restoration projects and long-term sand bypassing program at Ocean City Inlet through outreach activities publicizing existing problems and explaining potential benefits.
2. MDE will expedite permit issuance to fast-track the plan to the extent possible.

Expected Benefits:

- improved navigation in coastal bays
- improved aquatic habitat and fisheries
- improved stability of Assateague Island

Related Actions: RN 2.1

GOAL 2: IMPROVE THE MANAGEMENT OF NAVIGATION AND DREDGING IN THE COASTAL BAYS

RN 2.1 ***Challenge: Improve coordination and environmental safeguards***

Responsibility for navigation and dredging in the coastal bays is shared by several federal, state, and local agencies as well as private communities, businesses, and individuals. The lack of overall planning and coordination has contributed to a variety of problems, including public confusion about dredging and navigation issues, inadequate environmental safeguards, failure to make full beneficial use of dredged materials, and non-standard channel maintenance and marking. Locally based planning, coordination, and "vision" are needed to enhance the management of navigation and dredging and minimize adverse effects on the coastal bays.

Solution: Develop a master plan to guide the management of navigation and dredging in the coastal bays through the establishment of a navigation and dredging advisory group.

Actions:

1. MCBP will establish a navigation and dredging advisory group (NDAG) to improve planning and coordination, including (but not limited to) the following agencies and interests.
   - US Army Corps of Engineers
   - Ocean City Engineer
   - User Group Representatives
   - Private Local Dredging Firms
   - Community Representatives
   - Harbor/Marina Representatives
   - MD Dept. of the Environment
   - U.S. Coast Guard
   - US Fish and Wildlife Service
   - Environmental Groups
   - Worcester County
   - Environmental Protection Agency
   - Academic institutions
   - NOAA
   - DNR representatives (waterways improvement, heritage, permitting, NRP, CZM, POS)
2. The above agencies will endorse the development of a master plan by the navigation and dredging advisory group, to include the following:
   A. Dredged materials management, including:
      i. Location of potential placement sites.
      ii. Support for and promotion of the beneficial use of dredged materials, including habitat restoration and creation.
   B. "Best Management Practices" for dredging, including time-of-year restrictions, preferred methods, safeguards for sensitive areas, and contaminated sites management.
   C. Channel improvements, possibility of new channels, and potential removal of shoaling in critical navigation areas.
   D. Standards for and mechanisms to encourage marking of all existing channels and identification of responsible parties for non-federal channels.
   E. Priority areas to improve channel markers, including "small channels" leading to and from boat access points and the federal channel in Chincoteague Bay.
   F. Timely updates to nautical charts.
      i. Develop mechanisms to update bathymetric (water depth) data for channels and bays to facilitate better navigation information charts.
      ii. Explore the potential of NOAA certification for local private charts.
   G. Distribution of existing information describing the positive and negative effects of dredging and promotion of beneficial aspects.
   H. Development of a long-range plan for scheduling/financing the maintenance of non-federal channels.
   I. Identification and evaluation of future marina locations for navigation and local land use planning.
   J. Evaluation of the need for monitoring dredge sediment quality from outside of major harbors.
   K. Examination of performance of dredged materials placed in the coastal bays. Both physical monitoring (area covered, thickness, change over time) and biological monitoring (degree to which native species have inhabited the material, species diversity, biomass, etc.) should be performed.

L. Develop and put into action a permit approval procedure with MDE, ACOE, WC, and OC to expedite the permit application process.

Expected Benefits:
- improved navigation
- reduced long-term dredging costs and improved environmental quality through better coordination among public and private entities responsible for navigation and dredging
- improved boating safety
- increased island habitat
- improved understanding of dredged material uses, and dangers

Related Actions: RN 1.1

RN 2.2 ***Challenge: Increase public awareness of dredging and navigation issues***

The public is often confused about channel maintenance responsibilities, the process of acquiring necessary dredging permits, environmental effects of dredging (positive and negative), and a variety of other issues related to navigation and dredging. Targeted outreach to provide this information will enhance the public's awareness of protection issues while facilitating improvements to commerce and recreation.

Solutions: Enhance public awareness of navigation/dredging issues and processes.

Actions:
1. MCBP will publicize Navigation and Dredging Advisory Group as forum for public input.
2. The Navigation and Dredging Advisory Group will develop education materials (e.g., fact sheets, newspaper articles) providing information about key dredging and navigation issues, including:
    A. Channel "ownership" and maintenance scheduling, including information describing public versus private responsibilities.
    B. Agency responsibilities, regulatory requirements, and points of contact for dredging information and permits.
    C. Problems/issues/solutions associated with dredging and navigation.

Expected Benefits:
- more effective public participation in local decisions affecting dredging and navigation

Related Actions: RN 2.1

GOAL 3: BALANCE RESOURCE PROTECTION WITH RECREATIONAL USE

RN 3.1 ***Challenge: Reduce resource impacts from water-based recreational activities***

Certain water-based recreational activities are thought to be incompatible with long-term protection of coastal bay resources. The presence of too many boats and personal watercraft (PWC) in sensitive areas poses threats to natural resources due to pollution, direct impacts, and excessive noise. Action is needed to identify sensitive estuarine resources, evaluate the risks from specific recreational activities, and develop appropriate management tools to mitigate those threats.

Solution: Identify sensitive resources and incompatible recreational activities. Develop protection mechanisms and educate the public to reduce damage to and disruption of sensitive resources and personal property.

Actions:

1. DNR will convene an interagency task force of resource experts to (a) evaluate resource sensitivity and threats and (b) establish priorities for protection, emphasizing activities and locations having the greatest negative impacts.
2. DNR will develop maps of sensitive resource locations throughout the entire bay system.
3. DNR will identify outstanding research/information needs related to recreational activity effects on natural resources.
4. MCBP will investigate protection mechanisms used in other parts of the country.
5. MCBP will develop, and DNR will forward to the EPA, a formal request that the Maryland coastal bays be designated as a federal No-Discharge Area under Clean Water Act Section 312.
6. MCBP will solicit input regarding protection alternatives through public workshops.
7. DNR and other responsible agencies will develop specific protection measures for application in the coastal bays. Potential opportunities include, but are not limited to:
    A. Designation of resource sanctuaries to improve habitat for recreationally and commercially important fish and shellfish species.
    B. Designation of zones for specific types of use.
    C. Creation of new sensitive habitat types in areas with minimal potential for conflicts.
    D. Catch-and-release fishing programs.
    E. Time-of-year use restrictions.
    F. Development of upland recreational opportunities and attractions to reduce pressure on coastal bay resources.
    G. Targeted public education campaigns.
8. MCBP will enhance public awareness of resource protection issues and needs.
    A. Produce and distribute fact sheets and newspaper articles to publicize resource protection problems/solutions and sensitive resources and areas.
    B. Distribute copies of DNR threatened & endangered species brochure.
    C. Develop resource protection posters for display at local boat dealers, rental outlets, marinas, visitor centers, and other focal areas.
    D. Work with USCG auxiliary and NRP to distribute resource protection information during annual boat inspections (e.g., sticker for boat consoles listing key resource protection tips).
    E. MCBP and DNR will develop curricula for a required boater education course to include environmental protection information.

F. Work with navigation chart producers to enhance the information on local charts to include sensitive areas, bathymetry (water depths), sewage pump-out facilities and resource protection tips.

G. Publicize fishing size and creel limits in popular land-based fishing areas and by boat launch facilities.

Expected Benefits:

- decreased economic and environmental costs associated with unnecessary disruption of sensitive estuary locations
- reduced boating congestion and fewer accidents

Related Actions: CE 3.1, FW 1, FW 4

GOAL 4: IMPROVE BOATING SAFETY IN THE COASTAL BAYS

RN 4.1 ***Challenge: Improve navigation conditions at Route 50 bridge and inlet***

Strong currents, congestion, and limited space in deep water channels combine to create a variety of navigation and boating safety concerns in the vicinity of the Ocean City Inlet and Route 50 bridge channel.

Solution: Identify and resolve safety concerns associated with navigation at the Ocean City Inlet and Route 50 bridge.

Actions:

1. Evaluate safety issues related to navigation under the Route 50 bridge.
    B. USCG will conduct a survey of boating activity at the Route 50 bridge to identify priority safety problems and issues.
    C. MCBP will investigate and if feasible facilitate the development of a local telephone "hot line" for the public to report boating safety problems.
    D. MCBP will acquire all available accident/incident information, including search and rescue reports, from all local responders (including USCG, MD DNR-NRP, Maryland coast towing around Route 50 bridge and inlet) to determine trends in type, time, and location of incidents. From this data MCBP will identify most significant needs.
    E. MD Natural Resources Police will evaluate safety issues related to fishing from the Route 50 bridge.
2. MCBP and DNR will develop a survey for boaters to identify local boating safety issues.
3. Implement programs to improve boating safety around the route 50 bridge and inlet.
    A. MCBP will develop educational materials describing navigation conditions at the bridge and inlet and tips for safe passage, and target the general public and boat rental businesses.
    B. MCBP will ask MD Department of Transportation to place high profile signs (liquid crystal display type) on bridge approaches describing current

conditions and safety warnings (e.g., "Current flowing south at 5 knots. Use caution").

C. DNR, WC, and OC will examine issues related to boat rental facilities that may pose potential safety and resource protection problems, and develop and implement effective solutions.

4. MCBP and DNR will evaluate the feasibility of alternate routes under the Route 50 bridge to reduce congestion by:
    A. Acquiring bathymetric data to evaluate existing conditions ("west channel").
    B. Supporting maintenance of existing Shantytown channel as part of the Assateague restoration project.
    C. Evaluating potential of restoring the "west channel" to former depths.
    D. Improving signs if use of "west channel" or other passageway is feasible.

Expected Benefits:
- improved tourism

RN 4.2 ***Challenge: Reduce conflicts between water-based activities and user groups***

As the number of recreational boaters in the coastal bays has increased, so too has the incidence of user conflicts. Many of the problems stem from the limited availability of deep water and the resulting competition between users. For example, this includes conflicts in navigation channels due to their use as both access corridors and fishing spots. In addition, there is a growing tension between the non-boating public and recreational boaters over use of resources, particularly in the case of personal watercraft.

Solution: Identify and resolve recurring user conflicts and problem areas to improve boater safety and quality of recreational experience.

Actions:
1. MCBP and DNR NRP will conduct a public opinion survey about specific user conflicts, problems, and areas where the quality of recreation is being impacted by existing types, intensity, or patterns of use. The survey will be used to develop recommendations to resolve the problems identified.
2. MCBP will produce educational materials describing user conflict issues, areas to avoid, boating courtesy, and other targeted information to address existing problems. Educational media include fact sheets, newspaper articles, and television "infomercials" for local markets (e.g., hotel channels, public service channels).
3. DNR will encourage development of alternative fishing opportunities (offshore reefs, beneficial dredging) to reduce use of existing channels.

Expected Benefits:
- promotion of tourism
- reduced user conflicts
- enhanced recreational boating and swimming opportunities

Related Actions: RN 4.1.2

RN 4.3 ***Challenge: Increase public awareness of boating rules and regulations***

With its continuing increase in popularity, recreational boating in the coastal bays must be managed effectively. There is a need to improve compliance with existing laws and regulations, and enhance education of both recreational users and the boating industry. Basic rules of navigation, courteous operation, safety, and resource protection are key areas of emphasis.

Solution: Enhance public awareness of boating rules and regulations to improve boating safety and protect natural resources.

Action:

1. DNR will update curricula for a required boater education course to include specific information about the coastal bays and environmental protection.
2. DNR and MCBP will develop educational media for boat dealers, marinas, rental outlets, schools, and other focal points to improve education on rules and regulations and promote boating safety, including:
    A. One-page "boaters' atlas" to impart key regulations and resource protection information.
    B. Brochures/exhibits (for posting at major entry points to bays) summarizing rules and regulations.
    C. Safe boating/proper use video highlighting local problems and issues for use at boat dealers, rental facilities, schools and for other interest groups.
3. MCBP will explore the potential for development of on-the-water boater education programs by local businesses.
4. DNR will explore potential for mandatory education of all persons renting boats (as is done with personal watercraft rentals).
5. MCBP and USCG will develop incentives for users to become better educated about rules and regulations (e.g., reduced insurance premiums for completion of a safety course, USCG safety inspection).
    A. Determine which insurance companies offer discounts for safety inspections and completion of a safety course (MCBP only).
    B. Educate boaters on which insurance companies give rate reductions for safety training and inspections (MCBP only).
6. DNR, MCBP, and USCG will develop strategic alliances with local entities to ensure adequate facilities are available for conducting boating safety courses.

Expected Benefits:

- less congestion and fewer boating accidents
- enhanced recreational boating experience
- reduced costs associated with operating a boat and with public management of recreational boating courses

Related Actions: RN 4.4

RN 4.4 ***Challenge: Increase compliance with safe boating and resource protection rules***

The growing popularity of recreational boating, including use of personal watercraft, is placing increased demands on local law enforcement agencies to ensure that activities are conducted safely and in compliance with resource protection regulations. There is a growing perception by the local public that existing capabilities are not keeping pace with the problems and additional law enforcement resources may be necessary.

Solution: Develop additional law enforcement capability to protect sensitive resources and promote boating safety in the coastal bays.

Actions:

1. DNR will evaluate existing law enforcement capabilities, needs, problems, emphasis, and direction.
2. DNR will implement and MCBP will promote the "Bay Watch" program to enhance existing enforcement efforts.
3. DNR will identify and evaluate alternative methods of enhancing enforcement (e.g., troopers in residence, marina watch programs).
4. DNR and MCBP will develop local/state political support for additional funding for enforcement.
5. DNR and WC will conduct a study to determine how boat registration fees are distributed among counties and used. The study will examine how fees from locally derived activities could be used for boating enhancements and additional law enforcement in Ocean City and Worcester County.
6. DNR NRP will initiate and promote the NRP Reserve Officers Program in Maryland's coastal bays to enhance existing law enforcement efforts.

Expected Benefits:

- improved boater safety

Related Actions: RN 4.3

GOAL 5: IMPROVE WATER-BASED RECREATIONAL OPPORTUNITIES AND DIVERSITY OF ACCESS TO COASTAL BAYS AND TRIBUTARIES

RN 5.1 ***Challenge: Enhance recreational access, opportunities, and infrastructure***

The anticipated growth in recreational use of the coastal bays has the potential to overwhelm existing infrastructure and place additional stress on the ecological integrity of the system. To date, most of the emphasis in facilitating public use has been directed towards recreational boating. While boating will likely remain a keystone activity, other recreational pursuits such as birdwatching, hiking, and land-based fishing may be more inherently sustainable and should be accommodated and actively encouraged.

Solution: Enhance sustainable recreational use and public access in the coastal bays and their tributaries.

Actions:

1. WC will identify outstanding recreational facility/access deficiencies:
    A. Update 1991 boating survey to evaluate status and adequacy of marinas, launch ramps, and other boating-related facilities.
    B. Evaluate existing opportunities for non-boating recreation, including demand for facilities, types of use, and economic value of non-boating activities.
2. WC will seek funding, identify opportunities, and develop recommendations for additional coastal access such as open space, public parks, campgrounds, walkways, trails, boardwalks, and other passive recreational opportunities.
3. WC will include diverse coastal access and passive and active recreational needs in county recreation and comprehensive plans and:
    A. Encourage the use of floodplains as sites for coastal access for passive, water-based recreation; and
    B. Encourage passive recreation in and near Chincoteague Bay, E.A. Vaughn Wildlife Management Area, and other protected or sensitive resources.
4. MCBP will work with boat dealers to encourage sales of appropriate boats for desired uses (shallow draft vessels are needed to access many areas); MCBP will develop brochure.
5. DNR and SHA will encourage the state Greenways Program to support the development of bicycle corridors between development centers and recreation sites.
6. MCBP and WC will enhance public awareness of existing facilities, opportunities, and access points.
    A. MCBP will distribute copies of county brochures on recreational areas and DNR bay access guides.
    B. MCBP will produce fact sheets, newspaper articles, and public service television spots to publicize new opportunities.
7. MCBP and WC will stress the importance of protecting private property near waterways from recreational abuses (e.g., no campfires or trash on private beaches or along waterways).

Expected Benefits:

- enhanced eco-tourism opportunities
- reduced tax expenditures through shift from high- to low-impact tourism
- improved aquatic habitat, fisheries, and swimming

RN 5.2 *Challenge: Increase public awareness of resource protection needs*

Safe boating and the protection of sensitive resources from recreational boating activities are strongly dependent upon an educated and aware public. A wide variety of pertinent information currently exists but is not uniformly available or in a format conducive to widespread use by the boating public. Existing information needs to be consolidated, focused, and widely distributed to recreational users.

Solution: Produce "Guide to the Coastal Bays" to improve recreational activities and protect natural resources.

Actions:
1. MCBP will include in the guide information on:
    A. Shoreline access, boat launch facilities (including condition assessment), good fishing/crabbing/shellfishing areas, safe swimming areas, and other water-based recreational amenities.
    B. Recreational boating rules/regulations, clean boating, pollution prevention practices and facilities, and existing fishing regulations.
    C. Sensitive resources, areas to avoid, protection tips, and activities incompatible with natural resources.

Expected Benefits:
- better understanding of boater safety and resource protection among recreational boaters

Related Actions: RN 3.1, RN 5.1, RN 7.2

GOAL 6: CREATE GUIDELINES FOR LOCATING NEW FACILITIES

RN 6.1 ***Challenge: Reduce resource impacts from marinas due to location and design***

The design and location of harbors, marinas, and related facilities may contribute to environmental degradation by restricting tidal flushing, concentrating pollutants, adding to eutrophication problems, and reducing sensitive habitat areas. Guidelines are needed to ensure that future marina locations consider environmental effects and are compatible with regional land-use planning. In addition, there are currently a number of legal and commonly used definitions of what constitutes a harbor or marina. These definitions are often contradictory, leading to practical difficulties in developing and implementing policies and educating users/public.

Solution: Work with state and county to establish guidelines for the location and design of new marinas to reduce environmental impacts and improve consistency between regulatory programs.

Actions:
1. MDE will identify existing marina "definitions" from federal, state, and local regulatory programs and review for adequacy and consistency.
2. MCBP and DNR will work with Worcester County to develop a working (and possibly legal) definition for what constitutes a "marina."
3. MCBP will consult with federal, state, and local agencies to identify current problems/issues relating to marina locations.
4. WC will evaluate marinas location issues within the context of WC's comprehensive and zoning plans.

5. WC and MDE will acquire examples of guidelines or regulatory mechanisms from other jurisdictions related to locating new marina facilities.
6. MCBP, USFWS, MDE and ACOE will clarify responsibilities of federal, state, and local agencies in permitting process and identify any "missing links" or problem areas.
7. WC, OC, and MCBP will form a working group of the public and appropriate federal, state, and local agencies to develop recommendations for the location and design of new marinas to reduce environmental impacts. Potential options include, but are not limited to, voluntary guidelines, new regulations, and additional review processes.

