POLICY AND PROGRAM RECOMMENDATIONS FOR THE CHESAPEAKE BAY

BY JFA, INC.

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FOREWORD

STATEMENT OF PURPOSE

This report fulfills the last of the assignments given to the U.S. Environmental Protection Agency by Congress in 1976 when funds were appropriated to establish the Chesapeake Bay Program. The final Congressional directive asked for specific recommendations on what actions should be taken by EPA and the state and local authorities in the Bay region to address the Chesapeake Bay's water quality problems and losses of living resources analyzed by the Bay Program's intensive scientific study of the declining health of the estuary.

The Program's study of the state of the Bay disclosed a serious trend of excessive amounts of nutrients entering the Bay, causing algae to flourish and depleting dissolved oxygen levels essential for plant and animal survival. Elevated levels of heavy metals and toxic organic compounds were documented in various parts of the Bay--conditions that can be the cause of death for aquatic organisms, fish and invertebrate species and may present potential human health problems. Of the losses of natural resources examined, the decline of submerged aquatic vegetation to their lowest levels in recorded history is particularly disturbing. A pattern of decreases in landings of fresh water spawning fish also was verified and analyzed. A geographic characterization of the Bay demonstrated a significant relationship between the losses of its living resources and the declining quality of the estuary's water and sediment in segments of the Bay.

The publication of this report occurs at a time when a new phase of action is being led by federal, state, and local authorities to control or improve the activities in the watershed which are creating serious ecological stress and damage to the Bay. The study of the Bay disclosed that there is no "single bullet" causing its problems, but rather a variety of pollution sources and human activities are resulting in a myriad of ecological stresses. Therefore, a broad-ranging set of programmatic, regulatory, management, and educational measures must be instituted and must affect a range of different sources in order to effectively begin to restore the Bay's ecological health.

Thus, the set of individual recommendations set forth in this report calls upon everyone in the region to act steadfastly to control all sources of releases of pollutants to the Bay. Restoring and protecting the Bay cannot wait for a definitive, empirical cause-and-effect understanding about each of the

myriad of sources of pollutants. Continuing to develop knowledge will help establish priorities and formulate precise directions in the application of controls and allocation of funds. But there is simply no alternative to the necessary task of implementing and imposing controls if the objectives of improving the Bay's water and sediment quality and maintaining its valuable resources are to be achieved.

The report's thesis is that the problems studied by the Bay Program may be solved by using existing institutions and authorities, and building upon work already underway. A framework for action defined as the existing structure, composed of federal, state, interstate, and local institutions. Recommendations specify applications of management tools presently available and, in some cases, in use, for remedy the Bay's ills and prevent their spreading.

The focus of the report is on the application of authorities provided by the Clean Water Act as the nation's principal water pollution control statute which plays a major role in the health and productivity of the Bay. An attempt is made throughout to recognize the central importance of the individual states in implementing this federal law and in formulating and carrying out other important federal and state statutes which are critical to protecting and cleaning up Chesapeake Bay. All units of government, particularly EPA and the states, must form strong partnerships and also must work individually to effectively accomplish the goals shared throughout the region concerning the Bay.

In addition to suggesting what can be done by the governmental entities having explicit authority related to preserving the Bay, the report makes a strong case for the public in the broadest sense to participate aggressively in this task as well. The Bay Program's study, with a catalogue of findings of stressed conditions and disturbing trends in the ecosystem, asserts a need for numerous forms of human activity which appear to be harming the Bay to be altered or controlled. The challenge ahead is not simply to control the more familiar or larger sources of pollution such as industrial plants and sewage treatment facilities, but also to reduce the flow of harmful releases from a variety of diffuse sources in the Bay region that includes, in particular, land used for agricultural purposes and areas being developed or redeveloped for residential and commercial purposes. The message underlying the findings of the

Bay study is that a great number of individuals and smaller public and private sector enterprises must adopt, or strengthen their application of, pollution prevention practices in order for the health of the Bay to be successfully improved.

Certainly the imposition of such controls will not be painless--sustained political and individual will, resources, and hard work will be required. At the same time, under the existing federal/state institutional arrangements for environmental protection, a water pollution control strategy is normally applied in phased steps--according to priorities set to target critical areas and problems, accommodating undue economic burdens, and entailing the use of available technology or methods.

HISTORICAL BACKGROUND ON THE BAY PROGRAM

In directing EPA in 1976 to undertake a major research project on the Chesapeake Bay, Congress responded to the growing concern among scientists and the public who recognized increasing signs of trouble in the estuarine system. Congress was urged to provide the financial resources to EPA for conducting a coordinated, in-depth scientific examination of ecological conditions which, according to the region's scientific community and others, was necessary to verify and explain certain apparent trends so that effective action to remedy the Bay's problems could be devised.

Studies existed at that time documenting the negative results of pollution sources concentrated near urban and industrialized centers. However, it was claimed that there was an absence of scientific documentation and analysis of the serious problems disturbing leaders and citizens throughout the Bay region--namely, a trend of disappearing Bay grasses (submerged aquatic vegetation) and of declining fish landings among certain species. Arguments centered on questions of whether the losses of fish and grasses were cyclic or permanent occurences, and due to natural or man-made causes.

EPA established the Chesapeake Bay Program following an appropriation of funds by Congress in 1976. The other governmental entities sharing crucial forms of jurisdiction or influence over the quality of the Bay were enlisted to

participate throughout all of the Program's activities including planning, technical support, data collection, and program development and implementation. The states of Maryland, Virginia, and Pennsylvania, the District of Columbia, municipalities in the three states, and a number of regional commissions participated in all major projects and committees.

The Bay Program formed a Management Committee, which is still in existence and actively at work. Its members have met regularly since its inception at the beginning of the Bay Program, consisting of representatives of the Chesapeake Bay Citizens Program, EPA's Region III office located in Philadelphia, the environmental protection agencies of the states of Virginia, Maryland, and Pennsylvania, Chesapeake Bay Commission, and the Susquehanna River Basin Commission. Recently the Committee has focused on steering and overseeing the development of a detailed management plan to improve the water and sediment quality of the Bay and restore its fisheries and other living resources. The "Management Report" is expected to be published soon and will include substantial technical and programmantic information for the use of managers at all levels of government--particularly state and local government officials.

To ensure citizen input, EPA established a public participation program, the Citizens Program for Chesapeake Bay, which has served as the principal mechanism through which information flowed between citizens and managers regarding scientific findings and other types of information and issues concerning the Bay Program's work. The Citizens Program is currently administering a contract from a number of institutions including EPA to provide staff services to mount the "1983 Chesapeake Bay Conference." This event is scheduled to take place in early December, 1983 and will bring together elected officials, government managers, scientists, users, and the interested public to agree upon policies for protecting and enhancing the living resources of the Bay.

The Citizens Program assisted in setting up two formal groups through which the public contributed to the Bay Program. One was an ad hoc advisory committee, the Resource User Team, representing industry, power generators, transportation, agriculture, seafood, and recreation interests. It focused on assessing possible strategies for controlling pollution released into the Bay and on devising management options for maintaining and improving the Chesapeake Bay with a special interest in enhancing its economic productivity.

The other group, the Citizens Steering Committee, was an advisory committee to the Bay Program, formed in 1978 to provide citizen guidance on the conduct of the Program. It met twenty-seven times between March of that year and September 1982 and, representing a wide array of interests, was the official Bay-wide citizens advisory committee to the Bay Program. The committee's purpose was accomplished in the form of a final report issued in 1982 which presentedthe issues which they felt to be of greatest importance during the course of the Bay Program and listed their recommendations for formulating the transition from a federally-sponsored research effort to an implementation program designed to put technical, scientific findings to use in local, state, and federal water quality management programs.

The Congressional mandate directed the Bay Program to conduct a two-fold study, consisting of both a scientific inquiry and an institutional analysis. A better understanding of the physical, chemical, and biological processes of the complex and dynamic Bay ecosystem was sought through numerous large-scale, multi-faceted studies as well as smaller, more discrete technical research ones. Simultaneously, an examination was undertaken analyzing management mechanisms within the drainage basin of Chesapeake Bay in order to gain the knowledge for formulating effective strategies to remedy the problems of the Bay identified by the scientific studies. Over the past six years, a considerable number of written reports were published and widely distributed, the most important of which was a lengthy synthesis published in late 1982 summarizing the scientific findings concerning the three problems afflicting the Bay that were priorities for the Bay Program's research.

THE REPORT'S ORGANIZATION

This report is organized into five chapters.

Chapter I, "An Overview of the Chesapeake Bay Ecosystem," provides a short education on the ecological processes governing the Bay and the complex ways that animals and plants make use of the ecosystem along various stages of life. The chapter is intended to offer a look at the strong interrelationships of dependency and support that the living resources have for another, indicating how the conditions of the water and sediment affect the linkages that ensure the growth and productivity of the Bay's living resources.

Chapter II, "What We Know," summarizes the scientific findings of the Bay Program's study of the state of Chesapeake Bay. The focus is on three priority environmental problems designated for targeting the greatest proportion of the study's research--nutrient enrichment, presence of toxic substances, and the decline of submerged aquatic vegetation. Since the Bay Program has previously published a separate report synthesizing its scientific research and analysis, this chapter only briefly describes the major changes occurring in water and sediment quality and in the Bay's living resources. What is known about the pollutants causing adverse trends Bay-wide or in certain parts of the estuarine system is presented--the sources of these pollutants are briefly described in terms of geographic location, relative contributions, and other important characteristics explaining their respective roles in discharging nutrients and toxics into the Bay. Finally, trends of changes in land uses are discussed in order to indicate their implications for the types and scope of pollutants entering the Bay.

Chapter III, "What Has Been Done," describes in some detail the existing programs and authorities concerned directly or indirectly with protecting the quality of the Bay. Within the drainage basin of Chesapeake Bay, there are hundreds of governmental bodies and agencies with some function or authority affecting the condition of the Bay's water and sediment. Among the governmental jurisdictions at all levels, those playing the most important roles in controlling or otherwise affecting the discharges of pollutants into the Bay are discussed. This chapter summarizes specific management, programmatic, regulatory, and educational tools already formulated and at work to achieve the goals of the water quality laws of the nation and the individual states in the Bay region. To the extent possible, the recent and current accomplishments and successes of these authorities, particularly those of the states and District of Columbia, are highlighted to indicate their proven ability to effectively implement controls to preserve their respective waters.

Chapter IV, "What Should Be Done," lays out the recommendations that are the centerpiece of this report. As stated above, they are the result of an in-depth assessment of existing jurisdictions which concluded that the institutions exist under Acts of Congress, state legislatures, and local ordinances to abate point and non-point sources of pollution flowing into the Bay. The recommendations specify actions or approaches which appear to be most necessary and effective to

improve and maintain the well-being of this precious ecosystem. Suggested roles for a broad spectrum of the region's community are offered which engage everyone including elected officials, governmental agencies, the scientific community, user groups, and the public at large in doing what they can to accomplish a common purpose of restoring and protecting the Bay.

Finally, Chapter V, "How Should It Be Done," proposes an institutional mechanism for mobilizing and directing the existing and supplemental authorities and programs contained in an implementation strategy for restoring and protecting the quality of Chesapeake Bay. No glaring gaps or omissions were determined by the assessment of the existing set of water pollution control management and regulatory institutions. However, in order for the next phase of action to be most effectively managed and implemented, this new mechanism is presented as a way of bringing together the officials who will have major responsibility for the implementation effort to use their authority to direct the necessary leadership, talent, and resources to accomplish their goals.

CONCLUSION

Thanks to Congress's generosity in its support for the Chesapeake Bay Program, many leaders and citizens residing in the watershed were involved in meaningful, active ways throughout the past six years of the intensive study of the Bay. The awareness and concern about the Program's work displayed by the region's residents and institutions typifies the strong emotion felt throughout the area about Chesapeake Bay.

In recent years, key officials at the federal, state, and local levels have repeatedly communicated in public and private forums their intention to step up efforts to solve the Bay's problems and restore its valuable resources. Success will require the application of the same human resources and commitment to the task of reversing the trend of deterioration of Chesapeake Bay that were so intensively directed towards investigating the problems threatening this national and regional treasure.

The fact that the region's populace became educated about the ecological problems of the Bay, at the same time that these problems were being discovered and analyzed by the Bay Program, means that policy makers responsible for

resolving these problems have essentially a valuable "head start." Normally, research of environmental problems must be followed by an extensive effort of disseminating and explaining the research findings in order to trigger the next steps of remedial action. However, as indicated previously, the region's populace gained a great deal of awareness and understanding about the health of the Bay while the study was being conducted. Much of the public, therefore, now has considerable knowledge enabling them to understand and be guided on how they must also participate in the upcoming increased efforts to clean up the Chesapeake Bay and keep it clean.

This report suggests a course of action that can be initiated and carried out in the real world. Whereas financial and other limitations will play an critical part in shaping this course, so should the human capabilities of technical innovation, scientific expertise, planning, and coordination which exist throughout the region. Tangible constraints must not mask the ability to improve the quality of the Bay. Preservation of the physical, biological, and chemical integrity of the nation's largest and very precious estuarine system should be viewed as an art of the possible. The information and ideas in this report are intended to help stimulate the necessary leadership and decisionmaking required to regain and maintain the rewards that can be provided by a Chesapeake Bay that is clean, healthy, and biologically sound.

CHAPTER I

AN OVERVIEW OF THE CHESAPEAKE BAY ECOSYSTEM

General Description

The Chesapeake Bay is the largest estuary in North America and one of the most biologically productive systems in the world. It is part of an interconnected system including the mouths of many rivers which drain parts of New York, Pennsylvania, West Virginia, Maryland, Delaware, and Virginia. The Bay and all of its tidal tributaries comprise the Chesapeake Bay ecosystem. (See Illustration A.)

The Bay proper is approximately 200 miles long and ranges in width from about four miles near Annapolis, Maryland to 30 miles at its widest point near the mouth of the Potomac. The water surface of the Bay proper encompasses more than 2,200 square miles. That figure nearly doubles when its tributaries are included. However, it is a relatively shallow body of water, averaging 30 feet in depth, making it very sensitive to temperature and wind.

The mainstem of the Chesapeake Bay lies totally in the Atlantic Coastal Plain, situated within the states of Maryland and Virginia. The mainstem draws from an enormous 64,000 square-mile drainage basin. (See Illustration B) Of the more than 150 rivers, creeks and branches flowing through portions of six states and the District of Columbia and contributing fresh water to the Bay, 50 are considered major tributaries. Eight of these fifty rivers contribute about 90 percent of the fresh water contained in the Bay mainstem: they are the Susquehanna, Patuxent, Potomac, Rappahannock, York, James, West Chesapeake, and Choptank Rivers. The Susquehanna is by far the largest river in the basin, discharging approximately 50 percent of the fresh water that reaches the Bay. In addition, it has the highest fresh water discharge rate--a mean annual rate of 40,000 cubic feet per second--of any river in the East Coast of the U.S. These eight major tributaries shape the circulation and salinity characteristics of the estuary. Thus, the way in which land is used and managed within each of river basins largely determines the volume and chemical properties of the fresh water discharged into the Bay.

The Bay's Ecological Processes

Natural processes have subjected the Chesapeake ecosystem to unending modifications. In the Chesapeake's long history, beginning when climatic changes started to form it 20,000 years ago, humans have only recently emerged as lead actors in this reshaping process. Following is a brief overview of the Bay ecological processes and characteristics which helps show how natural and man-made actions continually initiate chains of events that can change of the condition of the Bay's ecosystem. The description is divided into four major areas: geological composition; water and sediments; key biological communities;and food production and consumption.

Geological Composition:

In geological terms, the Chesapeake is very young. If the entire geological calendar from the earliest fossil formations were equated to one year, the Bay would be less than one minute old. The birth of the Chesapeake Bay was brought about by the most recent retreat of glaciers that had advanced and fallen back up and down the North American continent during the final part of the Pleistocene epoch (which began a million years ago). The melting glacial ice resulted in a corresponding increase in sea level that submerged coastal areas including the Susquehanna River Valley and many of the river's tributaries. The complex of drowned stream beds now forms the basin of the Chesapeake Bay and its tributaries.

As mentioned earlier, the Bay proper lies within the Atlantic Coastal Plain, a relatively flat, low land area with a maximum elevation of about 300 feet above sea level. It extends from the edge of the continental shelf on the east, to a fall line that ranges from 15 to 90 miles west of the Bay. The fall line forms the boundary between the Piedmont Plateau and the coastal plain. Waterfalls and rapids clearly mark this line, where the elevation sharply increases to approximately 1,100 feet, due to the erosion of the soft sediments of the coastal plain. (See Illustration C) Cities such as Fredericksburg and Richmond, Virginia; Baltimore, Maryland; and Washington, D.C. have developed along this fall line, for reasons including the limits of navagability, abundance of freshwater, and the water power potential of the the falls and rapids.

The Chesapeake's shoreline has undergone constant modification by erosion, and the transport and deposition of sediments. Areas of strong relief, like peninsulas and headlands, are eroded and smoothed by currents and tides, and the materials are deposited in other areas of the Bay. Sediments carried by a river are left at the margins of the Bay and major tributaries, depositing mud and silt. Grasses colonize and stabilize the sediments, developing marshes. Build-up of land in the marshes causes the area to eventually become part of the shoreline.

The forces of erosion and sedimentation are continually reshaping the Bay. For example, erosion caused a historically swift submersion of Sharp's Island, in colonial times a rich plantation of six hundred acres situated off the eastern shore--the region's residents still recall being able to see the white frame hotel located on the island. Mooring piles for sailing ships are visible at Joppatowne, Maryland, more than a mile from open water today, demonstrating the rapidity with which sediments can fill an estuary like the Gunpowder River.

Water and Sediments:

Of all bodies of water, estuarine systems offer the greatest diversity in water composition. Fresh water mixing with salt water creates unique chemical and physical environments, each of which supports different communities of organisms particularly suited to that type of water.

Temperature, salinity and circulation are the three very important physical characteristics of water determining distribution and stability of Bay environments: Fluctuations in water temperature affect the rates of chemical and biochemical reactions within the water, which in turn influence processes such as spawning of fish. Salinity refers to the concentration of dissolved salts in the water. Since seawater enters the Bay through its mouth, the salinity is highest at that point and gradually diminishes moving toward the northern end. Salinity levels are also graduated across the horizontal plain from one end of the Bay to another. A factor of the density of water and the presence of salts, these gradations in salinity levels play an enormously important role in the distribution and well-being of various biological populations living in the Bay. The movement of waters transports plankton, eggs of fishes, shellfish larvae, sediments, minerals, nutrients, and other chemicals. The salinity effect of fresh water coming from rivers, streams, and runoff from land is the primary factor driving circulation of the Bay and tidal tributaries.

The waters of the Chesapeake are a complex chemical mixture, containing dissolved organic and inorganic materials, including dissolved gases, nutrients, and a variety of other chemicals:

o Dissolved Oxygen

Among the chemical constituents most important to the Bay Program's study of the Bay is dissolved oxygen which is essential for all plants and animals inhabiting the Bay. Oxygen is transferred from the atmosphere into the surface waters by the aerating action of the wind. It is also added at or near the surface as a by-product of plant photosynthesis. As a result, floating and rooted aquatic plants increase dissolved oxygen levels. Since the existence of plants also depends on the availability of light, the oxygen-producing processes occur only near the surface or in shallow waters. Due to natural process of seasonal and other types of changes in temperature and salinity, levels of dissolved oxygen diminish in deeper areas of tributaries in the summer and go back up in the fall.

o Nitrogen and Phosphorous

The nutrients nitrogen and phosphorous are also key constituents in the Bay's system. In addition to being "supplied" by natural processes, they enter the Bay in significant quantities through discharges from sewage treatment plants, food processing industries, and the run-off from agricultural land, urban areas and forests.

