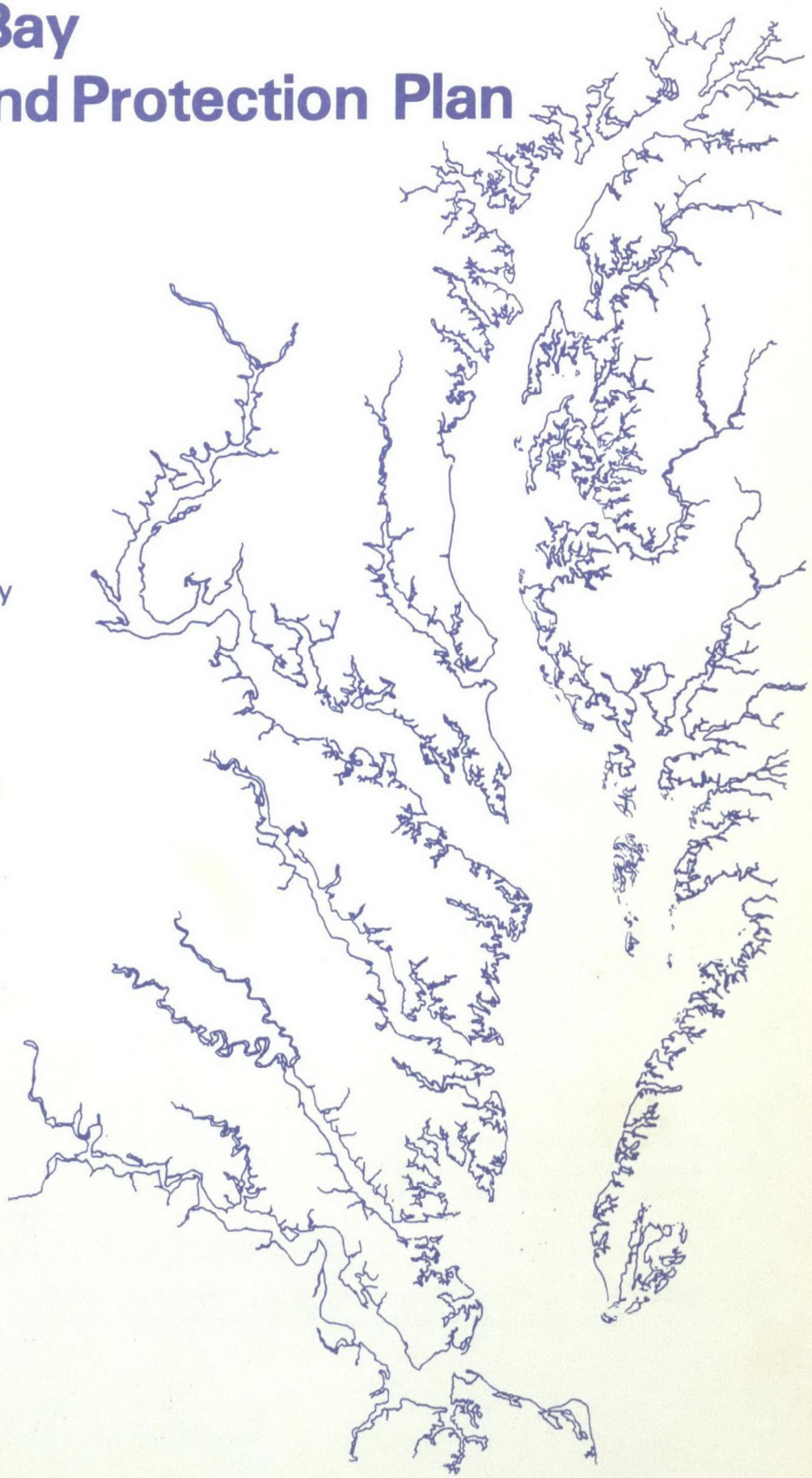
Chesapeake Executive Council

September 1985

Chesapeake Bay Restoration and Protection Plan



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Restoration and Protection Plan

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CONTENTS

FOREWARD

On December 9, 1983, history was made. On that day, the Commonwealths of Pennsylvania and Virginia, the State of Maryland, the District of Columbia, the Chesapeake Bay Commission, and the U.S. Environmental Protection Agency pledged to restore and protect the Chesapeake Bay. This precedent setting commitment, known as the Chesapeake Bay Agreement of 1983, called for the preparation and implementation of coordinated plans to improve and protect the water quality and the living resources of the Chesapeake Bay. The Chesapeake Bay Restoration and Protection Plan is the first iteration of the planning effort implemented in response to this commitment.

The Plan is structured to address the goals and objectives of the Chesapeake Bay restoration and protection effort. It has been formulated based on our present understanding of the causes of the decline in the Bay's health and productivity. Achieving the goals and objectives of the Plan will require the continued commitment of federal, state and local governments, private and public sector institutions, and, most importantly, the general public. Clearly, a genuinely concerned and well informed citizenry is the ultimate key to restoring and protecting the health of the Bay.

Overall, the Plan describes the federal and state strategies and programs which are to be implemented to meet the objectives and goals of the restoration and protection commitment.

Chapter I provides a look at the Bay's present status and describes some of what we know to be wrong with it. It also gives some of the history of the present effort to restore and protect the Bay.

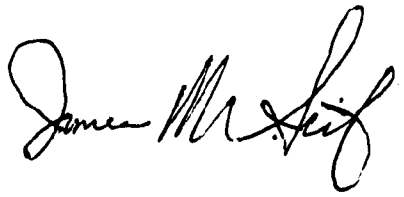
Chapter II states the goals, objectives, and strategies of federal and state government agencies. In many cases, these reflect on-going endeavors to upgrade water quality (such as sewage treatment); in other cases, they represent new initiatives (such as the implementation of agricultural best management practices). These goals, objectives, and strategies are specifically addressed to a variety of topical areas such as nutrients, toxics, living resources, and other related matters. Institutional arrangements designed to coordinate, evaluate, and oversee the restoration and protection effort are also outlined; as is the management support structure of the Chesapeake Bay Program. Appendices A through E provide a more detailed account of the implementation strategies listed under each objective in Chapter II.

Chapter III describes the problems and management strategies each state will use in approaching the restoration and protection of river basins encompassing Chesapeake Bay.

In Chapter IV we look ahead as though through the mist which, on occasion, shrouds the Bay. The steps described in the first chapters will continue to retard the decline of the Bay and its resources. This Chapter briefly outlines what we hope to achieve beyond a mere holding action. Work planned over the next several years will quantify and more precisely forecast what we must do to completely restore the Bay to a satisfactorily robust condition.

Many of the strategies and programs will help to achieve more than one goal and objective; the National Pollutant Discharge Elimination System Program, for example, controls for both nutrient and toxic discharges from both municipal waste treatment facilities and industrial point sources. The editors of the Plan have tried to demonstrate this by citing such multi-faceted implementation strategies under different objectives in Chapter II and/or making multiple citations to such programs in the Appendices.

Please join this effort. The Chesapeake Bay Restoration and Protection Plan is an inventory of the many federal and state government agency programs which have an impact on the water quality of the Chesapeake Bay. The integration of these is a major step in establishing a cooperative federal/state effort for comprehensive environmental management of the Bay. The Executive Council, its committees, and the general public will be involved in future efforts to expand and refine this Plan which will serve as an evolving blueprint for the restoration and protection of the Chesapeake Bay.



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ACKNOWLEDGEMENTS

This Chesapeake Bay Restoration and Protection Plan is the product of many contributing authors, editors and commentors. Credit must be given to the members of the Chesapeake Executive Council and Implementation Committee who were responsible for initiating the Plan and overseeing its development. The Citizens Advisory Committee and Scientific and Technical Advisory Committee members actively followed and helped steer its development. The Chesapeake Bay Liaison Office staff prepared and helped edit much of the document.

A special credit should be given to members of the Planning Subcommittee who had the major responsibility for this document.

Keith Buttleman, Commonwealth of Virginia, Chairman of the Planning Subcommittee
Louis Bercheni, Commonwealth of Pennsylvania
James Collier, District of Columbia
Kenneth McElroy, State of Maryland
Virginia Tippie, Chesapeake Bay Liaison Office

Special thanks are also due to Dr. Alvin R. Morris, Chairman of the Implementation Committee.

A Note on Pagination: The pagination of the Plan is arranged according to chapter, objective and page within the individual chapters. For example: "II.A.1.p.8" refers to the eighth page in Chapter II found under Nutrients (A) Objective #1; "A.3.MD.p.4" refers to Appendix A: Nutrients, Objective #3, of a State of Maryland implementation program found on page 4 of Appendix A. The Appendices correspond to the implementation strategies outlined in Chapter II.

CHESAPEAKE BAY RESTORATION AND PROTECTION PLAN

EXECUTIVE SUMMARY

> Improve and protect the water quality and living resources of the Chesapeake Bay estuarine system to restore and maintain the Bay's ecological integrity, productivity, and beneficial uses and to protect public health.

This is the consummate purpose of the Chesapeake Bay restoration and protection program. Achieving it will take time and the commitment of the federal, state and local governments, public and private entities, and citizens.

For several decades as population has been increasing, the water quality and living resources of the Bay have been declining. The evident degradation has led to a number of research and monitoring efforts by various governmental and private institutions to discover the causes.

The largest and most comprehensive of these was the five year study of the Chesapeake Bay conducted by the U.S. Environmental Protection Agency (EPA) in cooperation with other federal, state and private entities. The study findings and recommendations prompted action.

In 1983, the Environmental Protection Agency and the states in the basin formalized their commitment to restore and protect the living resources and environmental quality of the Chesapeake Bay in the Chesapeake Bay Agreement, which states:

> "We recognize that the findings of the Chesapeake Bay Program have shown a historical decline in the living resources of the Chesapeake Bay and that a cooperative approach is needed among the Environmental Protection Agency, the State of Maryland, the Commonwealths of Pennsylvania and Virginia, and the District of Columbia (the states) to fully address the extent, complexity and sources of pollutants entering the Bay. We further recognize that EPA and the states share the responsibility for management decisions and resources regarding the high priority issues of the Chesapeake Bay."

The parties to the Agreement called for the preparation and implementation of coordinated plans to improve and protect the water quality and living resources of the Chesapeake Bay. This Chesapeake Bay Restoration and Protection Plan is the first iteration in response to that charge. It documents the collective implementation activities of the federal and state agencies, party to the Agreement. The plan acknowledges the contributions of local governments, private and public sector groups and citizens and encourages consideration of the Baywide goals and objectives in conducting their programs.

The Plan is structured to address the goals and objectives of the Chesapeake Bay restoration and protection effort, formulated on present understandings about the causes of the decline in the Bay's health and productivity. Each implementation program addresses one, and often more than one, objective.

The Chesapeake Bay Study found that a combination of point and nonpoint sources of nutrients and toxics has degraded the quality of water in the Bay and its tributaries and has contributed largely to the decline in their living resources. Point sources are those which discharge through a pipe or ditch, such as municipal sewage treatment or industrial plants and animal feedlots. Nonpoint pollution is runoff from urbanized areas, construction, hydrologic modification, silviculture, abandoned mines, agriculture, irrigation return flows, waste disposal, and individual sewage disposal. The loss of submerged aquatic vegetation, mostly due to turbid waters and decreased sunlight, and the decline of oysters, freshwater spawning finfish, and benthic organisms are of major concern. The Plan describes the goals, objectives and strategies which focus on those concerns.

Because the Bay is a complex interactive ecosystem, actions taken in any part of the watershed may affect a downstream environment. It is, therefore, crucial to have a cooperative effort among the governing agencies of the area. Each state, party to the Chesapeake Bay Agreement, is implementing programs to meet the requirements of its own statutes and regulations and also is working with its neighboring states, the federal government, local governments and private entities to attain mutual benefits for the Bay. The state/federal institutional base prescribed in the Agreement is designed to forge cooperative efforts on the Bay. A Chesapeake Executive Council, composed of leaders of EPA and the key state cabinets, oversees the implementation of coordinated restoration and protection plans. The Citizens Advisory Committee provides independent advice to the Executive Council. An Implementation Committee guides and reports to the Council on state and federal program efforts. Advising the Implementation Committee is a Scientific and Technical Advisory Committee.

This institutional structure is a flexible, non-binding one; yet, it reflects the commitments of the parties to the Agreement to restore and protect the Bay. These federal and state parties have provided the political support and considerable financial backing for both site-specific, discrete state efforts and Baywide undertakings. A significant accomplishment of the participants in the Agreement has been to agree on an overall purpose for the restoration and protection plan, as well as goals and objectives for controlling nutrients and toxics, protecting and restoring the Bay's living resources, addressing other related matters, and supporting a cooperative approach in managing the Bay.

Nutrients

Goal: Reduce point and nonpoint source nutrient loadings to attain nutrient and dissolved oxygen concentrations necessary to support the living resources of the Bay.

Scientific studies have shown that excessive nutrient loadings produce high nutrient concentrations in the water column, resulting in an increase in the microscopic floating plants called algae. The increase of the algae prevents light from reaching the submerged grasses; and, as the algae decompose, they contribute to low oxygen conditions which, in turn, can be harmful to both finfish and shellfish. It appears that phosphorus controls the process in tidal-fresh areas such as the upper sections of the Bay and its tributaries, while nitrogen may be limiting in the more saline areas. It has been concluded

that reducing nutrient loadings to the Bay from point and nonpoint sources will reverse the Baywide trend toward nutrient enrichment and begin to restore the environmental quality of the Bay.

The Baywide objectives designed to reduce nutrient loadings are to:

Provide timely construction of public and private sewerage facilities to assure control of nutrient discharges;
Reduce the discharge of untreated or inadequately treated sewage into Bay waters from such sources as combined sewer overflows and leaking sewage systems;
Provide for adequate maintenance, operation and replacement of equipment at sewage treatment facilities;
Establish and enforce nutrient and conventional pollutant limitations to ensure compliance with water quality laws;
Reduce the levels of nutrients and other conventional pollutants in runoff from agricultural and forested lands;
Reduce the levels of nutrients and other conventional pollutants in urban runoff; and
Reduce pollutant discharges from recreational boats in shellfish growing areas and beach areas used for swimming.

Directed toward meeting these objectives are implementation programs that have existed for a number of years, such as sewage treatment plants, and relatively new programs, such as agricultural best management practices (BMPs.). EPA has provided considerable funding to state and local governments for construction, maintenance and improvements to sewage treatment facilities. This year approximately $84 million is being directed to the Bay area; the states also provide sizable contributions. New sewage treatment techniques for the removal of nutrients (phosphorus and nitrogen) are being tested and on-site sewage treatments and sewerage lines are being improved. States are stepping up their enforcement efforts to control point sources. As part of an agreement with EPA, the Department of Defense is enhancing its comprehensive National Pollution Abatement Program.

The states have accelerated and expanded their efforts to control nonpoint sources as a priority for solving the problem of nutrient enrichment in the Bay and its tributaries. Aided by agencies of the U.S. Department of Agriculture and approximately $10 million, state efforts to apply best management practices on farms in selected areas have increased dramatically. Stormwater management programs in urban and suburban areas are also being implemented to reduce nutrients associated with sediment from construction sites and streets and roads. State legislatures are appropriating about $14 million this year to control nonpoint source pollution.

The implementation programs address specific locations with their specific problems since the problems and their remedies vary from place to place. Collectively, these remedies will ameliorate the nutrient over-enrichment of the Bay and its tributaries.

TOXICS

Goal: Reduce or control point and nonpoint sources of toxic materials to attain or maintain levels of toxicants not harmful to humans or living resources of the Bay.

Research has shown a relationship between elevated levels of toxic compounds in the sediments and the survival and diversity of individual organisms necessary to have a balanced Bay ecology. In certain areas of the Bay, living resources are threatened by high levels of toxic substances. The major sources of the toxics are industrial facilities and sewage treatment plants. There are over 5,000 permitted dischargers in the Bay basin. For contaminants such as lead, zinc, and many of the organic compounds, urban runoff and atmospheric deposition are also important sources. Runoff containing pesticides from agricultural areas may also contribute to this degradation in some areas of the Bay. Future forecasts indicate that, unless the trend is halted, the sources of toxic substances will continue to grow in number and change in nature.

To achieve improvement, point and nonpoint sources of toxic materials which have been contaminating areas of the Bay need to be reduced, and care should be taken not to resuspend toxicants currently in the sediments. At the same time, degradation to uncontaminated areas must be prevented. The Chesapeake Executive Council, to control toxics, adopted six objectives. They are to:

Identify and control toxic discharges to the Bay system through implementation and enforcement of the states NPDES permit programs and other programs;
Reduce the discharge of metals and organics from sewage treatment plants resulting from industrial sources;
Reduce the discharge of metals and organics from industrial sources;
Reduce chlorine discharges to critical finfish and shellfish areas;
Reduce the levels of metals and organics in urban and agricultural runoff; and
Minimize water pollution incidents and provide adequate response to pollutant spills.

As part of the effort to attain the goal and objectives for reducing toxics, the states are implementing the National Pollutant Discharge Elimination System (NPDES) program by issuing permits for municipal and industrial point sources, monitoring for compliance, and taking enforcement action, as needed. States are, or will be, requiring toxics limitations and are, or will be, enforcing best available technology (BAT) and water quality-based effluent limitations, where needed. Efforts are underway to encourage pretreatment of effluents from industrial sources and to reduce chlorine discharged from municipal sewage treatment plants. To reduce toxics from runoff, stormwater management programs are aimed at developing areas, with some demonstration projects being initiated; pesticide education programs are being established as part of the nonpoint source control effort on agricultural and suburban lands. While the federal and state governments collaborate on all of these endeavors, this cooperative effort is heightened during emergencies, such as oil spills.

Because of the many uncertainties involved in identifying the toxic substances, their sources and effects, considerable monitoring and research efforts are being conducted by several federal agencies and the states to better characterize these substances and their fate. Results of these efforts will guide development of future programs.

Living Resources

Goal: Provide for the restoration and protection of the living resources, their habitats and ecological relationships.

The decline in the living resources of the Bay can be attributed to several factors including pollution, physical loss of habitats, overfishing and major climatic events. The observed relationships among nutrients and toxicants and living resources provide compelling evidence that water and sediment pollution threatens important living resources.

To attain the goal for living resources, the following objectives were established:

Develop or enhance state fisheries management programs to protect the finfish and shellfish stocks of the Bay;
Provide for the restoration of finfish stocks in the Bay, especially the abundance and diversity of freshwater and estuarine spawners;
Provide for the restoration of shellfish stocks in the Bay, especially the abundance of commercially important species;
Restore, enhance and protect waterfowl and wildlife;
Restore, enhance and protect desirable species of submerged aquatic vegetation;
Protect and enhance, and restore where possible wetlands, coastal sand dunes, and other important shoreline and riverine systems;
Conserve soil resources and reduce erosion and sedimentation to protect Bay habitats; and
Maintain freshwater flow regimes necessary to sustain estuarine habitats.

The National Oceanic and Atmospheric Administration (NOAA), Fish and Wildlife Service (FWS), Department of Defense (DOD), Corps of Engineers (COE), Soil Conservation Service (SCS), Environmental Protection Agency (EPA), and U.S. Geological Survey (USGS) are working cooperatively with states and local entities, performing data management, monitoring and research projects around the Bay. At least $1.5 million is spent annually to regulate the fisheries industry, assess and enhance fish stock, and ensure that habitats, such as wetlands, are protected.

In addition to developing comprehensive fisheries management programs, states are replenishing fin and shellfish stocks, building hatcheries and fishways, and "planting" shellfish. In FY 86 alone, the states will spend about $14 million on these efforts. Furthermore, a number of state programs are controlling shoreline erosion, protecting wetlands, and re-establishing submerged aquatic grasses. Approximately $12 million to restore and protect habitats will be expended by states in FY 86.

These efforts, combined with accelerated and expanded programs to reduce nutrients and toxics entering the Bay system, are expected to produce significant improvements.

RELATED MATTERS

Goal: Develop and manage related environmental programs with a concern for their impact on the Bay.

It has become increasingly apparent that "cross-media" environmental pollution is a serious problem. Air deposition, leachate from waste dumps, residuals from industries and sewage treatment plants, and contaminated spoil from dredged areas are now recognized contributors to Bay pollution. An integrated approach to environmental problem solving has been acknowledged in the formulation of the following objectives:

Manage sewage sludge, dredged spoil and hazardous wastes to protect the Bay system;
Manage groundwater to protect the water quality of the Bay;
Consider and address the impacts of atmospheric deposition on the Bay system;
Improve and maintain public access to the Bay including public beaches, parks and forested lands; and
Improve opportunities for recreational and commercial fishing.

To address these concerns EPA and other federal agencies are administering major environmental laws. The states are routinely managing their environmental problems, implementing federal programs and their own laws and regulations.

Further, the states are actively improving access for people to enjoy the benefits of the Bay and its tributaries---swimming, boating and fishing.

INSTITUTIONAL/MANAGEMENT

Goal: Support and enhance a cooperative approach toward Bay management at all levels of government.

The Chesapeake Executive Council and many federal, state, regional, and local public and private entities are already working in support of this goal. Voluntary as well as mandatory programs are being expanded to meet the following Baywide objectives:

Adequately coordinate Bay management activities and develop and maintain good mechanisms for accountability;
Assure a continuing process of public input and participation;
Enhance Bay-oriented education opportunities to increase public awareness and understanding of the Bay system;
Track and evaluate all activities which may impact estuarine water quality and resources;
Develop a coordinated Chesapeake Bay data management system;
Implement a coordinated Baywide monitoring program; and
Implement a coordinated Baywide research program.