Expected Benefits:
- reduced water quality impacts from marinas
- reduced tax expenditures through better coordination of permitting and planning
- activities and the reduction of contradictory requirements
- improved aesthetics and tourism opportunities

Related Actions: FW 1.7, RN 7.1

GOAL 7: IMPLEMENT SUSTAINABLE MANAGEMENT PRACTICES AT HARBORS AND MARINAS

RN 7.1 ***Challenge: Reduce water pollution from marina operations and practices***

The maintenance, operation, and storage of recreational and commercial vessels have the potential to contribute pollution to marine waters. Contaminants include petroleum from careless fueling practices, vessel sewage, paint dust and chips from hull maintenance operations, solvents from engine cleaning, residues from pressure washing, and marine debris from littering. These pollutants may be deposited directly into coastal waters or they may be carried in by stormwater runoff from land-based facilities.

Solution: Identify, evaluate, and improve best management practices and pollution control infrastructure and practices at harbors and marinas to improve water quality, pollution prevention efforts, and public education.

Actions:
1. DNR will evaluate adequacy of existing sewage pump-out and recycling facilities for used oil, gasoline, antifreeze, and solid waste by surveying marinas for the presence of these facilities and associated use patterns.
2. DNR will identify recurring problems relating to the use (or lack thereof) of these facilities.
3. DNR will identify methods and incentives to develop new BMP's as needed (e.g., encourage marinas to participate in the Clean Marina awards program for recognition as a "clean marina").
4. MCBP will investigate the status of alternative hull construction materials that reduce the need for anti-fouling treatment.

5. MCBP will investigate the benefits associated with use of alternative materials for bulkheading (e.g., vinyl).
6. DNR will hold workshops in the watershed to discuss and explain the Clean Marina Initiative.
7. DNR will explore the availability of grants and loans for marina owners/operators to install and maintain Best Management Practices.
8. DNR will promote alternatives to current practice of dumping fish cleaning remains into the bays.
9. DNR will develop and distribute educational materials on pollution prevention actions relating to bottom paints, corrosion anodes, fueling methods, and waste disposal including:
    A. Problems associated with improper waste disposal (e.g., sewage, used fuel, oil, antifreeze).
    B. Methods of proper waste disposal.
    C. Existing waste disposal regulations and prohibitions.
    D. Use of bilge pillows and other similar devices to reduce fuel and oil discharge.
    E. Proper maintenance techniques (e.g., control of paint chips when scraping hulls).
10. MCBP will enhance public awareness of pollution prevention problems and solutions by adding phone numbers for emergencies. [Add to local telephone book and provide information via congressional representatives (e.g., magnets).]
11. MDE will evaluate the adequacy of existing regulations and enforcement capability pertaining to harbors and marinas to address point and nonpoint source pollution by
    A. Contacting responsible agencies (e.g., NRP and USCG) and local marinas to obtain status information about regulatory requirements and enforcement capabilities.
    B. Reviewing marinas to evaluate compliance with permit requirements.
    C. Researching, evaluating, and reporting on the adequacy of federal, state, and local permit/policy requirements for harbors and marinas.

Expected Benefits:

- reduce toxic inputs to bays and tributaries
- enhanced recreational opportunities
- reduced economic and environmental costs associated with :non-green" marinas, e.g., less debris removal, monitoring of toxic "warm" spots, etc.

Related Actions: RN 6.1, 7.2

RN 7.2 ***Challenge: Reduce resource damage from oil and hazardous material spills***

Due to the presence of large concentrations of boats and maintenance and fueling facilities, harbors and marinas are potential sites for accidental hydrocarbon and other toxic material spills. Adequate contingency plans, trained personnel, and sufficient material and supplies are necessary to minimize the risk of and impact from hazardous material spills.

Solution: Evaluate existing pollution response capabilities including public vs. private responsibilities, availability of equipment and staff, and need for new policy and permit requirements.

Actions:

1. MCBP will obtain status information about response capabilities.
2. MCBP will obtain local area contingency plan from USCG.
3. MCBP and USFWS will request the Mid-Atlantic Coastal Area Committee, through the USCG (Marine Safety Office, Hampton Roads) to conduct an evaluation of pollution response capabilities, including local equipment and supply stocks, response personnel, training, and outstanding needs (this will include an evaluation of specific types of spills expected and the specific needs associated with each).
4. USCG and Mid-Atlantic Coastal Area Committee members will implement recommended changes.
5. MCBP and OC will support and encourage public and private cooperation in voluntary spill response exercises designed to improve area readiness to contain and respond to spills in the coastal bays.
6. WC, OC, Berlin, and local fire companies will examine means to enhance local hazmat-related response capabilities.

Expected Benefits:

- reduce tax expenditures through more efficient toxin monitoring and cleanups
- reduced toxins loading to aquatic resources

Related Actions: CE 2.3

COMMUNITY AND ECONOMIC DEVELOPMENT

In 1940 Worcester County's population was 21,245. Prior to the nation's highway and rail system expansion and the completion of the bridge spanning the Chesapeake Bay in July 1952, Worcester County's growth rate was slow and consistent. Since the early 1970's, however, Worcester's population has steadily increased, largely due to increased accessibility from the Western Shore, the development of a viable tourism industry, the influx of retirees, and the attractive quality of life. Based on data from the 1990 census, the Maryland Office of Planning, and Worcester County Department of Planning growth projections, the county's population in 1998 was 44,291, a figure that under expected growth patterns is expected to swell to 72,117 by 2020 - triple the population in 1940.

More telling than absolute numbers is the shift in where these increases are occurring within the county. In 1940 just over 50 percent of the county's population lived in the coastal bays watershed. Since then this proportion has increased steadily. Census statistics for 1990 show approximately 62 percent of the county population living in the coastal bays watershed and by 2020 that percentage is expected to rise to more than 73 percent.

To accommodate population growth, many acres of uplands, wetlands, forests, and productive farmland in the county have been converted both to residential and commercial use. Citizens of Worcester County must work together to formulate a plan which will determine where and how the county will grow in the future. Care must be given to protect sensitive areas, as well as natural, cultural, and economic resources, in order to accommodate more residents without losing the very amenities which attract them.

Worcester County is at a crossroads and county residents should begin contemplating where to go from here. Do we continue the county's present growth and development trends or do we find alternative ways to address those issues that may adversely affect both our quality of life and efforts to preserve and protect the fragile coastal bays watershed?

In order to meet the environmental, economic, and recreational needs of our present population without compromising the ability of future generations to meet their own needs, county residents and decision makers must be willing and able to make informed decisions about the future of the county. Such decisions are not always easy but recognizing that economic prosperity depends on the health of the environment is a critical first step. We have one foot in the past and one in the present. What is our next step?

GOAL 1: EDUCATE AND INFORM THE POPULATION SO IT CAN MAKE KNOWLEDGEABLE DECISIONS ABOUT WHAT IT WANTS FOR ITS COMMUNITY AND FUTURE

CE 1.1 ***Challenge: Increase Public Participation***

Citizens often are unaware of all the associated impacts of growth in a community. We want more conveniences, services, and housing but do not associate development with the increased demands they also bring. Providing the public with information on community costs, like financing new schools and roads, increased traffic, loss of trees and open spaces, as well as the benefits of growth and additional services, will enable them to make better decisions about what they want for their community and their future.

Solution: Increase the community's understanding of growth impacts to increase involvement and foster informed decision-making.

Actions:

1. DNR will develop and distribute information on costs of community services related to various land use development patterns.
2. MCBP will determine stakeholders' current understanding of impacts to the bays and target public education by:
    A. Creating an electronic Watershed Atlas;
    B. Establishing Coast Day as an annual event; and
    C. Linking County public libraries to GIS.
3. MCBP will promote and provide education to decision makers and the public on low-impact development by:
    A. Encouraging demonstration projects which show model developments, green building, and examples of "doing the right thing;"
    B. Establishing annual planning awards;
    C. Establishing Osprey/Gold Star award for "doing the right thing;" and
    D. Promoting workshops sponsored by other organizations related to sustainable development.
4. WC, OC, and the Town of Berlin will support redevelopment efforts in existing communities.
5. OP will characterize the differences between expanded (i.e., growing bigger) and enhanced communities.
6. MCBP will educate the community about the demands and needs of transients (tourists and seasonal residents), traditional locals (e.g., Stockton), new locals (e.g., Ocean Pines).
7. MCBP will educate seasonal residents, new residents, and visitors by:
    A. Providing environmental education on topics like recycling and water conservation and promoting eco-tourism opportunities in advertising and marketing campaigns.
    B. Mailing information packets to new residents about the MCBP and the importance of recycling, and water and energy conservation.
    C. Providing information to new residents and visitors about the pros and cons of living near wetlands, open marsh, and coastal ecosystems.

Expected Benefits:

- more public participation in decisions affecting the community
- more rational and predictable growth patterns
- enhanced tourism opportunities

Related Actions:

CE 1.2 ***Challenge: Improve planning tools***

Elected officials, appointed officials, and local agency personnel need more tools and information when evaluating growth and land use issues. These resources are necessary to make more informed decisions that better reflect community needs.

Solution: Provide tools and information, such as GIS capability, examples of successful local ordinances, and information on sub-watershed-based planning to local decision makers to facilitate implementation of actions contained in this plan.

Actions:

1. The technical resources of MCBP will be made available to local governments to assist them in making decisions to resolve planning issues.

Expected Benefits:

- more accurate and less costly county decision making
- improved political accountability and responsiveness

GOAL 2: FOSTER A COMMUNITY CONSENSUS ON THE DESIRED FUTURE CONDITION OF THE MARYLAND COASTAL BAYS REGION AND A VISION OF HOW TO PROMOTE THE COUNTY AS A VACATION DESTINATION, FARMING REGION, RESOURCE PROTECTION AREA, AND RETIREMENT COMMUNITY, WHILE PROTECTING AND PRESERVING THE COASTAL BAYS

CE 2.1 ***Challenge: Reduce threat of development to cultural and natural resources***

As development pressures continue to increase in the watershed, important natural and cultural resources are threatened. Actions that preserve and enhance natural and cultural resources are essential for maintaining water quality and habitat, and for ensuring the economic stability of the watershed. The needs of specific groups must be met in order to ensure true community consensus.

Solution: Promote the culture and character of the region by continuing to preserve, restore, and enhance wetlands, forests, and cultural resources and educating the public about available tools.

Actions:
1. Explore a variety of planning tools that promote sustainable low impact practices. OP and MCBP will provide examples where effective use has been made of Transferable Development Rights (TDRs), Purchase of Development Rights (PDRs), preferential taxation, compact development, open space preservation, and efficient development.
2. WC and MCBP will identify important cultural areas and promote traditional ways of life by:
    A. Working with MHT to encourage museums, such as old oyster packing houses;
    B. MCBP will educate developers and realtors about the information available from MHT regarding archaeological and cultural resources.
    C. WC will incorporate cultural, heritage, architectural, archeological, and historic resources planning components in the Comprehensive Plan.
3. DNR and the Maryland Forestry Task Force will conduct an analysis of forestry industries and if necessary propose changes to ensure its long-term viability and environmental benefits.
4. MCBP will produce educational materials about the importance of protecting wetlands, forests, and cultural resources to ensure the cultural integrity and economic viability of the coastal bays region.

Expected Benefits:
- more cost-effective county planning proposals
- enhanced eco-tourism opportunities
- greater community appreciation of natural and cultural heritage
- increased enjoyment of open spaces and forested land cover

Related Actions: CE 3.3, FW 2.2, FW 2.3, FW 2.6, FW 3.1

CE 2.2 *Challenge: Articulate long-term vision*

Seeking community consensus is the first step in developing a vision for the future. Once the community has been given the tools to make informed decisions and the opportunity to express what they want for their future, those ideas must be incorporated into land use decision making. "Alternative Futures" analysis is a tool to demonstrate various possible outcomes for the future of the watershed.

Solution: Present "alternative futures" to the community to educate citizens and demonstrate possible outcomes for the future of the watershed.

Actions:
1. OP will perform build out analysis of the watershed including impacts from necessary services such as schools, roads, police, etc.
2. MCBP will document community vision for future.

3. MCBP and WC will sponsor workshops to present alternative futures scenarios based on zoning build out and community visioning, and
    A. Incorporate carrying capacity benchmarks.
    B. Incorporate workshop results into regional planning activities.

Expected Benefits:
- more rational and predictable growth patterns
- improved political accountability and responsiveness
- greater local control over local issues

Related Actions: WQ 1.3

CE 2.3 ***Challenge: Enhance natural disaster planning***

Attention to public safety during short and long-term planning and land use decision making will minimize the impacts of natural and man made hazards. Consideration of emergency response times, evacuation and property protection measures, Federal Emergency Management Agency (FEMA) requirements, and the need for comprehensive disaster and hazard mitigation plans can reduce long-term financial costs for local governments and the community as a whole. Furthermore, adequate planning and incorporation of proper safety measures can minimize the negative impacts of disasters when they occur.

Solution: Modify codes and policies within the county so communities are designed with safety features that protect them from coastal hazards and minimize economic loss.

Actions:
1. WC and OC will ensure that emergency operations plans include provisions for flood hazards, natural disasters, flood mitigation, environmental hazards, fire and emergency response times, etc.
2. WC will adopt local regulations that minimize National Flood Insurance Program incentives for building and rebuilding in floodplains, and work with:
    A. MCBP, MDE and OP to educate about the disadvantages of building and rebuilding in flood-prone areas; and
    B. MEMA to review local policy/plan for post-disaster redevelopment; and
    C. DNR to incorporate sea level rise impacts in county planning efforts.
3. WC, Town of Berlin, and OC will encourage development practices that minimize the impacts of disasters through proper siting, design, and construction by:
    A. Assuring that safety design standards for development projects are included in county and city zoning, building, and floodplain regulations.
    B. Amending local floodplain ordinances to require one foot of freeboard above the 100-yearfloodplain elevation for development in tidally influenced floodplains.
    C. WC determining, based on ongoing and existing sea level rise studies, appropriate code changes necessary to address sea level rise and erosion problems.

D. WC initiating a series of roadway corridor plans that will include specific recommendations for safety, aesthetics, transportation efficiency, vehicular movements, and evacuation concerns.

4. WC, OC, and Town of Berlin will promote individual business and community disaster plans.
5. WC, MDE and OC will make a response plan for gas & oil spills, floating tanks, septic damage, etc.
6. The Town of Berlin, WC and OC will support regional evacuation plan development and request that:
    A. FEMA and MEMA review appropriateness of existing plans as part of the evacuation plan development process.
    B. FEMA and MEMA review timing of Ocean City evacuation plan.
7. Local governments will cooperate in evaluating the adequacy of hurricane evacuation issues in local land use and infrastructure decision-making, and seek opportunities for improvement.

Expected Benefits:

- improved public safety
- reduced government waste of tax revenue and economic impacts on private property
- enhanced attractiveness of area as resort and retirement community
- increased green space and improved water quality

GOAL 3: MANAGE THE WATERSHED TO MAXIMIZE ECONOMIC BENEFITS WHILE MINIMIZING NEGATIVE RESOURCE IMPACTS TO THE COASTAL BAYS

CE 3.1 ***Challenge: Reduce impacts from tourism***

Tourism is recognized as a vital part of Worcester County's economy that is growing as tourism related opportunities increase. Seasonal impacts to local infrastructure and natural resources should be anticipated as seasonal populations swell. Strategies are necessary to minimize negative impacts and provide alternatives to conventional practices.

Solution: Plan for the impacts of tourists.

Actions:

1. OC and MCBP will partner with the hospitality industry to identify common goals and promote:
    A. Economic benefits of water and energy conservation, use of low-flow water devices, reduced frequency of changing sheets and towels.
    B. Use of reusable materials instead of disposable items, e.g., in-room glasses, coffee service.
    C. Benefits of recycling materials.

D. Packages combining existing Ocean City accommodations and attractions with county natural resource-based activities.

2. Worcester County Tourism will partner with MCBP and OC to promote ecofriendly tourism opportunities, educate area visitors, and:
    A. Identify tourism demographics to determine target audiences.
    B. Produce and provide educational information on environmentally sensitive practices for visitors and members of the tourism industry.
    C. Place brochures in hotel lobbies, the convention center, gas stations, marinas, boat ramps, restaurants, surf shops, real estate rental offices, etc.
    D. Encourage tourism marketing that promotes alternative transportation, eco-tourism, and non-peak visits.
3. MCBP will incorporate education efforts into existing ongoing programs, e.g., NRP boat ramp messages, Ocean City wrapped bus messages, signs at beach access paths, etc.
4. MCBP will link web sites of hotels, Worcester County Tourism, and others to environmental education information and MCBP web site.

Expected Benefits:
- reduced stress on public infrastructure and natural resources
- improved image of area to potential visitors
- decreased business costs

Related Actions: CE 3.3, WQ 1.3, WQ 7.4

CE 3.2 ***Challenge: Reduce loss of farmland***

Farming in the watershed is central to the character of the community. The county's agricultural heritage has historic, cultural, economic, and environmental significance. Development encroaches further into previously farmed areas as pressures mount on farmers to sell their property. It is important to create and promote incentives to retain the culture and character of farming in the watershed.

Solution: Retain strong agricultural zoning and foster other incentives to preserve farmland and forestland.

Actions:
1. WC will continue to support strict A-l zoning.
2. MCBP will connect farmers with citizens to foster a greater appreciation of farming's contributions towards environmental enhancement.
3. WC will seek support industries for farming such as corn research, beneficial use of chicken litter, wood markets, etc.
4. MDA and WC will create economic and other incentives to retain farming.
5. MCBP and WC will discuss with the County Register of Wills methods of addressing inheritance tax problems and possible reform at the state level.
6. WC will consider developing and implementing a state-certified Agricultural Preservation Program. This would allow the county to access up to 75 percent of the agricultural transfer tax revenue to use in easement purchases.

7. WC will consider developing a strategic farmland assessment and plan for conservation.

Expected Benefits:
- protection and stabilization of traditional rural character of community
- reduced infrastructure needs
- improved fish and wildlife habitat
- enhanced eco-tourism opportunities

Related Actions: CE 2.1, FW Goal 2

CE 3.3 *Challenge: Establish sustainable development patterns*

The economic success of the watershed, including the agricultural, forestry, fin, and shell fishing, development, and tourism industries, depends on the health of our natural resources. Clean water and air, fresh local seafood and attractive scenery are promoted as reasons to visit the area. The region needs to use more efficiently existing resources and promote innovative opportunities to enhance the region's economy.

Solution: Enhance or strengthen a diversified and sustainable economic base by promoting eco-tourism and eco-friendly businesses which will preserve and maintain natural resources.