Nitrogen plays a principal role in producing plant and animal tissue. Phosphorous is essential to cellular growth and reproduction of phytoplankton and bacteria. Just as fertilizer aids the growth of agricultural crops, both nitrogen and phosphorous are vital to the growth of plants within the Bay. Too many nutrients, however, can lead to an overabundance of phytoplankton, creating dense population, or blooms, of plant cells. These blooms become a nuisance for oxygen is used up as they decompose. This can lead to anoxic conditions, meaning he affected water area becomes devoid of oxygen and therefore of life.

o Sediments

Suspended in the waters of the Chesapeake are huge quantities of particulate matter called sediments, which are composed of organic and inorganic materials. Individual sediment particles have a large surface area, and many molecules easily adsorb, or attach, to them. As a result, sediments act as chemical sweeps

by adsorbing metals, nutrients, oils, and other potentially toxic organics. Thus, areas of high sediment deposition can possess high concentrations of long-lasting chemicals. Accumulation of sediments tend to cause undesirable consequences. They settle in bottom waterways and lead to filling of the Bay; bottom dwelling plants and animals (benthos) are smothered; and when the sediments are suspended, the water becomes turbid (muddy) and thus decreasing the amount of light available for plant growth.

Key Biological Communities:

Being one of the productive estuarine systems in the world, the Chesapeake provides critical types of habitat for all stages of animal and plant life and serves as a supplier of seafood to man. More than 2,700 species of plants and animals inhabit the Chesapeake and its shoreline. All depend on the Bay and their fellow inhabitants for food and shelter. Each, in turn, contributes to the continued life of the entire Chesapeake ecosystem. Five major communities that interact closely are the marsh dwellers, bay grass inhabitors, plankton, bottom residents, and swimmers, each of which are briefly described below. Each community makes use of a particular habitat (the natural environment of an animal or plant) within the Bay, and these habitats exibit a wide range of characteristics:

o Marshes

Marshes form a natural boundary between land and water, existing as spongy areas dampened by rain, groundwater seepage, adjacent streams and the Bay's tides. These types of wetlands have usually bountiful supplies of nutrients which make them extremely productive sites of plant growth of diverse kinds depending on the salinity of the waters. The abundance of food and shelter offered by the marsh grasses offers a favorable habitat for other members of the Bay community. A host of invertebrates, for example, feed on decomposed plant material and, in turn, provide food for numerous species of higher animals.

o Submerged aquatic vegetation

Approximately ten species of bay grasses are found in the Chesapeake. They are grouped under the name submerged aquatic vegetation or SAV. Most cannot withstand excessive drying and must live with their leaves at or below the surface of the water. Like the marsh grasses, they are distributed according to salinity.

These submerged grasses are an important link in the food chain of the Bay's waters. They serve as protective cover and food to a diverse community of organisms. For example, invertebrates feed on decaying grasses and then, in turn, provide food for small blue crabs, striped bass, perch, and other small inhabitants of the Bay. Wading birds such as herons often feed on small fish in the zones where SAV lie. Another important ecological function of bay grasses is their ability to slow down water velocities, causing particulate matter to settle at the base of their stems--this makes water clearer in the SAV zones. Finally, like marsh grasses, bay grasses act as nutrient buffers, taking up nitrogen and phosphorous and releasing them later when the plants decay.

o Benthic organisms

The organisms that live on and in the bottom of the Bay form a complex assemblage of communities. Commonly termed benthos, they are considered in terms of the animal components although plant and bacterial groups are crucial parts of the ecosystem as well. Again, salinity and sediment type help dictate the distribution and specific kinds of benthos residing in the Bay.

Some benthic organisms are commercially important, namely, oysters and blue crabs, and are widely distributed. Salinity determines the locale of hard-shell clams and soft-shell clams, the former requiring highly saline waters and the latter being able to thrive in lower salinity. Certain benthic predators, diseases, and parasites, tend to be unable to tolerate lower salinities so they are far less a problem in upper Bay areas than they are in the lower Bay.

o Nekton

Nekton, including fish, certain crustaceans, squid, and other invertebrates, are the swimmers of the Bay. The approximately 200 species of fish living in the Bay are classified as either permanent residents or migratory. The residents tend to be smaller in size, therefore less capable of negotiating the distances often covered by the larger migratory species. They include killifishes, anchovies, and silversides.

The migratory fish fall into two categories: those who spawn in the Bay or its tributaries, and those who spawn on the ocean shelf. The members of the Bay spawning category migrate varying distances to spawn in fresh water. For example, yellow and white perch travel quite short distances from their

residence areas in the slightly salty (brackish) water of the Bay to fresh water areas in the upper parts. Striped bass also spawn in low salinity areas. On the other hand, shad and herring fit the definition of migrators more completely--they travel from the ocean to fresh water to spawn, and return to the ocean to feed.

Other migratory fish use the Bay strictly for feeding since they spawn on the ocean shelf. Croakers, drum, menhaden, weakfish and spot fall into this group. Menhaden occupy the Bay in particularly great abundance, supporting a major commercial fishing enterprise.

Food Production and Consumption:

o The Food Web

The production of the Chesapeake's important species of fish and plants depends on the production of plant biomass in the Bay. The animals, plants and microbes of the Bay are connected by a complex network of feeding interaction called the food web. (See Illustration ___)

Direct and indirect linkages make up the food web. Typically, the direct food web encompasses four principal linkages--five, if humans are included. For example, a predominant feeding pattern in the open waters of the Bay starts with phytoplankton converting sunlight and nutrients into living tissue. They, in turn, are eaten by copepods, members of the zooplankton family. The copepods are then swallowed by anchovies, which are later eaten by bluefish.

The indirect (detritus) pathway leads from dead organic matter to lower animals and then to higher animals. The marsh and bay grass communities are largely dominated by this this pathway.

Several important ecological characteristics depict the food web patterns. For one, energy flows through an ecosystem via the food web. The sun provides energy at every transfer between "trophic levels," the connecting phases of the food web. Also, relatively few animals are supportable at the highest trophic level. For instance, massive amounts of plants are required to support few carnivores such as the striped bass or bluefish. High-level carnivores consume many times their weight in food. If this food contains a toxic chemical, even in small

amounts, the fish or animal may be exposed over time to high levels of the chemical. Heavy metals and organic chemicals can be stored in tissues of the animal and concentrate there. As a result, the body may contain a much higher concentration of the chemical than did its food. This phenomenon is called biological magnification.

Concluding Remarks

The physical and ecological processes of the Bay briefly looked at above make the Bay a complex support system for many forms of life and of food. Diverse habitats are sustained, exchanging materials and complementing one another's resources. The existence of the two major food webs--direct and indirect--promotes overall stability. If one pathway falters, resources can be used via the other. Some organisms are even able to switch food sources. However, while the e dual food webs provide a degree of resiliency, they by no means are able to singularly maintain and restore high levels of biological productivity in the Bay.

The interacting principles governing the Bay's ecosystem demonstrate that sudden or sustained changes place their mark on the Bay's ecological processes and linkages. For example, as the next chapter describes in more detail, because of the the Bay's circulation pattern, the increasing amounts of sediments and nutrients entering the Bay are being retained and accumulated in the ecosystem; the result is increases of undesireable phytoplankton growth. The Bay study documented a host of other trends that reveal the ways in which new or increasing forms of pressure and stress are causing changes and damage to the food, consumption, and growth cycles of the biological communities produced within the ecosystem.

The following chapter makes a transition from this chapter's brief education on the ecosystem to an account of the specific ways in which the ecosystem is being changed for the worse. Relationships are described which link these changes to the increased population growth occurring in the watershed and corresponding increased pollutant loads entering the Bay. Forecasts say that the increases in population will continue. However, as this chapter has pointed out, the ecological make-up of Chesapeake Bay is much more of a "given" in terms of its size, basic structure, and its need for resources (such as aquatic

vegetation and wetlands) to serve the various functions that are relied upon and cherished by the region's populace. In summary, the Bay's ecological "performance," is highly subject to the intervention of human beings as well as to natural forces. Therefore, the manner in which each type of human intervention is altered or controlled in the upcoming years will determine a great extent the degree to which the Bay's current ecological conditions will be maintained and improved.

CHAPTER II

WHAT WE KNOW -- THE STATE OF THE BAY

INTRODUCTION

Summary of the Findings

> "The Bay is an organic whole. If one part is damaged all parts are affected. It is of little use to study one link in an environmental chain without relating it to the whole. If the Chesapeake Bay is to survive, it must be addressed as an entity, as a total system without duplication and without omission."
>
> Charles McC. Mathias
> United States Senator, Maryland

The Bay Program's study of the Chesapeake Bay made an effort throughout to evaluate every individual scientific analysis in the context of the Bay as an "organic whole." Research findings were thus integrated on a continual basis to further an understanding of the Bay as a total system.

The information assembled and stored in a computerized date base by the Bay Program is considered to be the most extensive body of scientific knowledge on any single estuary in the world. Most importantly, the data and analysis gathered for the study have formed a common and comprehensive set of knowledge about the Bay's ecological conditions--the prerequsite, as presented to Congress originally by those calling for resources to conduct a study of the Bay, for establishing goals of individual and collective action to improve the health of the Bay.

The Bay Program's scientific investigation has essentially documented that the Bay has dramatically changed in the last century and that this change has accelerated in the last thirty years. Increasing population growth over time has resulted in major land use changes, large increases of municipal wastewater, and other outcomes which in turn have caused substantial increases in the amounts of pollutants entering the Bay. Research has shown that the contaminants entering the Bay do not readily flush out into the ocean because of the unique circulation pattern of the estuarine system, and many of the contaminants then accumulate along the food chain and/or in Bay sediments. The repercussions of the process of contaminants being trapped consist of various forms of ecological

stress and impairment of the growth and reproductive capacity of a wide range of animal and plant species.

The major trends, pointing to the continuing deterioration the Bay's water and sediment quality and the condition of its living resources, which were documented by the Bay Program are summarized below. Although the evidence is compelling, the Bay Program's analysis did not definitively link the trends regarding the resources to the pattern of deterioration in the Bay's water and sediment quality. Other factors also influence the abundance of the grasses and of the fish such as overfishing, climatic trends, and physical alterations of the Bay caused by dredging and filling. In addition, new or increasingly emerging forms of pollution are certainly causing detrimental effects as well--the Bay Program did not examine to any extensive degree the role of acid mine drainage, runoff from hazardous waste facilities and landfills, and atmospheric deposition. Nonetheless, an enormous step has been taken forward by what now is known due to the Bay Program study. Since no single culprit exists nor can a single solution be devised, action to begin remedying the problems of the Bay needs to begin now. If one were to wait for the definitive answer to the remaining questions and to the less-understood problems, the life of the Bay could be soon beyond reach.

Following, therefore, is a summary of what is known now about the declining health of the Bay. A series of illustrations can be referred to for a further look at these specific problems:

- In the upper Bay, an increasing abundance of massive blue-green algal blooms has been observed--cell counts increased approximately 250-fold since 1965. In contrast the algal populations in the upper Potomac River have become more diverse, with the massive blue-green algal blooms steadily disappearing since controls were imposed in the 1960's and early 1970's on sources of nutrients in this segment of the Bay watershed.

- Submerged aquatic vegetation has declined throughout the Bay, most dramatically in the upper Bay and western shore tributaries. The loss has moved progressively down-stream and the diversity of species of the Bay grasses has decreased.

- Landings of freshwater-spawning fish such as shad, alewife and striped bass have decreased in recent years. Harvests of marine-spawning fish such as menhaden and bluefish have generally remained stable or increased.

- Oyster harvests have decreased Bay-wide. Oyster spat set has declined significantly in the past ten years particularly in the upper Bay and western shore tributaries and some eastern shore tributaries such as the Chester River.

- Increasing levels of nutrients are entering many parts of the Bay: the upper reaches of the tributaries are severely enriched with nutrients; lower portions of the tributaries and eastern abayments have moderate concentrations of nutrients; and the lower Bay appears to not be enriched. Data covering 1950 to 1980 indicate that in most areas water quality is degrading partly because increased levels of nutrients are entering the waters. Only in sections of the Patapsco, Potomac, and James Rivers is there improvement in water quality which is evidently largely due to pollution control efforts in those areas.

- The amount of water in the main part of the Bay which has low or no oxygen has increased fifteen-fold in the last thirty years. Currently, from early- to mid-May through September in an area reaching from the Bay Bridge to the Rappahannock River, much of the water deeper than 40 feet has no oxygen and therefore is devoid of life. Nutrient enrichment has affected the dissolved oxygen levels in the Bay. After excessive loads of nutrients enter the Bay and stimulate the growth of undesirable large algal blooms, the blooms prevent sunlight from penetrating the water and reaching the submerged aquatic vegetation. Also, as the algae dies it settles to the bottom, it decays and consumes the oxygen that is crucial for Bay organisms such as crabs, oysters, and finfish. Although these processes occur naturally in an estuarine system, they have become far more severe in magnitude the Bay in recent years.

- High concentrations of organic compounds are in the bottom sediments and water column of the main Bay near known sources such as industrial facilities, at river mouths, and areas of maximum turbidity. Highest concentrations were found in the Patapsco and Elizabeth Rivers where several sediment samples contained concentrations exceeding 100 parts per million. The general trend suggests that many of the these toxic substances adsorb to suspended sedminent and then accumulate in areas dominated by fine-grained sediments. Further, benthic organisms located in such areas tend to accumulate the organic compounds in their tissues.

- Many areas of the Bay have metal concentrations that are significantly higher than natural ("background") levels. Most of the Bay has metal concentrations that are less than four times the natural background levels. However, high levels are in the upper Potomac, upper James, small sections of the Rappahannock and York Rivers, and the upper mid-Bay. The most contaminated sediments--with concentrations greater than 100 times natural background levels--are in the industrialized Patapsco and Elizabeth Rivers.

In summary, the valued living resources of the Bay are disappearing. This

trend parallels an increase of nutrients and toxic substances throughout the Bay. As mentioned in the Foreword, the Bay Program's geographic characterization and analysis of segments of the Bay clearly show a significant relationship between the relative abundance of the resources and the quality of water and sediment. For example, in areas afflicted by high concentrations of nutrients and toxics such as Baltimore Harbor and the Elizabeth River, there is no submerged aquatic vegetation and only a few healthy organisms such as worm can survive in this hostile environment. On the other hand, in certain areas of the Eastern shore, where the nutrient concentrations are still fairly low and there is little contamination by metals and organic compounds, submerged aquatic vegetation still grows and crabs, oysters, and finfish are plentiful.

Relationships Between Water Quality and Living Resources

The relationships between levels of nutrients and conditions of living resources in the Bay, and between concentrations of toxic substances and conditions of living resources, are the puzzles which the Bay Program's study made great advances in deciphering:

o Nutrient Enrichment and Changes to Resources:

Whereas conceptually an increase in nutrients--which are essentially fertilizer--into the Bay suggests a corresponding increase in plant production, the study discovered the negative ramifications that afflict the Bay when levels of nutrients are excessive: the weedlike blue-green algae blooms sprout up and prevent the growth of vitally important plants such as submerged aquatic vegetation. A similar but not as precise relationship between nutrients and Bay fisheries was disclosed. Fish that spawn in the freshwater, nutrient enriched upper sections of the tributaries are disappearing, whereas the marine spawners are increasing. Also, oysters and other commercial shellfish that live all their lives on the bottom of the Bay are declining, possibly due in part to the elimination of their habitat by waters with low levels of dissolved oxygen. Although the link in the decline of resources to the increase in nutrients cannot be definitively made, the Bay Program found sufficient evidence to take corrective actions and control nutrient discharges entering the Bay now.

o Toxic Contamination and Changes to Resources:

Toxic compounds are also affecting the Bay's resources. Metals, such as

cadmium and lead, organic chemicals such as PCB's and DDT, and other chemicals like chlorine are contaminating the Bay. As concentrations become increasingly elevated, they cause reductions in hatching and survival rates of animal life, gross injuries such as lesions or fin erosion, and eventually mortality of an entire population. In localized areas of the Bay, the Bay Program found evidence of such toxic stress--the deterioration of fish and other organisms is associated with high concentrations of toxic chemicals.

The Sources of Nutrients and Toxics

The Bay Program examined in detail the sources of the nutrients and toxics entering the Bay, and the relative contributions of differents types of sources. In addition, a determination was made of changing land-use activities such as intensification of agricultural activities and urbanization which have strong implications for the levels of pollutants going into the Bay. For example, as popultation continues to increase in and around the metropolitan areas located on the fall line and tidewater areas of the Bay, the volume of municipal effluent also increases. Illustration _____ shows the increase in volume of municipal wastewater discharged between 1950 and 1980 as well as the anticipated volume of municipal effluent to be discharged in the year 2000 for each basin. Increases in volume of wastewater have paralleled population growth. If current projections prove true, the volume of municipal effluent, generated and discharged, is expected to increase 36 percent by the year 2000.

Special attention was given to gaining an understanding about the relative importance of point versus nonpoint sources in various geographical sections of the Bay watershed as a basis for targetting management and control strategies. For example, the Susquehanna River basin is dominated by nonpoint sources of phosphorus including particularly agricultural land; in contrast the West Chesapeake Bay basin (which comprises several rivers including the Patapsco, Back, and Gunpowder basins) is dominated by point sources of phosphorus, consisting particularly of municipal sewage treatment plants. A strategy for phosphorus reduction in each of these basins would logically focus on controlling the dominant source or sources.

Below is a more detailed summary of these variations in sources of nutrients and toxics entering the Bay, and what is known about the recent and future

impact of major land use changes in the Bay region on the nature and scope of these different sources:

o Point Sources:

Point sources are defined as waste streams discharged to a water body through a pipe or ditch. Although there may be daily or seasonal fluctuations in flow, they are essentially continuous, daily discharges which occur throughout the year. The significance of point sources increases during the summer and other periods of low rainfall because the receiving water volume is low and the dilution of effluent is reduced. Conversely, their relative significance decreases during perods of wet weather when rainfall, runoff from land, and other nonpoint loadings increase.

Examples of point sources include industrial facilities and sewage treatment plants, the latter referred to also as publicly-owned treatment works (POTWs). The Bay Program's data base contains an inventory of over 5,000 industrial and municipal point sources located within the Chesapeake Bay drainage area.

o Nonpoint Sources:

Nonpoint sources of pollution by definition are diffuse, consisting of forests, farmland, residential and commerically developed lands, groundwater flows, and atmospheric deposition. In the Bay region, agricultural lands appear to be the principal nonpoint source of nutrients. Heavy metals and other toxic compounds, on the other hand, enter the Bay through runoff from urban and other developed areas. Moreover, in the many paved surface areas in the watershed, pollutants accumulate during dry periods, allowing large concentrations of pollutants, including toxic substances, to build up and enter the Bay in massive doses after heavy rains.