Each state and federal agency is working within its own requirements and is cooperating in the Baywide effort, as well. States are evaluating their initiatives on an annual or biennial basis. The agencies are committed to expanding public participation and education programs. Major new educational efforts are involving farmers in the application of best management practices to reduce soil erosion, with its accompanying nutrients and toxicants.

To support efforts to plan for, manage, track and evaluate these programs, approximately $18.5 million is provided by EPA alone. Federal and state agencies continually are collecting and analyzing data to measure results so they can determine if remedial programs are meeting their own objectives and those established Baywide.

Measuring progress in the longer-term are comprehensive monitoring, research, modeling, and data management strategies. To help tie pollutant loadings to effects on water quality and living resources, about $5 million is being spent by federal and state governments annually on monitoring. Another $5 million is supporting research each year to better define present problems and avoid new ones.

As these activities reveal more information and current initiatives are evaluated, we will be better able to predict results and therefore better manage the restoration and protection of the Bay. Then, more streamlined, numerical objectives will be crafted and implementation programs will be reviewed and modified, as needed.

The Chesapeake Bay Restoration and Protection Plan demonstrates that action to clean up the Bay has begun. The states and federal government are using the Plan as a tool for defining and shaping both short-term and long-term commitments. These commitments are crucial if we are to renew and restore this national treasure---the Chesapeake Bay.

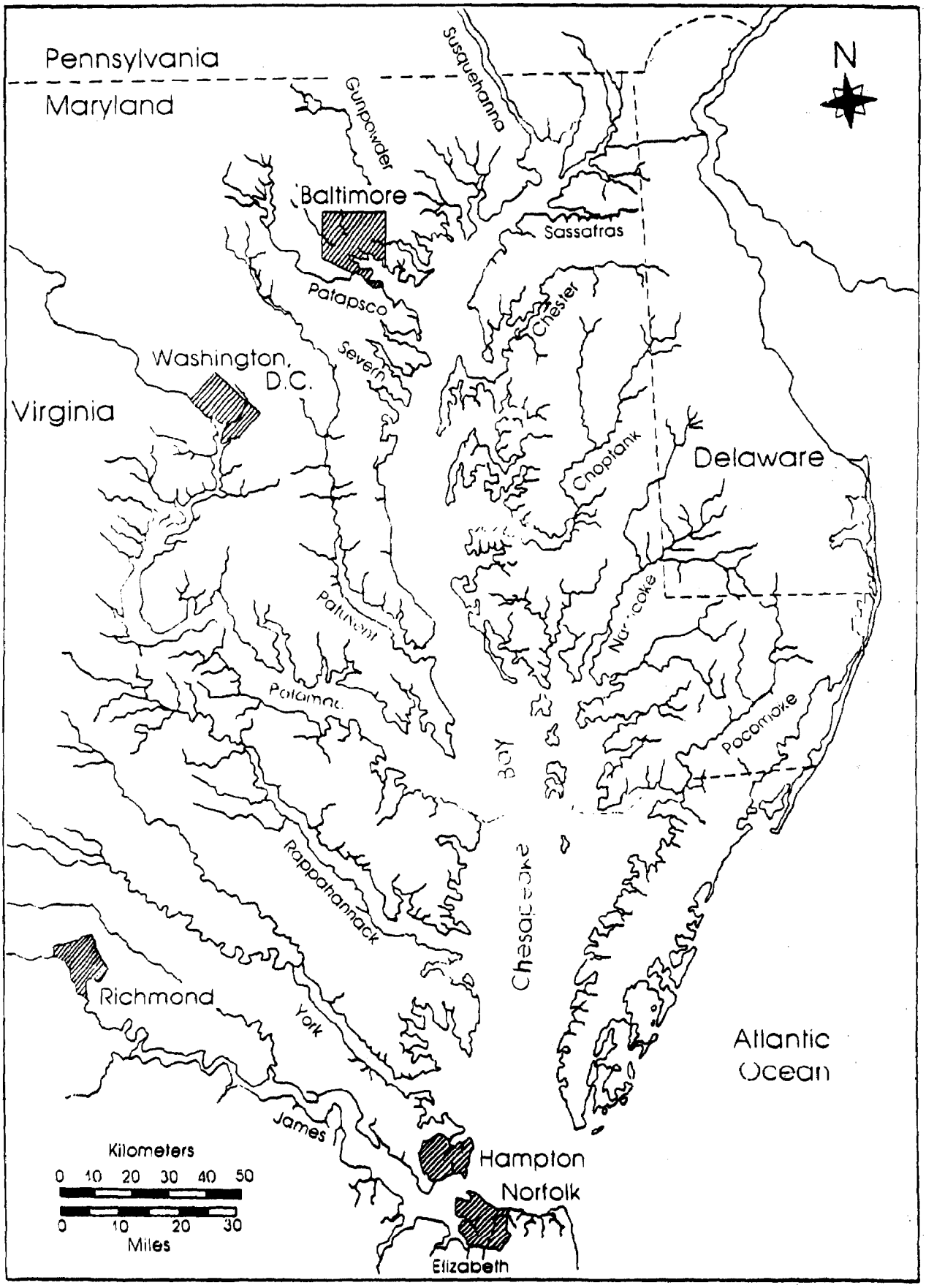


FIGURE I-1. The Chesapeake Bay.

CHAPTER I - AN OVERVIEW

INTRODUCTION

The Chesapeake Bay is the nation's largest estuary and one of its most valuable natural resources. Located in the mid-Atlantic region within Maryland and Virginia, its mainstem is over 195 miles (314 km) long and 3.4 to 35 miles (5.5 to 56 km) wide. Because the Bay drains 64,000 square miles (165,760 km^2) and has over 150 rivers, creeks and streams flowing through portions of six states and the District of Columbia, a regional approach to its environmental management is essential.

Renowned for its bounty, the Bay provides an abundant fishery and wildlife habitat of national importance; its fishery harvests are exceeded only by those of the Atlantic and Pacific oceans. This extensive finfish and shellfish harvest represents an annual commercial value of approximately one billion dollars. In addition to the riches from its waters, the extensive 7,000 miles (11,270 km) of shoreline and wetlands provide a home for countless animals and plants, and are a major stop along the Atlantic Migratory Bird Flyway. The Chesapeake undoubtedly supports a fisheries and wildlife population unmatched by any other estuary.

As an important regional economic resource, the Bay has for centuries supported a wide range of human activities. It is a major commercial shipping center with two major port complexes connected by extensive transportation networks to inland areas. This network has encouraged the development of commercial activities in the region such as fishing, shipbuilding, agriculture, steel-making, paper manufacturing, and chemical production. These activities have attracted more people to the area as residents and tourists who, in turn, support the Bay's recreational industries. Boating, sportfishing, and hunting are just a few of the recreational activities available to shoreline residents and millions of visitors.

Recent studies have shown, however, that the cumulative effects of these activities have resulted in a decline in the living resources of the Bay. It is expected that the increasing population and continued development of the Bay area will cause even greater damage to the Bay's living resources. In response to this growing threat, the federal government and the states of the Chesapeake Bay region have pledged to restore and protect the Chesapeake Bay and its living resources. This commitment to restore and protect the living resources and environmental quality of the Chesapeake Bay was formalized in the Chesapeake Bay Agreement of 1983 which states:

> "We recognize that the findings of the Chesapeake Bay Program have shown a historical decline in the living resources of the Chesapeake Bay and that a cooperative approach is needed among the Environmental Protection Agency, the State of Maryland, the Commonwealths of Pennsylvania and Virginia, and the District of Columbia (the states) to fully address the extent, complexity and

sources of pollutants entering the Bay. We further recognize that EPA and the states share the responsibility for management decisions and resources regarding the high priority issues of the Chesapeake Bay."

This Plan provides the framework for an integrated and comprehensive federal/state effort to restore and protect the Bay. The purpose, goals, and objectives of this effort are described in Chapter II.

BAY TRENDS AND PROBLEMS

In 1975, the U.S. Congress authorized the U.S. Environmental Protection Agency to conduct a major study of the Bay's water quality and living resources. The EPA Chesapeake Bay Program identified or confirmed a number of environmental problems which represent a threat to the health and productivity of this estuary. In addition, the Corps of Engineers conducted a major study of the potential future degradation of the Bay due to land use changes and hydrological modifications within the watershed. The study identified the major areas of concern: nutrients, toxics, and living resources. In turn, the Chesapeake Executive Council, through the Chesapeake Bay Restoration and Protection Plan process, adopted goals and objectives to address these areas of concern. The states (including the District of Columbia) and federal government are focusing their existing programs and initiating new efforts to meet these goals and objectives.

A. NUTRIENTS

Increasing levels of nutrients are entering the Bay system, both from point sources (primarily sewage treatment facilities) and nonpoint sources (agricultural lands, and in some places inflows from urbanized areas). Population growth within the basin, as well as changing farming practices, are contributing to eutrophication of the Bay. It is predicted that by the year 2000, phosphorus loads will increase 43% and nitrogen loads will increase 7% given 1980 treatment levels.

Elevated nutrients have resulted in increasing frequency of phytoplankton blooms, particularly in the Upper Bay and upper reaches of major tributaries. Increased algal density and increased sediment loads delivered to the Bay have reduced water clarity in many areas of the Bay.

The estimated volume of water experiencing reduced oxygen levels in summer months has increased significantly in the last thirty years. In addition, the duration of this hypoxia has increased, typically lasting from May through September. Increased organic loading resulting from eutrophication appears to be the primary cause. To address these problems, efforts to reduce phosphorus loadings at sewage treatment plants in the upper Bay are under way. Nutrient loadings from agricultural runoff into the Susquehanna, York and Rappahannock rivers are being reduced while nutrient loadings from industry and sewage treatment plants in the Susquehanna, West Chesapeake, Patuxent, and James rivers are being cut back.

While the nutrient reductions from nonpoint sources cannot be quantified at this time, it is evident that recent point source control efforts have resulted in significant reductions of phosphorus loadings in the West Chesapeake, Patuxent and Potomac rivers. It appears, also, that further reductions will be achieved through agricultural best management practices. Many questions still remain, however, to determine precisely what reductions are needed to protect water quality and living resources.

B. TOXICS

Elevated levels of heavy metals and toxic organic compounds have been found in Bay water and sediments. The highest concentrations occur near urban or industrialized areas and in the upper Bay. These toxicants come both from point sources (primarily industrial and municipal facilities) and from nonpoint sources (including urban, suburban and agricultural runoff, and from atmospheric deposition). It is predicted that these levels will continue to increase in the future due to increasing population pressures.

The reduced diversity and abundance of benthic organisms can be related to the toxic contamination of the sediments in the more heavily affected areas. Recent work has also found tissue abnormalities in finfish from two Bay tributaries with high levels of sediment toxicity. In some areas, organisms are bioconcentrating significant levels of metals or organic chemicals.

Both point and nonpoint source controls are needed to abate toxic substances pollution to improve water quality and provide a healthy environment for the Bay's living resources. Through the current National Pollutant Discharge Elimination System (NPDES) programs and stepped-up enforcement efforts, pretreatment programs, and dechlorinization at sewage treatment plants, significant reductions are expected in some rivers. Additional monitoring will help determine exactly which substances need special controls and at which locations. Nonpoint sources control programs are also being implemented which will reduce toxics from urban areas and from farm uses. Because of the many uncertainties with respect to toxics, new research and data gathering are continuing priorities of the federal and state governments.

C. LIVING RESOURCES

Habitat degradation, either through physical modification or reduction in water or sediment quality, has occurred for several economically important Bay species. Freshwater spawning finfish and those organisms (such as oysters) which inhabit areas with anoxic bottom waters are especially harmed. Areas used as nursery grounds by other species have also been affected by declining habitat quality.

Landings of freshwater-spawning finfish have decreased in recent years; successful spawning of these species has also been poor in most of the study areas. Similarly, landings of oysters have declined, and spatset has been reduced significantly, particularly in the upper Bay, western shore tributaries, and some eastern shore rivers.

The recent loss of submerged aquatic vegetation (SAV) is unprecedented in the Bay's history. Increased turbidity and decreased sunlight in the past 20 years is a major reason for the decline in SAV. There is also some evidence that, in local areas close to sources, herbicides may have an adverse impact on the plants.

Still another problem is the reduction of the volume of freshwater flowing into the Bay due to increased individual and industrial consumption. This reduction could adversely affect a number of living resources, especially those species which spawn or live in freshwater, or are vulnerable to higher salinity predators and parasites.

To begin to solve the problem of restoring the Bay's living resources, the states have management plans for fire and shellfish and are restocking fish and oysters. Over 50 acres of submerged grasses are being planted in rivers.

Still, the cause and effect relationships have not been definitely established, even though it is apparent that the Bay's environmental quality has been seriously harmed by human activities. State and federal governments are now committed to addressing the known effects of these activities on water quality. Chapter II describes in specific terms the goals, objectives, and strategies which have been developed to restore and protect the Bay's health and productivity. Monitoring and research efforts continue, however, so that we can better understand and respond to problems which affect the Chesapeake Bay.

POLLUTION SOURCES AND CONTROL PROGRAMS

Increased pollution from human activities has caused the deterioration of the Bay's water and sediment quality, which in turn has affected the Bay's living resources. The major Bay pollutants - nutrients, sediments and toxics materials - come from point and nonpoint sources throughout the Bay watershed. Achieving the necessary reductions in pollutants from point and nonpoint sources will require the implementation of a variety of pollution control strategies.

Point sources of pollution generally are described as those which discharge effluents into a waterbody through a discrete pipe or ditch. Examples include municipal sewage treatment plant discharges, combined sewer overflows and industrial discharges (including large animal feedlot flows and active mines). Over 5,000 point sources discharge nutrients and toxics to the creeks and tributaries that flow into the Chesapeake Bay. The Chesapeake Bay Program watershed model estimates that 61% of the phosphorus and 33% of the nitrogen delivered to the Bay system comes from point sources. Strategies for controlling polluting point sources include developing new initiatives and continuing existing programs such as NPDES, which was established by the Clean Water Act and whose permitting and enforcement regulations are used to control discharges of nutrients and toxics from all point sources.

Nonpoint source pollution is generally carried over or through soil and groundcover via rainfall and snowmelt. Unlike discrete and readily identifiable point sources, nonpoint sources (NPS) are extremely diffuse, can come from any land area or from the air, and are difficult to quantify and trace. EPA defines NPS as the effects of runoff from urbanized areas, construction, hydrologic modification, silviculture, abandoned mines, agriculture, irrigation return flows, waste disposal, and individual sewage disposal. In the Chesapeake Bay watershed, the principal source of nonpoint source pollution is runoff from agricultural, suburban, and urban lands. The Chesapeake watershed model estimates that 39% of the phosphorus and 67% of the nitrogen delivered to the Bay system comes from nonpoint sources. Strategies for controlling pollution from nonpoint sources also include a mix of existing and new programs. To control agricultural and urban runoff, regulatory programs, educational efforts, technical assistance, and cost-share programs are being implemented; additional personnel are being hired. New programs are underway to address leaking underground storage tanks and spills. Other nonpoint sources such as atmospheric deposition, acid mine drainage, hazardous waste sites, as well as problems such as contaminated groundwater need further study so that programs may be developed to address any problems and their impacts on the Bay.

BAY MANAGEMENT AND PROGRAM IMPLEMENTATION

The Chesapeake Bay Agreement of 1983 recognized the need for a regional management structure to support and enhance a regional cooperative approach for the environmental management of the Bay. Toward this end, the Agreement established an Executive Council, an Implementation Committee, and a Chesapeake Bay Liaison Office. This regional management structure was instituted in 1984, and the restoration and protection program was begun. Figure 2 outlines this management structure. Appendix E further describes these management and institutional arrangements. These management organizations, their members, and their roles and responsibilities are:

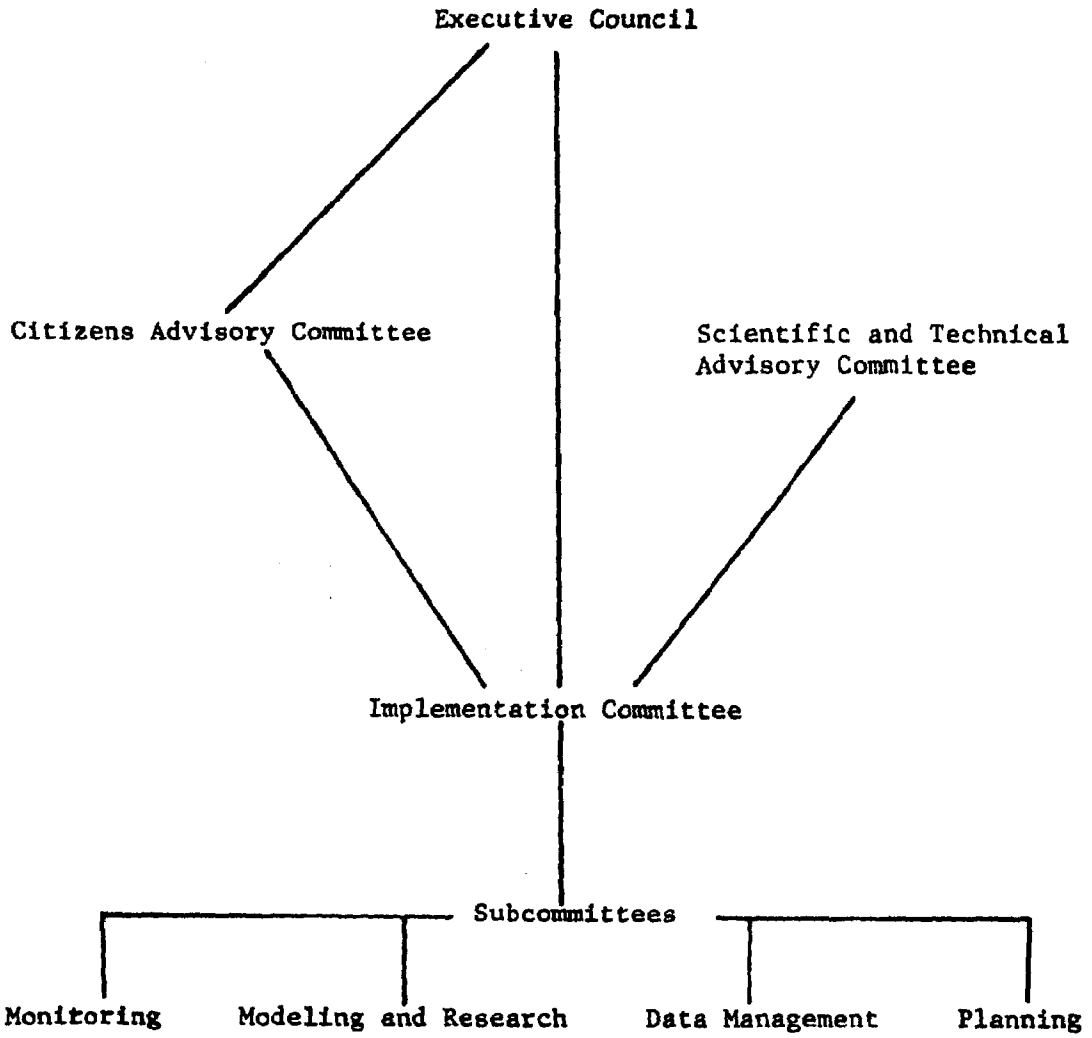
Executive Council

- meets at least twice a year to assess and oversee the implementation of coordinated plans to improve and protect the water quality and living resources of the Chesapeake Bay estuarine system;
- members are the designated representatives of the EPA Administrator and state governors; these are:

U.S. Environmental Protection Agency
Regional Administrator
Region III

Commonwealth of Pennsylvania:
Secretary of Agriculture
Secretary of Environmental Resources

State of Maryland:
Secretary of Health and Mental Hygiene
Secretary of Natural Resources



Chesapeake Bay Liaison Office

Figure I-2 The Chesapeake Bay Management Structure

Commonwealth of Virginia:
Secretary of Commerce and Resources
Secretary of Human Resources

District of Columbia:
Director of Consumer and Regulatory Affairs
Director of Public Works

In 1984, the Council recommended new programs and funding allocations, and also established a Citizens Advisory Committee; a Scientific and Technical Advisory Committee is to provide guidance to the Implementation Committee.

Implementation Committee

- meets at least 8 times a year to implement Executive Council guidance and programs;
- members represent federal and state agencies with water quality and/or living resources responsibilities, and are appointed by the Executive Council.

In 1984, the Implementation Committee identified major issues of potential concern, recommended appropriate distribution of FY 84 and FY 85 Chesapeake Bay Program implementation funds, and drafted a 1984 Chesapeake Bay Plan. The Committee also established subcommittees for Planning, Monitoring, Modeling and Research, and Data Management, and acted on recommendations of the subcommittees in conformity with Executive Council Policy Guidance.

Chesapeake Bay Liaison Office - Annapolis, Maryland

- advises and supports the Executive Council, the Implementation Committee, and the subcommittees;
- supports the coordination of Bay initiatives;
- staff is primarily from EPA, although other agencies have provided support.

In 1984, the office initiated and funded planning, monitoring, research, modeling, data management, and public information efforts, and also administered EPA state assistance grants for implementing demonstration projects. At the federal level, the Liaison Office established Memoranda of Understanding (MOUs) with the other federal agencies involved in Bay activities including the Army Corps of Engineers, Fish and Wildlife Service, National Oceanic and Atmospheric Administration, Soil Conservation Service, and the U.S. Geological Survey. These MOUs will assure coordination of federal activities in the Bay.