Actions:
1. WC, OC and MCBP will promote non-traditional tourism activities including eco-tourism, historic and cultural interpretation, and other active recreational and package tour opportunities.
2. DNR and MDA will encourage agricultural, silvicultural and other research and experimentation to expand markets;
    A. DNR will investigate and promote possible incentives and markets for production of hardwood species; and
    B. MDA, WC and DBED will investigate feasibility of aquaculture development.
3. MCBP, WC, EPA, and DBED will identify and promote eco-friendly businesses and businesses with eco-friendly practices and encourage broader business participation.
    A. DBED will conduct cost/benefit comparison of traditional vs. eco-friendly businesses.
    B. WC and DBED will seek technology-based, resource-based, non-polluting industries.
    C. WC and DBED will encourage training and retraining the local workforce.
    D. WC, DBED, and EPA will develop incentives to promote eco-friendly business practices.

Expected Benefits:
- integration of environmental protection and economic development needs
- reduced public and private expenditures for mitigating development impacts

Related Actions: CE 2.1, FW 1.2, FW 2.1, FW 2.2, FW 2.3

CE 3.4 *Challenge: Manage groundwater consumption*

Groundwater substantially influences the coastal bays and provides all of the residential and commercial water used in the watershed. Overuse of groundwater is currently encouraged in the county due to a decreasing pay scale (i.e., the more you use the less you pay per unit). Increasing population growth and density will increase the demand for groundwater in the region and increase the potential for contamination of the region's aquifers. Although recent statutory plumbing codes require the installation of water-saving fixtures with new systems, existing water systems and water used for other purposes, like sweeping driveways, are not addressed. Community members need to understand the limits to current water supplies and practice water conservation practices.

Solution: Promote water conservation.

Actions:

1. MDE will work with appropriate state and federal agencies to determine quantity and quality of groundwater resources available for use in the basin. MCBP will assist WC in developing projections of future water requirements. If the available water resources appear inadequate to meet projected needs, MDE and MCBP will assist WC in reviewing its options. MCBP and MDE will assist WC in making presentations of this information to elected officials and the public.
2. MCBP will educate about existing water conservation regulations.
3. MCBP, WC, UMD Cooperative Extension Service and MDE will promote conservation of water:
    A. MCBP/MDE will educate about water conservation techniques such as alternative landscaping, water conserving fixtures, etc.;
    B. MCBP, with assistance from WC, will develop an educational brochure to send with residential water bills;
    C. MDE and MDA will advance grey water reuse for agricultural irrigation.
4. WC will set a rate structure that encourages conservation, i.e., the more you use, the more you pay.
5. MCBP will encourage hotel/motel industry to conserve water by:
    A. Encouraging installation of water-conserving fixtures and minimization of towel & sheet changes for extended stays;
    B. Demonstrating retrofitting possibilities;
    C. Identifying potential uses for old fixtures, e.g., artificial reefs, pavement substrate, flower planters.

Expected Benefits:

- economically and environmentally sustainable water supply
- reduced contaminant concentrations in groundwater entering bays
- enhanced public awareness and appreciation of groundwater resource

Related Actions: CE 2.2, FW 2.4

CE 3.5 *Challenge: Reduce airborne pollution*

Although many sources of atmospheric deposition to the coastal bays are outside the watershed, there is still much that can be done within the watershed to reduce airborne pollution.

Solution: Educate communities and promote residential and business energy conservation to decrease atmospheric deposition.

Actions:
1. MCBP and MDE will develop educational materials on home and workplace energy conservation practices, and automobile exhausts or combustion contributions to atmospheric pollution.
2. WC and MDE will support alternatives such as composting as a means to reduce open air burning.
3. MCBP, MDE and WC will advance use of alternative energy sources, such as clean burning fuels like geothermal, solar, wind, etc.
4. MCBP will support the use of electric lawn mowers and 4 cycle boat engines, and explore development of a trade-in program for old equipment or offer other incentives.
5. MOOT, MCBP, WC, OC, and Berlin will increase commuting opportunities by promoting carpooling and MCBP will provide educational materials regarding flex place/flex time workplaces.
6. WC and OC will examine the benefits of adopting a model energy code for residential and commercial buildings.

Expected Benefits:
- reduced nutrients and toxins in air and water resources
- improved aesthetics, e.g., reduced congestion, localized air quality problems, oil and gas spillage, etc.
- enhanced eco-tourism activities
- improved community understanding of relationship between air and water resources

GOAL 4: ENHANCE THE LEVEL OF SUSTAINABILITY IN LAND USE DECISION MAKING

CE 4.1 ***Challenge: Promote planned growth***

Growing within the limits of existing or planned services just makes good sense. If growth occurs in excess of existing or planned services the local government is burdened with providing additional infrastructure to satisfy the demands of new growth. This can place unwelcome and unwanted burdens on the local government and citizens who eventually "pick up the tab" for the costs.

Solution: Ensure growth is compatible with existing or planned services in order to maximize funding sources, while minimizing the local tax burden and impacts to natural resources.

Actions:

1. WC will investigate the development and implementation of an Adequate Public Facilities (APF) Ordinance.
2. WC will promote development in designated growth areas as identified in the County comprehensive plan and promote development in priority funding areas to obtain State assistance:
    A. WC and DNR will determine tax impacts associated with infrastructure costs that accompany growth;
    B. WC, DNR, and OP will investigate land use development patterns which support effective use of County financial resources, e.g., subdivision design standards, clustering development, location of development.
3. WC, OC, MDE, MGS, and MCBP will evaluate the watershed's carrying capacity and develop indicators of watershed change for use by the county in long-range planning and land-use decision-making. They will:
    A. Explicitly consider drinking water availability from groundwater as an indicator for carrying capacity.
    B. Examine other watershed characteristics as carrying capacity indicators such as impervious surface, groundwater recharge areas, etc.
4. MCBP and WC will review the feasibility of fees associated with APF and make recommendations.

Expected Benefits:

- reduced tax burden through more compatible land use planning and economic development decisions
- more predictable and controllable growth patterns reflecting citizens' vision for the community
- reduced economic and environmental impacts associated with unplanned and haphazard development, e.g., sprawl, congestion, encroachment in sensitive areas, loss of agricultural land, etc.

Related Actions: CE 2.1, WQ 1.1, WQ 1.2, WQ 2.1

CE 4.2 *Challenge: Promote environmental protection incentives*

Incentives can motivate developers to protect or preserve the natural resource features of a site under development. Incentives include predictability and efficiency in permitting, reducing permit by permit reviews, and expediting classes of similar permits. A careful balance must be maintained with incentives to ensure significant environmental benefits are achieved. If protection of natural resources is the primary focus, incentives may encourage developers to avoid sensitive areas, employ sensitive building techniques, and provide a more environmentally-friendly development to their clients and the community.

Solution: Provide incentives to developers to encourage and include natural resource preservation and restoration.

Actions:

1. WC and MCBP will provide technical assistance and coordination with all appropriate parties in the planning stages of development by educating appraisers, realtors, and the consulting industry about the availability of front-end planning assistance.
2. MCBP will provide continuing education for Realtors, consultants and others through design of specific continuing education courses.
3. WC and OC, working with OP and DNR, will provide flexible design standards that allow for eco-friendly development, ensuring consideration of cumulative impacts to identified sensitive areas;
    A. WC and MDE will streamline the permitting process if specific design standards are met.
5. WC, OC, OP, and DNR will promote incentive mechanisms to encourage (e.g., through density bonuses) wider buffers, environmental extras, use of porous pavement, clustering, and other "green building" practices.
6. WC, OC, Berlin, SHA, and MDOP will encourage aesthetically pleasing streetscapes, parking facilities, architectural standards, commercial development areas, etc., through Worcester 2000, Corridor Plans, and the County Comprehensive Plan.

Expected Benefits:
- cost savings through more efficient local permitting procedures
- improved aesthetics and property values
- improved habitat quality

Related Actions: CE 2.2, CE 4.3, CE 4.4, FW 2.4

CE 4.3 ***Challenge: Enhance the buffering capacity of the watershed's tidal and nontidal shoreline area***

The coastal bays watershed was not included in the buffer provisions of the Critical Area Program when that legislation was enacted. In the intervening time period, Worcester County has wrestled with this issue. The buffer controversy has probably been the most contentious local issue in the past decade. Currently, Worcester County requires a 50-foot structure setback for new development, with a 25-foot vegetative buffer within that setback.

Science alone has not produced an answer that will address all of the component issues. Further, given the tremendous variability of the watershed's shoreline land uses (e.g., Agriculture, forestry, golf, wetlands, tidal marsh, intense residential, commercial, development, etc.); land cover; topography; etc. a "one-size-fits-all" approach has met with considerable resistance. Local interests have encouraged the program to pursue a flexible approach with a focus on incentives rather than a purely regulatory strategy.

Solution: Promote water quality, habitat protection and creation, resource conservation, and economic viability by enhancing the buffering capacity and function of the Coastal Bays' tidal shoreline and portions of the watershed that fall within 1,000 feet of the tidal waters' edge or the landward edge of adjacent tidal wetlands.

Actions:

1. 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.
    A. These holistic, subwatershed examinations will include, but may not be limited to: topography; past, present and projected land use; zoning; subdivision; development patterns; physical and habitat characteristics; sensitive resources and their significance; sea level rise and shoreline migration; existing vegetation and land cover; soils and geology; patterns of surface and groundwater discharge; shoreline conditions; nutrient contributions; and water quality data.
    B. These studies will identify various means to positively impact the water quality, habitat protection, resource conservation, economic viability and buffering capacity of the coastal bays shoreline areas including, but not limited to: new and/or existing state, federal or local programs; economic and other incentives; and new and/or existing state, federal or local regulatory initiatives.
    C. These studies will identify appropriate (short-term and long-term) programs or mechanisms, as well as the administrative entity(ies) that is/are to be responsible for implementation (and follow up) of the identified action(s).
    D. Worcester County, with assistance from the identified entities, will specify a reasonable timetable for implementation of the identified action(s) (it is anticipated that substantial action will be taken during the first two years of the project's initiation).
    E. The study process will be inclusive and seek to engage agencies and organizations with related responsibilities, as well as potentially affected landowners.
2. At the conclusion of the first full year, Worcester County will present a status report to the Implementation and Policy Committees.
    A. This report will focus on progress to date and include recommendations for action in the future.
    B. The report shall indicate Worcester County's willingness to continue the program, as initiated.
3. NRCS, STAG, MD DNR, MDOP, USFWS, MDA, MDE, and NOAA will fully support and actively participate in the small area analyses and assist in the implementation as appropriate of the subwatershed-based recommendations.
    A. OP will provide technical assistance and examples of other regional, state and local ordinances regarding setbacks and vegetative buffers.
    B. MD DNR will provide Worcester County with the results and interpretive assistance of their ongoing sea level rise and shoreline migration study.
    C. MD DNR and USFWS will provide data related to preferred conditions and specific width requirements for indigenous species' habitat.
4. It is understood that if the Policy Committee determines that this subwatershed-based effort is unsatisfactory or fails to achieve substantial progress by the end of the first two year review, the state agencies have indicated that they will pursue a legislative initiative to

accomplish the water quality, habitat protection, resource conservation, and economic viability goals of the coastal bays shoreline areas.

Expected Benefits:
- highly reduced nutrient and chemical loads to the bays
- habitat preservation for birds, reptiles and mammals

Related Actions: WQ 2.3, WQ 6.1, WQ 6.2, FW 1.9, CE 4.2

CE 4.4 *Challenge: Improve efficiency of transportation systems*

Design standards and development policies often do not facilitate greater transportation efficiency. Both should reflect the county's rural character and incorporate the use of trails, greenways, bike-ways, and local and regional bus systems.

Solution: Improve transportation efficiency and reduce reliance on automobiles.

Actions:
1. MCBP will ask SHA to work with the county and municipalities to conduct a regional transit analysis and develop a regional transportation plan;
    A. SHA will limit access on Routes 50, 589, 611 and 113;
    B. WC will incorporate rural scenic roads, greenways, bikeways;
    C. WC and OC will encourage and cooperate in developing and providing mass transit to and from Ocean City and on the bays (water taxi), Park-N- Ride in Berlin, shuttles from Salisbury Airport, and alternative transportation options;
    D. MCBP will support county effort on right-of-way preservation and endorse setbacks on arterials.
2. WC, OC, and MTA will study and expand countywide bus system.
3. MOP will provide WC with examples of development designs that integrate retail/ commercial with residential as a means to encourage development, community design standards, and zoning practices that decrease reliance on automobiles, reduce traffic congestion, and promote mass transit.
4. MTA and MCBP will develop lecture series to educate community on transit planning and commuting issues.

Expected Benefits:
- reduced air pollution, congestion, travel time, accidents, and sprawl
- reduced tax expenditures through more compatible planning decisions
- enhanced tourism

Related Actions: CE 2.2, WQ 3.1

CE 4.5 *Challenge: Make the enforcement of environmental laws more consistent*

Nearly all activity in the coastal bays watershed impacting water quality and the use of natural resources is regulated by one or more statutory authorities. Those of most importance are

sediment and erosion control, stormwater management, wetlands protection control, mining and reclamation and waste disposal from both point and non-point sources. There is general consensus that stepped-up enforcement would improve water quality in the coastal bays.

Solution: Achieve and maintain adequate enforcement of all applicable laws and regulations thereby assuring consistency and predictability in enforcement actions. To be cost effective, all means of supporting the compliance effort must be used to the fullest extent possible.

Actions:

1. MDE, WC, and municipalities will use all existing legal and administrative remedies to carry out enforcement activity in a timely, effective and consistent manner. Seek additional authority if necessary; for example, expand civil penalty authority for use in all enforcement.
2. When possible, MDE will implement supplemental environmental projects in the location where environmental damage to be mitigated has occurred.
3. MDE, WC, and municipalities will maximize coordination among involved agencies to achieve most appropriate division of labor, e.g., MDE participation on Worcester County's Technical Review Committee.
4. WC will seek delegation from MDE for sediment and erosion control enforcement. MDE will support the request and its implementation to the extent possible with technical and financial assistance.
5. WC, with assistance from MDE, will develop a county tracking system and review process to keep abreast of pending permit and enforcement actions. All regulatory agencies/authorities shall maintain a log of complaints received and actions taken. A copy of this log shall be provided to all other applicable jurisdictions when the complaint involves overlapping jurisdictions.
6. MDE will provide technical assistance to the regulated community to facilitate compliance and minimize need for enforcement action.
7. MDE and MCBP will provide briefing sessions and suitable educational materials for judges and staff of judicial offices.
8. MDE, MCBP, WC, and municipalities will encourage citizen participation in the regulatory process through:
    A. Dissemination of educational materials,
    B. Provision of easily accessible telephone numbers for inquiries and reporting suspected violators; timely response to citizen calls and provision of follow up communication, and
    C. Periodically meeting with appropriate local government officials and citizen groups to advise them of enforcement program status and get feedback.
    D. Establishment of a trained citizen watch group responsible for reporting enforcement violations to regulatory agencies and establishment of a program to recognize outstanding practices.
9. Stormwater guidelines for new development should require greater clarity in identifying responsible parties for maintenance agreements.

Expected Benefits:

- reduced taxpayer costs through more efficient enforcement of existing laws and regulations

- reduced compliance costs for regulated parties through greater consistency and predictability in enforcement actions

Related Actions: FW 3.4, WQ 5.1

CE 4.6 ***Challenge: Enhance coordination between Delaware, Maryland and Virginia***

Lessons learned from the Chesapeake Bay Program's effort to coordinate three states and the District of Columbia can be valuable to the coastal bays effort. Cooperation and collaboration between Delaware, Maryland and Virginia is ultimately necessary to protect the natural resources of the region.

Solution: Establish a collaborative tri-state coastal bays effort.

Actions:
1. MCBP will participate in periodic conferences with Delaware, Virginia, Maryland.
2. OP and WC will promote consistent land-use decision making within the tri-state region.
3. MCBP and WC will promote tri-state compatibility utilizing CIS planning tools.

Expected Benefits:
- reduced resource needs associated with data collection and analysis
- reduced conflicts and improved coordination among jurisdiction in watershed planning objectives and strategies

FINANCE PLAN AND IMPLEMENTATION STRATEGY

INTRODUCTION

This section describes the process the Maryland Coastal Bays Program will use to prioritize, implement, and monitor the actions included in this plan. A critical part of this process will be the determination of the best approaches to funding actions. Because the program is a cooperative partnership, it is important to understand that this Finance Plan and Implementation Strategy does not imply any responsibility by a given entity, even a designated "lead agency," to necessarily provide the funds needed to implement an action. The completion of the CCMP, along with its endorsement by the program partners, does not confer financial burden on the partners to fund particular actions, even those actions which they have agreed to implement.

Therefore, the cost estimates provided in the Summary Tables are not intended to represent final budgetary allocations or even final estimates as to how much funding a particular action will require. In fact, this finance plan is important not only because such estimates need further refinement, but because program partners have identified many actions that cannot be completed under existing budgetary constraints. With this in mind, the finance plan and implementation strategy identifies potential funding sources for federal, state, and local organizations, as well as appropriate implementation and oversight mechanisms to carry out the commitments established in the CCMP.

PROGRESS TO DATE

Both the Governor's nomination and U.S. EPA's acceptance of the Maryland Coastal Bays for inclusion in the National Estuary Program represented a critical first step in an ongoing partnership among those governments and citizens interested in a healthy and productive estuarine ecosystem in Worcester County. Because of continued interest in the program by county government, municipalities, and local citizens, the program's federal partners have invested more than $1 million in planning and coordination activities necessary to establish and solidify this partnership. Non-federal partners have provided the 25 percent cost share necessary to obtain the federal funding and made substantial contributions in the form of technical assistance, such as planning projections and scientific consulting. Finally, countless hours of county and municipal staff time, not to mention more than 5,000 hours of work by citizen volunteers serving in a variety of capacities, have been expended in this effort.

However, it is important to understand that successfully managing an estuarine resource like the Coastal Bays is not possible except as part of a broader vision for a sustainable future that the citizens living within the watershed develop and pursue on their own behalf. Thus, the program works by recognizing the mutual dependence of good estuary management practices and citizen-based efforts to sustain their community's culture and economy. For example, the desire to ensure that tourism remains a vital source of local revenue (both private and public) provides

economic incentives and opportunities to maintain a healthy estuarine resource. Similarly, enhancing stormwater and septic system management in the watershed improves homeowners' property values and quality of life, while also reducing environmental stress on aquatic resources. Therefore, many of the actions in the CCMP are designed first and foremost to promote the region's culture, economy, and planning infrastructure, with the coastal bays themselves an indirect though critical beneficiary. From the standpoint of financing, therefore, this emphasis on enhancing the local economy and promoting its heritage means that many actions will require funds generated within the watershed.