In general, the nutrient nitrogen enters the Bay waters primarily from nonpoint sources, which consist primarily of runoff from cropland. Point sources, on the other hand,--especially sewage treatment plants--are the major source of phosphorus discharged into the Bay. Due to the differences in wet vs. dry seasons, nonpoint source pollution entering waterways primarily through stormwater runoff constitutes a greater share of total nutrient loadings during years with substantial levels of rainfall.

o Relative Contributions From Point and Nonpoint Sources:

The Bay Program estimated that 33 percent of the nitrogen load on a Bay-wide basis comes from point sources in an average year; looking at dry vs. wet years, the point source contribution of nitrogen is 38 and 19 percent respectively. In an average year, 61 percent of the phosphorus load is attributable to point sources; 69 and 36 percent is contributed by point sources in dry and wet years, respectively.

Nonpoint source loads of nitrogen are estimated at 67 percent of the total load in an average year. In dry vs. wet years, nonpoint sources contribute 62 and 81 percent, respectively. In an average year 39 percent of the phosphorus loadings to the Bay come from nonpoint sources. Contributions of phosphorus ranges between 31 to 64 percent in dry vs. wet conditions.

o Geographical Variations:

As mentioned earlier, to help federal, state, and local managers determine the best and most urgently needed course of action, the Bay Program attempted to find out about the relative contributions of point and nonpoint sources by major river basin. With this information, control strategies can be implemented to address specific circumstances in Chesapeake Bay and its tributaries to try to restore their living resources.

Nutrient Loads

Of the three major tributaries, the Susquehanna, James, and Potomac River basins, in only the Susquehanna do nonpoint source loadings dominate the total load into the Bay. In the James and Potomac River basins, the point source loadings exceed that from nonpoint sources under all hydrologic conditions except a wet year in the Potomac's case. In two other highly urbanized (and smaller) river basins, the Patuxent and West Chesapeake, point sources also dominate regarding phosphorus loadings. In the three largely rural basins, the Eastern Shore, Rappahannock, and York, nonpoint sources of phosphorus exceed the point sources.

The situation is somewhat different regarding nitrogen contributions. The Susquehanna's nonpoint sources of nitrogen play a dominating role under all conditions as they do for phosphorus. But in the Potomac River basin, in contrast to nonpoint sources dominating in a wet year regarding phosphorus, the nonpoint source nitrogen load dominates under all hydrologic conditions similar to the Susquehanna case. However, in the James River basin, point sources make up the largest share of the nitrogen load under dry and average conditions though nonpoint sources exceed them in a wet year.

Toxic Substances Loads

Toxic materials enter the Bay from a variety of sources, including industrial wastewaters and discharges from sewage treatment plants, runoff

from urban areas and agricultural lands, deposits from the air, and disposal of contaminated dredge spoil. Except for the case of long-range atmospheric deposition, the sources of toxics are located within the basin.

Industrial facilities and sewage treatment plants discharge significant amounts of metals and organic compounds. Chlorine and clorinated organics also are common constituents of effluent from industries, POTWs, and power plants. The Bay Program analyzed the effluent of 20 industries and 8 POTWs: over 75% of the facilities had toxics in their effluent. Point sources of toxics appear to be most significant in industrialized areas such as Baltimore, Richmond, and Greater Hampton Roads area.

The three major tributaries to the Bay, the Susquehanna, Potomac, and James Rivers, deliver metals and organic compounds from urban and agricultural lands. In addition, deposits of air pollution are delivered directly to Bay waters and indirectly through urban runoff. One major example is automobiles and their contributions of large amounts of lead from gasoline. Urban runoff contributes the most substantial amounts of toxic substances in the urbanized areas of Baltimore, Washington, D.C. and the Greater Hampton Roads area. Another important nonpoint source is shore erosion which contributes significant amounts of iron to the Bay. Also, maritime and work boats occasionally leak or spill petroleum and cause copper to go into the waters via remnants of the boats' anti-fouling paints. Toxic levels associated with maritime activities reach their highest levels in harbors and marinas where natural flushing is low.

Land Use Shifts and Their Impact on the Bay

The Bay Program's study of the nature and scope of changes in land use occurring between 1950 and 1980 provides considerable explanation as to why the pollutants entering the Bay have increased. Major shifts in land use patterns occurred over the last thirty years. For one, pasture land has diminished by 39 percent.

o Changes in Agricultual Activities:

A critical trend concerns the changes related to agricultural activity: in the eight major basins, cropland has decreased by an average of 24 percent. At the same time, agriculture in the watershed has shifted from a labor intensive to a capital intensive activity. More specifically, three major changes in agricultural activity have increasingly emerged in the region over the past thirty years: a growing number of farmers have adopted low tillage or conservation practices; agricultural land is being farmed more intensively; and the size of the average farm has increased due a steady consolidation of land.

Conversion to Conservation Tillage Practices
Economics has been the driving force behind the widespread conversion to conservation tillage. By diminishing their use of a plow or disc on the

fields, farmers therreby lessen their energy consumption and costs. In order to control weeds and pests, however, they have had to increase their applications of herbicides and pesticides, as evidenced by statistics that herbicide use in Maryland more than doubled between 1971 and 1975, and increased by 1.4 times in Virginia. Conservation tillage has another important by-product related affecting the Bay's health--it helps to diminish soil erosion and therefore the runoff of nutrients because it disturbs soil conformation less than regular tillagee practices. Additionally farmers are tending to leave vegetative cover on the ground during the winter months which increases soil nitrification and decreases soil erosion normally caused by spring runoff from bare land.

Intensification of Farming

Illustration ___ indicates a growing trend of the past thirty years of intensification of farming by illustrating a steady increase in the use of nitrogen-based fertilizer in the Bay drainage areas in the three states. This pattern is in sharp contrast to the gradual decline in the total amount of harvested croplands in these same areas. This intensification of farming heightens, therefore, the very same problems which conservation tillage helps to lessen. The large equipment that is used is very heavy and often causes soil compaction. Modern tractors tend to be six or eight rows wide. Their large turning radii preclude the use of contour terraces, designed to minimize erosion. Thus, intensification requires the use of increased fertilizer, pesticide and herbicide inputs. In addition, the technologies used to increase the efficiency and speed of soil preparation, crop maintenance and harvesting, have made many of the better-known and basic conservation techniques obsolete.

Consolidation of Agricultural Land

Consolidation of agricultural land refers to a pattern of fewer and larger farms and more absentee owners, especially including corporations, who lease the land to tenants. The impermanence of this relationship makes tenants reluctant to adopt new practices that would reduce soil erosion and runoff which entail extra costs, time, and commitment. Tenants simply have fewer incentives, especially when interest rates are high, to invest in capital intensive projects which have high initial costs and slow paybacks.

Other Changes Including Urban and Residential Development

Due to conflicts and inconsistencies in data, the Bay Program had difficulty in gaining a precise break-down of the changes in the "other" land in addition to cropland and forests. An effort was made to track specifically the trends of urban development, wetlands disappearance, and expansion and construction of institutional facilities. However, it appears clear that a continual expansion of urban and residential areas has occurred, making up the greatest proportion of the growth charted in the "other" category showin in Illustration ____.

o Industrial Operations:

A range of industrial operations exist in the watershed, discharging wastewaters often containing large amounts of toxic chemicals (e.g. synthetic organic chemicals, heavy metals, solvents) as well as the more traditional pollutants such as biological oxygen demand (BOD) materials and nutrients. Within the Chesapeake Bay drainage area, there are an estimated _____ industrial facilities. Among the specific categories of industrial operations are steelmaking and shipbuilding, leather tanning, plastics and resin manufacturing, papper manufacturing and chemical production. Poultry, seafood and vegetable processing are important industries on the eastern shore. Other animal husbandry and processing activities take place throughout the Chesapeake Bay basin area.

o Exporting Commerce Including Coal:

Baltimore and the Greater Hampton Roads area are two of the major port complexes in the North Atlantic region of the country. Situated near the coal-producing regions of Appalachia, they are the primary points for exporting coal, accounting for 20 and 75 percent of total U.S. export tonnage, respectively. Widespread expectations of the increased use of waters in these areas have been prompted by growth estimates indicating that the total cargo handled by Baltimore and the Greater Hampton Roads complex may double over the next twenty years. in 1980, the increased demands for coal drove exports up to 93 million tons, a 39 percent increase over 1979 levels. Industry projections indicate that coal exported may reach 280 million tons by the year 2000. While this trend suggests a boost for the economy of these areas, it also poses increased stress on the water quality of the Bay.

o Population Growth and its Impact:

The steady trend of population growth in the Bay region has had a major impact on the shifts of land use. During the last thirty years, conversion to residential, urban, and suburban areas has taken place at an increasingly rising rate. Although such land today represents less than 15 percent of the watershed, this represents an increase of 182 percent since 1950. The conversion of land to residential areas has been concentrated in areas surrounding existing development. For example, in the Patuxent River basin, the percent of developed land has risen from approxiamtely 3 percent in 1950 to over 35 percent in 1980.

The resulting increase in the number of municipal sewage treatment plants from

the rise in population in the watershed was mentioned earlier to introduce this section of the chapter. Currently there are an estimated 580 POTWS located in the Chesapeake Bay drainage basin. Illustration ____ shows the location and magnitude of municipal discharges to Bay tidal waters in 1980. Altogether, these facilities discharge an estimated 1350 million gallons per day (MGD). POTWs are a significant source of organic materials, nutrients, bacteria and toxic compunds. The concentrated discharge of these materials have been found by the Bay study to be placing considerable stress on the ecological conditions of the Bay and serious degradation in areas located near the outfalls of the individual plants.

o Geographical Variations:

A closer geographical break-down of the these land use trends occurring in the the Bay region shows that the West Chesapeake and Patuxent River basins have felt dramatic increases in urban and residential development, losing at the same time cropland and pasture, forest area, and gaining rapidly rising populations between 1950 and 1980. In the Patuxent River basin, a significant rate of conversion in land use has occurred, from farming to institutional purposes and new residential development.

o Loss of Wetlands

Finally, the Bay's wetlands have been disppearing. Wetlands, both headwater and tidal, serve as spawning, feeding, breeding and nesting habitiat for mammals, finfish and shellfish. Moreoever, vegetated wetlands act as "buffers" within the aquatic environment; through "denitrification," precipitation, adsorbtion on organic matter and assimilation, wetlands filter nutrient runoff into the Bay's waters. They also intercept sediments, protect vulnerable shorelines from erosion, contribute to flood control by absorbing and holding considerable amounts of water; and they trap pollutants such as heavy metals, pesticides, and fecal contaminants.

Today, the Chesapeake Bay is edged by more than 40,000 acres of wetlands. Although statistics vary widely regarding the trends of wetlands loss, research indicates, for example, the several thousand acres of Bay wetlands were destroyed each year during the 1960's. Increased federal, state, and local regulation, as well as public and private conservancy efforts. seems to have slowed down the loss to approximately 100 acres per year. Losses are

attributable to various forms of modification to land or water areas where the wetlands lie. For example, agriculture drainage is a principal cause of wetlands loss in Maryland; channelization projects play a dominant role in destroying wetlands in Virginia. In addition, residential development, industrial projects, expansion and development of marinas, and dredge-and-fill activities, also have cause the continuing decrease in wetlands in the Bay area.

To summarize, the geographical variations in the land use shifts affecting the region, the Susquehanna River basin has remained over the past thirty years an area of agricultural land and forests. The Potomac, Rappahannock, York and James River basin have all experienced similar patterns in agricultural land use trends. During the last thirty years, the amount of cropland has declined. Above the fall line the land returned to its natural forested condition. Below the fall line, urban development and population growth have been the primary trends

Summary

In summary, the Chesapeake Bay's ecological health is clearly bearing the brunt of a relatively recent increase and intensification of changes made by the region's populace in how they use the land and what they do on that land. The concentrations in the ecosystem of excessive sediment, organic and metal contaminants, and nutrients documented in detail by the Bay Program's study are the products to a great extent of: the rapid population growth of the past thirty years and resultant increases in municipal wastewater discharged into the waters; the nature of industrial processes concentrated in certain areas and their effluents; the consequences of substantial changes in agricultural activities; and the other conversions taking place that were summarized in this chapter.

The Bay Program's research has documented in detail the serious impact of the nutrients and toxic chemicals released from these sources on the Bay's water and sediment quality and on the vitality and abundance of its living resources. Moreover, forecasts indicate that the sources of these pollutants are continuing to grow in number and change in nature, indicating corresponding

increases in the levels of the pollutants entering the Bay. The picture of the present and particularly the future is the basis for the recommendations set forth in the subsequent chapters to act now to control and alter man's activities and practices on land in order to halt the deterioration of the Bay and the subsequent losses of animal and plant life it produces.

CHAPTER III

THE BAY'S EXISTING WATER POLLUTION CONTROL STRUCTURE

WHAT HAS BEEN DONE

INTRODUCTION

This chapter describes the framework and components of the existing water pollution control institutional structure in the Bay region. Since the recommendations presented in the next chapter for addressing the problems of Chesapeake Bay call for federal, regional, state, and local components to continue or begin to employ their respective tools to achieve particular ends, the reader receives in this chapter the essential information and background to form a general understanding of how these tools are organized; how they relate to one another; and what goals they are meant to accomplish.

Underlying this chapter and the rest of the report is appreciation for the past performance and efforts of the many authorities described below charged with protecting Chesapeake Bay and the other waters lying in Pennsylvania, Maryland, Virginia, and the District of Columbia. Their respective records demonstrate an ability to establish controls and develop and implement programs that effectively clean up and maintain the quality of these waters. Certain problems such as the discharges of conventional pollutants from point sources have been tackled and resolved to a great extent in recent years.

Unfortunately, at the same time, a number of problems (in particular the release of pollutants from non-point sources and toxic water pollution resulting from an increasing use of toxic chemicals) have not consistently received the level of attention and resources needed for arriving at solutions. However, in recent years, the states in the watershed have stepped up and targeted various actions to deal with these difficult problems. Thus, this next phase of acting on the problems documented by the Chesapeake Bay Program should be viewed as a time of restating and redoubling many of the water pollution control initiatives and programs already operating and achieving positive results. In the cases where adding to or restructuring these programs is necessary, such efforts will entail improving and building upon the existing foundation.

In summary, the three states, the District of Columbia, and the many regional and local governmental entities in the Chesapeake Bay watershed have formulated powerful goals to express in their respective terms the intent to accomplish both the Clean Water Act's objectives and additional resolutions of their own related to cleaning up their waters and keeping them clean. This chapter is an account of the way in which each jurisdiction mentioned above has translated into tangible action its declaration resolving to preserve the health of surrounding waters.

There is no way to successfully credit every authority and accomplishment of the various levels of government in this area--such a presentation would be too lengthy for this report and is beyond the charge of the Bay Program. However, it is hoped that a sufficient product is demonstrated below, which makes clear what are the available institutions and what are its capabilities (as demonstrated in their recent and current performance) for protecting the Chesapeake Bay.

The next phase of implementing an aggressive Bay-wide effort to address the problems of the estuary will require full appreciation, knowledge, and analysis of this existing structure in order to assess and conclude who will do what to get done the impending job of cleaning up and protecting the Bay.

II. THE FRAMEWORK: THE REGION'S WATER QUALITY GOALS AND OBJECTIVES

Our nation sets goals for itself by a variety of mechanisms--some more formalized than others. These statements of goals provide the incentive and rationale for carrying out programs of action and establish targets or benchmarks against which to measure our progress. For a large and diversified resource, such as the rivers in the Chesapeake Bay watershed, different sets of goals are adopted and pursued <u>simultaneously</u> by different divisions of society, including units of government and the private sector.

Goals statements can serve as powerful motivators for effective efforts or, at the other extreme, as high sounding but hollow gestures which accomplish nothing. It seems that the credibility of a particular goal statement largely depends on the breadth of the consensus that was developed prior to the goal's

adoption; the ability ("power") of the adopting group to carry out the necessary action program; and the willingness of the adopting group to commit resources to that program. In these terms, a goal stated in an act of Congress, when tied to specific new legal powers and adequate funding, may well represent the most credible kind of goals statement.

The Clean Water Act provides the foundation for the region's water pollution control efforts. It sets out as its objective "to restore and maintain the chemical, physical, and biological integrity of the nation's water." To achieve this objective, two national goals and three major policies were formulated.

(1) It is the national goal that the discharge of pollutants into the navigable waters be eliminated by 1985;

(2) It is the national goal that wherever attainable, an interim goal of water quality which provides for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water to be achieved by July 1, 1983;

(3) It is the national policy that the discharge of toxic pollutants in toxic amounts be prohibited;...

(4) It is the national policy that federal financial assistance be provided to construct publicly owned waste treatment works;

(5) It is the national policy that areawide waste treatment management planning processes be developed and implemented to assure adequate control of sources of pollutants in each state;.... (Section 101)

DESCRIPTION OF THE REGION'S PROGRAMS

Primarily as a result of federal, state, and local regulatory programs, the decline in Bay water quality has been slowed and in many cases reversed. For example, over the last ten years, the quantity of oxygen-demanding (conventional) pollutants discharged by industrial and municipal point sources has been substantially reduced. During the 1970 to 1980 period, the volume of effluent (flow) discharged by municipalities within the James River basin more than doubled; yet the BOD_5 (5 day biological oxygen demand) load was nearly halved. In the Potomac there has been a similar increase in discharged effluent but both the BOD_5 and the total load phosphorus (TP) into the river has been decreased.

Although concerted efforts to control discharges of heavy metals and synthetic organic chemicals have only just begun, there is evidence that pollution equipment installed to control "conventional" pollutants has also contributed to reductions in the amount of certain toxic loadings to the Chesapeake Bay. For example, construction of the Humphreys Creek industrial waste treatment plan in 1971 by Bethlehem Steel and the adoption of mandated pollution control measures by other industrial dischargers have brought about significant reductions in metal loadings to Baltimore Harbour. In terms of Bay-wide loading trends, Chesapeake Bay Program analysts estimate metal and other pollutant loadings discharged by point sources to the Bay may have decreased by 33 percent during the 1970's as water use by manufacturers declined and industry responded to pollution control requirements enacted during the same period.

These and other statistics are proof of the fact that point source pollution controls are being effectively employed. Yet the evidence is equally compelling that these measures alone are not sufficient to restore the Bay, especially in light of the anticipated growth throughout the area. We are still a great distance from achieving the nation's goal of restoring and maintaining "...the chemical, physical, and biological integrity of the (Bay) waters...." To reach that goal, additional point source control measures need to be implemented to control toxics and heavy metals and further limit nutrient discharges from municipalities and industry. Comprehensive nonpoint source

control measures need to be undertaken to control agricultural, exurban and urban run-off. Simply put, releases of pollutants from all sources must be reduced.

The existing governmental structure related to water pollution control is essentiall hierachial. At the federal level, much of the initiative, directing, funding, and ultimatel, the responsibility, for controlling water pollution originates and finally rests with the Environmental Protection Agency. In addition, other federal agencies, principally the Department of Agriculture, the Fish and Wildlife Service (Department of the Interior), Corps of Engineers, Soil Conservation Service, and Bureau of Air and Water Quality have programs whih also influence the quality of the nation's waters. Underneath the federal level are the states which have their own water qualtiy standards for surface waters, state permitting and enforcement programs, and water qualtiy planning and monitoring activities. Underpinning the states are the counties and municipalities with their own publicly owned treatment works (POTWs), industrial pretreatment and sewer ordinances, zoning and land use requirements. In addition, a multitude of special districts have been created with special responsibilities for soil conservation, land use planning, fisheries management and sanitation.