During the past 7 months, the management organizations set into motion the drafting of the Chesapeake Bay Restoration & Protection Plan. A Planning Sub-Committee, to draft this first annual Plan, was appointed by the Implementation Committee. In this first Plan, a number of accomplishments should be noted:

- The federal and state parties agreed upon a set of Baywide goals and objectives;

- The actions underway and proposed to address the goals and objectives are catalogued here in one document;

- The actions herein represent the state and federal governments as individual entities, as well as in concert within specific river basins;

- The state activities reflect all of the state agencies' contributions to the Bay effort, and the initiatives supported and funded by their legislative bodies;

- The Plan allows for comparison among agencies and encourages an exchange of views among those agencies and others;

- It emphasizes gaps in data and future research needs; and

- Finally, the Plan helps to point out the strengths and weaknesses of the specific planned actions and determine whether collectively the activities will meet the Baywide goals and objectives. Thus, it helps to define a longer-term planning process and strategy to improve the Bay.

In addition to establishing regional management and institutional mechanisms, the states and federal government have also made substantial financial commitments to the restoration and protection of the Chesapeake Bay. In 1984, the state legislatures and the U.S. Congress authorized new expenditures in support of the Chesapeake Bay cleanup effort totaling approximately $60 million. These financial commitments were in addition to ongoing program obligations such as the EPA's Construction Grants Program which had allocated approximately $186 million annually to the Bay area for the construction of sewage treatment plants. The following chapters and appendices of this Plan describe how these and new federal and state initiatives are to be employed in the Chesapeake Bay area. Funding projections, where possible, are stated for the next three fiscal years. Some of these figures represent "carry-over" funds; some are based on allocations from previous years; Virginia's are based on a biennial cycle. Future appropriations cannot be stated with certainty at this time.

Cleaning up and restoring the Chesapeake Bay requires the commitment of local governmental units as well as the state and federal agencies. Agricultural runoff controls and best management practices are generally implemented in local conservation districts; stormwater runoff from city streets and construction sites is the responsibility of city and county governments; zoning restrictions, sewage treatment operations and buffer strip maintenance programs are conducted at the local level. While this plan recognizes the vital role played by the local jurisdictions, public and private sector groups and the general public, it does not elaborate on their considerable financial contributions nor the time they have contributed as part of the Bay effort.

The next chapter of this report outlines the goals and objectives which the parties comprising the Executive Council have adopted to address the restoration and protection needs. For each objective, each party has also listed its related implementation strategies. The strategies, or implementation programs, are more fully detailed in the appendices.

CHAPTER II - GOALS, OBJECTIVES AND STRATEGIES

INTRODUCTION

Chapter II is organized according to goals, objectives, and strategies (or implementation programs); this framework demonstrates the recognition that strategies should be implemented to meet specific, concrete objectives which have been set as the means toward achieving the general goals of this Plan. Each implementation program strategy listed in the tables of this chapter is described in detail in a corresponding appendix. For example, if the reader is interested in the specific program being implemented in Pennsylvania to support the goal for Nutrients (A), Objective 5 (reducing agricultural runoff) on p. 13 of Chapter II, the reader would refer to Appendix A.5. and locate the pages of interest under PA. The statement of purpose provides the rationale for the activities identified in the implementation strategies.

PURPOSE AND GOALS

PURPOSE

Improve and protect the water quality and living resources of the Chesapeake Bay estuarine system to restore and maintain the Bay's ecological integrity, productivity, and beneficial uses and to protect public health.

GOALS

A. NUTRIENTS

Reduce point and nonpoint source nutrient loadings to attain nutrient and dissolved oxygen concentrations necessary to support the living resources of the Bay.

B. TOXICS

Reduce or control point and nonpoint sources of toxic materials to attain or maintain levels of toxicants not harmful to humans or living resources of the Bay.

C. LIVING RESOURCES

Provide for the restoration and protection of the living resources, their habitats, and ecological relationships.

D. RELATED MATTERS

Develop and manage related environmental programs with a concern for their impact on the Bay.

E. INSTITUTIONAL/MANAGEMENT

Support and enhance a cooperative approach toward Bay management at all levels of government.

A. NUTRIENTS

GOAL

Reduce point and nonpoint source nutrient loadings to attain nutrient and dissolved oxygen concentrations necessary to support the living resources of the Bay.

BAYWIDE OBJECTIVES

1. Provide timely construction of public and private sewerage facilities to assure control of nutrient discharges.

2. Reduce the discharge of untreated or inadequately treated sewage into Bay waters from such sources as combined sewer overflows and leaking sewage systems.

3. Provide for adequate maintenance, operation and replacement of equipment at sewage treatment facilities.

4. Establish and enforce nutrient and conventional pollutant limitations to ensure compliance with water quality laws.

5. Reduce the levels of nutrients and other conventional pollutants in runoff from agricultural and forested lands.

6. Reduce the levels of nutrients and other conventional pollutants in urban runoff.

7. Reduce pollutant discharges from recreational boats in shellfish growing areas and beach areas used for swimming.

B. TOXICS

GOAL

Reduce or control point and nonpoint sources of toxic materials to attain or maintain levels of toxicants not harmful to humans or living resources of the Bay.

BAYWIDE OBJECTIVES

1. Identify and control toxic discharges to the Bay system through implementation and enforcement of the states NPDES permit programs and other programs.

2. Reduce the discharge of metals and organics from sewage treatment plants resulting from industrial sources.

3. Reduce the discharge of metals and organics from industrial sources.

4. Reduce chlorine discharges to critical finfish and shellfish areas.

5. Reduce the levels of metals and organics in urban and agricultural runoff.

6. Minimize water pollution incidents and provide adequate response to pollutant spills.

C. LIVING RESOURCES

GOAL

Provide for the restoration and protection of the living resources, their habitats and ecological relationships.

BAYWIDE OBJECTIVES

1. Develop or enhance state fisheries management programs to protect the finfish and shellfish stocks of the Bay.

2. Provide for the restoration of finfish stocks in the Bay, especially the abundance and diversity of freshwater and estuarine spawners.

3. Provide for the restoration of shellfish stocks in the Bay, especially the abundance of commercially important species.

4. Restore, enhance and protect waterfowl and wildlife.

5. Restore, enhance and protect desirable species of submerged aquatic vegetation.

6. Protect and enhance, and restore where possible wetlands, coastal sand dunes, and other important shoreline and riverine systems.

7. Conserve soil resources and reduce erosion and sedimentation to protect Bay habitats.

8. Maintain freshwater flow regimes necessary to sustain estuarine habitats.

D. RELATED MATTERS

GOAL

Develop and manage related environmental programs with a concern for their impact on the Bay.

BAYWIDE OBJECTIVES

1. Manage sewage sludge, dredged spoil and hazardous wastes to protect the Bay system.

2. Manage groundwater to protect the water quality of the Bay.

3. Consider and address the impacts of atmospheric deposition on the Bay system.

4. Improve and maintain public access to the Bay including public beaches, parks and forested lands.

5. Improve opportunities for recreational and commercial fishing.

E. INSTITUTIONAL/MANAGEMENT

GOAL

Support and enhance a cooperative approach toward Bay management at all levels of government.

BAYWIDE OBJECTIVES

1. Adequately coordinate Bay management activities and develop and maintain good mechanisms for accountability.

2. Assure a continuing process of public input and participation.

3. Enhance Bay-oriented education opportunities to increase public awareness and understanding of the Bay system.

4. Track and evaluate all activities which may impact estuarine water quality and resources.

5. Develop a coordinated Chesapeake Bay data management system.

6. Implement a coordinated Baywide monitoring program.

7. Implement a coordinated Baywide research program.

Goal: Reduce point and nonpoint source nutrient loadings to attain nutrient and dissolved oxygen concentration necessary to support the living resources of the Bay.

Objective 1: Provide timely construction of public and private sewage facilities to ensure control of nutrient discharges.

Federal	Pennsylvania	Maryland	Virginia	District of Columbia
EPA: Provide grants for eligible costs to plan, design, and construct municipal sewage treatment systems (CWA Sec. 201); Support phosphorus removal demonstration projects and evaluation. COE - Continue Department of Army pollution abatement program of construction of new wastewater facilities.	Implement revised Water Quality Standards to continue to regulate phosphorus discharges within the Susquehanna River Basin (particularly within the lower basin). Provide construction grants for POTWs in accordance with EPA-approved project priority list; continue to make full use of federal grant funds earmarked for development and implementation of innovative/alternative sewage treatment technology.	Implement Upper Bay Phosphorus Removal Policy Construct and have operational phosphorus removal facilities by July 1, 1988, except for Back River which will take longer. Increase state share of federally eligible treatment works construction by local government to offset decreases in federal grant assistance. Make loans to local governments to finance the local share of sewerage construction costs.	Implement pilot projects for phosphorus removal Continue implementation and re-evaluation of Potomac Embayment Standards Provide state grants for construction of POTWs. Provide water and sewer funding assistance (loans).	Continue implementation of the Potomac Strategy to control eutrophication of the Potomac Estuary. Implement water quality related facility improvements at the Blue Plains WWTP as recommended in the Blue Plains Feasibility Study.

Goal: A

Objective 1: (continued)

Federal	Pennsylvania	Maryland	Virginia	District of Columbia
	Continue to implement the Comprehensive Water Quality Management Plans for Upper, Central, and Lower Susquehanna Basin Areas. Continue to implement the State's Municipal Waste Load Management Program.	Monitor nitrogen removal results in the Patuxent estuary and consider advisability of requiring nitrogen removal at other plants.		

Goal: A

Objective 2: Reduce the discharge of untreated or inadequately treated sewage into Bay waters from such sources as combined sewer overflows and leaking sewage systems.

Federal	Pennsylvania	Maryland	Virginia	District of Columbia
EPA: Provide grants for correction of infiltration and inflow (CWA Sec. 201);	Continue to implement Pennsylvania's Sewage Facilities Act to identify municipal sewerage needs and to regulate on-lot sewage disposal.	Improve enforcement of overflows/spills and raw sewage discharges.	Provide grants to localities for improvement of sewer line infiltration and inflow problems.	Implement Combined Sewer Overflow Abatement Program.
Authorize funds for correction of Combined Sewer Overflow discharges into marine bays and estuaries (CWA Sec. 201).	Continue to evaluate effectiveness of state-funded Marsh-Pond-Meadow demonstration project at Iselin (Young Township, Indiana County) as a low cost, alternative treatment process; provide for technology transfer of data and site visits for municipal officials, consulting engineers, and other interested parties.	Evaluate and foster opportunities to use innovative and alternative onsite technologies. Provide State financial assistance for special types of projects such as house connectors and collector sewers to service areas with failing septic systems.		Construct separate storm sewers as a part of development projects to direct storm flows away from the District's sanitary sewer system.

Goal: A

Objective 3: Provide for adequate maintenance, operation, and replacement of equipment at sewage treatment facilities.

Federal	Pennsylvania	Maryland	Virginia	District of Columbia
EPA - Provide grants for technical assistance to improve the operation of sewage treatment plants (CWA Sections 109(a) and 104(g)). COE - Continue upgrading of existing wastewater treatment facilities.	Continue to carry out an Outreach Operator Training Program for POTW personnel with funds under Section 104(g) of the Federal Clean Water Act. Continue to provide classroom training for sewage treatment plant operators (public and private) through the Pennsylvania Department of Community Affairs. Continue to enforce the Commonwealth's mandatory Sewage Treatment Plant Operators Certification Law. Continue to carry out Pennsylvania's Act 339 to provide annual grants to help defray the cost of operation and maintenance of municipal and public school district sewage treatment facilities.	Improve operation of phosphorus removal processes by providing on-site technical assistance for treatment plant operators and enhancing operator training and certification program. Require all existing sewage treatment plants to demonstrate that there are adequate revenues to support the facility presently and in the future years. Require new facilities to demonstrate adequate fiscal planning and revenues. Implement using amended regulations for construction permit authority and for water and sewer planning authority.	Provide technical training for POTW personnel. Provide O & M technical assistance for POTW owners and operators.	Increase O and M support at the Blue Plains WWTP, and increase supplies and materials in support of plant O and M.

Goal: A

Objective 4: Establish and enforce nutrient and conventional pollutant limitations to ensure compliance with water quality laws.

Federal	Pennsylvania	Maryland	Virginia	District of Columbia
EPA: Provide overview of state-delegated NPDES including periodic compliance inspections; Issue permits for D.C. DOD - Ensurecompliance with water quality laws.	Continue to carry out EPA-delegated NPDES Program (Permitting, Compliance Monitoring, and Enforcement) in accordance with delegation agreements. Enhance the computerized data system for NPDES and State permit, inspection, and enforcement data. Continue to carry out the State Water Quality Management Permitting, Inspection, and Enforcement Programs	Have more effective and frequent enforcement of NPDES municipal and industrial discharge permits. Bring all State-owned treatment plants into compliance with discharge standards: provide nutrient removal where applicable and land treatment where possible. Establish a computerized data bank of inspection and other permit data. Utilize water qaulity planning, water quality modeling, and wasteload allocation for setting NPDES permit conditions.	Conduct NPDES permit program. Continue enforcement of water quality laws and regulations. Require municipalities to meet National Municipal Policy. Continue implementation and re-evaluation of Potomac Embayment Standards. Continue NPDES compliance monitoring. Conduct No-discharge Certificate Program.	Promulgate regulations under the DC Water Control Act.

Goal: A

Objective 5: Reduce the levels of nutrients and other conventional pollutants in runoff from agricultural and forested lands.

Federal	Pennsylvania	Maryland	Virginia	District of Columbia
USDA/SCS - Provide technical and financial assistance to agricultural land users to reduce NPS pollution. EPA - Grant implementation funds to help control runoff. FWS - Assist in tracking effectiveness of BMPs in improving water quality and aquatic resources. USGS - Provide hydrologic information and technical assistance to help evaluate BMPs. SCS - Reclaim soil and water resources of rural lands adversely affected by past coal mining practices. COE - Require safeguards from NPS pollution on leased civil and military land.	Implement BMPs on 20% of critical farms in 10 priority watersheds by 1988. Complete watershed assessments and determine critical farms in 13 priority watersheds by 1988. Demonstrate nutrient testing on 750 farms in 20 priority watersheds by 1988. Implement a forestry program.	Have soil conservation and water quality plans developed for farms in priority watersheds by July, 1989. Provide agricultural cost-sharing grants to landowners in priority watersheds to assist with the installation of BMPs. Develop soil conservation and water quality plans for all farms by July, 1994. Recruit and place teams of planners and technicians in soil conservation districts where priority watersheds for agr. NPS problems exist. Develop BMPs for nutrient runoff control. Develop statewide education and demo. program to assist landowners.	Provide cost-sharing funds for agricultural BMPs. Identify potential sources of agricultural nonpoint pollution. Conduct research and demonstration projects for agricultural BMPs. Provide cost-sharing for funds for local personnel for BMP programs. Conduct BMP education programs. Implement State erosion and sediment control program. Conduct soil research and mapping. Assist property owners in forest land management.	

Goal: A

Objective 5: (continued)

Federal	Pennsylvania	Maryland	Virginia	District of Columbia
		Assure agricultural drainage projects protect Maryland waterways from pollution. Complement activities with enforcement actions as needed in priority areas.		

Goal: A

Objective 6: Reduce the levels of nutrients and other conventional pollutants in urban runoff.

Federal	Pennsylvania	Maryland	Virginia	District of Columbia
EPA - Provide information on pollutants in urban runoff and on costs and effectiveness of control strategies, based on the results of the Nationwide Urban Runoff Program and other available information. COE - Continue reduction of NPS pollution at military installations.	Implement the Storm Water Management program pursuant to the Pennsylvania Storm Water Management Act of 1978.	Implement the Statewide Stormwater Management Law with assistance grants to local jurisdiction. Make grants for demonstration projects to ascertain the cost and effectiveness of various methods of solving stormwater runoff problems created by existing development. Retrofit stormwater best management practices at State facilities. Provide 16 additional enforcement inspectors to assure consistent Statewide enforcement of the State's sediment control law. Improve sediment control techniques and their application by providing funding for review and revision of the Statewide standards for erosion and sediment control plans.	Provide cost-sharing funds for local government for BMP programs. Conduct BMP education programs. Conduct demonstration projects for urban BMPs. Implement State erosion and sediment control programs.	Formulate and implement Stormwater Management Program. Retrofit BMPs on public land in the Anacostia basin. Provide grants to Anacostia basin residential areas for BMP retrofit. Improve catch basin and stream cleaning to reduce sediment entering the estuary.

Goal: A

Objective 7: Reduce pollutant discharges from recreational boats in shellfish growing areas and beach areas used for swimming.

Federal	Pennsylvania	Maryland	Virginia	District of Columbia
		Use part of FY 84 implementation funds for demonstration pumpout facilities.	Continue to investigate feasibility of providing requiring pumpout facilities.	Promulgate regulations under the District Water Act to control boat discharges in D.C.

Goal: Reduce or control point and nonpoint sources of toxic materials to attain or maintain levels of toxicants not harmful to humans or living resources of the Bay.

Objective 1: Identify and control toxic discharges to the Bay system through implementation and enforcement of the states NPDES permit programs and other programs.

Federal	Pennsylvania	Maryland	Virginia	District of Columbia
EPA: Develop and implement an integrated strategy to control toxic pollutants beyond technology-based requirements; Reduce non-compliance with permit standards; Provide EPA oversight of state-delegated NPDES, including periodic compliance sampling; Issue D.C. permits. DOD - Ensure compliance with NPDES program. COE - Monitor for contaminants at reservoirs.	Continue EPA-delegated NPDES Program in accordance with delegation agreements. Continue State Water Quality Management Permitting, Inspection, and Enforcement Programs. Continue Phase II of triennial Water Quality Standards review to address priority issues, including Toxics. Continue State's Point Source Toxic Control Strategy for dealing with cer- NPDES permit renewals and new NPDES permits. Implement a study of PCB residues in fish tissue.	Use biomonitoring and chemical testing of industrial and municipal discharges to analyze effluents and to determine their toxicity to Bay aquatic resources. Perform ecological field assessments at the points of discharge of industries and sewage treatment plants. Complete the EPA Integrated Env. Mgt. Project for Balto. Harbor in cooperation with local gov'ts.	Conduct NPDES permit program. Develop and implement automated toxics "fingerprinting" system. Conduct toxics monitoring program. Study fate and effect of PAHs in estuarine environment. Develop early warning system for pollutants in seafood.	Promulgate regulations under the District Water Pollution Control Act to control point source discharges. Examine alternative methods of meeting future water quality standards for toxics.

Goal: B

Objective 2: Reduce the discharge of metals and organics from sewage treatment plants resulting from industrial sources.

Federal	Pennsylvania	Maryland	Virginia	District of Columbia
EPA-Encourage states to seek pretreatment delegation authority.	Continue to develop a proposal for delegation of EPA's Pretreatment Program responsibilities to Pennsylvania.	Implement a pretreatment program concentrating on enforcement, program development and laboratory services.	Develop and implement a pretreatment program.	Enact a sewer use ordinance and develop a pretreatment program.
			Conduct NPDES permit program.	
	Continue to implement the State's Municipal Waste Load Management Program.	Make loans available to industry for installation of pretreatment equipment.	Conduct toxics monitoring.	
EPA-Develop protocol to conduct toxicity reduction evaluations (TRE) at municipal plants.			Develop and implement automated toxics "fingerprinting" system.	

Goal: B

Objective 3: Reduce the discharge of metals and organics from industrial sources.

Federal	Pennsylvania	Maryland	Virginia	District of Columbia
EPA-Provide technical guidance to permit writers. EPA-Develop and implement an integrated strategy to control toxic pollutants beyond technology-based requirements. EPA-Develop protocol to conduct toxicity reduction evaluations at industrial plants. FWS-Document bioaccumulation of toxics near selected outfalls, recommend reduced concentrations.	Continue to carry out EPA-delegated NPDES Program (Permitting, Compliance Monitoring, and Enforcement) in accordance with delegation agreements.	Incorporate BAT effluent limitations in NPDES permits and enforce them.	Conduct NPDES permit program. Conduct No-Discharge Certificate Program. Conduct toxics monitoring, sampling, and analyses. Develop and implement automated toxics "fingerprinting" system.	Promulate regulations under the District Water Pollution Control Act to control point source discharges.

Goal: B

Objective 4: Reduce chlorine discharges to critical finfish and shellfish areas.

Federal	Pennsylvania	Maryland	Virginia	District of Columbia
EPA-Propose criteria for estuarine waters.	Continue to implement statewide regulation authorizing seasonal disinfection of effluents.	Where chlorine is used for disinfection, dechlorination processes should be installed.	Establish and implement a state water quality standard for chlorine.	Implement dechlorination at Blue Plains WWTP.
EPA-Provide grants for dechlorination (Blue Plains) (CWA Sec. 201).		Establish dechlorination requirements in State water quality laws and regulations.		
		Provide 100% State grants to assist affected public operators to retrofit dechlorination equipment.	Provide grants to localities for control of chlorine at POTWs.	
		Modify discharge permits to specify dechlorination requirements and reasonable schedules.		

Goal: B

Objective 5: Reduce the levels of metals and organics in urban and agricultural runoff.