Questions Answered: Who, What, When, and How Much

From its inception the Maryland Coastal Bays Program has been shaped by many unique challenges and opportunities. Therefore, the program recognizes and reflects the watershed's relatively small geographic extent, its location entirely within a single county, and the capacity for virtually every governmental and non-governmental entity with an interest in the program's mandate to protect the coastal bays by participating directly in developing and implementing the CCMP. Early on the program thus recognized both the necessity and possibility of taking advantage of these circumstances to resolve many funding and implementation issues that more institutionally complex and geographically diffuse estuary programs could address only after CCMP approval. To this end the identification and resolution of funding and implementation issues has been an explicit, ongoing, and integral task from the program's very beginning, especially during the development of the CCMP's four action plans.

As a result the action plans themselves answer many of the questions critical to a successful finance plan and implementation strategy. In this case the Summary Information tables in the action plans not only provide a high degree of detail regarding what actions will be taken to meet particular challenges, but also specify the partners (state or federal agency, local government, MCBP, etc.) who have committed to implementing each action, along with estimates of any additional funds needed and the year in which an action is expected to start. In this way the CCMP already has answered some of the most important questions that, according to U.S. EPA guidance, a successful finance plan and implementation strategy must answer, including:

- How much additional funding is needed to implement particular actions?
- When should responsible parties begin particular actions?
- Who has the authority, the resources, and the expertise?
- What mechanisms will be used to obtain agency commitments?
- Who will oversee implementation?

Thus, since the actions in Today's Treasures for Tomorrow represent not recommendations but specific commitments, the CCMP has gone a long way toward achieving what U.S. EPA identifies as the goal of the implementation strategy: "to 'institutionalize' the recommendations made in the CCMP."

Remaining Issues

However, not every aspect of funding and implementation has been resolved. The National Estuary Program provides funding for the development of management plans under Section 320

of the Clean Water Act, but it does not provide full funding for the implementation of the plans. While partners have agreed to implement approximately 225 of the action commitments in the CCMP using existing resources (Within Existing Resources or "WER" in the Summary Tables), additional funding is needed for more than 165 other actions. In addition, there are other challenges regarding implementation, coordination, and oversight of the CCMP's particular commitments, including further refining the role of the citizenry in assuring that such implementation reflects its broader vision for the watershed. This section, as well as the two sections that follow, focus on the resolution of these issues, with the understanding that many aspects of the finance plan and implementation strategy already are included in individual action plans.

There are two types of costs associated with implementing Today's Treasures for Tomorrow. The first cost is associated with maintaining a small program office staff. This office is expected to require approximately $150,000 per year for four staff members and $100,000 per year for office space, equipment, public outreach, and implementation of its voluntary monitoring program. This funding is expected to come from continued support from U.S. EPA, subject to a biennial review of implementation activities.

The second type of cost is the cost to implement the actions specified in Today's Treasures for Tomorrow. Anticipated costs have been allocated to actions contained in the CCMP's four action plans and monitoring program. These estimated costs are not intended to represent final budgetary allocations. MCBP staff, working with program partners, will complete such final adjustments as part of the start-up activities associated with implementing each particular action, when more detailed information about existing levels of effort, available funds, and other criteria can be assessed. The accuracy of the anticipated cost estimates contained in this Finance Plan and Implementation Strategy is therefore limited by current information. In many cases, the cost is based solely on "best professional judgment," but nevertheless is provided to give a good idea of the level of effort implied in an action.

Based on these estimates, over the CCMP's 15 year planning horizon approximately $5,200,000 in additional funding is needed to complete all of the actions outlined in the CCMP (excluding actions whose additional funding needs have yet to be determined). The program estimates that actions scheduled to begin in the first year of implementation will cost $1.1 million. Because this figure is the total for completing such actions, many of which will take longer than one year, funding needs during the first year (when these actions are scheduled to begin) could be somewhat less than $1.1 million. At the same time it also should be noted that start-up funds for many actions will be substantially higher than implementation in years subsequent to initiation. Funding to implement actions will need to be generated through a combination of local revenue streams and state, federal, and private foundation grant sources, which will be secured according to the strategy outlined in the following section. Also, through the work of the Coastal Bays Fund-Raising Committee, significant private contributions are anticipated. Generally, each partner committing to particular actions will serve as the fiscal agent for receiving and administering the funds necessary to implement those actions, subject to the oversight of the Implementation and Policy committees.

As mentioned above, this Finance Plan and Implementation Strategy does not imply any responsibility by a given entity to necessarily assume the financial burden for implementing an action. As the program moves forward to implement the CCMP, lead and partnership organizations will meet to jointly develop an itemized work plan that will include more definitive costs and sources of those funds. Whereas all implementing partners will be called upon to assist in identifying potential funding sources, including sources within their own budgets, completion of the plan does not in itself confer financial burden on any entity. In addition, it is anticipated that MCBP staff and the Coastal Bays Foundation will play a prominent role in identifying and pursuing funds for plan implementation. Activities could involve grant writing, solicitation of funds from private foundations, the brokering of public-private partnerships, privatizing certain actions, and any other activities needed to round out a complete "portfolio" of revenue sources for implementing the plan.

As mentioned above, many of the actions in the CCMP can be accomplished with existing resources or by redirecting current funding allocations to better address the needs of the watershed.

Additionally, a number of actions seek to improve coordination and planning among program partners and, thus, may actually result in cost saving for currently funded activities. Keeping with the thematic goal of compatibility between economic and environmental sustainability, all actions focus on the cost effective use of existing resources and a clear return on investment. Finally, the Citizen Advisory Committee will provide a non-governmental perspective on the use of any additional funds to ensure that issues of affordability, accountability, responsibility, and environmental equity are given a fair hearing.

FINANCE WORKGROUP

The MCBP will establish a Finance Workgroup, consisting of members of the Implementation and Citizens Advisory Committees, as well as the Coastal Bays Foundation, in order to address the outstanding issues identified in the previous section. In particular, the workgroup's focus will be assessing funding requirements, helping establish local revenue streams, and procuring state and federal grants. To these ends, the workgroup will operate according to the principles and approaches described below.

Categorize Actions

Cost information will be used to estimate the revenues necessary to support various groups of actions, such as septic system and stormwater actions. These groups are organized into "action sets" that might be funded through a single vehicle (or group of related vehicles). Page 138 includes action sets containing the majority of the most important currently unfunded activities, as well as brief discussions of funding and implementation mechanisms that the program will explore. During the summer of 1999, the Finance Workgroup will work with organizations like the Environmental Finance Center at the University of Maryland to broker agreements among affected public and private parties, regarding how revenues will be generated to implement particular action sets.

For example, if Worcester County finds it necessary, finance experts from the Center would facilitate a meeting among county staff, supervisors, representatives of the development community, and other relevant parties (such as potential private sources of funding) to negotiate an agreement regarding the generation of funds for county implementation of its stormwater commitments pertaining to new development. Similarly, representatives of homeowners might participate in negotiations to establish the fees or other mechanisms needed to pay for the county's implementation of its septic and stormwater retrofit activities. This process will entail both a technical effort, for example, some more detailed analysis of county needs in relation to the implementation of specific actions, and a political/negotiation process, where affected public and private parties work out acceptable solutions. The meetings will conclude in time to establish revenue sources to begin timely implementation.

State Revolving Loan Fund

Once new sources of funds, such as those from a septic maintenance utility or public-private partnership, have been worked out, the Finance Workgroup will look to the Water Quality State Revolving Loan Fund (SRF) as an important source of start-up funds for many of the action sets mentioned above. The SRF was established by Congress in 1987 and is intended to fund virtually any type of water quality project, including nonpoint sources, wetlands, and estuaries. SRFs are similar to banks with federal and state contributions used to capitalize the fund, providing assets from which low or no-interest loans are made. Funds are repaid over terms as long as 20 years. MCBP staff already has met with the fund's administrators in the Maryland Department of the Environment to ensure SFR eligibility of virtually any action in the CCMP which would benefit water quality, since this appears to be the intent of U.S. EPA's recent expansion of the fund's use to NEP projects. This eligibility would include funding for the staff necessary to carry out county and municipal commitments to develop and implement new planning-based activities, not just funds for capital projects.

Although a loan, this approach has significant cost and administrative advantages. A no interest SFR loan costs approximately 50 percent less than the same project funded by a grant program with a 50 percent cost share financed by a commercial loan charging 7.5 percent. In addition, there is much less administrative oversight by the SRF than typical grants require. Finally, this approach would make the MCBP one of the few NEPs taking advantage of this relatively new opportunity, which could attract additional interest/resources to the program, while providing the ancillary benefit of promoting this expanded use of the SRF in Maryland and elsewhere.

The President also is proposing that the SRF be modified to allow states to use up to 20 percent of their SRF capitalization dollars for grants (not loans) to support nonpoint source pollution abatement programs and estuary projects. While this proposal would not take effect until 2000, if approved it would represent an important source of implementation funds for the Coastal Bays Program.

Federal and State Grants

As indicated by the summary tables accompanying each subplan, program partners have identified many actions that can be implemented within existing resources (WER). For those

actions requiring additional funding, partners will work to incorporate such needs into future budgets, for example, by redirecting resources from lower priority activities.

However, because current budgetary constraints will make it difficult to build all of these additional needs into future budgets, it is anticipated that grant funding also will be necessary. The MCBP has the advantage of having as members many federal and state agencies with grant programs well suited both to the environmental management needs of the coastal bays watershed and to the institutional advantages associated with being one of the 28 National Estuary Programs. Unfortunately, perhaps because of its small size and proximity to the more widely known Chesapeake Bay estuary, as well as to budgetary constraints, the coastal bays watershed routinely has been left out of a variety of procedures critical to grant procurement, including the steering committees charged with developing criteria for ranking and screening grant proposals and even notification of requests for proposals (RFPs). Given the huge amount of leveraged resources represented by three years of planning and the myriad of commitments already made by program partners, the coastal bays clearly is a very cost-effective area for state and federal grants administrators to obtain the "most bang for their buck."

Consequently, the Finance Workgroup will assist partners, particularly those associated with the U.S. EPA, NOAA, USDA, MDA, MDE, and DNR, in advocating for the MCBP with regards to their respective agency's grant and resource allocation decisions. Through such effort the workgroup expects that future grant decisions will better reflect the relative importance of and threats to the coastal bays resource, as well as the work and commitment of the coastal bays partnership. In fact, because this partnership reflects the hard work of the very agencies that administer such grants, it behooves these agencies to include the coastal bays in more grant decisions to avoid wasting their partnership efforts, should the program otherwise founder due to lack of resources.

ASSESSMENT OF IMPLEMENTATION RESULTS

As a living document, Today's Treasures for Tomorrow was designed to be revised and amended, in order to:

- respond to changing conditions, both environmental and programmatic
- respond to improved scientific understanding of environmental conditions
- amend existing actions, as necessary, because of (a) unresolvable problems associated with implementing an activity, (b) activities which, although implemented effectively, are not producing expected results, or (c) changes in expected results due to further program deliberation and public input; or
- add and delete actions, as necessary, because of the (a) completion of prior actions and (b) identification, through program deliberation and public input, of new goals and challenges reflecting the ongoing articulation of the community's vision for the watershed.

All of these tasks will be performed as part of the biennial review process specified under Clean Water Section 320(h). Upon U.S. EPA endorsement of the CCMP, an Implementation Committee will be established to oversee plan implementation and revision (program structure after U.S. EPA endorsement is discussed in the following section). Like the Management

Committee from which its responsibility evolved, the Implementation Committee will include representatives of all local, state, and federal government entities with the authority and expertise necessary to realize the vision articulated in Today's Treasures for Tomorrow, as well as members of appropriate non-profit organizations and the Citizen Advisory Committee.

As part of this process, the Finance Workgroup (discussed in the previous section) will work with the Implementation Committee to prepare an annual status report that documents program deliberation and actions regarding the purposes mentioned above. The status report will be prepared by comparing current management and environmental conditions with two sets of references: (1) the units of measure for the individual solutions listed in each subplan (Tables 1 through 4 provided draft units of measure, with the understanding that these units may change once the details for implementation are established) and (2) the narrative goals, along with associated quantitative standards currently under development (draft narrative goals are provided in Table 5). MCBP will provide such updates to solicit recommendations regarding minor revisions and amendments, as well as more significant changes that may warrant attention either by the Policy Committee or Citizens Advisory Committee. MCBP also will present the Policy Committee and Citizens Advisory Committee with a summary of this report, as well as a list of the recommendations that the Implementation Committee has made during the year, both regarding actions already taken and those issues requiring these committees' input or authorization.

The Program Office will include the results of this process in a biennial report that includes:

- a summary and overall assessment of implementation efforts;
- a brief status report on each action in the plan;
- a financial report reflecting finance needs;
- committee reports, noting work completed and issues addressed; and
- a report on implementation needs (both financial and programmatic) for the coming biennium.

An important part of implementation oversight is assessing the need for various legal and institutional instruments necessary to carry out particular actions. Thus, if it is determined that some of the actions (including new initiatives) should require legislation at the federal or state level, the MCBP will work closely with implementing partners to assure its passage. Likewise, where necessary the Program Office will help initiate negotiations for the development of Memoranda of Understanding (MOUs) between implementing partners, with the understanding that it is the partners' responsibility to actually implement the MOU, provide appropriate public notice, and issue rules, if necessary. The Program Office also will provide support in linking local governments with appropriate sources of technical assistance in the development of any local ordinances necessary to implement actions. Finally, each implementing partner will be encouraged to establish a Maryland Coastal Bays Program liaison to coordinate with the Program Office and Implementation Committee. Even as formal report requirements are established, the importance of routine informal communication among staff of involved agencies should not be underestimated.

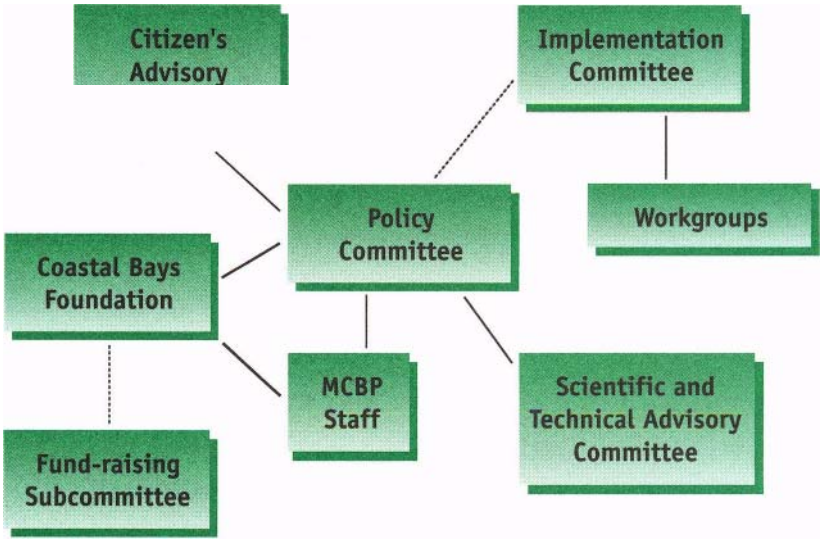
IMPLEMENTING THE COASTAL BAYS CCMP

The long-term success of the Coastal Bays Management Plan is dependent upon an effective implementation organization. To address this need, the MCBP determined that the existing organization has been effective in obtaining commitments from resource agencies and in securing public support for the Program. Members determined that an implementation structure should be responsible for overseeing and coordinating implementation activities. The new organization should have components that:

- promote a continuous federal, state, local, private, and public partnership
- provide avenues for effective public involvement in decision making
- promote an efficient process for decision making
- provide opportunities for private financial contributions
- promote efficient coordination of CCMP implementation
- promote scientific credibility, and
- ensure high-level political and governmental commitment.

With these components in mind, the Coastal Bays Program has designed an organization that builds upon the existing structure, improves program efficiency, is consensus driven, and increases opportunities for citizen involvement.

MARYLAND COASTAL BAYS PROGRAM



Policy Committee

The Policy Committee will provide a forum where bay related issues will be discussed to provide resource officials and the public with information necessary to make informed decisions about the management of the Coastal Bays. Members will establish policies and priorities for the protection of the Coastal Bays and serve as advocates for the implementation of the CCMP.

The Policy Committee will:

- provide broad policy direction

- approve priorities for CCMP implementation
- approve CCMP workplans and budgets (for federal and non-federal funding)
- seek and develop funding sources to carry out the CCMP
- approve CCMP changes that further the goals of the CCMP

Policy Committee Members
Secretary, DNR
Secretary, MDE
Secretary, MDA
Director, OP
EPA Regional Administrator
Superintendent, Assateague INS
Worcester County Commissioners (Dist. 1 thru 5 by basin)
Mayor, Ocean City
President, Ocean City Town Council
Mayor, Berlin
CAC Chair
STAG Chair
Two Fund-raising Committee Members

Maryland Coastal Bays Foundation

The Coastal Bays Foundation will be the non-profit organization responsible for administration of the Maryland Coastal Bays Program. The Foundation will not establish policy and is only intended to be administrative in nature. The Foundation will be the grant recipient and will guide the development of the annual workplan as well as approve budget shifts greater than 10% of the total annual budget. Collaboration with the Executive Director will facilitate timely implementation of the CCMP and help resolve issues that surface during implementation. This group will be responsible for hiring the Executive Director and establishing performance criteria. The Foundation also will assist the Executive Director in hiring staff by serving as an interview panel for new hires.

The Coastal Bays Foundation will:
- serve as a not-for-profit organization capable of receiving private and public dollars
- serve as the grant recipient for the MCBP
- administer the MCBP along with the Executive Director
- provide administrative assistance in hiring staff and managing the Executive Director
- work with the Executive Director in developing the annual workplan
- obtain and act as a clearinghouse for funding sources

Coastal Bays Foundation Members
Board Members:
Assateague Island National Seashore Official
State Official (DNR)
Worcester County Official
Ocean City Official

CAC Chair
2 Fund-raising Committee members

Staff:
Executive Director
Public Outreach Coordinator
Staff Scientist
Administrative Assistant

Fund-raising Committee

The Fund-raising Committee will facilitate implementation of the CCMP by raising private dollars to support activities outlined in the plan. Members will work with area businesses and individuals to develop support for program initiatives. Members will be comprised of interested citizens such as business owners, farmers, fishermen, developers, and religious leaders.

The Fund-raising Subcommittee will:

- support the Program by soliciting private dollars to support implementation activities
- facilitate public involvement and outreach activities
- sponsor public events that raise awareness and funding for CCMP activities
- recommend priorities for CCMP implementation
- provide representation to the Foundation, Policy Committee, and Implementation Committee
- seek innovative avenues to advance the goals of the CCMP

Implementation Committee

The Implementation Committee will meet at least quarterly to discuss progress and oversee implementation of the CCMP. The Committee will develop implementation tracking reports that will be provided to the MCBP for purposes of reporting progress to the general public and the Policy Committee. The Implementation Committee will resolve any contentious issues that may arise during implementation of the CCMP. Issues that cannot be resolved will be directed to the Policy Committee for consideration through the Executive Director via the Foundation.