Following is a description of the major activities which have evolved from the creation of the Clean Water Act and other federal, state and local water pollution control legislation.

A. Water Quality Planning

The NPDES Permit Program, local pretreatment requirements, effluent limitations and other parts of government regulatory programs represent the tools or mechanisms for implementing the CWA regulatory process. Answers to questions of how those mechanisms will be utilized in particular situations are dependent on the development of an overall plan or implementation strategy. Such a strategy will then allow water quality managers to answer questions such as when technology-based effluent limitations are more appropriate than water-quality based limitations, when water quality objectives will be achieved by control of nonpoint source discharges rather than further control on point source discharges, and so forth.

The CWA as well as comparable state legislation provides a number of mechanisms for the orderly resolution of these types of questions by detailed planning processes at the state and local levels. Set forth throughout the CWA, they, in theory, are designed to ensure that EPA, state, and local governments develop plans to improve water quality before spending funds for treatment plants and enacting regulatory schemes.

Unfortunately, these planning processes have not always been implemented in an effective manner. As a result, in May, 1979, EPA promulgated regulations governing water quality management planning. The regulations (40 CFR 35) consolidate the requirements for state and interstate water pollution programs funded under section 106 of the CWA, planning under section 106, facility planning under section 201, planning under sections 205(g) and 208, and the continuing planning process in section 303 into a single process called the Water Quality Management (WQM) planning process. States are now directed to prepare water quality management plans identifying the sources and severity of pollution problems and describing control programs. This planning process includes designating "water quality limited streams," establishing the "total minimum daily load" (TMDL) for each pollutant relative to the designated use of the stream segment, and employing a waste load allocation system to divide the TMDL among dischargers on a segment. Also required are state effluent limitations based on water quality schedules of compliance for point sources, controls for the disposition of any residual waste from water treatment facilities, and planning for nonpoint source pollution.

As discussed in subsequent sections, the planning processes in Maryland, Virginia, Pennsylvania, and the District have achieved mixed results. Most of these plans include strong point source planning frameworks. This is consistent with past EPA decisions to emphasize efforts to reduce wastewater discharges from industrial and municipal facilities through the NPDES process, enforcement, and the construction grant program.

In sharp contrast to point sources, significant work remains to make more effective the planning provisions for nonpoint source pollution. Methods for remedying or even minimizing the nonpoint source pollution problems remain inadequate. In most cases, the NPS provisions of each state's WQM plans contain only voluntary Best Management Practices and, therefore, must be consi-

dered preliminary. Indeed, all four states have reported that nonpoint source pollution is a major reason they will fail to meet the fishable/swimmable goals of the CWA in the near future.

. Water Quality Standards

Regardless of the mechanisms used by particular planning agencies, water quality standards are the foundation of that process. They define the water quality goals of a water body, or a portion thereof, by designating the use or uses to be made of the water and by setting criteria necessary to protect those uses. Once in place, they serve as a measure of program effectiveness and as a guide to the extensive water quality planning process established by the Act. Water quality standards also provide, at least in theory, a secondary tool for regulating point source discharges.

Section 303 of the CWA directs states to develop, establish, and if appropriate, revise their water quality standards. EPA then reviews the state standards to assure that the state's criteria and use designations are at least as stringent as the federal criteria. EPA also has the authority to replace inadequate state standards with federal standards. States have the latitude to adopt criteria and standards more stringent than the national ones.

To assist the states in the development of water quality standards, the Clean Water Act requires EPA to publish and periodically update water quality criteria. These criteria, which have no direct regulatory impact represent a qualitative or quantitative estimate of the concentration of water pollutant sufficient to protect a specified water use. For example, a criterion based on the protection and propagation of fish, shellfish, and wildlife is the best estimate of the maximum concentration of a given pollutant that protects aquatic life.

EPA originally published water quality criteria in a July, 1976 volume, Quality Criteria for Water (widely referred to as the "Red Book)." This document specified criteria for over twenty pollutants.

After each state submitted its own water quality standards, which were subsequently approved by EPA, the federal criteria were removed from the Code of Federal Regulations.

The 1976 document has recently undergone substantial revisions in response to a major consent decree.[1] During the late 1970's, EPA developed criteria documents for 64 of the 65 pollutants or classes of pollutants listed in section 307(a)(1). (See Table _____) These new documents update information and water quality criteria for the toxic pollutants already listed in the Red Book and add guidance on additional toxic pollutants.

Utilizing these ciriteria as a guide, each state is required to develop, establish, and if appropriate, revise their water qualtiy standards. Water quality standards generally have two components. The first is the use for the water in an area. Each state classifies its waters into categories, such as public water supply, agriculture, recreation, propagation and protection of fish and wildlife, and industrial. For each use category, states adopt water quality criteria necessary to meet the designated use. For example, the state of Maryland has set a water quality standard for the North Branch of the Patapsco River by designating it as a Class IV water (recreational trout waters) and requiring that the concentration of total residual chlorine not exceed 0.002 mg/l. EPA then reviews the state standards to assure that the use designations and criteria meetfederal requirements. EPA also has the authority to replace inadequate state standards with federal standards.

Within this framework, however, the states have considerable latitude as to how they set their standards and what levels of use designation they assign to specific water bodies and stream segments. Approaches to use and stream classification vary greatly from state to state. This is true in the Chesapeake Bay Region where, as can be seen from Table ___, Maryland, Pennsylvania, and District of Columbia have developed three

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[1]Under paragraph 11 of the consent decree in NRDC et. al. v Train, EPA was required to publish criteria for 129 top priority pollutants. This was subsequently codified under sections 304 and 307(a)(1) of the 1977 amendments.

different water use classification systems, while Virginia relates its classification to physical characteristics.

All four states have also adopted water quality criteria required to support those uses. As can be seen in Table II, there is substantial variation in the number of pollutants for which each state has adopted criteria. For example, Maryland is the only state among the four to have adopted criteria for toxic organic compounds--PCBs, endrin, toxaphene, DDT, benzidine, and aldrin-dieldrin. Pennsylvania, on the other hand, has adopted a much more comprehensive set of criteria for heavy metals. In addition, there are wide interstate variations in the criteria levels for particular pollutants. For example, the level of chlorine deemed necessary to protect trout waters varies from 0.002 mg/l in Maryland to 0.15 mg/l in Pennsylvania. Finally, there are wide interstate variations in which criteria apply to which water uses.

B. Point Source Controls

1. Regulation of Direct Industrial Dischargers

Within the Chesapeake Bay drainage basin there are over __ dischargers of industrial wastewater. Altogether, it is estimated that these sources contribute __percent of all nutrients entering the Bay and __percent of the toxic substances loadings. According to research done for the Chesapeake Bay Program, such releases are significantly impacting the Bay and its ecosystems.

A classic illustration of the effects of heavy industry on water quality is the severe degradation of the Baltimore Harbor and the Elizabeth River, both major industrial centers. These areas are characterized by substantial increases in levels of toxic metals and other industrial chemicals not only in the water column, but also in the sediments and the tissues of various aquatic species.

a. The National Pollutant Discharge Elimination System

The primary mechanism for regulating industrial dischargers is the National Pollutant Discharge Elimination System (NPDES). The Clean Water Act makes it illegal for anyone to discharge pollutants to the nation's surface waters without an NPDES permit. These permits, issued by EPA or an authorized state for periods not to exceed five years, incorporate applicable effluent limitations as well as other compliance measures, schedules, and monitoring and reporting requirements.

Responsibility for implementing this program is shared by EPA and the individual state agencies. Under section 301 of the CWA, EPA is required to issue effluent guidelines which are used in setting discharge limitations for industrial polluters. These permits, based on effluent guidelines where they are available, are issued by EPA or by states delegated responsibility for the NPDES program. Compliance monitoring and enforcement actions are jointly handled by federal and state agencies.

The Maryland Office of Environmental Programs (OEP), the Virginia State Water Control Board (SWCB), and the Pennsylvania Department of Environmental Resources (DER) hold the management and permitting responsibilities for their respective state water quality programs and each agency has received authorization to administer the NPDES program. In these states, the EPA's Region III office in Philadelphia issues guidance, provides financial and technical assistance, and reviews selected major permit applications. In the District of Columbia, permitting responsibilities are currently shared by the Department of Environmental Services(DES) and EPA's Region III office in Philadelphia. District officials essentially write the permits which are then issued by the regional office. The District is close to enacting legislation that will enable it to assume full responsibility for NPDES permitting in that jurisdiction.

Although each agency responsible for NPDES permitting has developed its own regulations, the actual permit processes are substantially similar. The most significant distinction is the division of permit

responsibility between the state's central and regional offices. In Maryland, the main OEP office writes and issues all permits. In Virginia, the regional offices prepare the permits which are then reviewed and approved by the central SWCB office in Richmond. In Pennsylvania, DER regional offices issue their own permits with cursory or no review by the state's central office.

The majority of the "first round" permits were issued jointly by EPA and the individual states between 1973 and 1975. In 1978, as these permits began to expire, EPA instituted a policy of reissuing short-term (two- to three-year) permits in order to await the completion of BAT/BCT effluent guidelines. Alternately, expired permits were allowed to continue in effect under the Administrative Procedures Act or similar states. However, as of July 1983 all four states were at various stages of writing "second round" permits containing efluent limitations that reflect the generally more stringent BAT/BCT effluent limitations.

o Permit Conditions

NPDES permit limits are based either on the application of available technology or on the protection of water quality, whichever is more stringent. The Clean Water Act (CWA) establishes two levels of technology standards and deadlines for industrial compliance: "best practicable control technology currently available" (BPT) by July 1, 1977 and "best available technology economically achievable/best conventional technology" (BAT/BCT) by July 1, 1984.

As noted above, the majority of the "first round" permits reflecting BPT or more stringent water quality based limitations were issued between 1973 and 1975. For most industries, effluent guidelines specifying the levels of control achievable through BPT were not available. Consequently, most of those early permits were developed according to "best professional judgment" (BPJ).

While representing a step forward, these permits have several major weaknesses. First, most permits specify only four or five pollutants as being subject to effluent limitations. In most

cases, these are limited to "conventional" measures of pollution such as biochemical oxygen demand (BOD), suspended solids, pH, and flow.

Second, many of the permit limitations were determined on the basis of past performance and therefore required only slightly better performance. The exercise of BPJ often reflected a sensitivity to the economics of pollution control.

Permit conditions for second round permits will be based largely on the BAT/BCT guidelines. The BAT limitations are especially designed to control toxic discharges and, once incorporated into a NPDES permit, should have a critical effect on reducing the release of organic and inorganic pollutants into Bay waters. This process is now taking place in all four states. For example, effluent guidelines for the iron and steel industry, issued on May 27, 1982, specify limitations for benzene, benzo(a)pyrene, and several heavy metals. These limitations are currently being translated into individual permit conditions at steel plants such as Bethlehem Steel's Sparrows Point Plant.

In certain areas, industrial permit limits for toxic pollutants could be made more stringent than BAT technology requirements based on water quality standards. Section 302 of the CWA authorizes EPA to establish permit limitations more stringent than the applicable BAT limits where necessary for the attainment or maintenance of water quality which "...shall assure protection of public water supplies, agriculture and industrial uses, and the propagation of a balanced population of shellfish, fish, and wildlife, and allow recreational activities in and on the water...". To date this section has been almost never used.

o Monitoring

An NPDES permit holder is required to monitor regularly the concentration in the discharged wastewater of each pollutant expressly limited in the permit. Monitoring and chemical tests must conform to procedures outlined by EPA. The parameters to be monitored and the

frequency of reporting are established in the permit. This information is supplemented and verified by routine compliance monitoring performed by each state agency.

The adequacy of current monitoring requirements has frequently been called into question. Existing NPDES permits contain monitoring and reporting requirements for conventional pollutant parameters, and in some cases, for heavy metals (e.g., cadmium, mercury, lead). However, in the majority of cases, no effluent limits and therefore no monitoring requirements have been established for toxic pollutants.

This is slowly being changed. As second round permits are written, limitations for certain toxic pollutants are being included. Consequently, monitoring programs will need to upgraded to include these additional parameters. Some states have moved aggressively to improve their source monitoring programs. For example, in Virginia, the SWCB has initiated a toxics monitoring program and requested 121 Virginia industries to evaluate their operations and submit to the SWCB a proposed program to monitor their effluent wastewater. Participation in the program is voluntary, but 75 percent of the industries have submitted plans.

Discharge monitoring reports are supplemented by on-site inspections and independent monitoring conducted by state officials. In most states, major dischargers are inspected once a year.

b. Areas of Concern

In attempting to develop and maintain an effective system for issuing NPDES permits, EPA and individual states have experienced a number of difficulties. Some of these problems have been resolved while others serve to limit efforts to establish, monitor, and enforce appropriate NPDES permit limitations for industrial dischargers. Principal difficulties include:

- Delays in promulgating effluent guidelines and second round NPDES permits
- Adequacy of permit conditions

- Compliance with permit conditions

  Adequacy of compliance monitoring

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2. Regulation of Industries Discharging to Publicly Owned Treatment Works (POTWs)

An estimated _____ industrial facilities use Bay Area sewage treatment facilities to handle their wastes instead of using their own treatment facilities to discharge directly into surface waters. This practice can cause three serious problems. The first and most obvious is that sewage treatment plants are designed to treat common residential wastes. They do a good job of removing suspended solids and oxygen demanding materials, but not many of the toxic materials found in industrial wastewaters. Instead, many of the toxic pollutants pass through the plant, causing the same health and environmental damage as if they weredumped directly into the waterway.

Second, highly contaminated industrial wastes can literally destroy a communities huge investment in sewage treatment. They can interfere with the sensitive biological processes that treat most sewage, causing the plant to do an inadequate job of treating not only industrial wastes, but also the much larger amounts of community wastes. The Kepone incident in Hopewell, Virginia is perhaps the best known example of this problem.

Finally, industrial wastes concentrate in the sludge produced by the treatment processes. Contaminated sliudge ismuch more expensive to treat especially in the large volumes generatedby POTWs. If improperly treated, the pollutants in the sludge will leach into groundwater, contaminate soil where it can be taken up into plants we eat, or become air pollutants when the sludge is incinerated.

In order to prevent such problems, Congress enacted a national pretreatment program requiring pretreatment of industrial wastes before they enter POTWs. This program was designed to have a strong federal, state, and local components. EPA with its greater technical capabilities was required to establish standards. "...prevent the discharge of any pollutant through treatment works which are publicly owned ... that interferes with, passes

through, or is otherwise compatible with such works." This requires that all industries on line to treatment systems be identified, the composition of their wastes identified, and pretreatment requirements set to provide comprehensive control of toxic pollutants found in their discharges. States and local government are then responsible for implementing the federal standards at specific municipal systems.

a. EPA Pretreatment Regulations

In contrast to the NPDES permit program, regulatory programs for regulating industrial discharges to POTWs are still in the development stages. The current EPA regulatory program contains two basic elements. First, EPA has promulgated general pretreatment regulations which outline the national policy for establishing and enforcing pretreatment requirements, delineates the responsibilities and deadlines applicable to the various parties involved in the pretreatment program, and establishes a number of requirements applicable to all industries (40 CFR 403). These standards, as amended in January, 1981 (46 FR 9404), prohibit the discharge into POTWs those pollutants that would interfere with the operation of the POTW (prohibited discharge standards); specifies how categorical standards (see below) will be modified to apply to combined wastestreams;
provides for revision of categorical standards to give credit for removal of pollutants by the POTW; allows for variances from categorical standards for "fundamentally different factors"; and requires certain POTWs to develop local pretreatment programs.

Categorical pretreatment standards, to be developed for 34 major industries, establish best available technology (BAT) levels of control on toxic pollutants for indirect dischargers comparable to the BAT controls for direct dischargers. Among the standards recently promulgated are those for the iron and steel, petroleum refining, pulp and paper, and inorganic chemicals industries. Guidelines recently proposed or scheduled to be proposed include battery manufacturing, foundries, metal finishing, organic chemicals, pesticides and pharmaceuticals. The Clean Water Act requires compliance with categorical standards within three years from the date the standards become effective or July 1, 1984, whichever is earlier.

b. State Pretreatment Programs

The general pretreatment regulations establish mechanisms and procedures for states to develop and submit for approval State Pretreatment programs before March 27, 1980. Due in part to the delays in finalizing EPA pretreatment regulations, all four states failed to meet that deadline. The relatively low priority placed on program development has also contributed to these delays.

As of July, 1983, the State of Maryland had developed and submitted for EPA approval a state pretreatment program. If approved, the state would be delegated pretreatment responsibility pursuant to federal law; the state already has pretreatment responsibility and authority pursuant to state law. OEP has identified 25 POTWs requiring pretreatment programs. The Water and Waste Management Administrations are now modifying permits for these systems to include compliance schedules for developing pretreatment programs.

Due to staff and funding constraints, Virginia's State Water Control Board has not developed a state pretreatment program. The Board has, however, identified 27 POTWs requiring pretreatment and has developed a checklist to assist those municipalities adopt sewer ordinances that contain the necessary elements for an enforceable program. NPDES permits are currently being modified to include compliance schedules for the development of local programs.

c. Local Pretreatment Programs

Through the NPDES permit mechanism, EPA requires POTWs to adopt local pretreatment progorams. Under current regulations, all authorities who own and operate POTWs with a design capacity of five million gallons a day and whichreceives wastes fromsources subject to coverage by the National Categorical Standards are required to develop pretreatment programs by July 1, 1983 in which principal enforcement authority will be lodged. In addition, smaller POTWs which desire to modify categorical standards (i.e., grant removal credits) will also have to establish a pretreatment program.

In the Chesapeake Bay area, there are _____ publicly owned treatment works which need to undertake an industrial survey and pretreatment program planning. As of June, 1983, the majority of these POTWs had not developed adequate programs. For example, in Maryland, the state has identified 25 treatment plants that will require industrial pretreatment programs. Of those plants, six had complete plans; an additional ten plants were developingn programs; plans for the remaining nine plants (including the Back River and Patapsco plants) are still to be developed.

The most advanced program in the Bay Area is the Hampton Roads Sanitation District (HRSD) System. This program was initiated in 1977 and was approved by EPA in 1982. In 1983, nine treatment plants, ranging from 10-36 MGD, will be receiving discharges from 209 permitted facilities. The basis of the program is to monitor and limit toxic influents from the major industrial facilities. Permits are based on national pre-treatment information, the EPA Development Documents and the District's monitoring and engineering knowledge of the facilities.

o Areas of Concern

In attempting to develop and maintain an effective system for regulating industrial facilities discharging to POTWs, EPA, the four states, and local agencies have experienced considerable difficulties, including:

- Delays in Promulgating Categorical Standards
- Delays in Developing State and Local Pretreatment Programs
- Sludge Management

3. Regulation of Municipal Dischargers

Chesapeake Bay Program research revealed adverse effects on water quality from municipal dischargers throughout the basin. Areas most affected are shown in Table ____. As expected, the more populous regions are generally the ones most impacted. Most of the pollution can be traced to inadequate

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treatment, overloaded treatment facilities, and/or poor operation and maintenance. The pollutants most often observed at unacceptable levels in municipal discharges are oxygen demanding materials, nitrogen, and phosphorous. Municipal discharges can also contain an excess of suspended sediments, heavy metals, chlorine, and toxic organic compounds.