Federal	Pennsylvania	Maryland	Virginia	District of Columbia
EPA: Provide implementation grants to states to control urban and agricultural runoff; Study and provide information on urban runoff and the effects of BMPs. EPA - Conduct pesticide registration program; provide grants to states to implement FIFRA and technical training and assistance for appropriate use of pesticides. USDA - Provide technical assistance programs; cost-share programs.	Implement the Storm Water Management program pursuant to the Pennsylvania Storm Water Management Act of 1978. Develop management systems with minimum chemical monitoring to minimize N and P contamination of agricultural drainage water without reducing corn yields. Identify the amounts and types of insecticides, herbicides and fungicides used in specific watersheds associated with the Chesapeake Bay Abatement Program. Initiate an education program to bring all pesticide users to a common level of awareness as to the potential impact pesticides may represent to the Chesapeake Bay.	Implement Statewide Stormwater Management Law. Use FY 84 implementation funds to retrofit stormwater best management practices. Install agricultural best management practices in priority watersheds. Implement Critical Areas Statute. Retain existing forestland in buffer areas.	Implement stormwater management program to: - conduct BMP education programs. - conduct demonstration projects for urban BMPs. - provide cost-sharing funds for BMP programs. Identify potential sources of agricultural nonpoint pollution. Provide cost-sharing funds for local personnel for BMP programs. Conduct research and demonstration projects for agricultural BMPs. Implement state erosion and sediment control program.	Formulate and implement a Stormwater Management Program to control heavy metals. Retrofit BMPs on public land in the Anacostia basin. Provide grants to Anacostia basin residential areas for retrofitting BMPs. Improve catch basin and stream cleaning to reduce heavy metals entering the estuary.

Goal: B

Objective 6: Minimize water pollution incidents and provide adequate response to pollutant spills.

Federal	Pennsylvania	Maryland	Virginia	District of Columbia
EPA-Respond to releases (or threatened releases) of hazardous substances that may endanger public health or welfare. FWS-Participate in emergency response actions.	Continue to carry out emergency response activities in coordination with local, state, federal, and interstate organizations. Continue to maintain and distribute an up-to-date Water Emergency Response Manual to provide guidance to agencies and industries on spill prevention, clean-up, and notification procedures. Continue to require Preparedness, Prevention, Contingency (PPC) Plans for activities that have a high potential to cause pollution incidents.	Implement MD's oil spill response program.	Maintain emergency response capability for pollution events.	Establish oil spill contingency fund and plan.

Goal: Provide for the restoration and protection of the living resources and their habitats and ecological relationships.

Objective 1: Develop or enhance state fisheries management programs to protect the finfish and shellfish stocks of the Bay.

Federal	Pennsylvania	Maryland	Virginia	District of Columbia
NOAA: Develop fisheries management plans for species under Magnuson Act; Assess status of Bay fish stock; Develop data on fish harvests; Evaluate shellfish habitat; Determine toxic effects on fin and shellfish. FWS - Measure chemical residues in fish to detect trends; determine toxic effects.	Develop a striped bass stocking program with Maryland in the Conowingo Pool/Reservoir (Pennsylvania Fish Commission).	Develop fisheries management plans for specific Bay species sought by commercial and sport fishermen: eel; shad/river herring; striped bass; white perch; yellow perch; spot; croaker, and shellfish.	Develop and implement a comprehensive fisheries management program including plans for striped bass and oysters. Enforce fisheries laws and regulations. Automate fisheries management information. Manage public health aspects of shellfish production and marketing. Survey and map shellfish grounds. Investigate factors affecting fluctuations in stocks.	Develop a Fisheries Management Program.

Goal: C

Objective 2: Provide for the restoration of finfish stocks in the Bay, especially the abundance of freshwater and estuarine spawners.

Federal	Pennsylvania	Maryland	Virginia	District of Columbia
FWS - Evaluate striped bass stocking practices.	Continue to carry out a program to restore American Shad and other diadromous fishes to the Susquehanna River.	Implement restrictive management measures on the harvesting of hickory and American shad and striped bass. Implement a moratorium on striped bass which began in January, 1985. Utilize hatcheries to aid in the restoration and enhancement of fish populations to increase brood stocks. Construct an intercept hatchery.	Conduct wetlands and bottomlands (habitat) management. Manage wildlife and fresh water fisheries. Implement all water quality-related programs. Develop fishery management plan for striped bass. Participate in interstate management plan for shad and herring. Study the diseases of finfish.	Establish regulations protecting anadromous fish as part of the fisheries management program.

Goal: C

Objective 2: (continued)

Federal	Pennsylvania	Maryland	Virginia	District of Columbia
		Utilize sharply focused research programs to resolve biological problems associated with the decline of fish stocks Mark fish for subsequent recapture to determine survival rates.	Develop program to provide fishways for anadromous fish at dams on tidal rivers. Study the feasibility of expanding the artificial reef program. Enhance James River striped bass population through restocking. Stock Blue catfish in James and Rappahannock rivers.	

Goal: C

Objective 3: Provide for the restoration of shellfish stocks in the Bay, especially the abundance of commercially important species.

Federal	Pennsylvania	Maryland	Virginia	District of Columbia
		Enhance the Maryland oyster industry through additional planting and seeding. Oyster repletion-Implementation of new oyster culture technology. Provide extension service to the industry.	Expand oyster repletion activities by developing oyster culture for replenishment activities and a seed oyster hatchery. Conduct wetlands and bottomlands (habitat) management. Implement integrated shellfish area enhancement program. Implement all water quality related programs. Provide grants to localities for improvement of deficient shoreline residential sanitation systems.	

Goal: C

Objective 4: Restore, enhance, and protect waterfowl and wildlife.

Federal	Pennsylvania	Maryland	Virginia	District of Columbia
FWS - Implement the Endangered Species Act of 1973. National Marine Fishery Service and other federal agencies protect waterfowl and wildlife. FWS - Carry out various projects and activities to enhance and protect waterfowl and wildlife.	Improve wildlife habitat within sections of the Susquehanna River Basin and Upper Chesapeake Bay by reducing agricultural nonpoint nutrient and associated sediment loading of receiving waters downstream from Pennsylvania's farmlands through implementation of BMP's.	Improve duck habitat on both public and private land to realize an increase in the black duck breeding population. Provide an intensive waterfowl habitat education project. Expand the existing program of tax incentives for conservation of water fowl habitat.	Conduct wetlands and bottomlands (habitat) management. Maintain system of wildlife management areas. Protect and manage migratory waterfowl. Continue work on programs to protect the bald eagle, and to study the peregrine falcon, osprey, colonial nesting birds, and marine turtles.	

Goal: C

Objective 5: Restore, enhance, and protect desirable species of submerged aquatic vegetation.

Federal	Pennsylvania	Maryland	Virginia	District of Columbia
Joint Federal Effort - Determine impact of hydrilla, and propose and test control measures. FWS - Fund mapping of SAV and development of management policies.		Revegetate areas of the Bay where regeneration would likely be successful. Intensify survey efforts.	Reestablish submerged aquatic vegetation. Conduct wetlands and bottomlands (habitat) management.	Establish regulations to protect SAV and continue observation of the resurgence of beneficial SAV.

Goal: C

Objective 6: Protect and enhance, and restore where possible wetlands, coastal sand dunes, and other important shoreline and riverine systems.

Federal	Pennsylvania	Maryland	Virginia	District of Columbia
NOAA - Establish sanctuaries for research and educational opportunities. FWS - Ensure that federally-funded activities protect fish and wildlife habitat. FWS - Catalogue, map and describe trends in wetlands; examine impact of shoreline structures. COE - Create wetlands through use of dredged materials.	Continue to implement a Wetlands Protection Program. Implement Dam Safety and Encroachment Act.	Enhance 401/404 water quality certification program. Evaluate public drainage projects and their impact on water quality. Maintain wetlands protection through existing licensing and permitting program. Monitor dredging and spoil disposal projects. Monitor 404 activities and report findings. Establish and implement criteria for drainage plan approval, including standards for the design, construction, and operation and maintenance of agricultural drainage projects. Initiate program for water conservation and control of consumptive water loss to maintain freshwater inflow to the Bay. Control the impacts of human activity within the critical area contiguous to the Bay and its tributaries.	Conduct wetlands and bottomlands (habitat) management. Conduct coastal primary sand dunes protection program. Protect public beaches from erosion. Provide shoreline erosion technical advisory services. Work with property owners to obtain open space easements. Manage state parks so as to protect the Bay.	Promulgate regulations under the District Water Pollution Control Act to protect wetlands.

Goal: C

Objective 6: (continued)

Federal	Pennsylvania	Maryland	Virginia	District of Columbia
		Implement the Critical Areas Statute.		
		Develop and implement BMPs around the Bay and its tributaries to intercept surface runoff and infiltrate it through the soil profile prior to reaching the water.		
		Define and map the critical land areas currently forested adjacent to the Bay and its tributaries.		
		Provide technical assistance to landowners, including the preparation of forest management plans.	Assist property owners in forest land management.	

Goal: C

Objective 6: (continued)

Federal	Pennsylvania	Maryland	Virginia	District of Columbia
		Encourage private landowners to preserve and protect undeveloped or low density areas along the shoreline of the Bay and tributaries. Increase the execution of easements within the existing Maryland Environmental Trust Easement Program.		

Goal: C

Objective 7: Conserve soil resources and reduce erosion and sedimentation to protect Bay habitats.

Federal	Pennsylvania	Maryland	Virginia	District of Columbia
COE - Identify and analyze severe shoreline erosion problems. Recommend projects for implementation. EPA and USDA-Provide technical and financial assistance.	Increase technical training for erosion, sedimentation, and nutrient control. Increase enforcement and compliance of the erosion and sedimentation control program by the addition of conservation district technical personnel.	Enhance the current level of effort for structural and non-structural property to mitigate shoreline erosion. Establish a vegetative shore erosion control program for non-critical eroding areas. Augment the existing structural program for critical areas. Use clean spoil from maintenance dredging projects to complement both approaches. Provide State grants to certain local jurisdictions, to assist with certain eligible costs for acquisition, design, construction, equipping, rehabitation, and improvement of certain projects designed to enhance the shoreline.	Implement state erosion and sediment control program. Conduct soil research and mapping. Provide shoreline erosion technical advisory service. Conduct demonstration projects for urban BMPs. Conduct BMP education programs. Conduct research and demonstration projects for agricultural BMPs. Provide cost-share funds for agricultural BMPs. Provide cost-sharing funds for local personnel for BMP programs.	Coordinate Soil Conservation District and stormwater control activities.

Goal: C

Objective 7: (continued)

Federal	Pennsylvania	Maryland	Virginia	District of Columbia
		Protect non-tidal wetlands, with shared responsibilities at the State and local government levels. Encourage and assist local governments with the design and implementation of locally administered non-tidal wetlands management. Initiate a non-tidal resource assessment and monitoring system which will provide for a quantitative analysis of wetland types. Establish criteria for soil and water conservation plans to help maintain the integrity of non-tidal wetland systems.		

Goal: C

Objective 8: Maintain freshwater flow regimes necessary to sustain estuarine habitats.

Federal	Pennsylvania	Maryland	Virginia	District of Columbia
COE - Conduct proposed Chesapeake Bay drought management study.		Quantify both existing and potential consumptive losses of freshwater flow to the Bay. Implement structural, non-structural, and water conservation solutions. Enforce plumbing codes using the Water and Sewer Planning Statute.	Conduct water resource planning and management. Conduct stream flow studies.	Maintain the minimum flowby under the Low Flow Agreement.

Goal: Develop and manage related environmental programs with a concern for their impact on the Bay.

Objective 1: Manage sewage sludge, dredge spoil, and hazardous wastes to protect the Bay system.

Federal	Pennsylvania	Maryland	Virginia	District of Columbia
EPA - Establish programs to manage sludge and hazardous wastes which include technical assistance, information transfer, training, and funding under RCRA, Superfund, and CWA. *DOD - Control hazardous* wastes at installations. FWS - Review dredge spoil activities and impacts on SAV and wetlands. COE - Conduct proposed Chesapeake Bay dredged material disposal study; continue navigation dredging management program.	Continue to carry out the Pennsylvania Solid Waste Management Act. Continue to seek primacy to carry out a federally-delegated RCRA Program.	Promote the use of state land to assist in the management of sludge or for land application of sewage effluent. Complete the Maryland Environmental Service sludge management plan. Secure permits for additional State-owned lands. Develop new markets for sludge compost. Continue to develop educational materials. Form an interagency technical team for sludge management.	Manage all categories of waste in a safe and effective manner. Conduct research study on the environmental effects of land disposal of sewage sludge. Continue to support land application of sewage sludge through approvals to localities and permits to private contractors.	Implement a long-term solution for Blue Plains WWTP sludge disposal.

Goal: D

Objective 1: (continued)

Federal	Pennsylvania	Maryland	Virginia	District of Columbia
		Implement Federal and State hazardous wastes laws and regulations. Investigate water quality impacts associated with dredging activities. Use clean spoil from maintenance dredging of channels in non-critically eroding shoreline areas for stabilization through vegetative means and to reduce annual dredging costs.	Implement federal and state hazardous waste laws and regulations.	Assist Corps of Engineers in locating upland sites for dredged spoil.

Goal: D

Objective 2: Manage groundwater to protect the water quality of the Bay.

Federal	Pennsylvania	Maryland	Virginia	District of Columbia
EPA - Develop and implement a groundwater strategy to protect underground reserves.	Continue to develop Groundwater Quality Management and Monitoring Strategies and a Leaking Underground Storage Tank Program.	Utilize NPDES, hazardous wastes, and landfill regulatory programs to protect groundwater.	Implement solid and hazardous waste and other waste programs, no-discharge and NPDES permit programs to protect groundwater.	Initiate a cooperative agreement with USGS for a comprehensive groundwater assessment.
USGS - Provide available groundwater data and technical assistance, as requested.		Utilize oil control program to prevent, contain, and clean-up oil discharges from leaking underground storage tanks.		Promulgate regulations for protecting groundwaters.

Goal: D

Objective 3: Consider and address the impacts of atmospheric deposition on the Bay system.

Federal	Pennsylvania	Maryland	Virginia	District of Columbia
EPA - Provide for research, monitoring, and information transfer on acid rain problems.	Continue to operate an Acid Precipitation Monitoring Network.	Coordinate, complete, and evaluate results of monitoring and special study efforts. Review state and national data to determine and analyze impacts on Maryland's resources. Review and assess the various legislative options being considered at the national and state level.	Review national research and data sources, conduct monitoring and selected acid deposition effect studies.	Evaluate re-establishing atmospheric deposition monitoring stations.

Goal: D

Objective 4: Improve and maintain public access to the Bay including public beaches, parks, and forested lands.

Federal	Pennsylvania	Maryland	Virginia	District of Columbia
		Assist local gov'ts in developing areas for public access.	Protect public beaches from excessive losses. Maintain and expand system of public boat landings, wildlife management areas, waterfront state parks.	

Goal: D

Objective 5: Improve opportunities for recreational and commercial fishing.

Federal	Pennsylvania	Maryland	Virginia	District of Columbia
COE - Collect and remove drift material.		Utilize funds from the Chesapeake Bay Saltwater Sportfishing License to increase recreational fishing opportunities in the Bay. Acquire and maintain fishing piers to increase fishing access. Construct and place sport-fish habitat reefs to increase estuarine fish nursery areas and to increase production of marine species in the estuary.	Improve public landings for commercial fishing craft. Maintain and expand system of public boat landings, wildlife management areas, waterfront state parks.	

E. INSTITUTIONAL/MANAGEMENT

Goal: Support and enhance a cooperative approach toward Bay management at all levels of government.

Objective 1: Adequately coordinate Bay management activities, and develop and maintain good mechanisms for accountability.

Federal/Regional	Pennsylvania	Maryland	Virginia	District of Columbia
Federal and State - Implement Chesapeake Bay Agreement of 1983 which commits the signatories to a cooperative regional management approach to improve and protect the water quality and living resources of the Chesapeake Bay estuarine system. Interstate, Regional and Local Commissions - Carry out regulatory and voluntary programs.	Continue to participate as a member of the Chesapeake Bay Executive Council and the Implementation Committee and its subcommittees. Continue to participate as a member of the Potomac and Susquehanna River Basin Commission. Continue the involvement of the Nonpoint Strategy Committee for overall planning and strategy development of Pennsylvania's nonpoint agricultural abatement program.	Maryland's Chesapeake Executive Council members will listen to and respond to concerns of the Citizens Advisory Committee. Maryland's Chesapeake Bay Implementation Committee members will interact with and review reports of the Scientific and Technical Advisory Committee. Maryland Executive Branch agencies will participate on the four subcommittees which report to the Implementation Committee. Governor's Council on the Bay will coordinate intrastate management activities, with staff support provided by the "Wye Group".	Participate in Executive Council, Implementation Committee and other intergovernmental organizations. Establish citizen advisory committees in each tributary basin. Monitor and report on Bay management programs and environmental trends. Conduct coordinated evaluation of NEPA documents, etc.	Participate in Chesapeake Executive Council and Implementation Committee. Participate in the Interstate Commission on the Potomac River Basin. Participate in the Metro. Washington Water Resources Planning Board. Manage in cooperation with Maryland the Anacostia Watershed Restoration Strategy Agreement between D.C. and Maryland.

Goal: E

Objective 1: (continued)

Federal	Pennsylvania	Maryland	Virginia	District of Columbia
	Provide Pennsylvania participation from the Legislative branch on the Chesapeake Bay Commission to facilitate effective cooperation and coordination of Bay planning and management among the states.	Provide leadership and liaison for Chesapeake Bay legislation through support for Chesapeake Bay Commission. Prepare annual report on progress and use of funds. (Gov.'s Council on Bay). Set priorities for initiatives annually and cite multi-year funding needs as needed. (Gov's Council).	Provide leadership and liaison for Chesapeake Bay legislation through support for Chesapeake Bay Commission.	

Goal: E

Objective 2: Assure a continuing process of public input and participation.

Federal	Pennsylvania	Maryland	Virginia	District of Columbia
EPA: Support a comprehensive program of public involvement to provide citizens with opportunities to influence decisions affecting the Bay; Provide support to Citizens Advisory Committee to increase public participation in developing and implementing Chesapeake Bay Restoration and Protection Plan; Fund activities of the Citizens Program for the Chesapeake Bay.	Utilize Citizens Advisory Committee (CAC) as a vehicle for public input and participation.	Implement the Chesapeake Bay Trust. Use individual and private sector contributions for Bay clean-up projects. Utilize watershed planning groups for overseeing implementation at the watershed level. Consult with SWOAC, CRAC, CAC as vehicles for public input and participation.	Provide grants for Chesapeake Bay education projects. Establish citizen advisory committee in each tributary basin. Develop and distribute Chesapeake Bay public service announcements.	Set-up space for public access to CBP computer via the D.C. computer. Establish a Chesapeake Bay Citizen Participation Program. Establish a Public Information Depository and information dissemination program.

Goal: E

Objective 3: Enhance Bay-oriented education opportunities to increase public awareness and understanding of the Bay system.

Federal	Pennsylvania	Maryland	Virginia	District of Columbia
EPA: Coordinate and support public information and awareness activities with state and local governments, institutions, public and private organizations, and the public; Fund educational activities of the Citizens Program for the Chesapeake Bay. FWS - Carry out a public awareness program.	Support educational programs concerning Chesapeake Bay coordinated through the Pennsylvania Environmental Education Network Master Plan. Develop and implement an education program on Chesapeake Bay pollution problems. Conduct an outreach program for small water companies to provide technical assistance for the reduction of water consumption, water losses, and operational inefficiencies.	Educate students about the ecology and problems of the Bay. Fund a contractual State specialist in environmental education to train teachers. Make grants to local systems for curriculum modification and implementation of instructional programs. Provide productive employment for disadvantaged youth. The Youth Conservation Corps will undertake labor intensive projects for stabilizing and refurbishing streams and estuaries.	Provide grants for Chesapeake Bay education projects. Develop and distribute Chesapeake Bay public service announcements. Provide opportunity for selected disadvantaged youths to participate in stream cleanup and related activities (Youth Conservation Corps).	Establish out reach to home owner for nonpoint source control. Develop educational initiatives to increase public awareness and understanding of the Bay eco-system.

Goal: E

Objective 4: Track and evaluate all activities which may impact estuarine water quality and resources.

Federal	Pennsylvania	Maryland	Virginia	District of Columbia
EPA - Provide grants to states for water quality management planning, monitoring, modeling, assessing, administering, and enforcing Clean Water Act programs. NOAA - Provide guidance, data, research to support Bay. DOD - Abate pollution in Chesapeake Bay installations. FWS - Support Bay through a variety of actions and programs. COE - Continue to implement CWA Sec. 404 (Regulatory Program).	Enhance the computerized data system for NPDES and State permit, inspection and enforcement data.	Develop computerized data bank of inspection and other NPDES permit data. Develop computerized data bank of installed and properly maintained best management practices. Implement Critical Areas Law.	Conduct special pollution effect studies. Conduct stream pollution source studies. Conduct Bay-related environmental reviews.	Support implementation of the Potomac Strategy.

Goal: E

Objective 5: Develop a coordinated Chesapeake Bay data management system.

Federal	Pennsylvania	Maryland	Virginia	District of Columbia
EPA: Develop a coordinated data management system for use by all researchers and analysts utilizing or contributing to the Chesapeake Bay data base; Update pollutant loading information on point source discharges, and store in computer. NOAA: Contribute to the Chesapeake Bay Data Center; Develop an National Estuarine Inventory. USGS - Develop a land use management system using its GIS.	Continue to enter ambient water quality data into EPA's STORET System to provided for storage, retrieval, and analysis.	Provide Maryland's share of funding for continuance of the centrally located and jointly maintained data center at EPA's Liaison Office in Annapolis. Provide operating funds for hardware/software to be located at both the Department of Natural Resources and the Office of Environmental Programs, and to store and analyze new monitoring data.	Upgrade capabilities of SWCB automated water quality data system. Establish automated and coordinated data base management system among agencies included in Bay work. Automate fisheries data management.	Establish telecommunication with CBP computer and update data base.

Goal: E

Objective 6: Implement a coordinated Baywide monitoring program.