The Implementation Committee will:

- coordinate implementation activities of responsible entities
- obtain commitments from all sectors implementing CCMP actions
- identify barriers to CCMP implementation
- develop remedies that remove barriers to implementing actions
- assure that "plans" identified in the CCMP are developed by responsible entities
- recommend CCMP changes to the Policy Committee through the Executive Director and Foundation
- recommend priorities for CCMP implementation
- solicit resources and direct programs to implement actions in the CCM

Implementation Committee Members
US Environmental Protection Agency
US Army Corps of Engineers
Natural Resource Conservation Service
US Coast Guard
US Fish and Wildlife Service
Assateague Island National Seashore
National Oceanic and Atmospheric Administration
Maryland Dept. of Natural Resources
Maryland Dept. of the Environment
Maryland Dept. of Agriculture
Maryland Geological Survey
Maryland Office of Planning
Maryland Dept. of Business and Economic Development
Executive Director, MCBP
Town of Berlin Department Heads
Town of OC Department Heads
MD Dept. of Transportation, State Highway Administration
MD Dept. of Transportation, Mass Transit Administration
Worcester County Soil Conservation District
Assateague Coastal Trust
Lower Shore Land Trust
Maryland Environmental Service
Federal Emergency Management Agency
Maryland Emergency Management Agency
Worcester County Dept. of Planning Permits and Inspection
Worcester County Dept. of Tourism
Worcester County Dept. of Economic Development
Worcester County Dept. of Public Works
Worcester County Dept. of Emergency Services
Worcester County Dept. of Recreation
Citizens Advisory Committee Chair
Scientific and Technical Advisory Committee Chair
Fund-raising Committee Member

Workgroups

Ad hoc workgroups will support the Implementation Committee by providing technical support on various issues identified in the CCMP. Resource experts will be called upon to support the committee by providing technical advice, scientific information, and assessment services. These workgroups will come and go as needed and will focus on issue areas such as fisheries, septic system management, navigation and dredging, eco-tourism initiatives, etc.

Citizens Advisory Committee

This committee is comprised of various stakeholders in the watershed interested in furthering the goals of the Coastal Bays Program. Local fishermen, developers, golf course managers, business

owners, community associations, recreational boaters, farmers, and environmentalists will continue to work together to protect the coastal bays.

The Citizens Advisory Committee will:

- ensure public involvement during implementation of the CCMP
- recommend changes to the CCMP through continuing planning exercises
- function as a watchdog and advocate for implementation of the CCMP
- ensure that public involvement and education are a central component of the Program
- recommend legislative changes necessary to further the goals of the CCMP

Scientific and Technical Advisory Committee

This technical committee is comprised of the region's most knowledgeable natural resource scientists and are responsible for providing important scientific information for program decision-making.

The Scientific and Technical Advisory Committee will:

- provide a scientific and technical review function for CCMP implementation
- solicit funding for assessments, studies, and research in the coastal bays
- carry out the Eutrophication Monitoring Plan in coordination with DNR
- complete the Coastal Bays Comprehensive Monitoring Plan
- coordinate and implement research and monitoring in the coastal bays
- provide technical support for CCMP implementation activities
- alert the Implementation Committee to new pertinent scientific information
- recommend any necessary changes to the Monitoring Plan

TABLE 1
DRAFT UNITS OF MEASURE: WATER QUALITY

SOLUTIONS		*MEASURE OF SUCCESS*
WQ 1.1	Reduce failure rate and inefficiency of on-site waste water treatment	• number of antiquated or failing systems replaced or upgraded • results of SepTrack tracking of septic tank maintenance
WQ 1.2	Update septic system designs	• number of alternative and innovative system installations (based on SepTrack data)
WQ 1.3	Improve understanding of groundwater resource	• publication and dissemination of report results
WQ 1.4	Reduce excessive fertilization by turf professionals	• changes in number of grounds management professionals complying with action 1.4.1 and 1.4.2
WQ 1.5	Reduce excessive fertilization by turf professionals	• number of citizens reached through educational efforts • number of backyard BayScapes
WQ 2.1	Reduce water quality impacts from stormwater designs	• number of new innovative stormwater management designs as a percentage of all systems implemented • changes in percent of impervious surface associated with development
WQ 2.2	Build new or retrofit stormwater management devices	• number of new designs and retrofits installed in existing development
WQ 2.3	Reduce groundwater contamination from roadside ditches	• County adoption of new policies • presentations to road crews • number of miles of ditches managed under improved guidelines
WQ 2.4	Improve coordination of Stormwater and septic systems	• implementation of policy changes called for in actions 2.4.1, 2.4.2, and 2.4.3
WQ 3.1	Improve understanding of atmospheric deposition	• completion of study and dissemination of results • establishment of NAD monitoring site
WQ 4.1	Reduce nutrient pollution from farming	• changes in rates of adoption of nutrient reduction techniques
WQ 4.2	Improve efficiency of fertilizer application rates	• number of farmers using precision farming technologies compared with numbers before this action is implemented
WQ 4.3	Improve management of drainage systems	• number of systems retrofitted using state cost-share program • number of agriculture plans that include sediments and erosion control plans

SOLUTIONS		*MEASURE OF SUCCESS*
WQ 5.1	More reuse of waste water	• zoning regulation revisions • number of waste water treatment facilities using waste water reuse and sludge application
WQ 5.2	Increase tertiary sewage treatment	• completion of upgrade assessment
WQ 6.1	Improve efficiency of sediment and erosion control program	• (see CE 4.4 and CE 4.6)
WQ 6.2	Reduce shoreline erosion rates	• rates of change in shoreline development and stabilization in highly erodable areas • publication of shoreline change map • miles of shoreline protected with soft methods v. hard methods
WQ 7.1	Reduce runoff of toxic chemicals	• number of individuals adopting IMP rate of use of BMPs to control gypsy moths
WQ 7.2	Better management of household and farm hazardous waste	• amounts of waste collected at collection sites and during hazardous waste disposal days

TABLE 2
DRAFT UNITS OF MEASURE: FISH & WILDLIFE

SOLUTIONS		*MEASURE OF SUCCESS*
FW 1.1	Obtain more accurate harvest information	• implementation of Atlantic Coastal Cooperative Statistics Program (ACCSP) recommendations
FW 1.2	Develop techniques to sustain fishery populations	• establishment of a Coastal Bays Fishery Advisory Commission
FW 1.3	Prepare a hard clam fishery management plan for the coastal bays	• development and adoption of hard clam fishery management plan • report on hydraulic clam dredging impacts • population of bay scallops
FW 1.4	Develop a crab management plan for the coastal bays and continue research on crab parasite	• development and adoption of crab management plan
FW 1.5	Investigate finfish management practices, along with habitat improvement (especially flounder) and associated educational opportunities	• establishment of a plan for achieving and maintaining optimal sustainable finfish fisheries
FW 1.6	Promote and enhance the natural recovery of seagrass beds	• changes in acres of seagrass • establishment of seagrass protection areas
FW 1.7	Improve water quality in dead-end canals	• number of canals with stormwater retrofits • changes in canal maintenance practices • cessation of new dead-end canals
FW 1.8	Reduce trash in the coastal bays	• number of citizens involved in educational efforts • changes in rates of littering
FW 1.9	Protect and enhance natural shoreline habitats	• changes in conversion rates of natural shoreline habitat • miles of shoreline stabilized using environmentally friendly practices • miles of natural shoreline
FW 2.1	Determine the distribution and composition of forested habitat for neotropical and migrating birds	• adoption of recommendations for habitat protection • changes in rates of habitat loss • numbers of acres of habitat preserved
FW 2.2	Conserve forest resources	• change in county code to adopt new migration rate • acreage of forested land per subwatershed
FW 2.3	Promote forest diversification	• numbers of landowners working to diversify their forests • number of local sources of diverse seedlings

SOLUTIONS		*MEASURE OF SUCCESS*
FW 2.4	Increase use of backyard habitats	• numbers of homeowners using backyard habitats • number of backyard BayScapes
FW 2.5	Increase use of agricultural habitats	• acres of agricultural land managed as natural habitat
FW 2.6	Reduce conversion of forests to other land uses	• percent change in conversion of forest land
FW 3.1	Protect existing wetlands and increase the amount of wetlands by 10,000 acres	• changes in acres of wetlands created • no net loss of wetlands
FW 3.2	Identify and protect staging, flyway, stopovers, nesting areas, and other critical habitats for bird populations	• identification of critical habitat • change in rates of habitat loss
FW 3.3	Protect existing wetlands and encourage effective private wetland mitigation	• acres of wetlands mitigated as a percent of those destroyed per year
FW 3.4	Better coordinate wetlands regulation	• identification and adoption of methods to coordinate federal, state and local wetlands protection programs • designation of areas in the coastal bays as "wetlands of special state concern" • change in county law regarding requirement of wetland delineation with all site plan
FW 3.5	Reduce any undesirable impacts of mosquito ditching in marsh lands	• identification and adoption of approaches to reduce impacts
FW 4.1	Reduce loss of threatened and endangered species habitat	• number of landowners participating in habitat protection programs
FW 4.2	Better coordination of species protection efforts	• acres of habitat retained, restored, and created • identification of habitats for threatened and endangered species in watershed
FW 4.3	Reintroduce more threatened and endangered species	• identification of species and sites for reintroduction
FW 5.1	Control invasive/exotic species	• extent of invasive/exotic species
FW 5.2	Reduce impacts to native plants and animal habitats from "nuisance" species	• changes in rates of impacts from nuisance species

TABLE 3
DRAFT UNITS OF MEASURE: RECREATION & NAVIGATION

SOLUTIONS		*MEASURE OF SUCCESS*
RN 1.1	Reduce unnatural sedimentation due to Ocean City Inlet	• amount of sand filling the bays
RN 2.1	Improve coordination of navigation and dredging in coastal bays	• formation of advisory group • development of master plan
RN 2.2	Enhance public awareness of navigation/dredging issues	• number of citizens reached through educational effort
RN 3.1	Identify sensitive resources and incompatible recreational activities	• list of resources and incompatible activities • changes in rate of resource impacts from water-based recreation
RN 4.1	Address safety problems associated with Ocean City Inlet and Route 50 bridge	• identification and resolution of safety concerns • number of emergency reports from Coast Guard
RN 4.2	Address recurring conflicts among recreational users of water resources	• identification and changes in rates of conflicts among users of water-based recreational resources
RN 4.3	Enhance public awareness of boating rules and regulations	• degree of public awareness of boating rules and regulations
RN 4.4	Develop more enforcement capacity to protect sensitive resources and enhance boating safety	• changes in violation rates of recreational boaters with resource protection regulations
RN 5.1	Enhance sustainable recreational use and public access	• changes in rates of water-based recreation other than boating
RN 5.2	Produce "guide to the coastal bays" to improve recreational activities and protect natural resources	• changes in public awareness regarding safe boating and protection of sensitive resources
RN 6.1	Reduce environmental impacts associated with new marinas	• establishment and use of new marina location and design guidelines
RN 7.1	Increase use of best management practices and pollution control infrastructure at harbors and marinas	• changes in numbers of best management practices and level of pollution control infrastructure at marinas
RN 7.2	Reduce resource damage from oil and hazardous material spills	• evaluation of current pollution response capabilities and implementation of resulting recommendations

TABLE 4
DRAFT UNITS OF MEASURE: COMMUNITY & ECONOMIC DEVELOPMENT

SOLUTIONS		*MEASURE OF SUCCESS*
CE 1.1	Increase public participation in planning decisions	• numbers of citizens contacted through educational efforts
CE 1.2	Provide planning tools to local decision makers to facilitate CCMP implementation	• use of new tools and data by local governments in implementing CCMP
CE 2.1	Promote the culture and character of the region	• number of developments emulating culture and character of region • number of new businesses dependent on region's culture and character
CE 2.2	Educate citizens about growth scenarios for future of watershed	• hold public meetings and publication of brochure
CE 2.3	Protect localities from coastal hazards and minimize economic loss	• modification and enforcement of relevant local codes and policies
CE 3.1	Plan for impacts of tourists	• number of citizens reached through education and outreach
CE 3.2	Reduce the loss of farmland and forest land	• changes in rates of farmland conversion
CE 3.3	Enhance or strengthen a diversified and sustainable economic base	• changes in relative amount of eco-tourism and eco-business interests
CE 3.4	Promote water conservation	• changes in rates of adoption of water conservation measures
CE 3.5	Promote residential and business energy conservation	• level of citizen and business participation in energy conservation programs
CE 4.1	Ensure growth is compatible with existing or planned services	• number of developments with municipalities or developments not dependent upon new infrastructure
CE 4.2	Provide incentives for developers to encourage and include natural resource preservation and restoration	• numbers of developments using incentives to enhance the resource protection elements in their proposals
CE 4.3	Improve buffers on tidal shoreline	• changes in the use and extent of vegetative buffers along the tidal shoreline
CE 4.4	Improve efficiency of transportation systems	• development of regional transportation plan, county-wide bus system • changes in per capita automobile travel miles
CE 4.5	Achieve and maintain adequate enforcement of all applicable laws and regulations	• changes in rates of inspection, compliance, violation, and other enforcement activities

SOLUTIONS		*MEASURE OF SUCCESS*
CE 4.6	Establish a collaborative tri-state coastal bays effort	• number and extent of coordinating activities among Maryland, Virginia, and Delaware

TABLE 5
NARRATIVE GOALS AND QUANTITATIVE STANDARDS

Narrative Goals

Water Quality Subplan:
Decrease nutrients and sediment deposition to levels consistent with healthy fish, shellfish and SAV communities; control pathogens and toxic chemicals such that sediment quality promotes healthy communities of benthic (bottom dwelling) organisms.

Fish and Wildlife Subplan:
Protect and enhance forest, wetland and seagrass habitat quality and quantity to the extent necessary for the reproduction and maintenance of healthy living resource populations (fish, shellfish, birds).

Recreation and Navigation Subplan:
Assure compatibility of navigation and recreation in the coastal bays with sustainable development and resource protection goals.

Community and Economic Development Subplan:
Promote ecologically sound, sustainable development that protects the heritage, economic vitality, natural habitat, and water quality of the coastal bays region.

Quantitative Standards

Quantifying narrative goals into specific standards is an important program priority. In fact, such standards are the only objective means for claiming that narrative goals have been attained. Specific pollution reduction targets are set based on the expectation that such reductions will results in attainment of these standards for the environmental resource. Otherwise, how could one know whether any nutrient and sediment reductions, taking the first goal as an example, represented "levels consistent with healthy fish, shellfish, and SAV communities?" Further, standards are needed to assess the environmental consequences of successfully implementing specific actions, as determined through the measures of success listed in Tables 1-4. Because of the shortage of environmental data for the coastal bays, including both measures of current ambient conditions and indicators of ecosystem health, significant work by the Scientific and Technical Advisory Committee (STAG) is needed to develop standards tailored both to the environmental conditions of the coastal bays and to the program's unique management needs. Therefore, while existing environmental indicators, such as those used in Maryland's Environmental Indicators: A Draft Status Report, may provide a useful starting point, standards reflecting scientific and management considerations particular to the coastal bays may include not only different measures or indices of environmental conditions but different target levels of attainment as well. Examples of such standards include:

- Attainment of habitat quality standards and acreage targets for submerged aquatic vegetation (SAV) throughout the coastal bays, as determined according to SAV

requirements established to reflect the unique environmental characteristics and management needs of the coastal bays.

- Attainment throughout the coastal bays of standards established for benthic (bottom dwelling) communities in the coastal bays, which may consider measures of water quality, habitat, species diversity, species composition, and species productivity, as well as other criteria, attained at representative reference sites.
- Attainment throughout the coastal bays of standards established for estuarine fish communities in the coastal bays, which may consider measures of water quality, habitat, species diversity, species composition, and species productivity, as well as other criteria, attained at representative reference sites.
- Attainment of standards for nitrogen concentrations based on benchmarks established through a relative scale reflecting the unique environmental characteristics and management needs of the coastal bays.
- Attainment of dissolved oxygen (DO) levels in the coastal bays consistent with Maryland's water quality criteria for DO, taking into account concerns about appropriate sampling time raised in the "Status and Trends Report on Maryland's Coastal Bays."
- Consistent with the fundamental objective of the Clean Water Act "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters," all of the individual water bodies within the coastal bays should fully support the "beneficial designated uses" specified for such water bodies by Maryland's Water Quality Criteria.
- Attainment of physical habitat standards for smaller (first, second, and third order) coastal streams, based on measures reflecting the unique environmental characteristics and management needs of the coastal bays.

FUNDING AND IMPLEMENTATION APPROACHES FOR KEY PROGRAM ACTIVITIES

SEPTIC SYSTEMS

Key Actions: WQ 1.1.1, WQ 1.1.2, WQ 1.1.3.B, WQ 1.1.5, WQ 1.2.1, WQ 1.2.3

Many of the actions designed to improve septic systems can be accomplished in a coordinated manner through a centralized management program funded through fees collected for services provided. Under this approach, a program housed in a sanitary management district, sanitary utility, or program within the county health, public works, or environmental services departments would collect fees designated to support program objectives such as:

- Conducting an assessment of systems within the watershed, potentially cross-referenced with a GIS system to identify distance to groundwater and surface water, slopes, soils etc. For example, Prince George's County has developed a database to capture and store this kind of information.
- Periodic inspection of all systems.
- Timely maintenance of all systems in the service district, or certification that timely maintenance had occurred using a reputable or "approved" private haulers.
- Development of a continuing education program for system owners, haulers, schools and others.
- Implementation of a monitoring program, including analysis of data and periodic assessments.
- Creation of a low-interest loan program, capitalized by a loan from the State Revolving.
- Loan Program, designed to encourage and assist septic system owners in voluntarily identifying and correcting malfunctioning or improperly designed septic systems.

A centralized management program would use the dedicated fees collected from owners of septic systems to borrow capital funds from the State Revolving Loan Program or a bank or other financial institution. The collected fees also could be leveraged or used as match for other federal and state programs such as NOAA's Community Based Restoration Projects Program, U.S. EPA's Sustainable Development Challenge Grant Program, and Maryland's Coastal Zone Management Program.

A centralized management program also can establish a list of Best Management Practices (BMPs) for residential, commercial and agricultural owners, and encourage their implementation through a series of credits which would offset any fees that otherwise would be due the program. BMPs might include innovative or non-traditional on-site waste disposal systems which remove nitrates and the installation of water conservation devices in the dwelling.

An alternative to a fee-based program or district is a type of "insurance premium" paid by septic system owners. In Puget Sound (Washington), for example, there is an annual "avoidable surcharge" of $75 for owners of septic systems. The surcharge is avoidable when septic systems are inspected and are in good working condition.

U.S. EPA Region III issues Environmental Education grants which would be used to help develop septic system owner education materials. In addition, there are a number of already-existing educational materials, such as those from Cooperative Extension, the Soil Conservation Districts, the national Farm*A*Syst Program, the National Small Flows Clearinghouse and more.