As is the case in most of the country's older urban areas, combined sewer overflows (CSO's) represents a significant problem several of the cities in the Bay Region pacticularly Washington, D.C.; and Baltimore, Maryland. When rainfall runoff is added to normal sewage flows in systems with combined storm and sanitary sewers, most of the POTWs in the region are unable to handle the flow and much of it bypasses treatment. Combined sewer overflow discharges contain bacteria, nutrients, oxygen demanding materials, heavy metals, and oil and grease.

Under the Clean Water Act, each POTW is required to provide secondary treatment of wastewater (a biochemical process) before it is discharged into a waterway. Effluent limitations achievable by this level of treatment are incorporated into a facility's NPDES permit. These permits, issued by EPA or an authorized state for periods not to exceed five years, specify applicable effluent limitations and describe required sludge disposal procedures if such disposal results in pollutants entering navigable waters. Municipal permits in each of the four states are currently undergoing review.

Recognizing that the resulting treatment requirements would be quite costly, Congress declared that "...it is the national policy that federal financial assistance be provided to construct publicly owned treatment works..." to carry out this policy, Congress developed the construction grants program, under which EPA provides funds that the states then allocate, on the basis of their own priority systems, to communities that need improved treatment facilities. Presently, EPA, provides up to 85 percent funding for planning, design, and construction of publicly owned treatment facilities. Through 1983, the following funds have been available to jurisdictions impacting the Chesapeake Bay:

Maryland	- 461 projects, $925 million
Virginia	- 212 projects, $680 million

Pennsylvania	- 263 projects, $610 million
District of Columbia	- 20 projects, $180 million

a. The National Pollutant Discharge Elimination System

As with industrial dischargers, the primary mechanism for regulating municipal dischargers is the NPDES permit program. These permits, issued by EPA or an authorized state for periods not to exceed five years, incorporate applicable effluent limitations as well as other compliance measures, schedules, and monitoring and reporting requirements.

The Maryland Office of Environmental Programs (OEP), the Virginia State Water Control Board (SWCB), and the Pennsylvania Department of Environmental Resources (DER) hold the management and permitting responsibilities for their respective state water quality programs and each agency has recieved authorization to administer the NPDES program. In these states, the Regional Office of EPA issues guidance, provides financial and technical assistance, and reviews most major municipal permits. In the District of Columbia, permitting responsibilities are currently shared by the Department of Environmental Services (DES) and the Regional Office. District officials essentially write the permits which are then issued by the Regional office. The District is close to enacting legislation that will enable it to assume full responsibility for NPDES permitting in that jurisdiction.

The majority of the "first round" permits were issued jointly by EPA and the individual states between 1973 and 1975.

o Permit Conditions

Municipal NPDES permit limits are based either on the application of available technology or on the protection of water quality, whichever is more stringent. Unlike the two levels of technology standards for industrial dischargers, the CWA establishes a single technology level for municipal dischargers, namely, "secondary treatment", to be in place by July 1, 1977.[2]

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[2]Municipalities that were eligible for permit compliance extensions under

The Clean Water Act requires that EPA can publish information on the degree of effluent reduction attainable through the application of secondary treatment within sixty days after enactment of the Act and from time to time thereafter. The Secondary Treatment Information regulation was originally promulgated on August 17, 1973 (38 FR 22298), and was amended on July 26, 1976 (41 FR 30785) and October 7, 1977 (42 FR 5165) to provide: (1) deletion of the fecal coliform bacteria limitations and clarification of the pH requirement, and (2) special consideration for suspended solids effluent limitations for best waste stabilization pond technologies.

The current Secondary Treatment Information regulation defines "secondary treatment" in terms of attaining an average effluent quality for both five-day biochemical oxygen demand (BOD_5) and total suspended solids (TSS) of 30 milligrams per liter (mg/l) in any period of 30 consecutive days, 45 mg/l in a period of seven consecutive days, and 85 percent removal in a period of 30 consecutive days. Special consideration is provided for wastewater effluent flows affected by combined sewer overflows, and industrial wastewater.

- Phosphorus Controls

The technology-based effluent limitations function as a nationwide minimum or base level treatment standard. However, individual states may adopt effluent limitations more comprehensive than those promulgated by EPA. For example, the District of Columbia requires the Blue Plains Treatment facility to meet a 0.2 mg/l phosphorus limit. This is the most stringent standard in the Bay region and has resulted in a considerable improvement in Potomac water quality. The State of Maryland, alarmed by field data indicating increasing chlorophyl concentrations, changes in plankton species composition, and the replacement of rooted vegetation by algae in the upper portion of the Bay, established the Upper Chesapeake Bay

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section 301(i) and applied for such extensions by June, 1978 were granted extensions until July 1, 1988. Eligibility was limited to those POTWs that were in the process of constructing the necessary treatment process, but unable to finish by the 1977 deadline and to those POTWs for which the federal government failed to provide construction grants with the specified time.

Phosphorus Limitation Policy. The policy limits phosphorus concentrations in POTWs' effluent. The policy was later adopted by Pennsylvania and currently applies to POTWs in portions of Maryland and Pennsylvania.

In Maryland, the technology-based limit sets a 2.0 mg/l effluent phosphorous limit for all treatment plants greater than or equal to 0.5 MGD discharging into the Maryland portion of the Bay north of and including Gunpowder River, or greater than or equal to 10.0 MGD and discharging between Gunpowder River and the southern edge of the Choptank River (Zone II).

In Pennsylvania, the policy requires 80 percent removal (approximately 2.0 mg/l) of phosphorus for all new or modified wastewater treatment facilities discharging to tributaries and the main stem of the Susquehanna River below its confluence with the Juniata River. EPA Region III recently recommended that in the lower Susquehanna the policy only applies to discharges greater than 0.5 MGD.

- Nitrogen Controls

The NPDES permit system may be used to set limits on the amount of nitrogen POTW's may discharge. In the Patuxent River basin the State of Maryland is currently setting nitrogen limits for POTWs in an efort to arrest deteriorating water quality.

o Chlorine Reduction

In the Chesapeake Basin (below the fall line) most POTWs now chlorinate their sewage effluent throughout the year. It is estimated that these practices result in the discharge of some 12,500 lbs/day of residual chlorine to tidal waters. However, because of the toxicity of chlorine to estuarine organisms there has been a reassessment of its use in the Bay Area.

Both Maryland and Virginia have ongoing programs dealing with chlorine use in POTWs. In Maryland, the discharges of chlorine to natural trout streams are prohibited; discharges to Class 4 waters of effluent concentrations of 0.02 mg/l are allowable in the receiving waters. Maximum concentrations allowable in effluents discharged to other waters is 0.5 mg/l. This latter concentration limit may be reduced in NPDES permits depending on particular aspects of the receiving water, e.g., nearness to an important spawning area, etc.

Maryland has also initiated two innovative programs for reducing chlorine discharges. The first program, known as Disinfection Optimization-Innovative Techniques (DO-IT), includes plants that discharge into spawning areas and which exceed permitted levels or have unusually high levels. Engineers from the Office of Environmental Programs (OEP) help plant operators by recommending changes in chlorine application or simple engineering procedures--such as installation of a chlorine contact chamber (OEP 1982). Under the second program known as Temporary Installation of Dechlorination Equipment (TIDE), the state lends or gives chemical feed pumps and dechlorination chemicals to plants for the months of April and May (OEP 1982).

In Virginia, permitted chlorine residuals in POTWs discharging to shellfish waters range from 1.5 to 2.5 mg/l; for other waters the permitted discharges range from 1.0 to 2.0 mg/l. An "anytime" maximum of 4 mg/l in POTW effluents is specified in NPDES permits. At least a 1:20 dilution at point of discharge is recommended to reduce residual chlorine levels to approximately 0.02 mg/l in nearfield receiving waters. In addition, Virginia's disinfection task force is currently investigating the environmental, technical and health effects of disinfection programs. The task forces report, to be submitted to the governor by July 1984, will contain recommendations on the need for restricting disinfection and the need for modifying current water quality standards.

b. The Construction Grants Program

To assist municipalities to achieve compliance, the 1972 amendments provided 75 percent matching grants for the design and construction of publicly owned wastewater treatment systems (POTWs). Local communities, usually with state assistance, pay the remaining 25 percent. Congress authorized eighteen billion dollars for this purpose for fiscal years 1973 through 1975; subsequent amendments have authorized additional monies.

In terms of the mechanics of the program, construction grant funds are appropriated by Congress each fiscal year. During the late 1970s, between $3 and $4 billion dollars were appropriated each year. The 1981 amendments reduced this amount to $2.4 billion per year for 1982-1985 plus an additional $200 million per year for 1983-85 to protect "marine bays and estuaries" from water quality problems caused by combined storm water and sanitary sewer overflows.

These funds are distributed among the states according to a congressionly determined allotment formula. In fiscal year 1983 the three Bay Area states and the District of Columbia received _____ million. With several exceptions,[3] these funds must be used to provide 75 percent grants for the planning, design, or construction of grant eligible portions of municipal wastewater treatment works.

The money available to each state is allocated within the state through the use of an EPA-approved priority list. Once EPA approves the prioritizing system, then any project within the fundable portion of the resulting state priority list is eligible for funding. The state's priority systems are summarized in Table ___. Maryland gives approximately equal weight to pollution abatement, protection of water use, type of facility improvement, and "special program goals". Pennsylvanias system is structured to support water use objectives establish by the state. Virginia sets priorities based on public health impacts, water

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[3]The Clean Water Act provides for three mandatory set-asides of certain portions of construction grant funds: rural set-aside (states with more than 25 percent rural population); innovative and alternative technologies set-aside (all states); and state management assistant grants (delegated states.)

quality conditions, population, and maintenance of existing high quality waters. Once a state recommends a project for funding, EPA or a delegated state reviews the project to determine whether the specific requirements of the CWA have been complied with.

Generally, the funding of any one project involves three separate steps. Step 1 consists of basic feasibility planning, the consideration of alternatives, analysis of environmental issues, and selection of the most cost-effective approach. Step 2 refers to the actual engineering design of a project. Step 3 refers to the actual construction of the project.

o Maryland

(CBP: Depending on the availability of data, tables should be prepared displaying statistics on funding needs, types of funding needs (treatment, collectors, CSO etc), sources of state funds, number of projects on priority list, etc)

o Virginia (refer to Table ___)

o Pennsylvania (refer to Table ___)

o District of Columbia (refer to Table ___)

c Areas of Concern

Efforts to improve water quality by upgrading the Chesapeake Bay region have resulted in considerable reductions in municipal point source loadings. However, in order to achieve further progress, several problems will need to be resolved.

o Grant Eligibility

In order to receive construction grant funding EPA's Advanced Treatment Review Policy requires that the proposed treatment works must be shown to definitely result in significant water quality and public health improvements. Such projects must be scientifically

supported by an adequate data base and technical studies which demonstrate the relationships between waste load and water quality or public health. In the case of the Patuxent River it is EPA's opinion that the information and studies performed to date do not provide an adequate technical basis to support nitrogen control in addition to phosphorus control. As a result, if a funding decision were to be made today, Federal construction grant funds could only be provided to fund the cost-effective solution for achieving the technically justified nutrient effluent requirements (i.e., phosphorus removal to 1.0 mg/l for the five year permit.)

One exception to this funding limitation is provided under current policy; additional federal participation is possible if land treatment is utilized and the costs are not excessive.

o Quality Control/Plant Performance

Despite a federal investment of almost $3 billion since 1972, plus state and local funds to construct new wastewater treatment plants or to modify and expand existing plants in the Chesapeake Bay drainage area, many are not treating wastewater at the efficiency levels they were designed to achieve. National EPA statistical reports on plant performance indicate that at any given point in time, 50-75 percent of the POTWs are somehow in violation of their NPDES permit.

The leading cause of poor performance by POTWs is improper operation and maintenance. Improving existing operator training procedures and materials would develop an untapped resource, plant personnel, to achieve improved plant performance. In some cases the states have taken action and now require training and certification of POTW operators. However, operators are often poorly paid and job turnover places an enormous strain on those programs.

o Funding Levels

The control of municipal sources has been more difficult, complex, and costly than Congress contemplated in 1972. Consequently in the Bay area, as in most of the country, there is a remaining backlog of

public treatment needs yet to be funded and built. According to EPA's 1982 Needs Survey estimate, remaining treatment needs in the Bay area total $__ billion.

o Combined Sewer Overflow

Most systems in the Bay area are not designed to treat stormwater flows. In those communities where storm and sewer systems are combined, heavy storm water flow either by-passes the treatment process completely or floods through it. In either case, the result is the same, major quantities of sewage and urban stormwater runoff head directly to the Bay, untreated.

Separation of storm sewers in the older cities with combined systems would be prohibitively costly and enormously disruptive. More selective, less costly, measures that can be taken to correct some of the CSO problem and control the frequency of storm overflow need to be identified and funded.

C. NONPOINT SOURCE POLLUTION CONTROL PROGRAMS

1. Section 208

The Federal Water Pollution Control Act Amendments of 1972 was Congress' first real effort to control pollution from nonpoint sources. However, because of the complex nature of nonpoint water pollution and a lack of experience in controlling it, Congress pursued a different abatement and control strategy than for point sources. The statute's NPS provisions emphasize long-term planning and rely heavily on local and regional cooperation.

The primary mechanism contemplated by the Clean Water Act for controlling NPS pollution is the planning and regulatory program created by section 208. This section requires each governor to identify areas of the state which have substantial water quality control problems. For each of these designated "waste treatment management areas" a state or local representative would be identified and charged with the responsibility of developing a

comprehensive area-wide plan to control those problems. Each state is responsible for area planning for those portions of the state not designated as "problem areas."

Under section 208, an EPA-approved planning organization would be eligible for federal grants to develop and implement an approved comprehensive planning program. The plans developed pursuant to section 208 must be consistent with the Act's other planning requirements (the section 303 continuing planning process and section 201 waste treatment management plans[4]) and are to provide both a general plan and a regulatory approach for dealing with important regional pollution control issues. The plan must include a program providing for regulation of the location, construction and modification of any facilities that might result in a discharge within the planning area.

For purposes of controlling area-wide and nonpoint source pollution, a plan must include a process to identify sources of nonpoint pollution within the planning area, including agricultural and silvicultural activities, surface or underground mine runoff (from both active and abandoned mines), construction activity, land disposal operations, and irrigation. For these identified sources, the plan must also include control measures such as management practices and land use requirements to minimize each activity's pollution potential. The control requirements developed under the 208 planning process may be enforced by the designated agency or by the Governor of the state.

2. Agricultural Runoff

Of the ____ acres in the Chesapeake Bay Basin, approximately _____ (16 percent) are classified as agricultural. Research by the Chesapeake Bay Program indicates that nonpoint pollution from these lands is severely impacting Bay waters. Sediment loss, long the focus of conservation efforts, continues to adversely affect many areas of the Bay and its tributaries. Nutrients (particularly nitrogen and phosphorus lost from cropland, pastures, feedlots and barnyards have also been identified as major water qual-

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[4]In May, 1979 EPA issued final regulations consolidating these planning provisions under a single process--the Water Quality Management Process. (44 FR 30016)

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ity problems throughout the Basin. In addition, bacteria, herbicides, and pesticides are found in agricultural runoff. These materials place additional stress on water bodies and ecosystems already in a severely degraded states.

The release of such pollutants from agricultural lands, as well as the environmental problems resulting from such releases can be minimized by careful on-site management and the employment of best management practices (BMPs). Beyond the water quality benefits afforded by these techniques, they often provide additional benefits such as reduction in operating costs.

Throughout the Bay Region, there are numerous federal, state and local programs designed to maximize the use of such practices. These are summarized below.

a. Federal Programs

o Environmental Protection Agency

As noted above, the Clean Water Act gives EPA no specific authority to regulate pollution from agricultural activities. The Agency, however, is attempting to address these problems through Section 208 (summarized under individual state descriptions) and a variety of demonstration projects. For example, EPA and the Department of Agriculture (USDA) have cooperated on series of projects to test various BMPs, to determine farmers attitudes, and to document costs.

Another EPA-USDA demonstration program directed towards controlling rural nonpoint source pollution is the Rural Clean Water Program. Administered by the Agricultural stabilization and Conservation Service of USDA, there are currently three RCWP projects -- Nansemond River (Virginia), Double-Pipe Creek (Maryland), and Conestoga Headwaters (Pennsylvania) -- in the Chesapeake Bay region. These programs provide accelerated financial and technical assistance to owners and operators having control of agriculture land. The purpose of this assistance is to install and maintain best management practices (BMPs) to control agricultural nonpoint pollution in order to improve water quality.

o Department of Agriculture

Erosion prevention has been the focus of considerable effort since the 1930's by local soil conservation districts and the U.S. Soil Conservation Service (USDA). These programs, originally intended primarily for soil conservation, now serve as the basis for water quality protection efforts in agricultural areas of the Chesapeake Basin.

The Soil Conservation Service (SCS), as a branch of the U.S. Department of Agriculture, provides District Conservationists and other federal employers who work side-by-side with state and local officials. They provide outreach and technical assistance to farmers for pollution control, which includes the design of site-specific pollution control measures. The SCS produces many of the basic handbooks and specifications used by state conservation districts in their day-to-day work of farm plan development and sediment and erosion control plan review. In addition, the SCS performs research and development in pollution control technology and carries out watershed management and other special studies. SCS provides national inventory and monitoring studies as a resource base on a regular basis.

The Maryland and Pennsylvania State offices of the Soil Conservation Service have designated the lower Susquehanna drainage area the "Mason-Dixon Erosion Control Area" and have proposed that the area receive "targeted" technical assistance. The primary objective of the proposal is the protection of the soil resource base and improvement of productive capability through a significant reduction in annual soil loss in the 22 county area below Harrisburg. The SCS has included $700,000 in its current budget to provide technical assistance by way of soil conservation technicians and engineers required to identify appropriate BMPs and to formulate a strategy for cropland erosion/nutrient control. SCS officials estimate that an additional $8.0 million per year in cost sharing funds for the next ten years is needed to allow implementation of practices identified as necessary to adequately protect all land in the targeted area.

Another branch of the U.S. Department of Agriculture is the Agricultural Stabilization and Conservation Service (ASCS). Through its national and state Agricultural Conservation Program, the ASCS provides cost-share opportunities

and financial incentives to farmers initiating practices covered by the program. In Howard County, the Cattail Creek special project is currently the focus of ASCS work in the Patuxent basin.

b. State Programs

All three states -- Maryland, Virginia, and Pennsylvania -- have initiated a number of activities to reduce pollution from agricultural activities.

o Maryland

In the State of Maryland there are several agencies that provide assistance to Maryland farmers in developing pollution control measures. First, the twenty-four Soil Conservation Districts (SCDs) are special purpose units of the Maryland government, independent of county government. The SCDs establish contact with landowners, provide technical assistance in the development of farm conservation plans and review sediment and erosion control plans for construction sites, mines, etc. Additionally, twelve SCDs review stormwater management plans for their counties.