Federal	Pennsylvania	Maryland	Virginia	District of Columbia
EPA - Coordinate state and federal monitoring efforts to determine trends in water quality, event correlations, and effectiveness of management decisions. USGS - Measure flow and conduct water quality sampling at Fall-Line stations. NOAA - Characterize long-term trends at selected sites and describe patterns.	Continue to conduct routine ambient, fixed station monitoring at 118 Water Quality Network (WQN) stations in the Susquehanna River Basin and at three WQN stations in the Potomac River Basin. Continue to carry out a project entitled, "Assessment of Nutrient Sources from Mainstem and Selected Watersheds in the Susquehanna River Basin" (Susquehanna River Basin Commission).	Improve the spatial, temporal, and parameter coverage of existing programs. Conduct baseline trend monitoring of water quality and sediment parameters increasing the number of stations tenfold. Utilize the U.S. Geological Survey services for Fall Line monitoring. Sample Potomac, Patuxent, Patapsco, Back, South, Rhode, West, Bush, Chester, Choptank and Little Choptank Rivers, Eastern Bay and Tangier Sound.	Conduct baseline water quality and sediment monitoring to improve the spatial and temporal coverage of existing programs. Conduct living resource monitoring to determine associations between living resources and water and sediment quality. Carry out special James River water quality monitoring program. Conduct toxics monitoring. Develop and implement automated toxics "fingerprinting" system. Conduct Kepone monitoring.	Continuing coordinated Potomac Monitoring activities.

Goal: E

Objective 6(continued)

Federal	Pennsylvania	Maryland	Virginia	District of Columbia
		Implement a regional monitoring program to determine association and potential cause and effect relations among living resources, hydrographic and climatic data and to provide a framework for directed applied research. Continue modeling to address larval transport, effects of habitat quality indicators on larval density, and effects of freshwater inflow and C & D Canal during the spawning period.		

Goal: E

Objective 7: Implement a coordinated Baywide research program.

Federal	Pennsylvania	Maryland	Virginia	District of Columbia
EPA: Provide technical information to support model development and guide management and implementation strategies; Develop and assess data to improve decision-making. NOAA: Quantify trends in coastal and estuarine environment; Characterize trends and patterns in meteorlogical forcing functions; Determine low DO impacts on biota. FWS - Provide needed scientific data. USGS - Study Potomac Estuary. USDA - Develop means to increase production while minimizing harm to environment.	Conduct research projects directed at reducing agricultural nonpoint nutrient loadings to the Bay.	Establish an annual research budget. The Governor's Council on the Bay will determine research priorities. Continue and/or complete research projects initiated in FY 85, during FY 86. Initiate new projects, as funding allows, during FY 86.	Conduct research and advisory services to support estuarine/marine resource management. Conduct Kepone health effects research.	Conduct research as needed by the Potomac Strategy Management Committee.

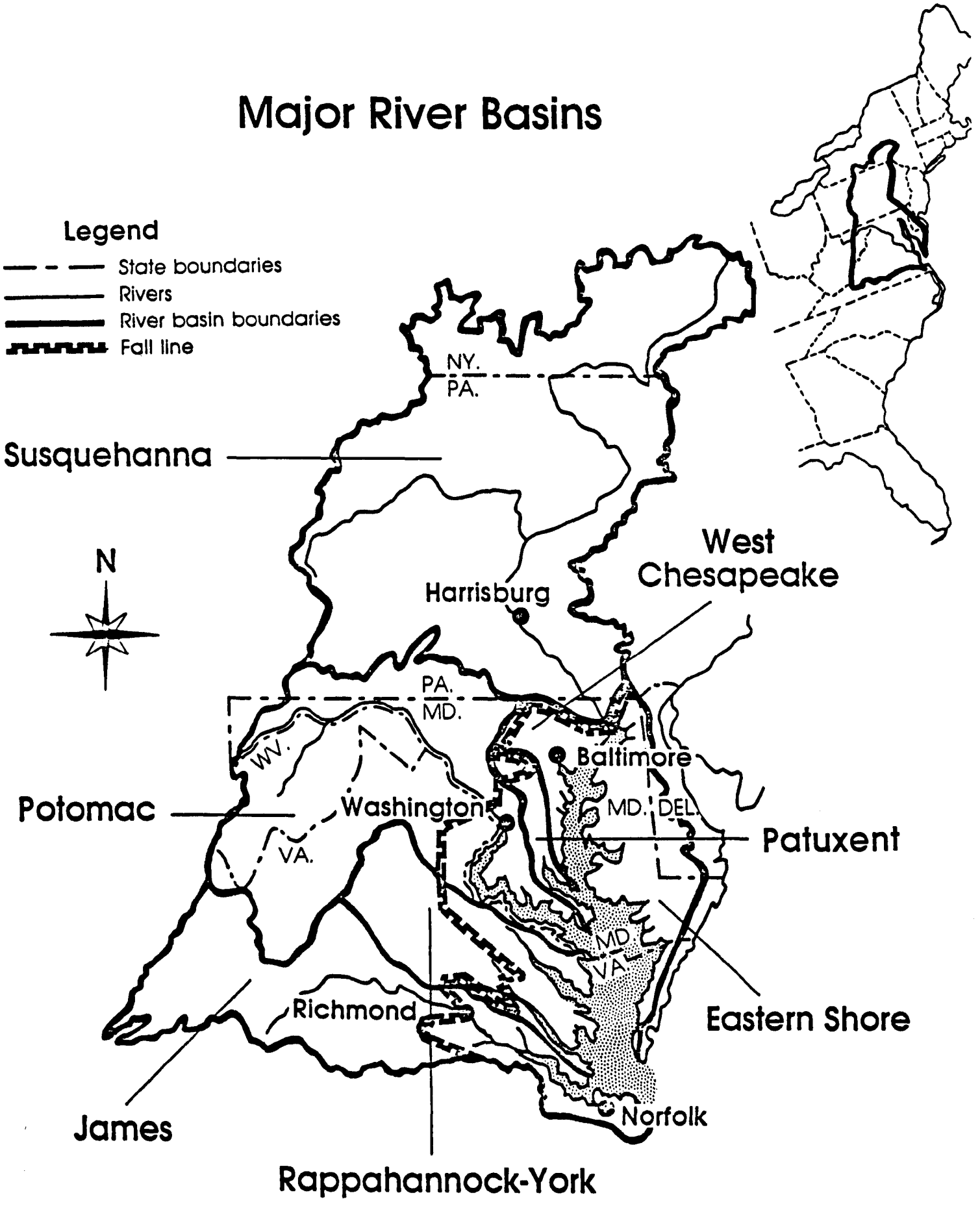


FIGURE III.1. Major river basins of the Chesapeake Bay.

CHAPTER III - BASIN STRATEGIES

INTRODUCTION

The Chesapeake Bay watershed, with over 150 tributary rivers and streams, covers 64,000 square miles. Its major sub-basins are the Susquehanna River Basin, Upper Chesapeake Bay, West Chesapeake, Eastern Shore, Patuxent, Potomac, Rappahannock, York and James river basins. Each of these major river basins has a unique set of characteristics; therefore, effectively managing the Chesapeake Bay system requires management strategies that address the special characteristics of each basin. This chapter describes the general characteristics of and defines a management strategy for each basin. Targeting strategies to deal with the most serious problems of a basin will help assure a more selective and more effective allocation of limited resources and alleviate the collective impact on the Bay and its living resources.

Each state and the District of Columbia have committed resources to help solve the most serious problems of the various basins. For example, the General Assembly of the Commonwealth of Virginia has given special emphasis to its commitment to the protection and restoration of the Chesapeake and the Virginia tributaries through its $15.5 million initiative package of the 1984-86 biennium budget period. Maryland, likewise, has made its commitment to the Bay with approximately $46 million dollars for a three year period. Pennsylvania's Susquehanna program commitment is supported by approximately $3 million for three years. The District of Columbia has authorized $13.3 million for 1984 through 1988. Each of the states' Baywide programs, outlined in Chapter II and described in Appendices A-E, applies to all the river basins and is not reiterated in this chapter. Rather, this chapter describes the problems and management strategies unique to each basin.

SUSQUEHANNA RIVER BASIN

DESCRIPTION

The major water pollutants of concern in the Susquehanna River Basin are nutrients: phosphorus and nitrogen. According to the CBP Management Study, the Susquehanna is dominated by nonpoint sources which account for 76% of the phosphorus and 90% of the nitrogen loads within the basin.

A high percentage of the nitrogen (85%) and phosphorus (60%) loadings delivered by the Susquehanna is attributable to runoff from cropland. The study found that 41% of the Susquehanna's nonpoint source load comes from the intensively farmed area in the lower Susquehanna River basin below Sunbury, Pennsylvania.

Within the lower basin, soil loss from untreated cropland may be as high as 17.7 tons/acre/year. In addition, the large concentrations of livestock produce more manure than required for land application. Furthermore, the lower Susquehanna River basin has a high percentage of conventional tillage cropland and a low percentage of forest land. This is significant because nutrient loadings from conventional tillage cropland are potentially the highest for all land uses, while those from forest land are the smallest.

The study also notes that fall line metal loadings indicate that toxic substances are being discharged from municipal and industrial point sources within the Susquehanna River basin.

Present pollution loads at the fall line during an average rainfall year are as follows:

Phosphorus	2,900,000	lbs.(March-October)
Nitrogen	58,200,000	lbs.(March-October)
Toxic Metals	12,531	lbs/day

MANAGEMENT PROGRAMS

Nutrients

In accordance with the CBP Management Study recommendations, Pennsylvania is initially targeting the lower Susquehanna River Basin for a comprehensive implementation program to reduce agricultural nonpoint source pollution. The program focuses on commercial fertilizer management, animal waste application management, animal waste control, erosion and sediment control, and pesticide/herbicide application and control. By 1988, watershed assessments will be conducted to identify critical farms in 13 priority watersheds; Best Management Practices (BMPs) will be implemented on 20% of the critical farms identified in 10 of the priority watersheds, and nutrient testing will be demonstrated on 750 farms in 20 priority watersheds.

The Pennsylvania program also calls for continued (1) implementation of recommendations contained in the DER report, "An Assessment of Agricultural Nonpoint Source Pollution in Selected High Priority Watersheds in Pennsylvania", (2) Mason-Dixon Erosion Control Project, and (3) the Conestoga Headwaters Rural Clean Water Program.

For further details on the Mason-Dixon Erosion Control Project, refer to the upper Chesapeake Bay basin strategy in this chapter.

Pennsylvania has been participating in the federally funded Conestoga Program since June 1981. The Conestoga River basin above Lancaster, Pennsylvania contains diverse and highly intensive agriculture with very little industry and has been designated as the number one priority watershed in Pennsylvania's Agricultural 208 Plan. The study is evaluating the effects of implementing agricultural BMPs to control fecal coliform bacteria, nitrate, dissolved solids, sediments, and pesticides from nonpoint sources of pollution. The BMPs include animal waste controls, terraces, and waterways, and will be implemented on about 300 farms (out of a total of 1,250 farms) which are considered to be the most critical nonpoint source problems in the study area.

The CBP Management Study also recommends that Pennsylvania continue to implement its regulation (similar to the UCBP Policy) which requires 80% removal (2 mg/l) of phosphorus at all new or modified point source discharges within the lower Susquehanna River basin. Revisions to this regulation went into effect on February 16, 1985. Phosphorus controls will be based on a determination by DER of the specific level of control needed. Final implementation guidance will be developed for the lower Susquehanna River basin by July, 1985. In the interim, (1) existing dischargers with

phosphorus controls in place will be required to continue to operate these facilities in accordance with their permit conditions; and (2) new or modified discharges will be required to meet a 2 mg/l effluent limitation.

In Maryland, Havre de Grace will decrease phosphorus loadings from an average of 92.6 lbs/day to 32 lbs/day for the year 2000; compliance with the phosphorus effluent limit is expected in 1987. Perryville phosphorus loadings will increase from 5 lbs/day to 10 lbs/day by year 2000. The plant is in compliance at the present time. Net phosphorus reduction from POTWs in Maryland by the year 2000 is 5,480 lbs. in the March-October period, a reduction of 22% below 1983 levels.

In 1984, the Maryland Department of Agriculture, in cooperation with the Office of Environmental Programs, developed and approved a report entitled Statewide Priority Watersheds for the Potential Release of Agricultural Nonpoint Phosphorus and Nitrogen. The report ranked all watershed segments which drain to the Chesapeake Bay in order of their relative potential to release phosphorus and nitrogen as a result of agricultural activities. Factors included in the ranking of the watersheds were: (1) the intensity of agricultural land use; (2) intensity of agricultural cropping; (3) the amount of cropland under conventional tillage; (4) the fraction of cropland on steep and erodable or, for nitrogen, highly permeable soil; (5) the potential intensity of animal waste application to cropland; and (6) an estimate of the influence of topography upon phosphorus movement. In setting priorities, meetings were held with the Maryland Department of Natural Resources to learn where stressed aquatic areas corresponded with critical agricultural areas. Targeted for the implementation of best management practices on critical farms is the Deer Creek watershed. The Mason-Dixon project will assist in the implementation of best management practices on farms in Cecil, Harford and Baltimore counties.

Toxics

Pennsylvania will continue to control toxic pollutants from point sources through implementation of the federally-delegated NPDES program and its State Water Quality Management Program. In addition, Pennsylvania has initiated steps to obtain delegation of the federal Pretreatment Program by the end of federal FY 1986.

Maryland will use the results of its biomonitoring program to determine the need for toxics limits in future renewals of NPDES municipal and industrial permits. Maryland expects pretreatment program delegation in 1985. Several of Maryland's statewide nonpoint source control programs, such as stormwater and sediment control, will also abate toxics.

Living Resources

The restoration of American Shad and other diadromous fishes to the Susquehanna River Basin, and the development of a striped bass stocking program with Maryland in the Conowingo Pool/Reservoir continue to be high priorities in Pennsylvania.

The State of Maryland is committed to restoring commercial and recreational fisheries such as the American Shad and yellow perch in the Susquehanna River basin.

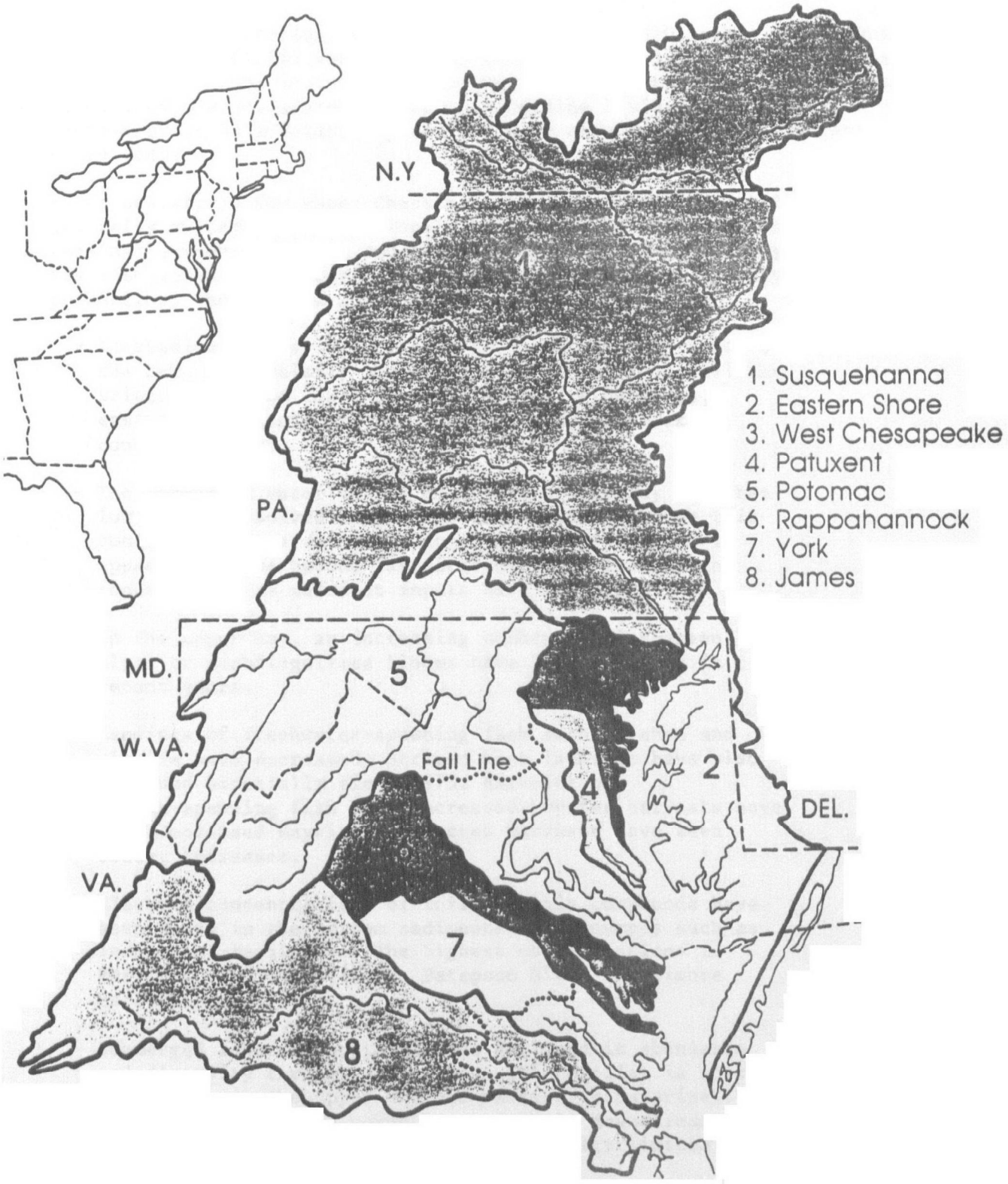


FIGURE III.2. The Chesapeake Bay drainage basin.

UPPER CHESAPEAKE BAY

DESCRIPTION

In the Maryland portion, the Bay proper covers 1,310 square miles, while the remaining area (1,165 square miles) consists of tidal tributaries. The Bay is about 200 miles in total length; Maryland's portion extends southward 125 miles from the Susquehanna River and contains 3,950 miles of tidal shoreline. It is a relatively shallow body of water, with an average depth of 28 feet.

Water quality in the upper Chesapeake Bay proper is good to fair and is generally suited for recreational activities and the maintenance of a reasonable number of most aquatic resources. The EPA Bay Program, however, has identified a number of disturbing trends in water quality and resource production. The program found that:

- Increasing levels of nutrients are entering many parts of the Bay, particularly the upper reaches of almost all the tributaries. The lower portions of the tributaries, eastern embayments and the lower Bay have moderate concentrations.

- The amount of water in the main part of the Bay that has low or no dissolved oxygen has increased. Although this condition occurs naturally in an estuarine system, it appears to have become far more severe in the Bay in recent years as nutrient inputs have increased.

- In the upper Bay, an increasing number of blue-green algal or dinoflagellate blooms have been observed in recent years.

- Landings of freshwater-spawning fish such as shad and alewife have decreased. Striped bass landings have also declined especially since 1973. Harvests of marine-spawning fish have increased. Oyster harvests have also decreased Baywide. Blue crab harvests have seen recent increases.

- Elevated concentrations of toxic organic compounds have been found in the bottom sediments near sources such as industrial facilities. The highest concentrations in Maryland were found in the Patapsco River (Baltimore Harbor).

- Submerged aquatic vegetation has declined in abundance and diversity throughout the Bay. This decline is most noticeable in the upper Bay and western tributaries. The loss appears to have moved progressively downstream and the current SAV populations are essentially limited to the lower estuary.

The decline of submerged aquatic vegetation and commercially important anadromous fish during the last decade indicates that the Bay is struggling to maintain these populations. Municipal discharges, urban and agricultural runoff contribute to the excessive nutrient and suspended sediment levels in the middle and upper Bay. Organic decomposition in the deeper waters contributes to anoxic or low oxygen conditions which reach into the Lower Bay. The Susquehanna is the dominant source of phosphorus, contributing 53% of the total phosphorus load to the upper Bay. The west Chesapeake is second, contributing 44% of the total load, and the upper Eastern Shore is the smallest, contributing 3% of the total phosphorus load reaching the Upper Bay. The Susquehanna is also the dominant source of nitrogen, contributing 77% of the nitrogen delivered to the Upper Bay. The west Chesapeake and upper Eastern Shore areas contribute 21% and 2% respectively.

MANAGEMENT PROGRAMS

Mason-Dixon Erosion Control Project

The Maryland and Pennsylvania State Offices of the USDA/SCS have included the lower Susquehanna drainage area and parts of the Potomac, Patuxent, Eastern Shore, and west Chesapeake drainage areas in the Mason-Dixon Erosion Control Area (SCS 1983b). The area has been targeted for technical assistance. The primary objectives of the project are the protection of the soil resource base and improvement of the productive capability through a significant reduction in soil loss in 22 county areas of Maryland and Pennsylvania. It is not certain how much effect the sediment, erosion, and animal-waste control BMPs in the Mason-Dixon Project will have on nutrient loadings. However, Chesapeake watershed modeling results indicate that applying an agricultural conservation practice, contour plowing, in concert with a more intensive practice, such as conservation tillage, reduces direct-stream loadings of phosphorus and nitrogen from nonpoint sources in the lower Susquehanna River by 30% and 13%, respectively.

Upper Chesapeake Bay Phosphorus Limitation Policy

In the Susquehanna, the upper Chesapeake Bay Phosphorus Limitation Policy (UCBP) requires 80% removal (approximately equal to 2.0 mg L-1 effluent) of phosphorus for all new or modified wastewater treatment facilities with flows greater than or equal to 0.5 MGD and discharging to tributaries and the main stem of the Susquehanna River below its confluence with the Juniata River. The Pennsylvania Department of Environmental Resources (PA DER) had a similar regulation for phosphorus removal but without the 0.5 MGD limitation. DER's regulation was revised on Feb. 16, 1985. For further details refer to Susquehanna River Basin Strategy in this Chapter.