STORMWATER

Key Actions: WQ 2.1.1, WQ2.1.2, WQ2.1.7, WQ 2.1.8, WQ 2.2.1, WQ 2.2.2, WQ 2.2.3, WQ 2.3.1, WQ 2.4.1, WQ 2.4.2, WQ 2.4.3

Grants of up to $500,000 for particular stormwater projects could be obtained through the Maryland Stormwater Pollution Control Cost-Share Program, which is administered by the Maryland Department of the Environment. Retrofits of aging or poorly performing facilities can be funded through the establishment of a local revolving loan program, capitalized by a loan from the SRF. These low interest, long-term loans would be used by owners of stormwater facilities to correct problems while at the same time lowering their watershed fee with a credit for improving the performance of their facility.

In addition to the SRF Program, funding for these actions can come from the Community Development Block Grant Program, U.S. EPA Section 319 program and, if stormwater management activities benefit habitat, then through programs such as the North American Wetlands Conservation Program and the Partners for Fish and Wildlife Program.

Funds for management of an expanded stormwater management program can be funded and implemented in much the same way as septic systems: through a centralized coordinating program, special district or utility. A comprehensive inventory of all stormwater facilities, both publicly and privately owned, would be completed through a one-time appropriation or, if a stormwater program, district or utility can be established, a loan backed by future fees could be used (e.g., from the SRF).

The term "stormwater" often fails to convey the full effect of nonpoint source pollution runoff, sediment and erosion problems, and related water quality concerns. One way to address these concerns is through the creation of "watershed district" fees collected to support water quality activities such as:

- stormwater management facilities inspections
- stormwater management maintenance
- enforcement of stormwater management regulations and penalties
- mapping and tracking performance of stormwater management facilities monitoring programs
- establishment and maintenance of riparian forest and vegetative buffers
- other erosion and sediment control efforts designed to minimize impacts from runoff

Because most privately owned stormwater facilities discharge into public waters, it could be argued that all parcels in the watershed should pay a minimum watershed fee. To encourage adoption of Best Management Practices and Low Impact Development techniques (LID), credits could be established which would reduce the amount of the watershed fees paid to the program.

WASTE WATER REUSE

Key Actions: WQ 5.1.1, WQ 5.1.3, WQ 5.1.4

If these activities are not paid for by revenues generated from the sources described above they could be funded through the Sustainable Development Challenge Grant Program offered by U.S. EPA Region III.

REDUCING SEDIMENT INPUTS

Key Actions: WQ 6.1., WQ 6.2.1, WQ 6.2.2, WQ 6.2.5, CE 4.6

Sediment control activities often are funded and implemented through the same mechanisms developed to pay for stormwater management programs. Funding also can come from Maryland's Shore Erosion Control Program, as well as credits which would offset either a watershed fee or stormwater fee, or reduce property taxes. Any special activities to promote the use of vegetative buffers to protect fish habitat could be supported by the Fish America Foundation.

ENHANCING NATURAL SHORELINE

Key Actions: FW 1.6.4, FW 1.6.5, FW 1.6.6

State funding for preserving and protecting natural shorelines is available through the Maryland Shore Erosion Control Program, Maryland Buffer Incentive Program, and the Maryland Rural Legacy Program.

Targeted surcharges also have been used to finance the types of local improvements called for by these actions. For example, a minimal surcharge would be added to existing prepared food and beverage sales tax, which would be dedicated to shoreline management projects. The surcharge may be time limited (e.g., 10 years) with optional renewal. Another possibility for a special surcharge is a "check-off." This technique requires that every retailer who markets a certain product used at a site created or enhanced by shoreline protection activities (such as beach accessories, snacks and beverages sold at a park or recreational site, recreational equipment, etc.) pay a fee for each unit sold. The fee is usually passed on to the consumer who benefits from the shoreline management project. These retailers vote on establishing a check-off and also vote on the check-off's renewal. If a majority vote favorably, a small surcharge is added to each product when it is sold. The funds generated are collected and managed by those overseeing the shoreline management project.

Another possibility is an annual fee on breakwater structures to finance shoreline stabilization projects. Because piers and docks can contribute to shoreline erosion, fees generated from this source could finance shoreline protection actions. The local government or watershed district could levy an annual fee per structure per owner. A separate fee could be levied on business owners.

FOREST CONSERVATION

Key Actions: FW 2.1.2, FW 2.2.2, FW 2.2.3, FW 2.2.4, FW 2.6.1

State funding and technical assistance sources include the Stewardship Incentive Program, Woodland Incentive Program, and Conservation Reserve Enhancement Program. Another option for supporting both forest conservation and wetlands creation is mitigation banking. Mitigation banks facilitate the administration of a system where appropriate areas for forest, wetland, or beach restoration/creation are matched with developers who need to satisfying off-site mitigation requirements.

In addition to mitigation banks, the purchase of environmental easements can protect forests and wetlands. Under this approach, a privately run endowment fund would be established through contributions from the private sector (possibly organized through the chambers of commerce). A marketing campaign based on the promotion of a successful public/private partnership also could be developed. The fund would coordinate with local agencies or a mitigation bank to target high priority areas where the purchase of easements would beneficial.

WETLAND PROTECTION AND MITIGATION; ENDANGERED SPECIES PROTECTION

Key Actions: FW 3.1, FW 3.3, FW 3.4.4, FW 4.2.2, FW 4.2.3

In addition to mitigation banking and purchase of easements (described above), there are many other programs which could be used to protect wetlands, including Maryland's Small Creek and Estuaries Program, Wetlands Reserve Program, Wildlife Habitat Incentives Program, U.S. Fish and Wildlife Service's Partners for Fish and Wildlife, MDE Nontidal Wetland Compensation Fund, the NRCS Small Watershed Program, and the state's SRF Program.

BOATING SAFETY

Key Actions: RN 4.1.3.C, RN 4.4.5

Actions such as these could be funded through SHA's Highway Construction Water Quality Mitigation Projects funding.

RECREATION

Key Actions: RN 5.1.1-3, RN 5.1.6., RN 5.1.7

The same mechanisms discussed above under "Enhancing Natural Shoreline" also apply here. Surveys establishing customer base and recreational usage frequencies could be co-funded through the chamber of commerce, which benefits from this information. A market research analysis or survey could be coordinated through a local university or college. Parking meter fees also can be diverted for a one-time marketing analysis.

PLANNING, EDUCATION, PUBLIC PARTICIPATION, AND NON-ENVIRONMENTAL RESEARCH

Key Actions: WQ 1.1.6, WQ 1.3.3, CE 1.1.2.C, CE 1.1.4, CE 1.1.6, CE 2.1.1, CE 2.1.2, CE 2.2.1, CE 2.3.1-7, CE 3.3.3, CE 3.4.4, CE 3.4.5, CE 3.5.2-3, CE 3.5.5-6, CE 4.1, CE 4.2, CE 4.5-7

Planning related activities can be funded through the Maryland Department of Transportation's Neighborhood Conservation Program and U.S. EPA's Environmental Education Grants and Section 319 Program funding. Additional sources include MDE's Maryland Watershed Planning/Assessment Loans, EPA's Sustainable Development Challenge Grants, EPA's Environmental Education Grants, and EPA's Environmental Justice Through Pollution Prevention Grant Program.

The private sector also is an important resource for distributing educational materials. For example, realtors and banks can include environmental education materials in closing packages for new property buyers. Grocery stores can hold contests for environmental art or photography and distribute educational materials. Assistance also is available from Maryland DNR's "Nature Tourism" program.

Another option is a local revolving loan program, perhaps capitalized with Small Business Administration or SRF funding, which would make low-interest loans to businesses for pollution prevention equipment purchases and retrofits. Training and re-training of the local workforce can be partially or wholly funded through a "check-off" (mentioned previously), or the establishment of an endowment fund created by local businesses for training purposes. Further, the Environmental Finance Center, private municipal finance planners, and others can provide rate structure analysis to determine whether all water and waste water utilities are self-supporting, freeing up funds from the general fund for other desired purposes.

With regards to transportation planning, many organizations promote the use of alternative energy, including U.S. EPA's Energy-Star Program and Maryland's Green Buildings Program. Many organizations around the country also invest in alternative fuel transit systems. The cities of Chattanooga and Miami have successful electric transit bus systems, and there are other communities expanding their electric bus systems.

Many organizations can partner with Worcester County to provide technical assistance for planning activities, such as the Institute for Governmental Service or the Environmental Finance Center. In addition, design standards such as appropriate streetscapes and architectural standards can be developed by working with the University of Maryland's School of Architecture.

In addition, there are a number of financing techniques which capitalize on a private property owner's stewardship inclinations. These techniques encourage the protection of natural resources with a minimum of governmental effort while building a sense of community spirit and creating an educational experience. Some of these techniques include are described below (note: "organization" refers below to a nonprofit organization, business group, or governmental agency)

Notification Program: Owners made aware of important resources on their properties often are willing to protect these resources once they learn of their existence or significance. For this approach, an organization might notify the property owner with a brief letter describing why the wetland, forest buffer, or stream bank deserves protection with a follow-up visit to answer questions. Notification can be an important first step in establishing good will with a property owner and may eventually result in a permanent commitment to protecting a significant resource.

Recognition Program: A recognition program takes notification one step further by announcing publicly that a property or portion of a property is significant. Similar to the National Natural Landmarks Program, a watershed-based recognition program appeals to the pride of an owner who has an inclination towards stewardship. By presenting plaques or certificates to owners of significant property, the community, as well as the owner, gains from the publicity.

Nonbinding Agreement Programs: A variation of the recognition program might require the property owner to agree in writing to protect certain specified features of their property. The owner's obligation to comply is strictly voluntary. The agreements are based on mutual trust, pride of ownership, and recognition and appreciation of the resource.

Management Agreements: Under a management agreement a property owner agrees to care for a significant resource on their property in a specified manner for a set period of time (or the owner lets an organization carry out the management). Sometimes an owner receives compensation for expenses.

Leases: Leases entitle the lessee to control the use of a property in return for rent, which may be nominal. An organization may lease the property from a property owner for a nominal fee or at market prices. On the other hand, an owner may agree in the lease simply to forgo destructive forestry or other practices that threaten the resource. In a lease-purchase agreement, the rents are applied toward an agreed-upon purchase price.

FARMLAND RETENTION

Key Actions: CE 3.2.1, CE 3.2.3, CE 3.2.4

A number of techniques are used to retain farmland, including:

- Special Agriculture Districts — agriculture districts can be protected from nuisance claims, special assessments for water and sewer, use of eminent domain to acquire farmland for public use, and others.
- Exclusive Agricultural Zoning — prohibits nonfarm activities in the zone.
- Restrictive Agreements — resource landowners enter into long-term contracts with counties in exchange for receiving preferential assessment. If land under this agreement is developed, property tax penalties are assessed.
- Property Tax Reform (Split-rate Tax) — a property tax in reality is two different taxes: a tax on the value of buildings, and a tax on the value of the land. By making land ownership more costly by increasing the tax on land values, land owners are motivated to develop their land, rather than hold onto it as vacant or underutilized lots. Since land adjacent to already existing infrastructure (e.g., water and sewer) has higher value than land further from infrastructure, land in areas already developed will tend to be developed

first (a higher tax on land values results in lower land prices). This results in higher density development within the urban core and reduces development pressures on land in rural areas.

- Income Tax Rebate — when local property taxes assessed on a farmer exceed some threshold (e.g.,7%) of net farm income, the state refunds income taxes equal to the property taxes paid in excess of that threshold.

if

MONITORING IMPROVEMENT IN THE COASTAL BAYS

BACKGROUND

A monitoring plan has been developed to help determine the effectiveness of management actions taken as part of the Maryland Coastal Bays Program Comprehensive Conservation and Management Plan or CCMP. Actions in the coastal bays management plan address five priority problems: degraded water quality, loss of habitats, changes in living resources, unsustainable growth and development and poorly planned recreational use of the bays. Degraded water quality, due to nutrient and sediment enrichment, was identified as the most pressing environmental problem facing Maryland's coastal bays. Due to practical limitations, the monitoring strategy initially has focused on the program priority of developing a detailed eutrophication monitoring plan. It is recognized that emerging issues (harmful algal blooms, blue crab parasite, wasting disease) and technologies (remote sensing) may bring about a reprioritization of monitoring efforts. A more complete monitoring strategy has been outlined that touches on additional monitoring needs. This strategy will be further developed to meet the needs of the CCMP during the first year of implementation. The Eutrophication Monitoring Plan is designed to track the implementation of management actions and monitor changes in nutrient/sediment loading and subsequent responses to the ecosystem (e.g., impacts to general water quality, habitat, and living resources). The monitoring plan addresses the eutrophication goals of the CCMP, although numeric goals will be developed during initial implementation as stated in the finance and implementation plan.

GOALS

The general goals of the Maryland Coastal Bays Comprehensive Monitoring Strategy are to:

- measure the effectiveness of implementing the management actions identified in the Comprehensive Conservation and Management Plan (CCMP),
- provide information that can be used to redirect and refocus the CCMP over time, and
- provide information that will assist in predicting future trends related to implementation of management actions.

In order to focus the goals, general monitoring topics were identified based upon recommended management actions in early drafts of the CCMP that are expected to improve environmental conditions or living resources. In addition, an outline of general monitoring issues was provided by the Scientific and Technical Advisory Committee (STAG). These were used to develop the following broad monitoring themes:

- characterize status and assess trends in nutrient inputs from surface water runoff (including ditches in the headwaters of streams), groundwater (direct discharge and base flow), atmospheric deposition, point sources, and the oceanic inputs to the coastal bays;
- characterize status and assess trends in sediment inputs from surface water runoff, shoreline erosion and the ocean (via shoaling and overwash) to the coastal bays;
- characterize status and assess trends in ambient water quality in the coastal bays;

- characterize status and assess trends in ambient sediment quality (sediment type and chemical contaminant concentrations) in the coastal bays;
- characterize status and assess trends in the areal extent and quality of habitats such as seagrasses, macroalgae, bottom type, coastal marshes, natural shoreline, bay islands, bay beaches and forests; evaluate the quality of fragmented habitats due to growth and development;
- characterize status and assess trends in the relative abundance and condition of plankton, benthic macroinvertebrates (including crabs and shellfish), fish, waterbirds, neotropical migrant birds, and songbirds in the coastal bays.

COMPREHENSIVE MONITORING STRATEGY

The current eutrophication monitoring plan focuses on the core elements related to the loading and impacts of nutrients and sediments in the coastal bays. A comprehensive monitoring strategy has also been prepared which outlines the goals, related management actions, existing programs etc. for a much larger monitoring program. The comprehensive monitoring strategy is intended to serve as a working document to guide the development of the monitoring program over the long term as resources allow. This comprehensive monitoring strategy appears as an appendix to the Eutrophication Monitoring Plan.

In order to develop the comprehensive monitoring strategy, each monitoring theme was broken down into specific goals and objectives. From these monitoring components, a coordinated and comprehensive plan can be assembled for eutrophication. A specific monitoring plan involves integrating a number of monitoring components and considering additional details, such as compatibility and consistency with efforts of existing monitoring programs, identifying classes of indicators that may be measured, sample design (spatial and temporal bounds, methods and sample station location), performance criteria, statistical analyses, and cost. Methods need to be chosen that incorporate quality assurance/quality control procedures to ensure that sampling, processing, and analysis techniques are applied consistently and correctly, and to minimize the number of lost, damaged and uncollected samples.

Information required to develop an effective monitoring program that would meet the needs of the MCBP was obtained from several sources. A compendium of over 70 relevant monitoring programs within the coastal bays and its watershed was compiled to identify historic and ongoing monitoring information, as well as monitoring plan elements and parameters that should be considered. To find out more about monitoring programs in the coastal bays refer to 'A Compendium of Monitoring Programs in the Coastal Bays' (MCBP 99-01).

All themes are covered in part in the eutrophication monitoring plan. Remaining categories of monitoring themes will be evaluated as part of the comprehensive monitoring strategy.

CONCEPTUAL FRAMEWORK OF THE EUTROPHICATION MONITORING PLAN

Eutrophication and its impacts on living resources was identified in the MCBP Characterization Report as the most pressing environmental issue facing the coastal bays (MCBP 98-01). As a result, the STAG recommended that the monitoring plan initially focus on nutrient and sediment

inputs to the coastal bays and their impacts on living resources. The attached draft focuses on those aspects of the monitoring themes that are directly related to eutrophication. Five general categories of monitoring activities were identified:

1) track management actions,
2) nutrient and sediment inputs from the watershed and airshed,
3) ambient water quality,
4) eutrophication impacts to habitat,
5) eutrophication impacts to living resources.

Structure: Actions in the monitoring plan have been organized into three levels: Landscape Monitoring (Level I), Stressor Monitoring (Level II), and Response Monitoring (Level III). The lower the level, the more directly the monitoring is related to management actions. Inherent within all three levels is the need for baseline and long-term monitoring data.

Baseline monitoring determines the current status of important indicators of the coastal bays environmental health against which to measure change. Data resulting from baseline monitoring are critical in being able to determine if management actions have had an impact. Sufficient baseline data are not currently available for all components of the monitoring plan, yet is necessary in order to evaluate future conditions (to determine, for example, whether management actions have had an impact) and should be collected as part of the monitoring plan to establish existing conditions prior to full implementation of management actions.

Landscape monitoring (Level I) tracks land cover, as well as the actual activities going on in the watershed (e.g., nutrient and chemical application rates, implementation of best management practices). These factors often can be directly related to implementation of management actions and may not need intense field monitoring. Depending upon the final management plan and its goals, this type of monitoring information may need to be reviewed in the future to evaluate the adequacy of current programs to track important aspects of landscape conditions and activities.

Stressor monitoring (Level II) determines the amount of pollutants (nutrient, sediment or chemical contaminants) entering the bays or extent of habitat alteration or loss occurring in the watershed. This may be very difficult to do in a comprehensive fashion but it was the decision of the STAG to initiate some of the high priority monitoring elements in this category that relates to nutrient inputs.

Response monitoring (Level III) uses indicators to show how the system is responding to management actions (changes in stressors) over time. This monitoring information can answer questions that are very important to the public (e.g., Is the water degraded? What is the condition of the fish?). This draft of the plan focuses most attention on this aspect of the monitoring program.

Evaluation of status and trends: The monitoring plan has been designed to allow for evaluation of environmental status and trends. Trends in most parameters are best measured by sampling fixed stations at representative locations on a regular basis. Status may also be measured by fixed stations, but providing comprehensive spatial coverage requires periodic, intensive random surveys. To accommodate both these needs, the monitoring plan primarily focuses on a fixed station design with intensive random surveys of certain parameters on a rotating basis throughout the segments.

Segmentation: In order to provide a spatial framework by which to compare different areas and assign stations, the bays were divided into six segments based on the 7-digit watershed codes. In general, the segments are sections of the bays that are geographically or ecologically distinct and, for the most part, have similar environmental conditions. These divisions will allow comparison of specific environmental conditions and living resource responses between segments, as well as for the entire estuary.