Coordination for Maryland's SCDs is provided by the State Soil Conservation Committee, which also allocates state funding from the Maryland Department of Agriculture. In addition, SCDs receive funding from the USDA Soil Conservation Service, and their respective counties, and some carry out income-producing activities of their own.

The University of Maryland Cooperative Extension Service promotes the general awareness of pollution control needs on farms as part of its farm management efforts. State specialists from the Extension Service assist farmers and land owners by providing current information on productive cropping practices, integrated pest management, animal husbandry, pesticide application practices, etc. They inform the farmer about erosion and water quality control, and refer him to the SCD for plan development and BMP application.

In response to the mandates for NPS planning contained in section 208 of the Federal Clean Water Act, Maryland's Statewide Agricultural Water Quality Management Program for Control of Sediment and Animal Wastes was developed in 1979 to provide a uniform approach across the state. (This includes both the

"designated" and "nondesignated" portions of Maryland). Through this program, high priority areas for sediment and animal waste were identified, agricultural BMPs were selected and updated, content of farm-specific soil conservation and water quality plan, and a procedure established for cases of possible enforcement action.[5] Although developed in 1979, the agricultural plan has not been implemented.

The State of Maryland's proposed Patuxent River Policy Plan contains a number of agricultural conservation and other land-use management methods designed to reduce agricultural runoff. The most recent proposal (July 1983) contains several proposals to improve watershed management by concentrating the separate efforts of all levels of government and individual landowners. The two-part strategy includes the establishment of a Primary Management Area and associated management strategies for land along the river and tributary streams in order to protect aquatic and riparian habitats and Watershed-wide Management Policies to reduce the impacts of new developments and protect valuable natural resources and recreational opportunities in the basin.

A number of specific policies were proposed to minimize agricultural runoff loadings to the Patuxent River basin. For example, the draft plan contains a policy to establish approximately 100-foot wide buffers or filter strips in the Primary Management Area along the streams and river banks. This measure would be implemented through conservation easements, as well as incentive and compensatory programs such as cost-sharing and education. Another proposed policy would require annual reports from each soil conservation district that documents 1) significant sites, contributing to nonpoint pollution, 2) the districts efforts to address these critical areas, 3) obstacles encountered in reducing the problems in a timely fashion, and 4) what further actions are needed to accelerate the adoption of conservation practices on agricultural lands. The plan urges the Maryland Department of Agriculture to work with the

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[5]If a particular agricultural operation is identified as a significant source of water pollution, the case is referred to the local SCD. Through the voluntary mechanisms of the SCD, SCD staff can work with the farmer to prepare a Soil Conservation and Water Quality Plan based on the BMPs recommended by the Agricultural Pollution Task Force. If the landowner in question is not amenable to voluntary compliance to correct the problem by implementing the plan, or if the landowner fails to implement the approved plan within the agreed-upon time, OEP could become involved. OEP, in the Department of Health and Mental Hygiene, has broad-based powers to protect water quality and can then pursue correction of the problem through its normal enforcement procedures (see footnote #1, page IV-23).

districts to target state and federal cost-share funds to the highest priority nonpoint source sites in the watershed. In addition, the plan stresses that conservation plans be prepared and carried out for all publicly-owned lands in the watershed that are leased for agricultural operations. Prime agricultural land is identified as one of the land uses that should be reserved from intense development to maintain water quality.

The Section 208 Water Quality Management Plan for the Patuxent River Basin has been prepared in parallel with the Policy Plan to insure that the two programs work together to accelerate the development of a watershed-approach to planning. Experience gained in implemented these two plans will serve as a guide for future efforts by the state of Maryland to develop integrated watershed planning in other river basins and the Chesapeake Bay.

o Virginia

The State Water Control Board has been the lead agency in Virginia for the preparation and implementation of the voluntary statewide 208 Water Quality Management Planning for agriculture. An Agricultural Best Management Practice Handbook was prepared to assist farmers and soil conservation districts in reducing nonpoint source runoff. In addition, the Soil Conservation Service conducted an assessment of potential nonpoint sources of pollution incooperation with the State Water Control Board. This project was conducted in three phases over a two-year period for agricultural as well as forestry related water pollution. In Phase Three, the two agencies selected 26 small watersheds which showed high potential for contributing to water quality problems; eleven of these are situated in the Chesapeake Bay Basin. Each was examined to determine the severity of water pollution originating from soil loss, animal waste, fertilizer, herbicides, and pesticides. BMP's to reduce nonpoint source pollution to acceptable levels were selected and the related installation costs estimated. The total cost to install BMP's and provide technical assistance, water quality monitoring, soil tests, and information in the priority watersheds located in the Chesapeake Bay Basin was estimated at near $30,000,000 ($6,8000 per farm) combined priority watershed acreage of 1,025,000 acres, or $29.27 per watershed acre. To put this estimate in perspective, the federal ACP cost-sharing funds allocated to the entire State of Virginia in FY 1979 was $2,681,917.

o Pennsylvania

Pennsylvania's Statewide 208 Plan for Agriculture and Earthmoving Activities is based upon the Pennsylvania Clear Stream's Law which provides the Department of Environmental Resources with the authority to regulate any activity that creates a danger of pollution. These regulations require all earthmoving activities, including agricultural plowing and tilling, to be conducted in a way that soil erosion and sedimentation is minimized. All farmers must have either an erosion and sedimentation control plan or have applied to their county conservation district for the plan; the implementation schedule in the plan must be followed, and plans must reflect current operations. The county conservation districts prepare the plans on a priority basis. The Bureau of Water Quality Management, DER, is responsible for inspection and enforcement, and the Bureau of Soil and Water Conservation reviews and evaluates the technical aspects of plans.

In addition, the Statewide Plan incorporated existing state regulations concerning manure management, and herbicide and pesticide control. Manuals for both manure management and soil erosion and sedimentation for agriculture were drawn up in 1974 and 1977, respectively. In addition, the Statewide Plan for agriculture and earthmoving Activities identifies twenty-one high priority watersheds (nine of which are located the in Susquehanna River Basin and two in the Potomac River Basin) and twenty-six medium-priority watersheds (ten of which are in the Susquehanna River Basin).

In June, 1983, the Bureau of Soil and Water Conservation, DER, published an Assessment of Agricultural Nonpoint Source Pollution in Selected High Priority Watersheds in Pennsylvania. A "policy plan for action," this document evaluated ten of the high-priority watersheds (including four Susquehanna and one Potamac River watersheds) in order to identify potential nonpoint sources of agricultural pollution, to develop recommendations to prevent potential sources from creating water pollution problems, and to develop an educational program for landowners and landusers to encourage BMP implementation. The study identified two major on-farm problems - soil and nutrient management. Soil management problems include lack of BMP's on rented land, about 50 percent of acreage with conservation plans traditional reliance on conventional tillage, and over-grazed pasture lands. The study found the following nutrient management problems: soil test recommendations are underutilized; combined application of

manure and commercial fertilizers results in over application of nutrients, especially nitrogen; and livestock operations frequently are too close to water courses and lack adequate runoff control measures. The major recommendations of the report include:

- special cost sharing should be provided for chronic problems;
- tax incentives should be made available to reduce the financial burden on landowners who apply best management practices;
- more research should be done to improve nutrient testing on application and tillage equipment;
- stream improvement devices should be installed to reduce bank erosion and livestock use;
- technical and financial assistance should be increased to improve livestock holding areas and prevent uncontrolled runoff;
- water quality monitoring programs in selected watersheds should be designed to allow the identification and measurement of the impacts of agricul tural pollutants on stream ecology.

o Program Uncertainties

The effectiveness of certain programs to reduce nonpoint source pollution from agricultural activities has been limited by a high degree of uncertainty. For example, the ACP has undergone several major revisions in the last 10 years, resulting in confusion about cost-sharing rates and practice eligibility. This has made it extremely difficult for farmers to plan ahead for conservation. Similarly, in 1979, the state of Maryland developed an extensive statewide agricultural water quality management program for the control of sediment and animal wastes. Until recently, this program was not being implemented.

o BMP Effectiveness

There is a great deal of uncertainty over what types of control measures are most effective in reducing nonpoint sources of pollution. The Pennsylvania Statewide Plan for Agriculture and Earthmoving Activities (1979), for example, states that the effectiveness of its erosion and sedimentation control program "cannot be affirmatively demonstrated with any existing water quality data." The Plan goes on to say that unless at least ten years of water quality data

following implementation were collected, any meaningful conclusions could not be drawn regarding effectiveness; and even with sufficient data, assumptions must be made to distinguish between natural and man-made erosion sediment and nutrient contributions. Other indicators can be evaluated, however, such as the number of acres needing treatment to meet tolerable levels of soil loss, the number of acres covered by conservation plans and how many of these plans are up to date and being followed, number of farmers testing their soils for the correct amounts of fertilizer and manure needed for application, the percentage of leased land adequately protected, etc.

Some of these indicators were evaluated by the Chesapeake Bay Program, in cooperation with the Soil Conservation Service, and presented in Appendix C, Agricultural Activities Report, CBP Management Study Report. In summary, data collected from soil conservation districts in Maryland and Pennsylvania indicate that soil loss exceeds tolerable levels in most areas; the percentage of district co-operators (farmers with conservation plans) who have updated, implemented plans is low -- especially in rapidly developing counties where district resources are also used for sediment and erosion control on new developments, farmers who lease farmland generally install far fewer conservation practices than on their own land because of the short-term nature of leases; and animal waste handling and storage facilities are needed in areas with concentrated livestock operations. As indicators, these data infer that the voluntary approach toward agricultural nonpoint source control may not be sufficient to achieve necessary levels of control. Much remains to be done toward adequate agricultural runoff control.

The Section 208 Water Quality Management Plans developed in each state for agricultural runoff have had several important impacts. They brought the problems associated with nonpoint source pollution into sharper focus for citizens, legislators, water quality managers, soil conservationists, etc. The interaction among related federal, state, and local programs dealing with erosion, water quality, and agriculture was improved. Although the link between agricultural opportunities and water quality of rivers, lakes, and estuaries cannot be documented with precision in most cases, the 208 programs have increased the awareness of these relationships and their implications for a stronger focus on implementing BMP's. Pennsylvania, and Virginia have identified the BMP's suitable for soil erosion control and manure management and delineated high-priority watersheds for the control of agricultural pollution.

Unfortunately, the accelerated implementation of measures needed to reduce nonpoint source loadings from agricultural activities has not occured. Several major reasons account for this problem: lack of priority setting, limited financial incentives and government funding, and too little emphasis on education.

o Lack of Priority Setting

A major failure of the SCDs has been that available staff and financial resources have not been targeted towards solving the most critical erosion problems. Instead, SCDs have tended to provide assistance on a first come, first served basis. If farmers, with the most critical erosion problems have not voluntarily approached the districts for assistance, districts were busy enough working with those willing to co-operate and generally made little effort to go to them. This policy is slowly changing, however. The combination of fewer federal cost-sharing and technical-assistance funds and increased targeting of critical watersheds, improvements in priority setting are becoming evident.

A problem related to the lack of priority setting is the poor records kept by conservation districts on their efforts to encourage the installation of erosion and animal waste control practices. Two policy plans dealing with agricultural run off in the Chesapeake Bay Basin (Patuxent River Policy Plan, July 1983; assessment of agricultural nonpoint source pollution in high priority watersheds in Pennsylvania, June, 1983) cite the need for district's to keep track of their accomplishments in order to assess program effectiveness.

o Limited Financial Incentives

Cost-share funding available to farmers is another major economic constraint on agricultural BMP installation. At current rates of cost-sharing assistance, it would take well over one hundred years to address conservation needs (CBP Management Study, Appendix C), assuming that other incentives for adopting BMP's remain constant. Cost-sharing is one of the key incentives to accelerated implementation of nonpoint source control practices on farmland. Unlike other sources of water pollution, such as industries or municipal sewage treatment plants, farmers do not get tax breaks for installing pollution control measures and cannot pass on the cost of control to consumers because they have little influence on the price of their products. Farmers are generally forced

to shoulder the cost of capital improvements, including BMP installation unless cost-share funding can be acquired. Present federal agricultural cost-sharing and technical assistance programs are not sufficient to meet conservation needs: the maximum federal cost-sharing assistance ($3500 maximum per farm per year) is not sufficient to meet the conservation needs on farms needing animal waste handling storage facilities which can cost between $10,000 and $100,000.

State assistance, such as the $5 million cost-share program in Maryland will provide some additional assistance. However, the Maryland State Soil Conservation Committee has estimated that it will need approximately $24 million to abate soil erosion and animal waste problems just in the top three critical areas of the State. In Virginia, as mentioned above, $30,000,000 is needed to reduce soil and nutrient losses in the States priority agricultural watersheds draining to Bay waters.

Increased cost-sharing funds at the federal or state level in addition to some other financial incentives are the most important components of an accelerated effort to meet soil conservation and nutrient run off control needs. State and local governments need to seriously consider establishing innovative financial incentives or disincentives for agricultural pollution control.

Priority of Education

For voluntary programs to achieve maximum success, a strong educational effort is crucial. While co-operative extension agencies provide excellent network for education, their programs work toward many ends, and the reduction of agricultural run off is only one of several. Current educational programs could therefore be strengthened to reach more farmers and inform them about the effects of runoff on water quality and the range of BMP's that can be utilized to curb loadings. Educational and public-awareness efforts should be used more aggressively to increase the number of farmers with conservation plans. They should take fullest advantage through wide participation and publicity, of demonstration projects, model farms, and other means to convince farmers of the benefits of BMP's to them and to water quality improvements to describe techniques used to implement BMP's, and to document the need to control run off. Pennsylvania's high-priority watershed assessment places strong emphasis on a coordinated program to promote conservational tillage and other low-cost BMP's,

the protection and maintenance riparian vegetation, sound nutrient application and management, BMP's for pasture improvement, proper pesticide and herbicide handling and application, and integrated pest management. The special programs funded by the ACP and the three Rural Clean Water Projects in the Bay region could be publicized widely outside of their immediate areas for full exposure.

3. Urban Runoff

Research conducted by the Chesapeake Bay Program indicates that a primary cause of degraded water quality in populated areas is urban runoff. In particular, stormwater runoff from the four largest cities in the drainage basin (Baltimore, Washington, Richmond, and Hampton-Norfolk) carries relatively high concentrations of pollutants such as sediment, nutrients, bacteria, heavy metals, and oil and grease. Because the four fall-line cities drain into the tidal-fresh zones of the Bay where prime spawning grounds for much of the biological resources in the Bay are located, they have the potential to place long-term stress on the system. Similarly, the Hampton Roads area drains into the lower James River, and while this more saline area is less sensitive to pollutants than the tidal fresh zones, the potential for long term impacts is an important consideration since the receiving water contains one of the most productive oyster regions in the Bay.

The problem of urban runoff is not unique to these four major metropolitan areas. For example, field studies in the Occoquan River Basin in Virginia indicate that urban land uses contribute more nitrogen and phosphorus to receiving waters than most rural-agricultural land uses.

To date, governmental efforts to deal with urban runoff have been directed largely toward (1) determining urban NPS loads and (2) identifying effective control measures. This has contributed to a greater awareness of the problem and what needs to be done to reduce it. However, very few regulatory programs have been initiated. In addition, many of the programs currently in place have not been vigorously implemented.

Existing state and local mechanisms for controlling urban storm water runoff include stormwater management programs which have had the historical function of quantity control (i.e., minimizing the inconveniences of flooding, erosion and sediment control, used oil management, zoning, and public information programs). For the most part, current programs are directed toward insuring that urban BMPs are implemented in developing urban areas. In most cases, however, little is being done to reduce urban runoff in existing areas. These programs are summarized in Table _____.

o Regional Planning Agencies

With the exception of Richmond, the regional planning agencies in each of the four major urban areas have addressed the problem of urban runoff in their 208 plans. The following descriptions summarize their activities.

- Baltimore, Maryland

The Jones Falls Watershed Urban Stormwater Runoff Project examined the problems associated with urban stormwater runoff in a densely populated section of Baltimore. The project also evaluated the feasibility of implementing structural and nonstructural BMPs in the area. Major conclusions from the study include:

- O urban runoff contributed significant amounts of copper, lead, and zinc to stream loadings;
- O implementation of structural BMPs was found to be prohibitively expensive due to the extensive infrastructure changes required;
- O nonstructural BMPs such as manual and mechanical street sweepers were judged to be of variable effectiveness;
- O implementation of nonstructural BMPs such as removal of animal waste by dog owners was highly dependent on the population's level of awareness regarding the relationship between animal waste removal and water quality

Based on these latter findings, the investigators concluded that education, particularly of urban dwellers, is a prerequisite for the adoption and success of nonstructural BMPs.

a. Federal Programs

Environmental Protection Agency

In 1978, EPA initiated the Nationwide Urban Runoff Program. The program's major objectives were to collect the necessary date to allow the assessment of urban nonpoint source problems and evaluate the impacts of those sources on receiving water quality. The program was also designed to identify and evaluate various BMPs which could be utilized to control the pollution from urban runoff. As part of this program, major studies were completed in 1983 in the Washington D.C. and Baltimore areas. These projects are discussed in the following section.

EPA/states currently possess the authority to regulate stormwater discharges under the NPDES permit program. Under the current regulations,[6] EPA or a state agency which has been granted NPDES authority, may issue a General Permit covering all separate storm sewer discharges in a previously designated General Permit Program Area. Where the decision is made to issue a General Permit, a single permit containing identical monitoring and reporting requirements, BMP requirements and/or discharge limitations would be issued for all separate storm sewer discharges within the General Permit Program Area. While the authority and system for regulating separate storm sewers exists, no NPDES permit of this nature has been written or is under active review. The two major reasons for this are: (1) the need to divert scarce federal and state NPDES permit-writing resources to higher priorities and (2) the lack of definitive data on stormwater impacts upon water quality and on BMP efficiencies.

b. State Programs

Responsibility under section 208 for developing nonpoint source control plans in urban areas is shared by state and local planning agencies. In most of the major urban areas of the Chesapeake Bay region, these responsibilities are held by regional planning agencies. Each of the states are then responsible for urban runoff controls in areas outside these major urban areas.

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[6]As a part of the NRDC settlement agreement, EPA has proposed to exclude separate storm sewers from the definition of "point source" (47 FR).

- Washington, D.C.

In contrast to the Jones Falls Project, the Metropolitan Washington Council of Governments/NURP Projesct investigated control measures in developing areas. During the four year study, the efficacy and cost-effectiveness of twelve types of BMPs (including wet ponds, dry ponds, porous pavements, etc.) were studied at several suburban sites in Virginia and Maryland. The investigators concluded:

- O wet ponds are among the most effective means of controlling urban runoff. Although the initial costs for constructing these structures is significantly higher than for dry ponds. These initial outlays tend to be offset by increased property values which wetponds tend to generate;
- O porous pavement was also identified as an effective BMP for reducing the rate of stromwater runoff and pollutant loads
- O grassy swales, long favored by developers, were found to be no more effective than the curb and gutter systems they were designed to replace.

In their recommendations, the coordinators of the Washington area NURP study plan to call for the strenthening of existing stormwater regulations in order to make them an instrument for improving water quality as well as reducing stream bank erosion. The program will also advocate the promulgation of regulations requiring the government and developers to absorb implementation and operation and maintenance costs, rather than leaving this responsibility to homeowners associations, which have fewer resources.