Maryland has targeted priority watersheds for the nonpoint source abatement of sediment, animal waste, nutrients and bacteria from agricultural sources that contribute to the upper Chesapeake Bay problems. The targeted watersheds are Deer Creek, upper Choptank River, and lower Wicomico River, lower Pocomoke River and upper Chester River.

To reduce phosphorus from POTW's discharging in the upper Bay, Maryland requires all POTW's with flows greater than or equal to 0.5 MGD discharging into the Maryland portion of the Bay north of and including Gunpowder River

(Zone I), or POTWs with flows greater than or equal to 10.0 MGD, between Gunpowder River and the southern edge of the Choptank River (Zone II), to meet the effluent limitation of 2 mg L-1.

Toxics

Maryland has targeted several west Chesapeake watersheds for initial implementation of its biomonitoring program. The sites are mostly in the Patapsco River basin at major industrial discharges.

Living Resources

Maryland has selected several sites within the upper Chesapeake Bay for the re-establishment of SAV beds for vegetative solutions for shoreline erosion problems.

WEST CHESAPEAKE RIVER BASINS

DESCRIPTION

The west Chesapeake river basins include the heavily developed Baltimore metropolitan region. Urban runoff and industrial discharges contribute major water pollutants of concern including toxic metals, suspended solids, bacteria and nutrients. Water pollution problems are most severe in Baltimore harbor, where heavy metal and organic chemical concentrations in the bottom sediments are among the most toxic found in the Bay system. Bacteria and nutrient pollution is common in the basin due to untreated stormwater runoff; occasional sewage overflows also contribute to the bacteria levels. Present pollution loads are as follows:

Phosphorus	2,391,000 lbs.	(March - October)
Nitrogen	15,984,000 lbs.	(March - October)

MANAGEMENT PROGRAMS

The table below summarizes specific objectives and implementation strategies which Maryland has established for the west Chesapeake basin. Primary emphasis in this watershed is on reducing nutrients and toxics from point sources, including a very substantial pretreatment program applicable throughout much of the sewerage systems serving the west Chesapeake watershed. Loch Raven, Prettyboy and Liberty reservoirs have been targeted for reduction of nutrients from both point and nonpoint sources. The State, Baltimore City, Baltimore County, and Carroll County have entered an agreement for nutrient reduction in those watersheds. The reduction in phosphorus loads from such sewage treatment plants as Aberdeen, Sod Run, Back River, Patapsco, Cox Creek, Broadneck, Annapolis and others will reduce STP phosphorus loads in the year 2000 to 77% below their 1980 level.

Pollutant/Resource of Concern	Specific Objectives	Implementation Strategy
Nutrients	Reduce total P loads from POTWs.	-Complete construction of all STPs where TP=2 is currently applicable (current UCBP policy) & enforce Net P reduction from POTWs in Maryland by year 2000 is 1,020,480 ® in March-October period, a reduction of 58% below 1983 levels. P loads in period 1980-1983 were reduced by 46%.
Nutrients	Reduce P and N loads from both point and nonpoint sources to the reservoirs	Implement the Reservoir Agreement signed by the State, Baltimore City, Baltimore County, and Carroll County.
Nutrients, Toxics, Conventional Pollutants	Consider how best to reduce pollutants from separate stormwater pipes.	Analyze the relative amount of pollutant loads from separate stormwater discharges. When effluent limits are violated, use educational effort, technical assistance, &/or enforcement & fines to reduce pollutant loads from stormwater pipes.
Nutrients, Toxics, Conventional Pollutants		Nonpoint sources -Implement & enforce 1983 State stormwater regulations -Agriculture - install BMPs in priority areas -Implement Critical Areas statute (see Bay-wide implementation strategy) -Complete & use 1984 CB implementation project results (Ritchie Hwy, Baltimore City, Towsers Branch) as basis for new requirements/policy re stormwater from existing development. -Implement educational campaign re fertilizer application by urban & suburban landowners.
Toxics	Identify & control toxic discharges to the Patapsco River	Implement biomonitoring program & use results to change provisions of future municipal & industrial NPDES permits. -Implement dechlorination at various POTWs.

EASTERN SHORE RIVER BASINS

DESCRIPTION

Maryland's Eastern Shore river basins include the coastal plain tributaries in a region that is predominately agricultural. Pollutants of concern in the region include nutrients, sediment, chemical pesticides. Bacteria levels in some local areas have caused shellfish harvesting areas to close. Nonpoint sources account for most of the pollution problems in these basins. Runoff from cropland contributes 50% of the total phosphorus and 83% of the total nitrogen loads in this region. Turbidity and sediment pollution problems are most severe immediately following storm events in areas of conventional cropland tillage. High levels of bacteria occur after peak periods of recreational boating activities in certain areas, such as Kent Narrows. Nitrogen is of concern in portions of the Chester watershed where the Maryland Soil Conservation Committee has identified a relatively high potential for nitrogen release to the Bay. Recent study has linked tile drainage to the transport of nitrate from fields to streams through groundwater. Nitrogen in animal wastes is being studied by OEP and USGS as a source of both surface and groundwater pollution. Present pollution loads are as follows:

Phosphorus	833,000 lbs	(March - October)
Nitrogen	8,741,000 lbs	(March - October)

The Eastern Shore of Virginia, just to the south, is predominantly forested (54%) and used for agriculture (44%) with less than 2% classified as urban land use. Pollutant problems of concern are nutrients, fecal coliforms and low dissolved oxygen.

Population there is expected to increase from the 1980 level of 48,900 to 56,800 by the year 2000.

MARYLAND - MANAGEMENT PROGRAMS

Maryland has just revised and expects to submit to EPA by Fall, 1985 an updated water quality management plan for the Chester River basin. A similar update for the Elk - lower Susquehanna basin should be completed by December, 1985. The Choptank plan should be updated by early in FY 87.

Nutrients

Point Sources

- Complete construction at all STPs where TP=2 is currently applicable (currently UCBP policy) & enforce permits

- The UCBP policy applies to the POTW's serving Elkton, Havre de Grace, Northeast, and Perryville. For these plants a 71.4% P reduction below present levels is expected by the year 2000.

Nonpoint Sources

- Implement BMPs in priority agricultural areas.
- Implement Bay Critical Areas legislation.
- Implement educational campaign re: fertilizer application by urban and suburban landowners in Elk and Choptank River basins.
- Strengthen agricultural enforcement and follow-up where needed.
- Strengthen sediment and erosion control enforcement on construction sites.
- Complete and evaluate Bay implementation projects, including marina pumpout facilities.

The State of Maryland has targeted several Eastern Shore river basins, including the upper Choptank River, upper and lower Wicomico rivers, lower Pocomoke River and upper Chester River to reduce nutrient loads from agricultural sources.

Living Resources

The State of Maryland is establishing a SAV nursery at the Oxford Ponds. The Deal Island fish hatchery facility will be constructed in the spring of 1985.

VIRGINIA - MANAGEMENT PROGRAMS

Nutrients

The Eastern Shore has been targeted as a priority area for cropland BMPs. Funding from the Infiltration/Inflow Rehabitation Initiative will assist the Town of Onancock in its program to reduce raw sewage overflows from its sewer system.

Toxics

The Town of Onancock will also receive initiative funding to convert its sewage treatment plant's disinfection system from chlorination to ultra violet radiation.

PATUXENT RIVER BASIN

DESCRIPTION

Water pollutants of concern in the Patuxent River basin include sediments and nutrients. Nutrient concentrations are among the highest of the Bay tributaries. The concentration of chlorophyll a, which is associated with high nutrient loads, is also among the highest. Dissolved oxygen concentrations are low in the estuary during summer months. Municipal treatment plants account for 79% of the total phosphorus and 47% the total nitrogen loads. Stormwater runoff from urban areas contributes nutrients and toxic metals. Present pollution loads are as follows:

Phosphorus	478,000 lbs	(March - October)
Nitrogen	2,493,000 lbs	(March - October)

MANAGEMENT PROGRAMS

Nutrients

Maryland has set a goal of reducing total daily phosphorus load from point sources to 420 lbs by 1987. Total phosphorus loads from POTWs will be reduced 1000 lbs, a 52% reduction, between 1983 and the year 2,000. This assumes:

1983 - 3.05 mg/l P concentration for 39 MGD
2000 - 1.0 mg/l P concentration for 76 MGD

The State has set a goal of reducing the total daily N load from point sources to 3,900 lbs by 1987. Total nitrogen loads from POTWs will be reduced 4900 lbs, a 43% reduction between 1983 and the 2000. This assumes:

1983 - 6000 mg/l N/day loading
2000 - 18 mg/l N for all STPs not named in Patuxent nutrient strategy (37 mgd)
3 mg/l N for all flows controlled by Patuxent nutrient strategy (39 mgd)

The Patuxent basin will receive Maryland agricultural cost sharing funds and will be involved in further research on agricultural nonpoint pollution. As of 6/1/85, the Maryland Department of Agriculture has approved 190 agricultural cost-sharing applications and 76 of these have been processed and approved by the Maryland Board of Public Works.

Toxics

The State strategy includes efforts to control the discharge of chlorine and other toxicants from power plants, industry, municipal waste water treatment plants and urban runoff sources.

Living Resources

The State of Maryland strategy for the Patuxent River watershed includes the re-establishment of SAV beds and the use of vegetative solutions to shoreline erosion problems. This strategy also includes efforts to restore habitat and resource potential for finfish and shellfish.

LOWER CHESAPEAKE BAY

DESCRIPTION

The lower Chesapeake Bay area includes the main Bay proper from the Patuxent on the western shore to the Choptank on the eastern shore, and extending to the mouth of the Bay at Norfolk. Major tributaries to the lower Bay include the Potomac, Rappahannock, York, and James. There are numerous smaller tributaries on both the eastern and western shores.

The upper segment of the lower Bay, CB-5 (Fig. III-3) is characterized by salinities of 12 to 13 ppt in the long-term summer average and lies mid-way in the area subject to summer anoxia. Most of the deeper areas of the Bay are found in this segment.

The boundary between CB-5 and CB 6-7, separates the lower Bay into three regions with different circulation patterns. North of this boundary, the Bay's density stratification results in two distinct, vertical layers. The deep water then moves in a net upstream flow, and the surface layer flows downstream. Between this boundary and the Bay mouth, the density distribution tends toward a cross-stream gradient rather than a vertical one. This results in net advertive flows throughout the water column, on the average, to flow north in segment CB-7 and south in CB-6 and CB-8. This pronounced horizontal gradient also exists across the Bay mouth. Thus, planktonic organisms and the larvae of anadromous fish are brought into the Bay with the higher salinity ocean water along the eastern side of the lower Bay, until they become entrained into the lower layer at segment CB-5 and are carried up the Bay to grow and mature. Also, the high rates of sand deposition in this segment are thought to be imported from the inner shelf region at the ocean boundary.

Eastern shore embayments such as Eastern Bay (EE-1), the sub-estuary of the Choptank River (EE-2), and Pocomoke and Tangier Sounds (EE-3) have salinities similar to adjacent Bay waters and are shallow enough to permit light penetration necessary for submerged aquatic plant growth. These areas provide shelter for many invertebrates and small fish that contribute to the Bay's natural richness.

Water quality in the lower Bay is fair to good. The upper segment is subject to summer anoxia which can be toxic to fish, crabs, shellfish, and benthic animals. The segment from the Patuxent to the Rappahannock is influenced by inflow from the Potomac and Patuxent Rivers and is rich in nutrients.

Point sources of toxics appear to be significant in the Norfolk industrialized area.

MARYLAND - MANAGEMENT PROGRAMS

Maryland has research projects underway.

VIRGINIA - MANAGEMENT PROGRAMS

Virginia is supporting pilot projects for phosphorus removal and is doing research in support of Chesapeake Bay management programs.

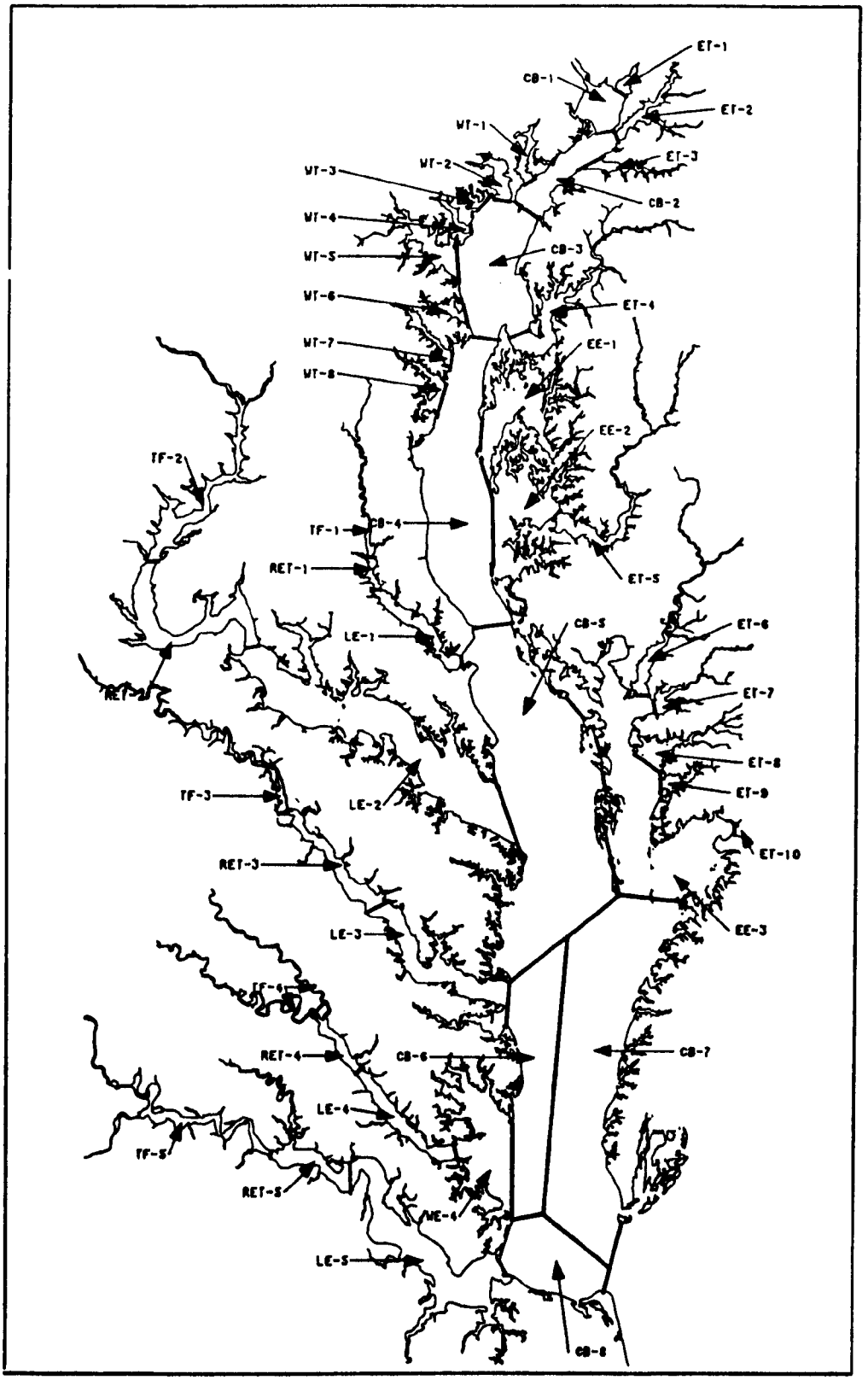


Figure III-3 Chesapeake Bay Program segments used in data analysis.

FEDERAL - MANAGEMENT PROGRAMS

EPA pilot studies for implementing its toxics control policy and DOD's installation restoration program are currently underway.

Note: See Management Programs of lower Bay tributaries: Potomac, Rappahannock, York and James rivers.

POTOMAC RIVER

DESCRIPTION

The Potomac River drains 14,669 square miles of Pennsylvania, Virginia, West Virginia, D.C. and Maryland. The majority of the land in the basin is either forested (56%) or in agricultural use (37%) and the remainder (7%) is developed. The Washington metropolitan area, the largest population center on the Bay, is located at the fall line and is served by Blue Plains WWTP, also the largest municipal WWTP on the Bay.

During the 1960's the Potomac estuary was characterized by massive blue-green algae blooms and low dissolved oxygen levels associated with high levels of nutrients. Efforts have been made to halt the river's degradation by upgrading the treatment capabilities of POTWs in Maryland, Virginia, and D.C. discharging to the river through the addition of nutrient removal capability. Today there is a decrease in the total phosphorus concentration in the water column of the upper segment and a decrease in total nitrogen levels in the lower portion of the estuary. There are large decreases in algae and significant increases in dissolved oxygen. In 1980, municipal point sources accounted to 59 percent of the phosphorus and 44% of the nitrogen load of the Potomac River basin. Nonpoint sources of pollution accounted for 41% of the phosphorus and 55% of the nitrogen load.

- High levels of nitrogen and moderate levels of phosphorus are found in the upper estuary. Total nitrogen concentrations in this area averaged from 1.0 - 1.7 mg/l and total phosphorus levels from 0.11 - 0.14 mg/l during 1977 - 1980.

- Low nutrient levels exist in the lower estuary. Nitrogen levels averaged between 0.4 - 0.6 mg/; and phosphorus from 0.06 - 0.08 mg/l from 1977 - 1980.

- Metal contamination is highest in sediments in and below the Washington metropolitan Area.

While there has been some improvement in living resources, the overall situation still requires considerable improvement.

- Oyster harvests and reproductive success have declined.

- Blue crab harvests have remained relatively stable.

- Landings of finfish spawning in the freshwater reaches of the river have declined.

MANAGEMENT PROGRAMS

An updated water quality management plan for the Middle Potomac basin in Maryland is expected to be completed and submitted to EPA by late Fall, 1985. The lower Potomac plan update will be started in late Summer, 1985.

Nutrients

In 1983 a severe algal bloom occurred in the tidal fresh Potomac and the embayments. The Potomac Strategy Management Committee, composed of Maryland, Virginia, the District and EPA, assembled a panel of nationally recognized experts to determine why the algal bloom occurred when nutrient loadings from point sources were at an historical low. The Expert Panel study, completed in March, 1985, determined that the bloom was initially stimulated by a combination of adequate nutrients and favorable hydrologic and climatic conditions. However, from August to October the bloom was greatly intensified and maintained by a substantial, unexpected source of phosphorus generated from the river sediments under high pH conditions.

The Panel provided general recommendations on alternative control actions which could be taken to reduce the risk of reoccurrence of algal blooms similar to the 1983 bloom, and subsequently to achieve various water quality goals. In addition to maintaining the existing phosphorus removal program, the Panel recommended that a number of other control alternatives be considered. It was also recommended that while pursuing development of a control strategy, additional scientific studies should be initiated in order that the remaining questions can be answered more fully. The Potomac Strategy Management Committee is currently evaluating the Panel's conclusions and recommendations, and will be developing a control strategy based upon this study, as well as all other necessary information including control costs, feasibility, and environmental risks and benefits of alternative control options.

A process has been established which will result in the development of revised wasteload allocations for nutrients by FY 87, with an interim allocation to be developed during the summer of 1985.

Toxics

Maryland, Virginia and the District of Columbia will be implementing dechlorination at various POTWs to improve finfish and shellfish survival. Control programs for urban runoff, proposed or in place will provide for reductions in heavy metals. The Potomac Estuary is relatively unaffected by industrial discharges but pretreatment programs will provide additional reductions in heavy metals from POTWs.

Living Resources

The Potomac Estuary supplies 80% of Virginia's commercial rockfish harvest, and partial bans on rockfish harvesting have been implemented by the bi-state Potomac River Fisheries Commission. The District is considering a ban. SAV, which had been declining, is beginning to increase in the estuary. However, this increase has been overshadowed by the discovery of Hydrilla, an introduced exotic SAV. Controversy exists over the benefits and detriments of Hydrilla. Research by USGS, Maryland DNR and the Corps of Engineers is underway.

Implementation of the Anacostia Watershed Restoration Strategy Agreement, signed by the State of Maryland and the District of Columbia in July, 1984 should improve water quality sufficiently to restore the tidal portion to a state suitable to again serve as a nursery ground for anadromous species. The removal of toxic chlorine from POTWs discharging to the Potomac Estuary will increase the survival of fish larvae and oyster spat.

Institutional/Management

Maryland, Virginia, the District, various local governments, and other agencies such as the Washington metropolitan area Council of Governments and the Interstate Commission for the Potomac River Basin, maintain a coordinated monitoring program on the Potomac. The Potomac Strategy Committee meets as needed and coordinates regulatory activities on the Potomac.

Other

Sludge management in the Washington metropolitan area has been a difficult problem; however, local, state and federal cooperation has resulted in an interim solution for the next five years while the long term solution is being put in place.

RAPPAHANNOCK RIVER

DESCRIPTION

The Rappahannock River drains 2,631 square miles and its land uses are primarily forest and agriculture. Its major developed area is Fredericksburg, near the river's fall line. The downstream Rappahannock area is also developed. The 1980 basin population was 150,000 and is projected to increase to 209,000 by the year 2000.

The Rappahannock is considered one of the least adversely affected western tributaries of the Bay. Nevertheless, negative trends in some living resources have been recorded.

- Commercial oyster harvests have recently declined, as has oyster reproductive potential.