Use of existing programs: Several existing, long-term eutrophication related monitoring programs are presently operating in the coastal bays. Unfortunately, most of these programs were implemented and designed to address a specific need, and alone are not comprehensive enough to meet the goals of this monitoring plan. Nonetheless, practicality dictates that these existing programs be utilized as much as possible. This may result in a less than ideal design, but every effort has been made to fill gaps and insure integration among the initially disparate elements.

IMPLEMENTATION

Implementation of the monitoring plan will involve multiple partners including local governments, volunteers, academic institutions, state and federal agencies, and will be coordinated by DNR's Resource Assessment Service through the Monitoring Subcommittee of the STAG. Coordination of the program through DNR, which conducts other state-wide aquatic and wildlife monitoring programs, will ensure consistent methodologies and analyses, rigorous quality assurance, integration with state-wide monitoring data bases and other aspects of the program.

Data will be analyzed by the respective group collecting the monitoring data and compiled on a biannual basis into a comprehensive review for presentation to the STAG. Data and results will be made available using a distributed Internet system. A geographic information system and other methods of public presentation (e.g., periodic "state of the bays" reports) will be used to display data and analyses. Implementation of the plan described here will depend on the continuance of a number of existing programs as well as additional resources that have not been identified to date.

PUBLIC INVOLVEMENT

PUBLIC INVOLVEMENT STRATEGY

Informed decision making is contingent on an enlightened public. With this in mind, the Coastal Bays Program has defined its successes by its ability to help residents of Worcester's coastal bays watershed learn the "ins and outs" of protecting the resources that support and define their community.

With hundreds of local farmers, developers, fishermen and other residents involved in producing a management plan for the bays, the Coastal Bays Program has been working to ensure that the fruits of their efforts are scrutinized by a public well-versed in issues involving their land, water, and ultimately their pocketbooks.

The sections below depict the nature and emphasis of outreach efforts as they have occurred during the planning phase of the comprehensive management plan. They highlight ongoing and planned projects and events designed to enlighten watershed residents. This multi-faceted approach infuses media coverage, outdoor events, educational workshops, local project funding, and public feedback opportunities into an effort which has transformed this coastal community's vision for its future.

Planning for the Future in Coastal Bays Watershed

Three very important workshops have helped residents in the coastal bays watershed contemplate how they want their community to grow. In May of 1998, the program held two *"Your Community Your Choice: Picturing Tomorrow"* workshops in Berlin and Snow Hill. Surveys conducted at the workshops allowed the 250 residents who attended to rate their feelings on land use and growth in the county. The results, revealed at a follow-up public meeting in October 1998, showed that preservation of natural and agricultural land is foremost in the minds of Worcester County residents.

An associated meeting in February 1999 in Berlin showed residents specific growth scenarios in their watershed based on zoning and population projections. The *"Alternative Futures Workshop"* helped further elaborate fiscal and planning issues related to the growth and development scenarios asked for by participants during the "Picturing Tomorrow" workshops. The feedback from the Alternative Futures Workshop will be incorporated into Worcester's community vision for itself.

As outlined in the management plan, additional workshops on growth and planning will help watershed residents make intelligent choices about the future of their land and water.

Using Events to Educate and Inspire

One of the largest annual program events is *Maryland Coast Day,* an opportunity for the Maryland Coastal Bays Program and Assateague State Park to bring together a host of local organizations and some 40 businesses to sponsor a day of environmental fun and education on Assateague. Every year MCBP and State Park officials, with help from more than 50

environmental entities, inform some 5,000 attendees about local ecology through numerous demonstrations and workshops. The day of coastal exploration includes free demos in sand castle building, kite flying, surf casting, and duck carving. Live animal displays, Native American dances, bays cruises, helicopter search and rescue shows and native species plantings also highlight the festival. Every Coast Day, local businesses and individuals support the festival with more than $10,000 worth of goods, services and monetary donations. Each September Maryland Coast Day will serve to remind local residents and tourists alike what is special about this estuary.

National Estuaries Day, too, is an annual event celebrated by the Coastal Bays Program with an October boat tour of the coastal bays. There, locals and scientists relate the lore of the coastal ecosystem and expound on the ecological uniqueness of its waters. The boat's 60-passengers also enjoy a stop on Assateague where they seine for mollusks, crabs, and fish.

The annual *Canoe Cleanup,* held the first Saturday in June, is another popular Coastal Bays Program event. Also sponsored by Assateague State Park, the cleanup lets canoers embark from Assateague Island to Sinepuxent Bay to collect thousands of pounds of refuse, including plastic, Styrofoam, discarded crabbing cages and golf balls.

A similar yearly event, the *Isle of Wight Cleanup* brings locals together on the fourth Sunday of every April to comb the shores of Assawoman and Isle of Wight bays for litter. Volunteers gathered 3,000 pounds of trash in 1999.

Already, the Coastal Bays Program has held numerous habitat restoration projects, Earth Day cruises, fundraisers, parade floats and other events which have been widely publicized and highly attended. During the implementation phase of the management plan, these efforts will continue to motivate and inspire those who call the coastal bays watershed home.

Expanding Awareness Through Newspaper, Television, Radio, and the Internet

Newspaper, television and radio are three of the most important means through which information is disseminated to the public. Recognizing media as the arbiter of public opinion, the Coastal Bays Program has fostered a sense of environmental awareness through these channels. In the two years leading up to this plan, the Coastal Bays Program appeared in local newspapers in 477 stories. Representatives for the program also appeared on 34 TV news segments and discussed coastal bays issues via radio 30 times. Two public service announcements and two 10-minute informational films on the program continue to air weekly on local television stations. In addition to these forums, the Coastal Bays website features current events, photos and scientific information at the click of a key. These media will remain an important outreach tool in the coming years.

Advising Through the Citizenry

National Estuary programs are defined by the involvement of their citizen committees. The strong support from the *Citizens Advisory Committee (CAC)* of the Coastal Bays Program has underscored the commitment of Worcester County residents in seeing that protection strategies defined by the program reach fruition. Held the first Wednesday of each month, the Coastal Bays CAC meetings allow the diverse membership to share ideas with other citizens and learn

new tools to better fulfill their needs and express their concerns. The developers, farmers, fishermen, and business people in the committee continue to be very active in publicizing events and otherwise spreading the word to the community about the program and the environment. The committee also serves as an important volunteer base.

Measuring Success Through Volunteerism

Volunteers make the Coastal Bays Program work. With only four staff members to tackle more than 20 annual public events, the Coastal Bays Program would be impotent without its strong volunteer base. More than 5,000 volunteer hours have gone into the production of the coastal bays management plan. But aside from those representatives, an additional 50 volunteers have been monitoring water quality in the coastal bays since 1996. By keeping track of a wide range of water quality parameters, these individuals provide scientific data essential to measuring the health of the bays and the success or failure of protection efforts. Also at-the-ready are some 150 additional volunteers who help make Maryland Coast Day, the Canoe Cleanup, workshops, and other public events possible. These hundreds of individuals, who have given their time to protect the resources they cherish, will continue to serve as the pillars of the Coastal Bays Program.

Funding Local Projects

To reaffirm the Coastal Bays Program as the community's program, some $250,000 has been awarded to locals for projects in the watershed since 1997. In the form of "minigrants" and "early action grants" these funds have provided a host of schools, businesses, local agencies, and organizations with the means to conduct a variety of projects in eastern Worcester. Native plant restoration, buffer planting, seagrass monitoring, pesticide alternatives, and bay scallop reintroduction are just a few of the projects that have been funded. One "BayScapes" project in South Point is encouraging an entire community to replace lawn space with native plants for wildlife. Some $20,000 has already been awarded to Worcester County schools as part of the Coastal Bays minigrant program. Public meetings to explain and promote the projects have accompanied the funding.

Disseminating Information

The foundation of intelligent decision-making is knowledge. With this in mind, the Coastal Bays Program has published more than 20 guides, fact sheets, brochures and reports which serve to inform and motivate. In addition to flyers and pamphlets for each coastal bays event, the Program has produced:

- Today's Treasures for Tomorrow, a document characterizing the condition of the coastal bays
- a brochure describing the program and challenges in the watershed
- five fact sheets on the bays, nutrients, habitat, water quality, and living resources
- a quarterly newsletter
- a boaters guide to clean bays
- a coastal bays sensitive areas guide for boaters
- a newspaper insert on what homeowners can do to fight Pfiesteria
- a newspaper insert on planting backyard habitat
- a newspaper insert on the comprehensive management plan
- MCBP note cards
- an illustrated Visioning Results booklet

- the 125-page MCBP Base Program Analysis, which describes the statutory and regulatory agencies affecting the coastal bays
- a 20-page guide to Maryland Coast Day
- Coastal Bays Program bumper stickers
- The Association of National Estuary Programs' (ANEP) fact sheet on the bays and ANEP report to the nation.
- a 30-page summary of this management plan

These items can be found at each Worcester County library branch, the Ocean City Convention Center, OC Chamber of Commerce and other locations throughout the county. The unyielding need for education will continue to spawn educational literature throughout the life of the Coastal Bays Program. New guides for environmentally friendly living around the home, farm, golf course and marina will be available in 1999-2000.

Reaching Out to the Community

The Coastal Bays Program also actively seeks community input. From 1997-1999 the program gave informational presentations to more than 70 local organizations, including the Coastal Association of Realtors, Eastern Shore Golf Superintendents, the Delmarva Poultry Industry, the Worcester County Schools staff, a number of anglers and garden clubs, the Lions Clubs, and the Chambers of Commerce of Berlin, Ocean City and Snow Hill. The program has also brought its message to the classroom and will work to insert aspects of the management plan into the schools' curricula. During implementation, the focus of these presentations will change to highlight implementation strategies each group might help fulfill.

Attending community events also has served as an important outreach tool. The program set up displays and disseminated information at 20 such venues in 1998 alone. The events, such as the White Marlin Open, the annual conference of the Maryland Farm Bureau, Ocean City's Springfest, the Worcester County Fair, and the Maryland Association of Counties Convention, help catapult education to a new dimension by drawing in often hard-to-reach audiences. This strategy will continue throughout implementation.

Filling in the Gaps

Other projects involving community outreach and problem-solving will continue to keep the Coastal Bays Program viable. The program is working with Realtor licensors to help them effectively teach coastal bays watershed dynamics to their students. An initiative to preserve the venerable Assateague hunting lodges is also being aided and supported by the program, as is a local effort to control snow geese numbers in certain parts of the county.

Coastal Bays staff have been meeting with septic pumpers, haulers, and regulators to find viable ways to control the systems' nutrient inputs into the bays. At the same time, the program continues to coordinate state and local wetlands initiatives to better protect and restore wetlands in the watershed. With help from Worcester County, the program has already produced voluntary golf course design standards which protect the ecological and economic vitality of new courses.

Environmental prosperity in the coastal bays watershed is wholly contingent on the public's ability to have the information it needs to make intelligent decisions. Only education can provide the means to protect this very special place in Maryland.

Below is a summary of educational initiatives the Coastal Bays Program will undergo in accordance with directives in the comprehensive management plan.

Homeowners

Ongoing	Public education and demonstration projects on bay-friendly lawn and garden practices
Ongoing	Public trash cleanups with an educational component
Ongoing	Household hazardous waste disposal and alternatives publication/education
Ongoing	Public creation of community vision for the future, including build out analysis and future land use scenarios
1999	Education of targeted canal-side property owners for water quality improvements around the yard and home
1999	Establishment of periodic coastal bays conferences with Virginia and Delaware
2000	Educational workshops, literature on bluebird, martin and bat house designs to manage insects
2000	Education of public through demonstrations and publications regarding the importance of wetlands, Worcester 2000, and distribution of costs associated with community services related to various land use development patterns
2001	Tourist information packets on recycling, energy conservation, and environmentally friendly vacationing in the coastal bays
2001	Septic maintenance educational materials to all septic owners includes pump out notices, care, maintenance, and installation instructions, and information on innovative treatment systems
2001	Public forum to show biological control options and alternative methods for mosquito control
2001	Feral cat control education
2002	Education of public through demonstration and publication on importance of preserving forestland
2003	Public education on best ways to protect groundwater
2003	Advertisement of benefits of threatened and endangered species programs for landowners
2004	Educational initiative on water and energy conservation for residents
2009	Informational brochure on mosquito life cycle, importance, and control options
2010	Educational seagrass restoration projects using schools and other citizens
2010	Lecture series to educate public on transportation planning issues
2011	Education on land management practices and feeding which promote undesirable species

Farmers/Foresters

2000	Information and demonstration projects on new nutrient management strategies and innovative alternatives
2000	Information on new cost-share and incentives for Best Management Practices
2000	Education of the forestry industry regarding the importance of hardwood species and fragmentation avoidance

2003	Education of public on hardship farmers face, as well as their positive environmental impact
2004	Workgroup to develop financial incentives and tax reductions to keep lands in forestry
2005	Information on farmland habitat management techniques and selected target species

Developers

2000	Demonstration projects on environmentally sound landscaping and viewscaping in riparian buffer areas
2000	Compliance assistance to resolve non-flagrant sediment and erosion control violations
2001	Demonstration of usage of transferrable development rights, purchase of development rights, preferential taxation, compact development and open space preservation
2001	Distribution of shoreline change map
2001	Continuing education courses for Realtors and consultants on development incentives which include natural resource protection
2001	Educational brochure on economic importance of retaining wetlands, forests and cultural resources in the coastal bays watershed
2002	Workshops for the State Highway Administration on environmentally friendly ditch maintenance practices
2002	Demonstration projects and workshops on low-impact, contiguous development for legislators, developers and the public
2002	Teaching of alternative wetland design for shoreline stabilization
2004	Workshops on stormwater management design

Fishermen/Boaters

1999	Information on positive and negative impacts of dredging
2000	Posting of annual size and creel fishing limits at docking and fishing locations
2000	Workshops on contaminant avoidance and management practices
2000	Educational materials for marina users on proper sewage, fuel, and antifreeze disposal, and chemical input avoidance measures
2001	Educational brochure on ownership of channels, regulatory requirements, dredge permitting, and points of contact
2001	Sensitive resource areas guide
2001	Smart boating/resource protection poster for display at boat dealers, rental outlets, marinas and visitor centers
2001	Curricula development for boater education
2001	Tackle shop/marina handout on navigation conditions around the Route 50 bridge
2001	On-the-water rules and regulations brochure for boat dealers, marinas, rental outlets and schools
2001	"Guide to the Coastal Bays" booklet with shoreline accesses, fishing spots, boat launches, dangerous and sensitive areas

Businesses

1999	Education of nurseries on native plants and importance of reducing the sale of exotic species

2000+	Education on the Maryland Department of the Environment's latest sludge prevention initiatives to industrial and municipal operators
2001	Publication on waste disposal and recycling options for distribution to relevant businesses
2002	Meeting series with sludge generators and users to identify waste re-use and application sites
2002	Demonstration site and awards program for integrated pest management on golf courses, farms and community organizations
2005	Hospitality industry workshops for landscaping, as well as energy and water conservation
2006	Informational brochure on eco-tourism in Worcester County

EARLY ACTION TO IMPROVE THE COASTAL BAYS

During the development of the CCMP, program participants identified restoration activities that needed to be implemented before completion of the plan. To initiate these efforts, the Maryland Coastal Bays Program provided over $175,000 in community grants to initiate early action projects. These demonstration projects, which are scaled down versions of CCMP actions, are intended to test the cost and effectiveness of solutions to priority problems. They also provide invaluable outreach and public involvement opportunities. Some of the projects are described below.

STEPHEN DECATUR MIDDLE SCHOOL: FRIENDLY COURTYARD GARDEN

The EARTH Club at Stephen Decatur Middle School took on the task of converting a bare courtyard into an area of beauty and a celebration of nature. The plant species in the garden are all native to the area and require very little water and no fertilizers. The garden includes bird feeders and a pond which eventually will include fish and water plants. The garden is intended to provided an outdoor learning area and demonstrate the benefits of native plants.

SUBMERGED AQUATIC VEGETATION PRESERVATION AND RESTORATION IN MARYLAND'S COASTAL BAYS

The purpose of this study was to locate the existing SAV beds in the coastal bays, distinguish characteristics of areas supporting SAV from those that do not support SAV, determine the effects of clamming on extant SAV beds, and to transplant vegetation into areas where SAV does not currently exist.

The results indicate that SAV is returning to the coastal bays. The study noted the expansion of existing beds, found previously unidentified beds, and recorded the difference between distribution of SAV in the early summer versus early Fall. Primary factors affecting SAV distribution in the upper and lower Coastal Bays were documented. From these observations, we identified the most promising areas for SAV transplanting, conducted experimental planting at those sites, and developed a set of recommendations for minimizing damage to SAV beds.

PROTECTION OF SEAGRASSES IN ISLE OF WIGHT BAY

During 1997, boat propeller scarring was identified as a potentially significant factor impacting seagrass in the northern Isle of Wight Bay. The purpose of this study was to investigate the impact of intense recreational boating activities on seagrass beds in Isle of Wight Bay and evaluate management strategies for seagrass protection. Intense scarring was evident in aerial surveys; scar widths ranged from 0.7 to 1.2 meters in both eelgrass and widgeon grass beds. These widths suggest that scars are most likely due to hydraulic clam dredging. In order to reduce the impacts of scarring, protection buoys will be placed in the early spring of 1999. A

fact sheet is also being developed to educate the boating community about the importance these sensitive nursery areas for fish and shellfish.

Wave Exposure and Sediment Characteristics as Habitat Requirements for Eelgrass in Chincoteague Bay

The distribution of the seagrass *Zostera marina* (eelgrass) in Chincoteague Bay is restricted mostly to the eastern side. Two hypotheses were suggested to explain this distribution: sediment characteristics and wave exposure. A clear pattern was observed in the epiphytic biomass on eelgrass leaves: it was highest at low wave exposures and decreased exponentially with increasing wave exposure. Since the smallest wave energy is found on the western side of Chincoteague Bay, the plants which are reappearing in this area are also the ones which have the highest epiphytic load. Furthermore, on the western side the sediment is very fine and the coastline is eroding which leads to decrease light exposure. Therefore, reduced light may be limiting the colonization of the western shore. Sediment characteristics may also be limiting eelgrass growth based on the tendency (statistically not significant) of eelgrass to grow slower in the very fine sediments of the western shore of Chincoteague Bay. The results of this research suggest that eelgrass distribution in Chincoteague Bay is not a direct function of wave exposure. However, the western shore of Chincoteague Bay may be more susceptible to problems associated with eutrophication than the eastern shore due to epiphytes (a function of wave energy) and sediments.