- Norfolk-Hampton Roads, Virginia

The Hampton Roads Water Quality Agency (HRWQA) has funded extensive water quality analyses of Hampton Roads and the James tributaries which drain Norfolk, Portsmouth, Newport News, and Hampton. The HRWQA has also evaluated the existing urban runoff control practices in the region and is currently testing the effectiveness of selected practices in the Lynnhaven River, an urban watershed.

o Statewide Urban Runoff Programs

Of the statewide 208 programs, only Virginia deals with the problem of urban runoff separately (Maryland's twelve section 208 river basin plans and Pennsylvania's Commprehensive Water Quality Management Plans (COWAMP) identify urban runoff problem areas, but generally cover the more rural areas of the states.) The Virginia statewide 208 program developed Best Management Practice Handbooks on a number of nonpoint source problems, including handbooks on urban BMP's and sediment and erosion control practices, (11,12), to accompany their statewide urban runoff management plan (13). In addition, Virginia has identified priority watersheds for urban areas (South Fork of the Shenandoah River near Staunton; the James River and York River drainage around Richmond; and the lower James River draining the Newport News-Hampton and Norfolk-Portsmouth regions). As with the plans in urban areas, each of the three states chose to adopt voluntary rather than regulatory implementation of their urban NPS strategies.

In the Chesapeake Bay region, Maryland, Virginia, and Pennsylvania have state laws requiring each county or municipality to pass a sediment and erosion control ordinance to minimize runoff loadings from land disturbing activities. The states set minimum criteria and guidelines for local programs, and provide techical assistance, training seminars, and public education. In most localities, sediment and erosion control plans must be approved by the local soil and water conservation district or local planning office before developers receive building permits.

Stormwater control laws are not as widespread. Pennsylvania has enacted a stormwater control law similar to its sediment and erosion control law; however, no funds have been appropriated to implement it. A few local governments in Pennsylvania have taken the initiative to establish stormwater control ordinances, but none are located in the Susquehanna River Basin.

In 1982, the Maryland State Legislature passed a new state stormwater management law. The 1982 legislation specifies that each county and municipality must adopt ordinances to implement a stormwater management program for developing urban areas by July 1, 1984. The Maryland Department of Natural Resources is drafting regulations which will specify the requirements for these local

programs. Additionally, DNR will also provide technical assistance, training, research, and coordination in stormwater management technology to local governments.

In Virginia, there are no stormwater management laws at the state or local leve, although it is the policy of the Soil and Water Conservation Commission to promote the management of stormwater runoff as part of the State Erosion and Sediment Control Program to control erosion from developing areas.

Numerous other state laws and local ordinances, however, exist to reduce the quantity of runoff in urban areas and to prevent receiving water quality impacts of urban stormwater runoff. Flood prevention laws are designed to reduce runoff volumes and velocities and thus encourage proper stormwater management planning. Land use and transportation planning, zoning, and subdivision regulations at the local level help to keep development away from sensitive areas with large potential for erosion, flooding, or water quality problems. Other municipal services such as garbage, used oil and leaf collection, street-sweeping, and road-salting play important roles in managing urban runoff quality.

CHAPTER IV

RECOMMENDATIONS FOR REMEDYING AND AVOIDING PROBLEMS

WHAT SHOULD BE DONE

INTRODUCTION

This chapter provides a set of recommended approaches and actions to respond directly to the Chesapeake Bay's environmental problems as identified by the Bay Program. It would be repetitious to discuss in any length the fundamental need disclosed by the Bay Program's study. As stated from the beginning of this report, the diagnosis of Chesapeake Bay's health is a list of stressed and declining conditions. The logical response is to make use of all available remedial and preventative tools and abilities to attempt to rid the Bay of these conditions and to shield it from further or new forms of harm.

The principal goals of the Clean Water Act and the major related statutes of the states and the District of Columbia are perfectly suitable, pertinent, and worthy objectives to guide the upcoming phase of action in the Bay region. In particular, the national goal stated in the Clean Water Act, "to restore and maintain the chemical, physical, and biological integrity of the nation's water," should inspire and guide all relevant federal, regional, state and local authorities to expend the necessary effort and resources to achieve this particular end in the case of Chesapeake Bay. This national and regional resource deserves no less than receiving the help and protection of the human beings who treasure, use and depend on it for many personal and collective purposes.

The time for action is now. Ecological principles state a strong and severe warning: There must not be a delay in making changes and applying measures to reverse trends of deterioration the Bay's ecosystems. The processes of nutrient enrichment and of toxic contamination are causing increasing injury and destruction to the vitality and productive capacities of the Chesapeake Bay. At the same time, research and experiences from the past indicate that the Bay

will respond affirmatively to man's improvements and rehabilitative activity that are needed on land and in the waters. The task at hand, therefore, is to eliminate the releases of all pollutants entering Chesapeake Bay.

The recommendations set forth in this chapter are neither the entire group nor in the final form of actions to be taken next. Whereas the recommendations do represent the ideas, insights, and in some cases, decisions of the region's policy makers involved in overseeing and contributing to the Bay Program, they still need to be transformed into a plan or charter by the officials who must direct and implement the measures.

The list of recommendations is organized into eight major categories related to water pollution control:

- o Water Quality Planning;
- o Industrial Dischargers;
- o Pretreatment Programs;
- o Municipal Dischargers;
- o Agricultural Runoff;
- o Urban Runoff;
- o Wetlands Protection;
- o Public Participation.

Each recommendation (or in some cases more than one) is preceded by a brief discussion of: the problem being addressed; the apparent reason that the existing institutional structure is not remedying the situation; and the rationale or an assessment that makes the case for the feasibility of the recommendation.

These recommendations are designed to form the basis for a comprehensive workplan that can involve and be monitored by all interested officials and citizens. Clear targets, including deadlines and specific outcomes, are stated to motivate the region to track the progress of its clean-up and pollution abatement. Just as a report card regularly tells a student how he or she has done that semester, such objectives and milestones should be used for measuring and analyzing the performance of the Bay-wide implementation of pollution controls.

WATER QUALITY PLANNING

As described in Chapter III, the Clean Water Act provides several mechanisms whereby conflicting or competing program goals can be resolved by detailed planning processes at the federal, state, and local levels. Included in several sections of the Act, they, in theory, function together to insure that all three levels of government work together to reach the common goal of improving the quality of the Bay waters.

In the case of point source pollution, the planning processes in all three states (Maryland, Virginia, and Pennsylvania) and the District of Columbia are well developed. Consistent with past EPA emphasis on controlling the discharge of conventional pollutants from industrial and municipal point sources, each jurisdiction has an established program for coordinating decisions on NPDES permitting, monitoring, construction grants, and enforcement. During the next decade, these programs will also provide the mechanisms for achieving further reductions in the discharge of toxic pollutants from point sources.

In contrast to point source planning and control, significant gaps remain in the provisions for nonpoint sources (NPS). Due to the greater emphasis placed on point sources, methods for assessing and remedying nonpoint source pollution problems remain inadequate. In all four jurisdictions, the NPS provisions for conventional pollutants and nutrients rely heavily on voluntary compliance with best management practices (BMPs). With respect to nonpoint sources of toxic substances, federal, state, and local programs are frequently ill-equipped to identify, much less regulate, critical problems.

Water Quality Standards

In the past, states throughout the country have adopted water quality standards for a limited number of pollutants of specific concern. With few exceptions, primary emphasis has been placed on conventional measures of pollution such as dissolved oxygen, pH, and fecal coliform bacteria. Very few states have established water quality standards that incorporate a comprehensive set of numerical criteria for heavy metals, pesticides, and other toxic pollutants.

While each of the states in the Chesapeake region has developed numerical criteria for certain toxic chemicals, none have incorporated a truly complete set into their water quality standards. For example, Pennsylvania's water quality standards include criteria for certain heavy metals. In Virginia, criteria for heavy metals are included in the WQS for public water supplies. In Maryland, water quality standards include criteria for chlorine and certain pesticides. Finally, the District of Columbia has developed, but not yet finalized, criteria for heavy metals. Consequently, current water quality standards provide an incomplete benchmark upon which to measure progress in restoring and maintaining the quality of the Chesapeake Bay.

Section 303 (c) of the Clean Water Act requires each state to review and revise, if necessary, their standards at least once every three years. The Clean Water Act, as amended, requires that before EPA can make a construction grant after October 1, 1984, a state must have reviewed the water quality standards for the stream segments affected by the project for which the grant is sought. Consequently, all states have initiated review/revision processes. These ongoing processes offer the opportunity for states to incorporate additional criteria into their standards.

Recommendation 1: The pollutants listed in Table IV - 1 have been identified by the CBP as causing problems in Bay waters. As part of their ongoing review processes, the three states and the District of Columbia should amend their current water quality standards to include specific numerical criteria for these pollutants as soon as possible, but in no case later than January 1, 1985.

Review of State Water Quality Management Plans

Under the Clean Water Act, the states are required to identify water quality limited waterbodies, prioritize those bodies of water in terms of the severity of pollution and the importance of designated uses, and estimate total daily maximum loads (TDMLs) and waste load allocation (WLAs). This information is continually updated through the continuing planning process and forms the basis for each state's water quality management plan. EPA is required to review and approve state water quality standards, total maximum daily loads, continuing planning processes, and water quality management plans. These various CWA authorities provide the opportunity/mechanism to coordinate federal, state and local point and nonpoint source decisions.

TABLE IV - 1

WATER QUALITY PARAMETERS

Arsenic	Toxaphene
Barium	2,4-D
Beryllium	2,4,5-T
Cadmium	Lindane
Chromium	Benzene
Copper	Benzidine
Cyanide	Benzo(a)pyrene
Lead	Carbon Tetrachloride
Mercury	Chloroform
Nickel	1,2-Dichloroethane
Selenium	Hexachlorobenzene
Polychlorinated Biphenyls (PCB)	Vinyl Chloride
Endrin	Bis (2-ethylhexyl)phthalate

During FY - 84 each state will complete its updated list of priority waterbodies which will then be used to establish priorties for collecting additional water quality data, revising water quality standards, establishing TDML/WLAs, issuing water quality based permits, and construction grants. This will set in motion a wide range of planning and implementation activities in each priority basin.

Recommendation 2: In updating their lists of priority water bodies the three states and the District of Columbia should carefully consider the CBP findings, particularily with respect to nonpoint source pollution.

Integration of Monitoring Programs

Effective protection of the Chesapeake Bay will demand accurate, detailed knowledge of existing environmental conditions and the ability to quickly detect and measure environmental changes. In recognition of this fact, monitoring is an essential component of current efforts by all four jurisdictions to protect and improve water quality in the Bay. Programs in the state of Virginia provide one example of the types of monitoring currently being done. First, the Virginia SWCB monitors the release of pollutants from industrial and municipal dischargers, checks surface water quality at numerous points throughout the state, samples stream sediments at these sites, and has established a biological monitoring program consisting of over a hundred stations which are sampled semiannually to monitor pollutant levels in living organisms. The SWCB is also moving aggressively to improve toxics monitoring programs at industrial facilities. In addition to SWCB monitoring efforts, the State Health Department, the Virginia Marine Resources Commission and others collect immense amounts of data on water, sediment, and environmental quality. Similar types of programs have been developed in the other two states and the District of Columbia.

In most cases, these programs were started at different times, for many different reasons, and by many different federal, state, and local agencies. Each has tended to approach water quality monitoring in its own way. As a result, existing programs, while often completely adequate for their original purposes, do not, taken together, provide sufficient data to allow federal, state and local water quality planners to make informed regulatory decisions.

Recommendation 3: As soon as possible, but in no case later than July 1, 1984, each state water pollution control agency should develop and implement a comprehensive statewide monitoring plan that will serve to improve and coordinate existing monitoring programs.

Water Quality Models

In the last ten years, a number of modeling studies have been undertaken in the Bay area. For example, in developing solutions to the environmental problems of the Bay, the Bay Program made extensive use of mathematical models to examine the relationship between various source of nutrients (POTWs, agricultural runoff, etc) and key features (e.g. chlorophyll, oxygen concentrations, nutrient concentrations) of ecological systems. The Metropolitan Washington Council of Governments (MWCOG) and EPA, in assessing the need for additional pollution controls in the Upper Potomac Estuary, have also developed a new state of the art model for the estuary. The state of Maryland, in developing a nutrient control strategy in the Patuxent, also made extensive use of modeling techniques. Application of these models have substantiated the value of the point source control programs implemented to date and shed new light on the incremental benefits that might be achieved by future control measures.

Recommendation 4: As part of their water quality planning processes, water pollution control agencies in the threee states and the District of Columbia should develop models for identifying nutrient control strategies for the Bay and its tributaries.

Program Management

There will continue to be a great need for federal funding for planning and implementation of management strategies for the Chesapeake Bay. These needs should be carefully analyzed by Regional EPA officials and considered during grant negotiations. Federal grant resources (Section 106, 205(j) and 205(g) funds) should be utilized whenever possible.

Congress should also continue to provide grants to the three states and the District of Columbia for implementing their responsibilities under the recommended strategy. In providing this funding, Congress should recognize that the time for research is over. Therefore, further financial support should be conditioned on the implementation of specific control strategies.

Recommendation 5: Congress should authorize $10 milliion per year for four years to assist the states and the District of Columbia in developing regulatory control strategies.

INDUSTRIAL DISCHARGERS

The restoration of the Chesapeake Bay and its tributaries will require strict control of discharges of toxics and nutrients from the __ industrial facilities in the Chesapeake basin. As discussed in Chapter II, such wastewaters are often heavily contaminated with a broad spectrum of toxic metals and synthetic organic chemicals such as solvents, plasticizers, spent oils, and other process residues. As the Bay Program's research indicates, the release of such pollutants will, unless controlled, continue to cause widespread and significant problems in the Bay ecosystem.

As is stressed through this report, the legal framework and regulatory mechanisms for controlling the release of toxic pollutants now exist. Indeed, the present NPDES system has proven effective in reducing the point source discharge of the more traditional pollutants (e.g. TSS, BOD, etc) into the Bay. The implementation of control measures to reduce conventional pollutants has also resulted in reduced loadings of toxics through the incidental removal of certain pollutants. Although several aspects of these programs will need to be considerably expanded, EPA and the individual states can build upon these successes to create a comprehensive program for reducing toxic discharges into the Chesapeake basin.

Effluent Guidelines

The seven-year effort to complete revised effluent guidelines limiting toxic discharges under the Clean Water Act is drawing to a close. Despite considerable difficulties, EPA's Office of Water Regulations and Standards has managed to issue these regulations under the schedule set by the U.S. District Court for the District of Columbia in August, 1981. Under that schedule, that process will be completed in June, 1984.

Recommendation 6: EPA should maintain its current schedule for promulgating BAT effluent guidelines.

Revising NPDES Permits

Most first round NPDES permits were written during the period from 1973 to 1975. The majority of these permits specified numerical limits for a relatively small number of "conventional" pollutants. According to research by the Bay Program, industrial efforts to achieve effluent limitations based on "best practicable technology" have accomplished a great deal in terms of reducing the industrial loadings of conventional pollutants.

As a result of delays in promulgating BAT guidelines with numerical limitations on toxic chemicals, most Bay area permits still reflect these early permit conditions. Although, some of the effluent limitations have been tightened as a result of further review, very few contain limitations on specific toxic chemicals.

Recommendation 7: No later than one year after the promulgation of individual effluent guidelines, states should, at a minimum, promptly revise NPDES permits to incorporate permit limitations based on those guidelines or levels necessary to achieve applicable water quality standards, whichever is more stringent.

Permit Enforcement

Success in cleaning up the Chesapeake Bay depends to a large extend upon compliance with NPDES permits issued to industrial and municipal dischargers. Strong state and EPA enforcement programs are essential to promote compliance with these permits.

Comprehensive compliance monitoring represents the key to reducing industrial water polllution. Unfortunately, state enforcement programs, faced with reduced federal financial assistance and increasing responsibilities under the RCRA hazardous waste programs, are not adequate to insure continuing compliance with industrial permit conditions. For example, in the State of Maryland, only 19 of the 42 major industrial facilities were inspected last year ( ).

As the states begin to develop their programs for controlling toxic pollutants, initial efforts to correct deficencies in their enforcement programs. For example, Maryland's Office of Environmental Programs has shifted several hazardous waste inspectors to the NPDES program. OEP is also reviewing its program in an effort ways to maximize the use of current staff resources. The Virginia State Water Control Board has also conducted a review of its enforcement program and is presently considering several enforcement program recommendations contained in an in-house management report (MASD, 1983).

Recommendation 8: The individual states and EPA should insure vigorous enforcement of NPDES permits. To facilitate such enforcement, each state should immediately expand and improve its compliance sampling and inspection programs.

Permit Guidance

A considerable amount of information and expertise is required to write an adequate NPDES permit. For those facilities where applicable effluent guidelines are available, the permit writer must be able to translate national guidelines into individual plant discharge limitations as well as determine whether local conditions warrant more stringent or comprehensive limitations. For those facilities or operations where no effluent guidelines are directly applicable, the permit writer must establish permit limitations based on best professional judgment. In either case, the permit writer must have information

on industrial processes, the types of pollutants generated by those processes, the chemical, environmental, toxicological characteristics of those compounds, and the availability and capabilities of various treatment technologies.

A major change in the NPDES permit application requirements is the reporting of toxic pollutants present in the facilities wastewater discharge. The most controversial and potentially the most useful of these new requirements is the Gas Chromatography/Mass Spectroscopy (GC/MS) testing requirement for organic pollutants. This is designed to provide permit writers with information on what pollutants are likely to be discharged in significant amounts and to set appropriate limitations, particularily for pollutants not covered by an effluent guideline. As the states have begun to write second-round permits it has become apparent that not all permitting agencies are prepared to interpret the significance of reported levels to establish appropriate permit limitations.

Currently assistance to state permit writers is provided through the effluent guideline development documents, treatability manuals, and Industry Technical Assistance Teams (groups of state and regional EPA industry-specific experts who assist in the writing of permits of permits for that industry). A major criticism of these forms of assistance is that guidance is often too broad to apply to a specific permit case. .

Recommendation 9: As soon as possible, but in no case later than January 1, 1984, EPA should transfer the knowledge and expertise developed during the effluent guideline process to state permit writers in a readily useable form. EPA should also increase the number of training programs for state permitting agencies. Procedures for providing guidance on specific permit issues should also be improved.

Identification of Critical Areas

Research done for the Bay Program indicates that water column concentrations in the Baltimore Harbor, the Elizabeth River, and several other parts of the Bay exceed EPA criteria for a wide variety of toxic chemicals. In many cases, levels of heavy metals and organic compounds in sediment and fish tissue also exceed reasonable levels.

The application of BAT and pretreatment requirements will result in a great deal of improvement in these areas. However, in areas characterized by heavy industrialization and poor flushing characteristics, such measures may not be sufficient to meet the fishable-swimmable water quality goals of the Clean Water Act.

Recommendation 10: As soon as possible, but in no case later than January 1, 1984, EPA and the states should develop a list of Bay waters designated for fishable-swimmable water quality, but which are not anticipated to attain the designation due to point source discharges of toxic pollutants after BAT and pretreatment.

Recommendation 11: As soon as possible, but in no case later than July 1, 1984, EPA and the states should determine which point sources are causing the toxics problems as well as the amounts of pollutants being discharged by those sources.