- Blue crab harvests have remained relatively stable.

- Harvests of finfish spawning in the freshwater reaches of the river have declined steadily.

- Submerged grasses disappeared in the river between 1970 and 1975. Near the river mouth less than 3% of potential habitat is occupied by these grasses.

- Over 24,331 acres of shellfish beds are closed to harvest due to fecal coliforms (7,628 acres of productive beds and 16,703 acres of non-productive beds).

Although concentrations of phosphorus in the mid- and lower reaches of the river are currently low, trend analysis indicates that concentrations of inorganic phosphorus have been increasing. Nutrient loadings in the Rappahannock drainage system are chiefly (74%) from nonpoint sources. Industrial activities generate more than one-third of the small total point source load. Toxic substances are not a problem in the river.

- 1980 nutrient loads to the Rappahannock River system approximated 2.9 million lbs. total nitrogen and 0.3 million lbs. total phosphorus.

- High levels of phosphorus, averaging between 0.14 - 0.24 mg/l during 1977 - 1980, and moderate levels of nitrogen, averaging 0.8 - 1.0 mg/l during this period, are found in the tidal fresh section of the river, just below Fredericksburg.

- Lower nutrient levels are found in the lower portion of the river. Between 1977 - 1980 phosphorus concentrations averaged 0.06 - 0.1 mg/l and nitrogen concentrations between 0.4 - 0.6 mg/l.

- River sediments contain low levels of metals, although small areas are enriched with metals, especially cadmium, from natural sources.

- Information on other water quality parameters and on organics is limited.

MANAGEMENT PROGRAMS

Nutrients

Given expected basin growth and development and assuming existing levels of controls, the future (year 2000) phosphorus loading is projected to increase 16% and the future (year 2000) nitrogen loading to increase 2% relative to 1980 nutrient loadings.

In order to achieve the Commonwealth's tentative goal of a 20% reduction in phosphorus relative to the 1980 loading, the total annual input of phosphorus into the Rappahannock from all sources would have to be 222,000 lbs. To achieve the tentative goal for nitrogen, the annual loading would have to be 2,945,000 lbs.

Work is continuing on methods that will allow a more accurate assessment of the effects of the various nonpoint source control techniques. As that information becomes available, it will be much easier to quantify the expected effects of alternative combinations of point and nonpoint control strategies for the basin.

The initial mix of control strategies being developed for the basin and the initial basin nutrient goals will be reviewed as new information becomes vailable and will be modified as necessary. The Virginia General Assembly has established a joint subcommittee to examine the nutrients question and associated management options. The findings of that subcommittee will be central to the development of a nutrients policy for this basin.

As population in the basin expands there is a corresponding need for expansion in sewage treatment capacity. During the two biennia under consideration two new publicly owned treatment works will be put into operation, and one plant will have its capacity expanded to accommodate that growth and to protect the river. The new and expanded plants are as shown in the following table.

Location	Total Flow/Permit Limit (MGD)	
	New	Expanded
Sperryville	0.055	
FMC*	2.6	
Rappahannock		to 0.4

* New discharge from the former FMC plant treatment facility with sewage bring transferred from Fredericksburg and Massaponax publicly owned treatment works. The new, reduced flows will be 1.48 MGD from the Fredericksburg facility and 1.47 MGD from the Massaponax facility.

The Commonwealth is also working to reduce the amount of nutrients entering the river from agricultural nonpoint sources. The Division of Soil and Water Conservation is managing this voluntary program in conjunction with the Soil and Water Conservation Districts of the basin. In the first year of the

1984-86 biennium, a total of $8,805 in cost-share funds has been allocated to 34 farms for the implementation of selected BMPs. Efforts are now being made to interest additional farm operators in the program.

Toxics

While toxics are not now a problem in the Rappahannock, the potential for a problem will increase as basin growth and development increase. Monitoring for toxics in the Rappahannock River is carried out on a routine basis.

Living Resources

A submerged aquatic vegetation (SAV) replanting effort is taking place in the Rappahannock River.

A program for improving deficiencies in shoreline residential sanitary systems will result in a total of 431 acres of shellfish grounds being reopened for harvest in the Rappahannock River and adjacent areas fronting on the Bay ("Western shore embayments").

Public Participation

A Rappahannock River citizens participation program is being developed in 1985 to give interested parties in the basin an opportunity to work with the State in the definition and resolution of basin water quality and living resource problems. Support for these activities of the citizens groups will come from both the State and EPA.

YORK RIVER

DESCRIPTION

The York River drains 2,986 square miles and its land uses are primarily forest and agriculture. Its major developed areas include West Point, at the confluences of the Mattaponi and Pamunkey tributaries, and Gloucester, near the river mouth. The 1980 basin population was 180,000 and is projected to increase to 285,000 by the year 2000.

The York River is a relatively unaffected western shore tributary, but it has lost some of its resource quality in the last decade or so.

- The river supports a small oyster fishery with wide fluctuations in harvest. However, oyster reproductive potential is fairly stable.

- Blue crab harvest have remained relatively stable, and finfish landings have steadily declined.

- Submerged grasses occupy between 0 - 6% of the available habitat in the river. However, the Mobjack Bay area supports some of the largest SAV beds in Virginia.

- Over 17,766 acres of shellfish beds have been closed due to fecal coliform contamination (8,569 acres of productive beds and 9,197 acres of non-productive beds).

The tidal-fresh portion of the York is moderately enriched with phosphorus, and trend analysis indicates the nitrogen concentrations are increasing in the Pamunkey and Mataponi rivers, tributaries to the York. The 1980 EPA-CBP data indicated that nonpoint sources were the major sources of nutrients, contributing 65% of the phosphorus and 87% of the nitrogen load. Point sources accounted for 35% of the phosphorus and 13% of the nitrogen load.

- 1980 nutrient loads to the York River System approximated 2.3 million lbs. total nitrogen and 0.2 million lbs. total phosphorus.

- Moderate levels of phosphorus and nitrogen are found in the upper reaches of the system, above West Point. Total nitrogen concentrations averaged between 0.6 - 0.8 mg/l and total phosphorus concentrations from 0.11 - 0.14 during the period from 1977 - 1980.

- Low levels of nitrogen, averaging 0.4 - 0.6 mg/l, and moderate levels of phosphorus, 0.08 - 0.11 mg/l during 1977 - 1980, characterize the lower portion of the river.

- Information on other water quality parameters and on metal and organic contaminants is limited.

MANAGEMENT PROGRAMS

Nutrients

Given expected basin growth and development and assuming existing levels of controls, the future (year 2000) phosphorus loading is projected to increase 58% and the future (year 2000) nitrogen loading to increase 11% relative to 1983 nutrient loadings. For the York River 1983 was chosen as the base year to take into account the HRSD-York River POTW that went into operation that year. In order to achieve the Commonwealth's tentative goal of a 20% reduction in phosphorus relative to that base year, the total annual input of phosphorus into the York from all sources would have to be 248,000 pounds. To achieve the tentative goal for nitrogen, the annual loading would have to be 2,710,000 pounds.

The Virginia General Assembly has established a joint subcommittee to examine the nutrient question and associated management options. The findings of that subcommittee will be central to the development of a nutrients policy for this basin.

Work is continuing on methods that will allow a more accurate assessment of the effects of the various nonpoint source control techniques. As that information becomes available it will be much easier to quantify the expected effects of alternative combinations of point and nonpoint control strategies for the basin.

The initial mix of control strategies being developed for the basin and the initial basin nutrient goals will be reviewed as new information becomes available and will be modified as necessary.

As population in the basin expands, there is a corresponding need for expansion in sewage treatment capacity. During the two biennia under consideration two publicly owned treatment works on the York River will have their treatment capacity expanded to accommodate that growth and protect the river. The plants being expanded are as follows:

Location	Total Flow/Permit Limit (MGD)
	Expanded
Louisa	to 0.2
Ashland	to 1.2

The Commonwealth is also working to reduce the amount of nutrients entering the river from agricultural nonpoint sources. The Division of Soil and Water Conservation is managing the voluntary program in conjunction with the Soil and Water Conservation Districts of the basin. In the first year of the 1984-86 biennium a total of $14,523 in cost-share funds has been allocated to 22 farms for the implementation of selected BMPs. Efforts are now being made to interest additional farm operators in the program.

Toxics

While toxics are not now a problem in the York River the potential for a problem will increase as basin growth and development increase. Monitoring for toxics in the York River is carried out on a routine basis.

Living Resources

A submerged aquatic vegetation (SAV) replanting effort is taking place in the York River off shore of the Virginia Institute of Marine Science of Gloucester Point and is showing substantial growth.

A program for improving deficiencies in shoreline residential sanitary systems will result in a total of 637 acres of shellfish grounds being reopened for harvest in the York River and adjacent areas of Gloucester County fronting on the Bay ("Western shore embayments").

Public Participation

A York River public participation effort will be developed in 1985 to give interested parties in the basin an opportunity to work with the State in the definition and resolution of basin water quality and living resource problems. Support for these activities will come from both the State and EPA.

JAMES RIVER

DESCRIPTION

The James River drains 10,195 square miles, about one quarter of Virginia's total area. Its land use is primarily forest with a small percentage of cropland and significant urban development below the fall line. Major urban developments are Richmond/Hopewell and the Greater Hampton Roads area with Williamsburg a separate center.

The James River shows environmental degradation and related loss of biological resources.

- Commercial harvests of market oysters and oyster reproduction potential have declined.

- Landings of finfish spawning in the upper reaches of the river (striped bass, shad, river herring) have declined.

- Submerged grasses disappeared from the river prior to 1970, with the exception of a few grass beds near the mouth of the James.

- Over 101,216 acres of shellfish beds are closed in the James River and adjacent Chesapeake Bay waters due to fecal coliform contamination. (53,979 acres of productive beds and 47,237 acres of non-productive beds).

Most of the James' total toxic and nutrient load is generated below the fall line by industrial and municipal point sources. High levels of both phosphorus and nitrogen are found in the upper- and mid-reaches of the river. However, trend analysis indicates that both phosphorus and nitrogen concentrations are declining throughout most of the estuary. Municipal point sources below the fall line account for 93% of the phosphorus and 79% of the nitrogen load in the James River. Industrial discharges are significant sources of toxic substances and nutrients.

- 1980 nutrient loads to the James River basin approximated 20.5 million lbs. total nitrogen and 3.8 million lbs. total phosphorus.

- High levels of both nitrogen and phosphorus are found in the James River between Richmond and the mouth of the Chickahominy River. Total nitrogen concentrations in this area averaged between 1 - 1.75 mg/l; total phosphorus between 0.14 - 0.24 mg/l during the period from 1977-1980.

- Moderate levels of nitrogen and low levels of phosphorus characterize the lower portion of the river. Between 1977-1980 total nitrogen concentrations in this area average between 0.6 - 0.8 mg/l; total phosphorus between 0.06 - 0.08 mg/l.

- River sediments contain high levels of metals near Hopewell and the Elizabeth and Lynnhaven rivers.

- High levels of sediment organics, especially PAHs, are found just below Richmond, near Hopewell and in portions of the Elizabeth River.

- Data on other water quality parameters are limited, with the exception of Kepone, which is routinely monitored by the State Water Control Board.

MANAGEMENT PROGRAMS

Nutrients

Given expected basin growth and development and assuming existing levels of controls, the future (year 2000) phosphorus loading is projected to increase 32% and the future (year 2000) nitrogen loading to increase 22% relative to 1980 nutrient loadings.

In order to achieve the Commonwealth's tentative goal of a 20% reduction in phosphorus relative to the 1980 loading, the total annual input of phosphorus into the James from all sources would have to be 3,040,000 lbs. To achieve the tentative goal for nitrogen the annual loading would have to be 20,505,000 lbs.

Work is continuing on methods that will allow a more accurate assessment of the effects of the various nonpoint source control techniques. As that information becomes available it will be much easier to quantify the expected effects of alternative combinations of point and nonpoint control strategies for the basin.

The initial mix of control strategies being developed for the basin and the initial basin nutrient goals will be reviewed as new information becomes available and will be modified as necessary. The Virginia General Assembly has established a joint subcommittee to examine the nutrient question and associated management options. The findings of the subcommittee will be central to the development of a nutrients policy for this basin.

As population in the basin expands there is a corresponding need for expansion in sewage treatment capacity. During the two biennia under consideration, two new publicly owned treatment works will be put into operation, and five plants will have their capacity expanded to accommodate that growth and to protect the river. The new and expanded plants are as follows:

Location	Total Flow/Permit Limit (MGD)	
	New	Expanded
Buena Vista		to 2.25
New Castle	0.175	
Smithfield		to 0.5
Bath County	0.45	
Proctors Creek		to 12.0
Appomattox		to 0.054
Surry		to 0.06

The Commonwealth is also working to reduce the amount of nutrients entering the river from agricultural nonpoint sources. The Division of Soil and Water Conservation is managing this voluntary program in conjunction with the Soil and Water Conservation Districts of the basin. In the first year of the 1984-86 biennium a total of $6,632 in cost-share funds has been allocated to 33 farms for the implementation of selected BMPs. Efforts are now being made to interest additional farm operators in the program.

Toxics

The James River has experienced various degrees to contamination from toxic materials. Kepone is a persistent problem although that toxicant is being buried by river sediments over time. The areas below Richmond and Hopewell are areas of significant concentrations of other toxicants as is the Elizabeth River. Special monitoring and analytical programs are being carried out for Kepone and for other organic compounds. The Water Control Board is developing a comprehensive Elizabeth River Water Quality Management Plan that will include an adequate assessment of the river's environmental conditions and recommend realistic management options.

Public Participation

A James River citizens involvement program will be developed in 1985 to give interested parties in the basin an opportunity to work with the State in the definition and resolution of basin water quality and living resource problems. Support for these activities will come from both the State and EPA.

Chapter IV - LOOKING AHEAD

Introduction

This Plan has described the current state and federal initiatives to restore and protect the Bay. Although the cumulative impact of these efforts cannot be predicted with certainty, there is reasonable evidence that these programs are a step in the right direction - an effort to stem the tide of pollution. It must be recognized, however, that the restoration and protection of the Bay will require long-term commitments from the citizens and governments of the Bay region. The Bay's problems are the result of decades of abuse; understandably, there is no short-term solution.

As discussed in Chapter I, the Chesapeake Bay Program findings clearly indicate that the Bay's water and sediment quality have degraded and many of its important living resources have declined. The relationship observed between the reduction in water and sediment quality and the Bay's declining resources demonstrate probable causes and their effects. These causal inferences have guided the direction of the control efforts and enabled the respective levels of government to qualitatively project the potential impacts of their remedial programs. The general results anticipated from the state and federal initiatives and the remaining questions are identified in this chapter. The continuing process to restore and protect the Bay is also discussed here. (Detailed descriptions of the implementation programs are included in Appendices A-D, and the research, monitoring, and modeling efforts as well as the institutional mechanisms to address remaining questions are described in Appendix E).

Nutrients

Goal:

> Reduce point and nonpoint source nutrient loadings to attain nutrient and dissolved oxygen concentrations necessary to support the living resources of the Bay.

Scientific studies have shown that excessive nutrient loadings produce high nutrient concentrations in the water column, resulting in an increase in the microscopic floating plants called algae. The increase of the algae prevents light from reaching the submerged grasses; and, as the algae decompose, they contribute to low oxygen conditions which, in turn, can be harmful to both finfish and shellfish. The nutrient which controls this process varies in different parts of the Bay. For example, it appears that phosphorus is the limiting nutrient in tidal-fresh areas such as the upper sections of the Bay and its tributaries, while nitrogen may be limiting in the more saline areas. This relationship between increased nutrient loadings and environmental quality was clearly demonstrated in the upper tidal-fresh Potomac when increased nutrient loadings from 1930 to 1970 resulted in massive blue-green algae blooms. These nuisance blooms were ameliorated by 1980 through phosphorus load reductions at sewage treatment plants. It can be reasonably concluded, therefore, that reducing the nutrient loadings to the Bay from point and nonpoint sources will reverse the Baywide trend

toward nutrient enrichment and begin to restore the environmental quality of the Bay. A target objective under consideration for the Bay proper is the dissolved oxygen condition of the middle 20th century, when resources were more abundant (Figure IV-1).

The varied control programs in this document reflect the fact that each region of the Bay has unique characteristics. The nutrient loadings from the Susquehanna and Rappahannock river basins are derived primarily from nonpoint source agricultural runoff, while the West Chesapeake basin and the Patuxent and James rivers are dominated by point source nutrient loadings from sewage treatment plants and industry. The Potomac and York rivers are fairly evenly divided between point and nonpoint sources. To assure cost-effective utilization of limited financial resources, the states and federal government are targeting their nutrient control strategies to the particular water quality needs of the different geographic areas. Thus, nonpoint source controls are emphasized in the Susquehanna and Rappahannock basins and point source controls are emphasized in the West Chesapeake basin and Patuxent and James rivers. If it is assumed that the tidal-fresh segments of the Chesapeake Bay tributaries are similar in their natural characteristics, one can predict that the Patuxent, Potomac or upper Main Bay can be improved through changes in phosphorus concentrations resulting from load reductions. Presently the Rappahannock is characterized by relatively abundant submerged aquatic vegetation and finfish and shellfish. This river system qualitatively represents the general condition worth achieving Baywide by the year 2000.

In this plan, there are no firmly established quantifiable target loads for each of the tributaries. Although it is not possible to predict with certainty the nutrient levels necessary to achieve specific goals or nutrient loadings before and after program implementation, such predictions will be developed. It is known that the existing nutrient loads are resulting in over-enriched conditions; therefore, included in this plan (see Appendix A) are nutrient reduction programs to reduce existing loads and control future loads as follow:

- The Upper Bay Phosphorus Limitation Policy, the Potomac Strategy and the Patuxent Strategy will reduce sewage treatment plant phosphorus loadings to the highly enriched tidal-fresh areas of the Bay;

- The Federal Construction Grant Program will provide approximately $84 million for sewage treatment plant construction in 1985. These funds will support projects that are currently reached on the priority list and are within the Bay drainage system. Appropriate matching funds will be provided by state and local governments;

- The Washington, D.C. combined sewer overflow abatement program will reduce pollutant loads to the Potomac estuary;
- State/Federal Agricultural Control Programs will be implemented in 1985 providing cost-share financial assistance in targeted areas and other support activities, including technical assistance and planning;

- State and local sediment and erosion control programs will be implemented to reduce nutrients associated with sediment from construction sites in urban and suburban areas; and

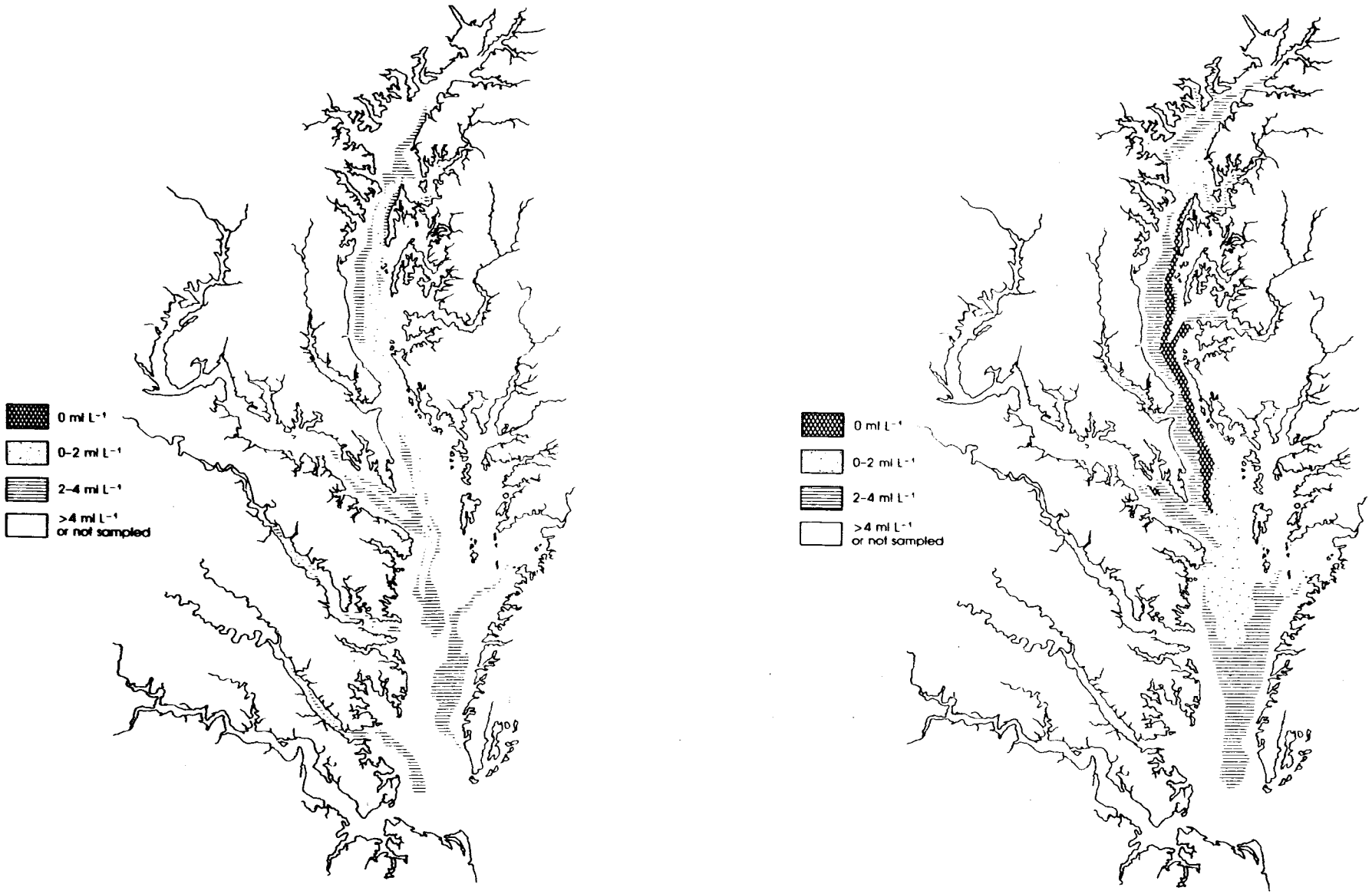


FIGURE IV.1. Comparison of dissolved oxygen levels in Chesapeake Bay in 1950 (left) and 1980 (right).