Correlation of Nutrient Enrichment with Seagrass Growth: Coupling Research and Education

This project was divided into three parts. The first part of the research dealt with trying to determine how water quality impacts sediments. The second part of the research looked for the relationship between water quality and epiphytic growth on plants. Epiphytes are anything that collects on the seagrasses (such as algae, worms, or sediments). The third part of this research involved looking for the relationship between water quality and epiphytic growth on artificial substrates (wrapping present ribbons tied to plastic grids). The project found that the artificial substrates can be used in areas with little or no grasses to help monitor water quality which leads to a useful classroom application. Berlin Middle School has adopted two streams that have no obvious signs of grasses and plan to use ribbons to make grids for water quality monitoring.

Ground-water Flow and Nitrate-Nitrogen Inputs to Maryland's Coastal Bays

Excessive nitrogen loadings lead to significantly increased growth of phytoplankton and algae in the bays, which can harm the bays' ecosystem. Nitrogen is usually found in ground water in the form of nitrate-nitrogen. The magnitude of nitrate-nitrogen loadings to the bays from ground water has been identified as a major data gap that warrants immediate attention. This study developed estimates of direct ground-water-discharge of nitrate-nitrogen loadings to the bays by calculating the flux of ground water to the bays from the surficial aquifer (depths ranging from

land surface to approximately 130 feet below mean sea level). While not extremely high, it is still a concern that the estimated average annual direct loading of nitrate-nitrogen is approximately 4,8501bs/mi2 distributed over the 56 mi2 area of Maryland's coastal bays.

Mosquito Control Using Starch

The potential role of carbohydrates in controlling larvae mosquitoes was investigated as an alternative control option. Specifically, modified starches (modified with fatty acids) were tested for their ability to form a temporary layer at the air-water interface capable of preventing the mosquito larvae and pupae from breathing air thereby suffocating the immature mosquitoes. It is hoped that such a class of compounds may ultimately be useful in commercial application of mosquito control in areas that are ecologically sensitive to more toxic pesticides.

Community BayScapes Project, South Point

BayScapes is a program that promotes citizen action in establishing environmentally sensitive landscapes that benefit people, wildlife, and the bays by reducing nutrient and chemical inputs. Residential developments are a priority target for this initiative because of the potential to reduce direct sources of adverse impacts, involve large numbers of citizens, and utilize the strength and structure of community groups to foster these concepts into a landscape-scale pollution solution.

The first pilot community BayScape project was in South Point, a community in Berlin, MD. The program included developing and installing a model community project, and training homeowners to plan and install their own BayScape project.

Bay Scallops Restoration in Chincoteague Bay

Over 60 years ago, the bay scallop *(Argopecten irradians)* disappeared from Chincoteague Bay soon after a disease virtually wiped out eelgrass *(Zostera marina)* beds in the region. Although eelgrass has since repopulated a substantial portion of Chincoteague Bay, bay scallop populations have not recovered. Scallops require vertical structures (such as seagrasses to avoid suffocation from silt), predator refuge, salinities over 20 ppt, and clean, hard packed sand substrate throughout their life cycle. Such conditions now exist in several areas along the east side of Chincoteague Bay and in October 1997, 533,000 seed scallops were transplanted to those areas. Overwintering mortality was relatively minor, on the order of 25-30%, and by May 1998, evidence of spawning was found in the transplanted scallops. To further enhance efforts, in the fall of 1998, over 700,000 seed scallops with an average length of 20 mm were planted with help from the MCBP. The larger size should enhance survivorship and reproductive effort for the 1999 season. These efforts will presumably overwhelm predation pressure and allow for a self-sustaining population of bay scallops marking the return of this ecologically and economically important species to Chincoteague Bay.

Aquatic Plant Communities as Indicators of Nutrients in the Maryland Coastal Bays

As part of a cooperative project with the University of Delaware, the Maryland Department of Natural Resources is conducting sampling for nutrients and aquatic vegetation. The hypothesis that is being tested states, "the primary producing communities in the coastal bays are influenced by the nutrient concentrations along a north-south gradient." Specifically, data is being collected to determine if 1) a nutrient loading gradient from Delaware to Maryland does in fact exist, and 2) there is a shift in the primary producer community from phytoplankton in the highly eutrophied areas to macroalgae in the moderately enriched areas, to submerged aquatic vegetation in low level enrichment.

FISH HEALTH, HABITAT QUALITY, AND *PFIESTERIA* SURVEILLANCE IN SUPPORT OF STATE'S RESPONSE TO TOXIC OUTBREAKS OF *PFIESTERIA* AND SIMILAR DINOFLAGELLATES

Toxic outbreaks of the dinoflagellate *Pfiesteria pisddda* on three Lower Eastern Shore rivers during 1997 lead to documented evidence of negative impacts to the health of humans that came in contact with affected waters. Eight Lower Eastern Shore rivers were selected for monitoring on the basis that either they contained confirmed outbreaks in 1997 or had similar water quality and physical dynamics to affected rivers. Two of the eight monitored rivers are tributaries of Maryland's coastal bays: the St. Martin River and Newport Bay/Trappe Creek. Results indicated that the health of coastal bay's fish populations was generally good, and no fish health problems indicative of a toxic *Pfiesteria* outbreak were observed in 1998. Preliminary water quality data indicates some portions of the two sampled tributaries had high nutrient and algal concentrations; of particular note were Bishopville and Shingle Landing Prong (St. Martin River) and Trappe and Ayres Creeks (Newport Bay/Trappe Creek). Although high nutrient and algal concentrations have been identified as two of the factors contributing to the likelihood of toxic *Pfiesteria* outbreaks, it is apparent that the full suite of conditions necessary for outbreaks were not met in these regions in 1998. Although final interpretation will need to await the analysis of the complete data set and independent review, low salinity and lack of dense concentrations of menhaden in these areas are possible explanations.

GLOSSARY

Active Recreation - recreational activities such as motor-boating, water skiing and mountain biking that may have impacts to the environment.

Aforestation - natural regeneration of a forest.

Alternative Futures - computerized scenarios of projected development patterns displayed on maps with associated costs and other variables.

Anodes - a sacrificial piece of metal used on boat engines to prevent corrosion from salt water.

Aquaculture - commercial raising and production of fish or shellfish.

Dead-End Canal - man-made canals that have limited flushing due to their unnaturally deep design.

Atmospheric Deposition - depositing of nutrients and chemicals from the air to land or water bodies.

Aquifer - permeable underground rock, sand, or gravel which holds freshwater that yields supplies of water to wells, springs and estuaries.

Bathymetry - variations in mean depth in a body of water.

BayScapes - the planting of native trees and shrubs to improve water quality and wildlife habitat.

Benthos - the assemblage of plants and/or animals living on the bottom of a body of water.

Best Management Practices - standardized set of practices on farms, forests, marinas, etc. that help improve or protect water quality.

Biochemical Oxygen Demand - the amount of oxygen taken up by microorganisms that decompose organic waste matter in water. Test that is commonly used to measure the amount of organic pollutants in water.

Biological Nutrient Removal - the removal of nutrients from a system under specific conditions by certain microscopic organisms.

Biological Reference - population level above which if harvest exceeded, the population will decline.

Biopesticide - biological substances (such as starch) that are used to destroy or control plant, fungus and insect pests.

Buffer - a strip of native plants, trees, and shrubs adjacent to water bodies.

Bulkhead - a wooden or metal retaining structure along a waterfront.

Catch And Effort - information which reveals the quantity of fish, crabs, or shellfish caught within a given time or number of individuals spent pursuing them.

Carrying Capacity - the population level above which the ability of a land or water resource to shoulder the needs of a given species cannot be met (e.g., humans, geese, etc.).

Chlorometer - Instrument that measures the amount of chlorophyll in a plant leaf to determine if it is photosynthesizing at peak rates.

Community Services - services provided by government such as police, fire, schools, water and sewer, etc.

Compact Development - buildings planned to minimize land consumption and maximize use.

Conservation Reserve Program (CRP) - a federal program that offers farmers annual payments up to $50,000 for 10-15 years to take cropland subject to excessive erosion out of production.

Conservation Reserve Enhancement Program (CREP) - a federal program that builds upon CRP practices of protecting sensitive lands by targeting funds to the enrollment of lands in specific states by providing higher incentive rates to landowners than CRP to establish riparian buffers, plant native vegetation and restore degraded wetlands.

Creel - the maximum number of fish allowed by law to be caught on a given day.

Easement - a contractual agreement between a property owner and another party whereby the property owner relinquishes his/her right, usually to build on the land, in exchange for monetary or tax compensation.

Estuary - a semi-enclosed coastal body of water where freshwater and saltwater mix.

Estuarine - of or having to do with an estuary.

Eutrophication - process of a body of water becoming degraded through excessive nutrient inputs.

Farming - the process of raising plants or animals; including row crops, aquaculture, live stock production, silviculture, etc.

Fecal Coliform Bacteria - an organism that is a normal part of the of the digestive system. The organism is used as an indicator of whether sewage (fecal matter from humans and animals) and associated pathogens have entered a water body.

Filter Feeder - aquatic organisms that strain the water in order to collect food particles.

Flushing - the movement of water in and out of an estuary.

Forest Character -the types of trees and shrub types found in a forest, their sizes, ages, and population densities.

Geographic Information Systems (GIS) - computer mapping tool capable of overlaying data for manipulation and display.

Geothermal - heat within the earth's interior that is a potential source of energy.

Global Positioning System (GPS) - a device which allows users to mark exact locations anywhere on the globe through the use of satellite data.

Groundtruth - verification of aerial data.

Groundwater - rainwater that has seeped through the ground and travels slowly under land and winds up in bays, streams or the ocean.

Grey Water - waste water from household use that does not contain any raw sewage (e.g., water from showering, washing dishes or doing laundry) and may be recycled/reused to conserve groundwater.

Green Building - building and development tools which strive to meet energy efficiency through the use of recycled building materials, renewable energy resources, and low-impact construction.

Greenway - contiguous stretch of farm or natural land, usually to benefit wildlife.

Habitat - the place in which a plant or animal normally lives.

Habitat Requirements for SAV - water quality and other conditions necessary to support growth of seagrasses.

Heavy Metals - a group of metals that are highly reactive (tend to bind with sediments and do not degrade). Such metals are toxic to life and continuously pose a threat because of resuspension.

Hydrocarbon - an organic compound often occurring in petroleum, natural gas, or coal.

Hydrologic - of or having to do with the properties or circulation of water on land, in groundwater or in the atmosphere.

Hydrodynamics - the study of the flow of water in a given system.

Hypoxic - water having little dissolved oxygen (< 3 mg/L).

Impervious Surface - any area that has been paved or altered in some way that does not allow water to seep through the ground (e.g., roads, buildings, sidewalks & driveways).

Indigenous - native.

Infrastructure - roads, schools, utilities, public facilities and other public services associated with development.

Integrated Pest Management (IPM) - the control of pests by biological (rather than chemical) means.

Invasive Species - plant or animal species whose growth or numbers become excessive and can hinder the functioning of an ecosystem.

Mitigation - an attempt to lessen impacts of development on natural resources. For example, new wetlands are constructed in place of those damaged during development.

Nationwide Permit - general permit on a nationwide basis for categories of activities deemed to be similar in nature, cause only minimal adverse environmental effects when performed separately, and have only minimal cumulative adverse effect on the environment.

Native Species - plants and animals naturally found in a particular region.

Nitrates - a form of the nutrient nitrogen that is readily absorbed by plants.

Non-point Source - a diffuse source of pollution coming from land (e.g., stormwater runoff and atmospheric deposition).

Nuisance Species - plants and animals having a negative impact on the natural environment.

Nutrients - essential chemicals needed by plants and animals for growth. Excessive amounts of nutrients can lead to degradation of water (see eutrophication).

Organic - any chemical compound that is based on carbon.

Passive Recreation - recreational activities, such as canoeing, hiking, hiking, or birdwatching, that has minimal impact on natural resources.

Pathogen - disease-causing micro-organisms including viruses, fungi and many bacteria.

Personal Water Craft - often called by the brand name, Jetski, a one-to-two-person, gas-powered vessel run by water propulsion.

Phytoplankton - microscopic plants in the water (e.g., algae).

Photosynthesis - the process by which plants use light energy for growth and the production of oxygen.

Point Source – direct source of pollution (e.g., waste water coming from a pipe or ditch)

Program Open Space - state program that buys land in order to help preserve open areas such as parks.

Prop Scarring - the destruction of seagrass beds or bay bottom due to linear cuts from boat propellers.

Purchase of Development Rights (PDR) - the monetary compensation of a property owner in exchange for keeping a given property development-free.

Retrofit - to furnish with new parts or equipment not available at the time of construction.

Riparian - the natural land area adjacent to a river, stream, lake, or bay.

Riprap - stones or rock used to armor shoreline.

Rural Legacy Program - a Maryland program which uses money to purchase easements or development rights in predetermined areas.

Sanctuary - place for protection.

Sea Level Rise - increasing ocean water volume due to melting glaciers from the earth's warming trends.

Shallow Draft Vessel - a boat with a hull designed to enter the water column at a shallower depth than boats of comparable size.

Shoal - shallow water; a sandbank or bar.

Shoreline Stabilization - the changing of natural shoreline, usually with riprap or bulk-heading, to prevent shoreline erosion.

Silviculture - the art and science of cutting forests to meet landowner monetary objectives.

Site Reclamation - to make a given waste area available for reuse.

Spartina - common saltmarsh grass.

Staging Area - land or water location where birds rest or feed during spring and fall migration.

Stormwater Runoff - water that moves across the surface of the land and empties into a body of water.

Submerged Aquatic Vegetation (SAV) - aquatic vascular plants; often referred to as seagrasses.

Subsidence - sinking land most often due to aquifer depletion.

Substrate - the base on which an organism lives; soil.

Subwatershed - a small watershed within a larger watershed (e.g., Assawoman Bay within the coastal bays watershed).

Sustainably - in a manner which ensures that land and water resources meet the demands of humans in the future.

Sustainable Yields - the ability to continue to sustain profitable harvests from the land or water (usually in reference to farming or fishing practices).

Surface Runoff - water that flows over the land surface.

Swale - a low-lying, often wet stretch of land.

Tidal Wetland - a land area which is wet throughout most of the year as the result of tidal influences.

Transfer Development Rights (TDR) - a property owner's giving up of development rights on a piece of land in exchange for compensation.

Translocation - change of location; moving.

Turbidity - a measure of the amount of material suspended in the water.

Variable Setback - a property boundary that changes with the landward migration of a water body.

Watershed - the area of land that drains into a specific body of water.

Well Head - the part of a well (e.g., drinking water well) that is visible at the surface of the land.

List of Acronyms

ACT	Assateague Coastal Trust
ACCSP	Atlantic Coastal Cooperative Statistics Program
ACOE	Army Corps of Engineers
AD	Atmospheric Deposition
AG	Agriculture
ANEP	Association of National Estuary Programs
APF	Adequate Public Facilities
ASIS	Assateague Island National Seashore
ASMFC	Atlantic States Marine Fisheries Commission
ASP	Assateague State Park
BER	Town of Berlin
BMP	Best Management Practice
BRD	Biological Resources Division
BZA	Board of Zoning Appeals
CBF	Chincoteague Bay Foundation
CCMP	Comprehensive Conservation and Management Plan
CFR	Code of Federal Regulations
COMAR	Code of Maryland Regulations
CRP	Conservation Reserve Program
CREP	Conservation Reserve Enhancement Program
CT	Chemical Contamination
CWA	Clean Water Act
CZM	Coastal Zone Management

DBED Department of Business and Economic Development

DHCD Department of Housing and Community Development

DIB Delaware Inland Bays

DMRs Discharge Monitoring Reports

DNR Department of Natural Resources

DO Dissolved Oxygen

DPI Delmarva Poultry Industry

EFH Essential Fish Habitat

EPA Environmental Protection Agency

ESA Endangered Species Act

EQIP Environmental Quality Incentives Program

FCA Forest Conservation Act

EEMA Federal Emergency Management Agency

FHO Forest Harvest Operation

FMP Fishery Management Plan

FSA Farm Service Agency

GIS Geographic Information System

GPS Global Positioning System

GW Groundwater

HM Harbors, Marinas and Related Facilities

IPM Integrated Pest Management

LESHC Lower Eastern Shore Heritage Committee

LOA Letter of Authorization

LSLT Lower Shore Land Trust

MACAC Mid-Atlantic Coastal Area Committee

MACS Maryland Agricultural Water Quality Cost-Share

MAFMC Mid-Atlantic Fishery Management Council

MCBP Maryland Coastal Bays Program

MCBF Maryland Coastal Bays Foundation, Inc.

MDA Maryland Department of Agriculture

MDE Maryland Department of the Environment

MDOT Maryland Department of Transportation

MEMA Maryland Emergency Management Administration

MES Maryland Environmental Service

MFA Maryland Forests Association

MFTF Maryland Forestry Task Force

MGS Maryland Geological Survey

MHT Maryland Historical Trust

MOU Memorandum of Understanding

MSSA Maryland Saltwater Sportfishing Association

ND Navigation and Dredging

NDAG Navigation and Dredging Advisory Group

NFIP National Flood Insurance Program

NMFS National Marine Fisheries Service

NOAA National Oceanic and Atmospheric Administration

NOS National Ocean Service

NPDES National Pollution Discharge Elimination System

NPS Non-point Source or National Park Service

NRCS	Natural Resources Conservation Service
NRP	Natural Resources Police
NWS	National Weather Service
OC	Town of Ocean City
OMWM	Open Marsh Water Management
OP	Maryland Office of Planning
OCWRS	Ocean City Water Resources Study
PDA	Public Drainage Association
PDR	Purchase of Developable Rights
PPI	Planning, Permits and Inspections (Worcester County)
PT	Point Source
PWC	Personal Water Craft
RFP	Requests for Proposals
RU	Recreational Use
SAV	Submerged Aquatic Vegetation
SCWQP	Soil Conservation and Water Quality Plans
SH	Town of Snow Hill
SHA	State Highway Administration
SIP	Stewardship Incentives Program
SRF	State Revolving Fund
SW	Stormwater
TBD	To Be Determined
TDR	Transferable Development Rights
TEAM	Teaching Environmental Awareness in Maryland

TES Threatened and Endangered Species

TRC Technical Review Committee (Worcester County)

UDEL University of Delaware

UMCE University of Maryland Cooperative Extension Service

UMD University of Maryland

USCG United States Coast Guard

USDA United States Department of Agriculture

USDOC United States Department of Commerce

USDOD United States Department of Defense

USDOI United States Department of the Interior

USDOI BRD United States Department of the Interior Biological Resource Division

USDOT United States Department of Transportation

USFWS United States Fish and Wildlife Service

USGS United States Geological Survey

VIMS Virginia Institute of Marine Science

WAS Waste Management Administration (MDE)

WC Worcester County or Water Clarity

WER Within Existing Resources

WHIP Wildlife Habitat Incentives Program

WMA Water Management Administration (MDE)

WQIA Water Quality Improvement Act

WRP Wetland Reserve Program

WSCD Worcester Soil Conservation District

WWTP Waste Water Treatment Plant