- The Department of Defense national pollution abatement program will reduce nutrient loading to the Bay from federal installations.

Efforts are currently underway to quantify some site specific and cumulative nutrient reductions that will be achieved by all these programs. Reductions will be projected from point source loadings and nonpoint source loadings. In fact, recent point source control efforts have shown significant reductions in phosphorus loadings between 1980 and 1983 in the West Chesapeake, Patuxent and Potomac. (See Table IV.1) Future projections, given the proposed strategies, suggest it may be possible to hold current loadings in several basins and achieve further reduction in highly enriched areas such as the West Chesapeake and Patuxent. It is evident, also, that significant nutrient reductions could be achieved if conservation tillage practices are implemented on more farms in key areas. Even further reductions will be achieved if other best management practices are applied.

Remaining are questions that need to be addressed to assure effective long-term nutrient management. The major questions are:

- What are the specific impacts of nutrient enrichment in the Chesapeake Bay system?

- What specific nutrient reductions levels need to be met to assure water quality and protect living resources?

- What specific water quality and living resources benefits will be attained at these levels?

- What additional actions, if any, are needed to achieve these levels?

The results from research, modeling and monitoring programs described in Appendix E will help answer these questions. As our understanding increases, we may need to redirect our priorities and implement additional strategies for the control of nutrients.

Toxics

Goal:

Reduce or control point and nonpoint sources of toxic materials to attain or maintain levels of toxicants not harmful to humans or living resources of the Bay.

Research has shown a relationship between elevated levels of toxic compounds in the sediments and the survival of individual organisms and the diversity of living organisms necessary to have a balanced Bay ecosystem. Individual organisms exposed to highly contaminated sediments of the Bay initially experience harmful effects such as fin decay and lesions and may die. Field studies have also shown that areas of the Bay contaminated with toxic sediments support only a few types of organisms while uncontaminated areas of the Bay have many different types of organisms. These findings clearly suggest that the living resources, in certain areas of the Bay, are threatened by high levels of toxicants. The major sources of the toxicants are industrial facilities and sewage treatment plants. There are over 5,000

TABLE IV-1

Municipal Point Source Phosphorus Loads (Millions of pounds) Discharged/Delivered to the Chesapeake Bay (March-October)*

BASIN	1980 (1)		1983(2)		2000 (2+3)	
	Discharged	Delivered	Discharged	Delivered	Discharged	Delivered
Susquehanna						
PA	3.11	0.61	2.20(3)	--	3.17(5)	--
MD	0.03	0.03	0.02	--		--
West Chesapeake	1.94	1.94	1.70(4)	--	1.12(4)	--
E. Shore						
MD	0.24	0.24	0.28(3)	--	0.33	--
VA	0.004	0.004		--	--	--
Patuxent	0.41	0.38	0.20	--	0.15	--
Potomac						
DC	1.04	1.04	0.20(3)	--	0.13	--
MD	0.43	0.14	0.58(3)	--	0.70	--
VA	0.78	0.52	0.44	--	0.62	--
Total	2.25	1.70	1.22	--	1.45	--
Rappahannock	0.07	0.07	0.10	--	0.12	--
York	0.04	0.04	0.14	--	0.32	--
James	2.72	2.58	2.96	--	3.92	--
TOTAL	10.81	7.59	8.82	--	10.58	--

(1) Framework for Action and Hartigan Model Results

(2) MD DEP and VA SWCB

(3) EPA CBLO Point Source Update Based on 1983 operational data

(4) Includes 0.42 million pounds of phosphorus in treated effluent from Back River STP discharged by Bethlehem Steel.

(5) Projected discharge based on 2 mg/l permit limits in lower Susquehanna.

* The Table shows that discharged municipal phosphorus loads have decreased basin wide between 1980 and 1983. This is due to implementation of policies limiting effluent phosphorus concentrations in the Susquehanna, West Chesapeake, Patuxent, and Potomac River basins. Discharged loads for 1980 and 1983 are based on operational data and if not available, an effluent phosphorus default value of 8.0 mg/l for secondary treatment. Discharged loads for year 2000 reflect permitted effluent phosphorus concentrations. Delivered loads reflect simulation of natural physical and chemical decay processes that occur to discharged loads as they are transported from within the Bay drainage basin to estuarine waters.

permitted dischargers in the Bay basin. For contaminants such as lead, zinc, and many of the organic compounds, urban runoff and atmospheric deposition are also important sources. Future forecasts indicate that, unless the trend is halted, the sources of toxic substances will continue to grow in number and change in nature.

To achieve improvement in the future, sources of toxic materials which have been contaminating areas of the Bay need to be reduced. Care should be taken not to resuspend toxicants currently in the sediments. Simultaneously, the discharge of toxic materials to uncontaminated areas must be dealt with to prevent degradation. The following activities, summarized from Appendix B, are expected to reduce toxic pollution:

- State NPDES permit programs are or will be requiring toxic limitations and are or will be enforcing best available technology (BAT) and water quality-based effluent limitations, where needed;

- Fingerprinting and biomonitoring programs to analyze toxics in effluents and evaluate their impact on the living resources in receiving waters are being implemented;

- Pretreatment programs are being implemented at municipal sewage treatment plants, where needed;

- Chlorine control programs, including dechlorination and/or seasonal disinfection, will be implemented at selected sewage treatment plants;

- Stormwater management programs to reduce toxicants in urban runoff will be implemented in developing areas and demonstration projects will be initiated in selected developed areas; and

- Pesticide management will be instituted as part of the nonpoint source program on agricultural and suburban lands. Mostly an educational program, this saves users many dollars per acres and costs little to implement.

While the cumulative impacts of the toxic control activities are difficult to quantify, it is certain that significant toxic loading reductions will be achieved through the control of municipal and industrial point source programs. For example, metal loadings from many industrial facilities were significantly reduced between 1970 and 1980 due to pollution control efforts. It is anticipated that future control techologies will result in even greater reductions. With respect to nonpoint sources, the Nationwide Urban Runoff Program has demonstrated that significant reductions can be achieved through stormwater management. To reduce potential harm caused by pesticides in agricultural runoff, educational efforts are being implemented. The effectiveness of all the control strategies will be evaluated and, if appropriate, modified. The evaluation may also indicate the need for additional actions.

In the future, an increased understanding of the fate and effect of toxicants will help us set, attain and maintain levels not harmful to humans or living resources. Questions that are being addressed to assure more effective toxics management in the long-term are:

- Which toxic substances and/or sources affect the Bay system?

- What are their impacts?

- What specific toxic levels should not be exceeded to protect water and sediment quality and living resources?

- What additional activities need to be implemented to achieve levels of these toxicants not harmful to either humans or living resources of the Bay?

Some of the research, modeling and monitoring programs described in Appendix E will help answer these questions and better characterize the fate and effect of toxic materials.

Living Resources

Goal:

Provide for the restoration and protection of the living resources, their habitats and ecological relationships.

The decline in the living resources of the Bay can be attributed to several factors including pollution, physical loss of habitats, overfishing, major climatic events, and reductions in the amount of freshwater entering the Bay. As previously discussed, the observed relationships among nutrients and toxicants and living resources provide compelling evidence that water and sediment pollution threatens important living resources. An effective indicator of both pollution stress and physical alterations is the decline in the desirable species of submerged aquatic vegetation from 1965 to 1980 (Figure IV-2); a return of grasses to the 1965 condition is an appropriate target objective and several states have initiated revegetation programs. Furthermore, it must be recognized that the decline in the Bay fisheries is exacerbated by overfishing. Finally, natural climatic factors, such as unusually cold or warm winters, extremely wet or dry springs, and events such as hurricanes, dramatically affect the spawning success of finfish and shellfish.

It is apparent that the decline in the Bay's living resources cannot be attributed to a single cause, but rather a myriad of ecological stresses and overuse. This Plan describes those factors which can be controlled -- pollution, physical alteration (dredging, filling, damming, diverting), and overfishing. Following is a summary of those activities that provide for habitat restoration and fisheries management (See Appendix C):

- Fisheries management plans for striped bass and oysters will be developed by 1986 for both Virginia and Maryland waters. Shad and river herring plans will be developed for Maryland waters by 1986;

- A Baywide assessment program will evaluate the status of the major economically important fishery stocks;

- Striped bass stocking and shad restoration programs are being developed in the Susquehanna River Basin (PA and MD waters);

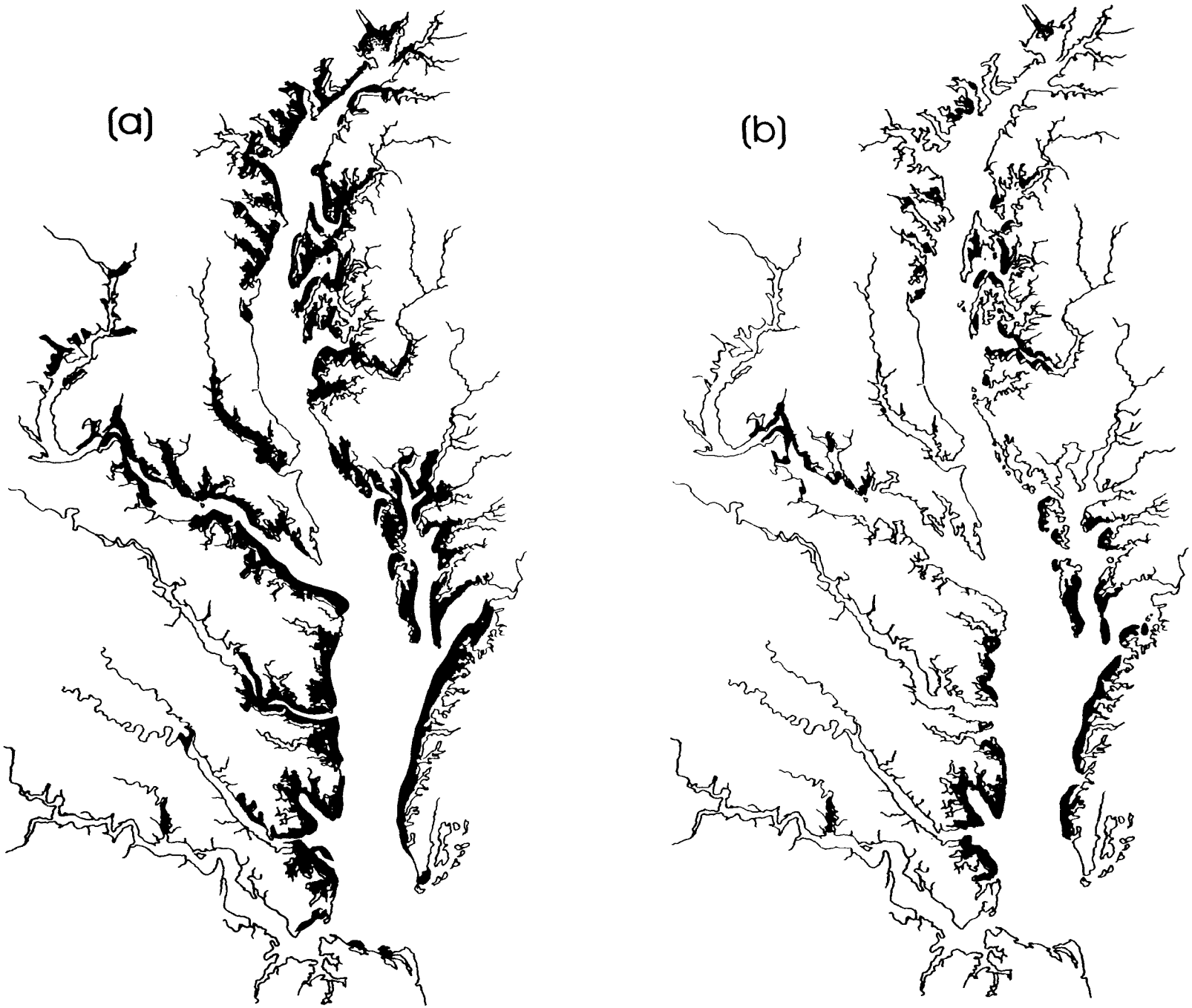


FIGURE-IV.2. General area of SAV distribution in (a) 1965 and (b) 1980.

- Oyster restoration efforts will result in approximately 3 million bushels of seed oyster planted in selected areas of the Bay and over 5 million bushels of fresh shell returned to the Bay by 1990; in addition, over 1000 acres of shellfish grounds will be reopened by 1986;

- Vegetative restoration efforts will result in 50 acres of submerged aquatic grasses planted in the Upper Bay, Choptank, York, Rappahannock and Potomac rivers; and

- Corps of Engineers shoreline erosion control programs are protecting the shores while reducing sediments into the Bay system.

Through these efforts to enhance Bay habitats and manage the fisheries, great strides can be made toward providing for the restoration and protection of the living resources. However, to assure effective long-term management of the living resources, there are remaining questions of concern:

- Which key living resources need special protection?

- What specific conditions are required in each area of the Bay to protect and restore those living resources?

- What specific actions do we need to take to reach these objectives?

Research, monitoring and modeling efforts will help address many of these remaining questions (see Appendix E). Because of the complex ecology of the Bay, we may never have all the answers to these questions. Nonetheless, we are taking immediate action to reverse the decline in these valued resources.

Institutional/Management

Goal:

Support and enhance a cooperative approach toward Bay management at all levels of government.

The Bay is a complex interactive ecosystem and actions taken in any part of the watershed may result in environmental degradation downstream. For this reason, it is essential that the activities of the federal and state planning and regulatory agencies be coordinated. Although each state, party to the Chesapeake Bay Agreement, is implementing programs to meet the requirements of its own statutes and regulations, the states and federal parties are working together to attain mutual benefits. States are also working with local governments and private entities to attain these benefits.

The federal/state cooperative effort called for in the Chesapeake Bay Agreement of 1983 has resulted in a number of major accomplishments:

- An Executive Council, Implementation Committee, four technical and management subcommittees, a Citizens Advisory Committee, and a Scientific and Technical Advisory Committee have been established and are operational;

- A regionwide planning process has been initiated and this initial Chesapeake Bay Restoration and Protection Plan has been developed;

- Memoranda of Understanding and a Joint Resolution among the federal agencies have been established to improve coordination and cooperation in Bay management, restoration, and protection efforts;

- Each state has established its own system for preparing, implementing, tracking, and evaluating its Chesapeake Bay initiatives on an annual or biennial basis;

- States will initiate new programs, as needed;

- For each basin, a strategy aimed at quantifiable objectives will be developed by the appropriate state(s) to address the unique problems and needs of that basin;

- Public education and participation efforts will be expanded to increase public awareness and understanding of the Bay;

- The need for and feasibility of a computerized, comprehensive BMP tracking system is being evaluated;

- A Chesapeake Bay Data Center has been established and the Baywide comprehensive data management system will be expanded;

- The Baywide integrated water quality and resource monitoring network is being implemented; and

- Coordinated Baywide research and modeling programs are being formulated.

The accomplishments and plans listed above summarize the many institutional and management programs described in Appendix E. These arrangements help establish the basis on which to assure accountability to the public. To further ensure accountability, the state agencies have instituted their own internal tracking systems to assure the implementation of their activities, and are performing annual evaluations of their progress. In addition, EPA and the other federal agencies oversee federal regulatory programs delegated to the states, and review all of the activities for which grants are awarded. Just as Congress scrutinizes the Executive Branch federal agencies to be sure their statutes are carried out and appropriated funds are properly spent, state legislatures watch over the state agencies. Tracking the activities of all state and federal elected and appointed officials are citizens who contribute to the system as additional checks and balances. Together, all of these efforts help ensure that each implementation program designed to improve the Bay does so.

All existing and new programs are being continually evaluated and the Chesapeake Bay Restoration and Protection Plan will be updated annually. As monitoring and research efforts unfold, new data will be assessed. Together, all levels of government, public and private sector groups, and the general public will need to judge whether the current efforts are successful, and what additional corrective measures may be necessary over the long-term. In the meantime, the efforts described here, such as agricultural best management practices and improved sewage treatment operations, represent the best informed judgement of the participants in the Chesapeake Bay restoration and protection program.

A major and significant accomplishment of the process leading to this Plan has been the adoption of goals and objectives for the Bay by the federal and state parties to the Chesapeake Bay Agreement. Although this 1985 Plan deals primarily with federal and state actions to meet these goals and objectives, there are some unique initiatives being carried out by other entities. County Conservation Districts play a major role in reducing agricultural runoff and local sewer authorities are key actors in the treatment of wastewater. In Pennsylvania, the Fish Commission is a leader in restoring bass, shad and other finfish to the Susquehanna River. Baltimore County, Maryland is providing, through a manual, specific guidance for proposed land developers to help protect wetlands and stream quality. Each local government's wetlands board, using local funds, administers Virginia's wetlands protection law. All local governments, as well as other private and public local, state, regional, and interstate entities are urged to continue to consider the Bay goals and objectives in the development and implementation of related programs.

Also, working voluntarily to improve the Bay are countless citizens and private groups. Citizen volunteers from all around the Bay are helping to replant submerged grasses and to record the return of grass to the Bay. Homeowners are becoming aware of the necessity of using lawn, garden and cleansing chemicals wisely. Community groups are organizing stream clean-ups, teaching their neighbors about erosion control, and monitoring their local creeks and streams. In Maryland, marina owners have sponsored workshops to inform boaters about their role in protecting the Bay and its tributaries. Pennsylvania's farmers are forming private associations, providing assistance in using best management practices. A chemical manufacturer is underwriting the cost of monitoring a no-till farm. Developers are making an effort to keep trees in place to reduce runoff. A major utility has loaned one of its high level employees to manage Maryland's new Chesapeake Bay Trust Fund. Environmental group memberships are growing rapidly. These groups are engaged in research, education, compliance monitoring and legal action. One group, through conservation stamp sales, has made a $20,000 fund available for community projects. All of these and other voluntary activities should be vigorously continued and expanded as an example to others. Moreover, each individual must recognize that his or her actions have an impact on the Bay and must take responsibility for the stewardship of the Bay, its tributaries and surrounding land.

This Plan represents a major step in a process to manage the Bay. It not only sets goals and objectives agreed to by the states and federal government; it also catalogues all the federal and state activities undertaken to improve water quality and restore living resources. As part of an ongoing evaluation effort, these implementation activities will be assessed to determine their effectiveness in achieving the goals and objectives; to see if there are significant problems still to be addressed; to consider priorities for the Bay clean-up; to evaluate additional funding needs; and, to encourage further efforts by local governments and the private sector. This evaluation will be used to refine specific goals for nutrients, toxics and living resources based on benefits to be achieved, balanced with their costs. Decisions about "how clean" and at "what cost" will then be weighed and made within the various institutional structures.

Perhaps the most important accomplishment of the Chesapeake Bay Agreement and its implementation has been the creation of an institutional structure which is flexible, allowing for change and growth. Yet, this structure is rooted in federal and state governmental institutions which provide the political support and the financial backing required to solve problems and attain the objectives which will help restore and protect the Bay. This cooperative commitment will be a continuing one led by the Chesapeake Executive Council, involving all interested citizens of the Chesapeake Bay area.

Also supporting the Chesapeake Bay Agreement restoration and protection effort are the Implementation Committee, Citizens Advisory Committee and Scientific and Technical Advisory Committee. Several subcommittees of the Implementation Committee, composed of representatives of federal and state agencies, are actively reviewing existing plans, recommending actions and continually evaluating Baywide monitoring, modeling, research and data management efforts. One of these groups, the Planning Subcommittee, is responsible for this and future planning activities. The Chesapeake Bay Liaison Office serves as staff to these committees.

Summary

Stemming the decline of the Bay will be difficult, and reversing the trend to achieve restoration will be an even greater challenge. It is very likely that the current population, the existing amount of deforestation, the constant alteration of the shoreline, and many present fisheries harvesting practices will inhibit recovery. Additionally, the projected increases in human population in the Chesapeake Basin will further stress the Bay and its resources, and test the adequacy of current efforts.

Nevertheless, it is very likely that we can restore the Chesapeake Bay to the conditions that existed in mid-century. At that time, robust fisheries produced substantially higher yields than today. Clearer waters with healthier plankton and more abundant beds of submerged aquatic vegetation were prevalent. The past 30 years has seen an overwhelming increase in human activity: suburbanization, with accompanying land development and burgeoning sewage treatment needs; flourishing agricultural production, with more chemicals on the land; new products in the marketplace, spurring the production of newer and more exotic substances; and advancing technology, too quickly utilizing our resources and rendering them obsolete. Now, we are

learning new ways to continue to prosper and grow, while we restore and protect our valuable resources. This restoration effort will take time, for the Bay has a "memory", particularly in its degraded sediments. Even so, as this Plan demonstrates, action has begun. To succeed, implementation of both short-term and long-term strategies, and firm commitments are crucial. The states and federal government are using this Plan as a major tool for defining and shaping those commitments. We have begun to renew and restore this national treasure---the Chesapeake Bay.

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