Control Strategies for "Target Critical Areas"

Paragraph 12(c) of the NRDC Consent Decree requires that EPA develop strategies for reducing or eliminating the discharges of toxic chemicals in areas where even the best available technology will not be sufficient to protect human health and water quality. Such strategies should be directed towards identifying options for establishing more stringent controls pursuant to existing authorities under Sections 302, 303, or 307 of the Clean Water Act or comparable provisions individual state statutes. A similar type of analysis will be necessary for critical areas in the Bay.

Recommendation 12: As soon as possible, but in no case later than July 1, 1985, EPA, in cooperation with the States, should propose and promulgate control strategies for each critical water body in the Bay area. These strategies should insure that each area is able to achieve applicable water quality standards by July 1, 1989.

Monitoring Programs

As discussed above (p. 5), many current monitoring programs are not coordinated in a way to ensure that permit writers have an adequate data base on which to base permit limitation. This problem will take on increasing importance as state permitting agencies attempt to establish water quality based permit limitations.

Recommendation 13: To facilitate the writing and enforcement of water-quality based permits, each state should develop a strategy to insure that existing ambient monitoring programs are coordinated with source monitoring programs. These strategies should be designed to provide information that can be utilized in permitting, enforcement, and other regulatory activities.

Fingerprinting Wastewater Effluents

The Chesapeake Bay Program has developed a computerized procedure for rapid, instream identification of wastewater effluents. When examined using Gas Chromatography/Mass Spectroscopy (GC/MS) analysis, the effluent produces a "fingerprint" which can be stored in a computerized data system. The fingerprint file can then be scanned to identify sources of contaminants which are discovered in the water column, sediment, or animal tissues.

Recommendation 14: Permitting agencies should require that industrial and municipal dischargers regularily submit "fingerprints" of their effluents. These should be stored in a permanent data base that can be accessed by permit writers and enforcement officials.

Biomonitoring Programs

The current EPA approach to toxic substances control is to regulate specific chemicals (priority pollutants) through effluent limitations. This approach does not take into account the potential synergistic effects of discharges ton water quality and the biological health of the receiving stream. In addition, certain extremely toxic materials (i.e. TCDD) present significant human health and environmental risks even at levels below current detection limits.

Developing a framework to better control toxic chemicals is a major objective of the Chesapeake Bay program. Individual or combinations of complex chemical compounds which pose a hazard to human and aquatic health must be rapidly identified and limited to safe concentrations. Biomonitoring offers one method for furthering that objective by supplementing current monitoring programs. Used in combination with current chemical specific monitoring programs, it would provide regulatory agencies with an additional indicator of the adequacy of permit conditions.

Recommendation 15: In writing the second round permits for major dischargers, permitting agencies should require that industries which discharge toxic chemicals implement a comprehensive (acute and chronic, lethal and sublethal tests) biomonitoring program to supplement traditional chemical-specific approaches.

Recommendation 16: As soon as possible, but in no case later than January 1, 1985, EPA and the states should develop procedures for establishing effluent limitations based on biomonitoring results.

PRETREATMENT PROGRAMS

An estimated __ industrial facilities classified among the 21 primary industries use Bay area sewage treatment facilities to treat their wastes rather than using their own treatment facilities to discharge directly into surface waters. This practice often causes serious problems because many industrial wastes are incompatible with normal sewage treatment processes. Research done for the Chesapeake Bay Program indicates that even after treatment at the POTW, these wastes are highly toxic (Chesapeake Bay Program, 1982).

These are the types of problems that Congress sought to mitigate when it enacted a national program requiring pretreatment of industrial wastes before they enter municipal plants. Responsibility for this program is shared by EPA, which has the task of establishing industrial discharge standards, and the states and cities who have the primary responsibility for implementing the Federal standards in specific municipal systems.

Categorical Standards

As noted in Chapter III, EPA has nearly completed its task of establishing discharge standards for categories of industries (i.e. categorical standards). Under the current schedule, that process will be completed in June, 1984. These standards will then be implemented through local pretreatment programs.

Recommendation 17: EPA should maintain its current schedule for promulgating categorical standards for remaining industries.

Local Pretreatment Programs

Through the NPDES permit mechanism, EPA/authorized states require POTWs to adopt local pretreatment programs by July 1, 1983. A number of cities have met that deadline and there are currently several fine local programs in the Chesapeake Bay region (i.e. the Hampton Roads Sanitation District and others). For the most part, however, local governments, dependent on EPA initiatives, have been slow to develop adequate local programs and, consequently, many will miss the July, 1983 deadline. Specifically, as of September, 1983 only __ of the __ systems required to have such programs have recieved EPA approval.

Recommendation 18: States and local governments must develop local pretreatment programs as soon as possible, but in no case later than July 1, 1984.

Toxics Survey

Chesapeake Bay Program research indicates that a wide variety of toxic chemicals are being discharged into Bay area POTWs (Monsanto, 1982). In particular, it was found that the effluent from several Bay area POTWs have high toxicity ratings. This suggests the need to further assess the impact, occurrence, and removal of toxic pollutants by Bay area POTWs and determine whether controls beyond those currently being developed by EPA will be necessary.

The EPA report, Fate of Priority Pollutants in Publicly Owned Treatment Works (EPA, 1982) outlines the type of program that is necessary to systematically study the occurrence and fate of the 129 priority pollutants in POTWS. That program involved an extensive sampling program designed to assess the

impact of industrial loadings on influent quality, removal efficencies for individual POTW treatment processes, mass balances, and daily variations in influent.

Recommendation 19: Through the NPDES permit process, all POTWs larger than 5 MGD should be required to test their effluent using the Chesapeake Bay protocol protocol. Those systems whose effluent is determined to be of high or moderate toxicity should be required to investigate the occurrence and fate of the 129 priority pollutants in their systems utilizing a protocol similar to the 40 POTW study.

Technical Assistance/Training

As noted above (p.), it is a difficult task for state permit writers to translate national guidelines into individual plant discharge requirements. The same types of problems will be faced by state and local officials attempting to establish limitations for those industrial facilities discharging to publicly owned treatment facilities.

Recommendation 20: As soon as possible, but in no case later than July 1, 1984, EPA and the states should establish technical assistance/training programs for local pretreatment program officials.

MUNICIPAL DISCHARGERS

In addition to heavy metals and synthetic organic compounds, publicly-owned treatment works (POTWs) represent a significant source of nutrients and chlorine. In the case of nutrients, CBP research noted that municipal discharges represent a significant source of nutrients in five of the eight major river basins emptying into the Bay. As expected, POTWs in the more populated basins (the Potomac, the James, etc.) represented the most serious problems. For example, in an average year, 59% of the phosphorus loadings in the Potomac basin is contributed by municipal dischargers. On a Bay wide basis, 49 % of the phosphorus loadings during an average year is attributable to POTWs. These loadings are significant cause of nutrient enrichment in various segments of the Bay.

As discussed in Chapter III, there are several on-going efforts to address nutrient problems in the Bay area by reducing POTW discharges of phosphorus and/or nitrogen. For example, in the Potomac River Basin, the District of Columbia has sharply reduced the effluent levels of phosphorus at the Blue Plains wastewater treatment plant. In the lower Patuxent Basin, the state of Maryland is preparing to limit nitrogen effluent concentrations as well as phosphorus in an effort to reduce chlorophyll a levels. Under the Upper Chesapeake Bay Phosphorus Limitation Policy, Pennsylvania and Maryland have imposed phosphorus limits on POTWs impacting the main stem of the Bay.

Bay area POTWs also discharge significant amounts of chlorine. Disinfection of sewage effluents is considered necessary for waters which are a source of drinking water , which are used for shellfish harvest, where contact recreation occurs, or where water is used for the irrigation of crops. It is estimated that POTWs currently discharge 12,500 lbs. of residual chlorine per day to tidal waters (CBP, 1983). Several on-going state programs are designed to reduce the amount of chlorine used and released.

Upper Chesapeake Bay Phosphorus Limitation Policy

In many parts of the Bay, nutrient loadings from POTWs represent a major cause of increasing chlorophyll a concentrations, changes in plankton species composition, and the replacement of rooted vegetation by algae in upper portion of the Bay. Recognition of these problems led Maryland and Pennsylvania to adopt policies limiting the concentrations of phosphorus in POTW effluents (i.e. the Upper Chesapeake Bay Phosphorus Limitation Policy).

Figure ____ illustrates the impact of the Upper Chesapeake Bay Policy on year 1980 phosphorus and nitrogen loadings to the Upper Bay. It reveals that existing phosphorus loadings would be reduced about 8 percent with full implementation of the policy. Projected year 2000 loadings would remain at existing levels. This implies that full implementation of the Upper Chesapeake Bay Policy will maintain the status quo for phosphorus loadings to the year 2000 in the Susquehanna.

Application of phosphorus and nitrogen limitations (phosphorus 1 mg/l and nitrogen 6 mg/l) to all POTWs discharging 1 MGD or more in the Bay area would reduce total phosphorus loadings by _ and total nitrogen by _. In some drainage areas, the necessity of the application of these nutrient limiting measures to POTWs would have to be weighed against the feasibility and potential effectiveness of nonpoint source control measures. However, as a matter of general policy, the deteriorated condition of the Bay indicates the necessity of applying these point source nutrient limiting procedures wherever possible.

Recommendation 21: The Upper Chesapeake Bay Phosphorus Limitation Policy should be fully implemented in the lower Susquehanna Basin in Pennsylvania and the lower Susquehanna, West Chesapeake, and Eastern Shore basins in Maryland. Both states should expand the strategy to include all POTWs with flows exceeding 1.0 mgd and require more stringent phosphorus removal (1.0 mg/l) in nutrient enriched areas identified by CBP research.

Patuxent River Strategy

A final Nutrient Control Strategy for the Patuxent River basin was issued in January 1982 and later incorporated into the draft Patuxent "208" Plan. The plan requires publicly owned treatment works larger than 0.5 mgd may discharge a maximum of 1.0 mg/l phosphorus. In addition, certain, POTWs will be required to achieve nitrogen load reductions to help attain a basin-wide reduction goal of 2000 pounds a day during the warm months.

Recommendation 22: The Patuxent River Basin Plan to restrict phosphorus and nitrogen loads from POTWs should be fully implemented.

The Potomac Strategy

In April, 1979, EPA Region III developed the Potomac Strategy, which is designed to coordinate local, state, and EPA water quality planning efforts into a comprehensive program aimed at addressing the most significant water quality issues of the Potomac River. The primary focus of the first phase of the strategy, which is scheduled for completion in early 1984, is to address the eutrophication and dissolved oxygen problems in the upper fifty miles of the tidal Potomac River. The ultimate objective of this first phase is the

development of recommendations for a control strategy, which upon approval by the states (Maryland, Virginia, and D.C.) and EPA, will lead to the establishment of updated total maximum daily loads (TDMLs) and NPDES permits.

Recommendation 23: The Potomac Strategy should be completed as soon as possible, but in no case later than July 1, 1984.

AWT/AST Policy

POTWs required to meet effluent limits will seek construction grant funds to finance the retrofitting of existing facilities. In order to recieve construction grant funding EPAs Advanced Treatment Review Policy requires that the proposed treatment works must be shown to definitely result in significant water quality and public health improvements. Such projects must be scientifically supported by an adequate data base and technical studies which demonstrate the relationships between waste load and water quality or public health. In the case of the Patuxent River basin, OEP has been unsuccessful in convincing EPA that significant water quality improvements will result from nitrogen control in addition to controls for phosphorus. Consequently, if a funding decision were made today, federal construction grant funds could only be provided to fund the cost-effective solution to achieving the technically justified effluent requirements (i.e. phosphorus removal to 1.0 mg/L for the five year permit).

Recommendation 24: EPA should modify its AWT/AST policy to enable consideration of nutrient impacts on an areawide basis.

Innovative Treatment Technologies

Using traditional AWT/AST technologies to remove nitrogen and phosphorus represents a significant investment. For example, it is estimated that $200 million would be required to fully implement the Upper Chesapeake Bay Phosphorus Limitation Policy in the lower Susquehanna, West Chesapeake, and Eastern Shore basins. It is also estimated that it will take $135 million to fully implement the Patuxent River Basin Plan. Given these high costs, other tech-

nologies, such as land treatment and other innovative treatment technologies that can provide secondary treatment as well as the equivalent of advanced waste treatment processes at much lower costs, should be examined.

Under Federal and many state laws preferential consideration and extra funding is given to such alternatives. The Clean Water Act, for example creates three economic incentives to encourage alternative and innovative (I&A) technologies. First, they authorize the Agency to give preferential consideration to an I&A process option if the life cycle costs of the treatment works does not exceed the life cycle costs of the most effective other choice by more than 15%. Secondly, EPA is allowed to fund 85% rather than 75% of the cost of any eligible treatment works or significant portion utilizing I&A technologies. Finally, EPA is authorized to pay 100% of all costs to replace I&A treatment facilities if they fail. To take advantage of these provisions, the State of Maryland, as part of the Patuxent River Basin Strategy, requires all 201 facilities to give serious consideration to land treatment as an alternative for meeting present and anticipated future discharge requirements. It is the expressed policy of the Strategy that land treatment is the preferred option and continued surface discharges by POTWs will be permitted only after exhaustive analysis has ruled out all land treatment options .

Recommendation 25: In assessing the need for additional treatment capabilities, EPA, the states, and the District of Columbia should evaluate the use of less capital-intensive nutrient removal technologies. In particular, greater emphasis should be placed on land treatment and other innovative alternatives.

POTW Operation and Maintenance

Despite a federal investment of almost $3 billion since 1972, many of the plants in the Chesapeake Bay drainage area are not treating wastewater at the efficiency levels they were designed to achieve. National EPA statistics indicate that at any given time, as many as 50-75 percent of the POTWs are somehow in violation of their NPDES permits. According to the Virginia Bureau of Enforcement, 32 % of the 56 major POTWs in Virginia were not in compliance with numerical limitations for BOD5 and TSS. According to Maryland enforcement officials, 79 of 159 POTWs were listed as out of compliance; of those 79, 40 were part of the Construction Grants program.

A leading cause of poor performance by POTWs is improper operation and maintenance of existing plants. All too frequently, a particular plant can not operate according to design specifications because of the lack of skilled operators, chemical supplies, replacement parts, or periodic inspections. In a 1979 study, EPA's Office of Research and Development concluded that significant potentioal exists for improving performance simply and inexpensively by upgrading O&M, upgrading management and administration, and making lowcost corrections of design deficiencies.

For the last several years, the states have required training prior to certification of POTW operators. These programs have resulted in some improvement and, if expanded, represent a largely untapped resource for improving plant performance. Potential sources of funding include the 205 (g) funds and the section 106 state assistance grants.

Recommendation 26: EPA should immediately strengthen existing training program for POTW operators.

State Priority Systems

The Construction Grant money available to each state is allocated within the state through the use of an EPA approved priority list. Once EPA approves the prioritizing system, then any project within the fundable portion of the resulting state priority list is eligible for funding. In order to accelerate the construction of treatment facilities that discharge to certain segments of the Bay, the state's priority systems could be revise to give added weight to criteria regarding protection of the Bay.

Recommendation 27: The states and the District of Columbia should revise their priority systems to assign additional points to POTWs which impact critical areas in the Bay area.

Construction Grant Funding

One of the purposes of the municipal construction grants program authorized under the 1972 Federal Water Pollution Control Act Amendments was to finance the backlog of municipal treatment facilities needed to achieve the requirements of the Act. In particular, section 301 requires all POTWs to comply with the seondary treatment requirements issued by EPA.

The 1982 Needs Survey shows that considerable amount of work remains to be done. For example, the Survey indicates that $1.5 billion is necessary to meet the construction needs for 776 Virginia communities. This backlog of projects will be significantly altered beginning October 1, 1984, due to Congressional action which reduces the eligible categories to which federal assistance can apply. In Virginia, the backlog needs in categories then eligible for Federal assistance would be approximately $690 million (SWCB, 1983). The roughly $800 million reduction in eligible projects will place an enormous funding burden on state and localities. With such an enormous shift in funding responsibility,it is unlikely that many of the necessary projects to upgrade treatment works will be undertaken on a timely basis.

Recommendation 28: The Federal Construction Grant Program should be continued at an adequate level of funding to meet the region's treatment needs.

Combined Sewer Overflows

Combined sewers are double duty systems that carry stormwater runoff as well as industrial and domestic sewage. During relatively dry periods, such systems are relatively efficient--all wastes are collected by interceptor sewers and conveyed to a central treatment plant. However, when it rains heavily, so much water runs off the streets that most systems can't handle the increased volume. Overflow controls automatically discharge this combined sewage and runoff into nearby waters.

Many of the major cities in the Bay are served by combined sewers. Wet weather discharge of untreated sanitary sewage has been identified as a major cause of water quality standard violations. For example, a recent report prepared for the District of Columbia (O'Brien and Gere, 1983) estimated that such

discharges occur approximately 85, 60, and 17 times per year on the Anacostia, Potomac, and Rock Creek. This has a significant impact on nutrient and bacteria levels in these stream segments.

Programs to reduce the frequency of such overflows represent an enormous capital expenditure for Bay area cities. For example, the recommended CSO control for the District of Columbia will cost an estimated $70 million. Bay-wide CSO requirements are estimated to be ___ billion.

Recommendation 29: EPA and the states should form a special task force to identify solutions to CSO problems in the Bay. The results of the task force should by submitted to the management committee by September 30, 1984.

The Municipal Wastewater Treatment Construction Grant Amendments of 1981 (P.L. 97-117) earmarked an additional $200 million for CSO projects that are necessary to protect important basin estuaries. During FY 1983 only 37 million was requested by EPA.

Recommendation 30: Congress should immediately appropriate additional funds for CSO problems in estuaries and bays.

Civil Works Program

The majority of CSO projects are directed towards pollution control and flood control. With storm water the predominant concern is probably flood control. There are currently large sums of Federal money spent by the Corp of Engineers for the purpose of flood control. This civil works program could provide a source of additional financial resources for communities faced with CSO problems.

The Corps' current policy is to become involved only in projects designed to alleviate the effects of flood events which exceed 800 cubic feet per second. This effectively precludes the agency from becoming involved in designing and/or constructing sewage and drainage systems which are primarily designed to handle smaller, more typical amounts of rainfall. Although the Corps' will provide technical assistance to communities which do not have the resources to hire private architectural and engineering firms, its' general policy is not to

compete with private industry. Although more than 50% of its' projects are designed to alleviate flooding in urban areas, the Corps has not been involved in urban waste management issues since the Urban Studies Program ended in the late 1970's.

Recommendation 31: A significant portion of the Corp of Engineer's civil works program resources should be directed towards solving the nation's urban waste management problems.

Phosphorus Detergent Ban

Analysis by the Chesapeake Bay Program indicates that a phosphorus detergent ban could reduce existing phosphorus loads from POTWs. In certain river basins, it is estimated that such a ban would reduce phosphorus loadings by as much as 10 percent. It is also estimated that reduced influent concentrations would result in reduced operation and maintainance costs. For example, Jones (1982) estimated that the annual cost savings associated with an effluent phosphorus limit of 1 mg/l would average approximately $12,000 per million gallons per day (MGD) treated (Jones, 1982). In the Upper Bay, total savings would amount to approximately $4.9 million annually. These savings would accrue from (1) the reduced use of chemicals needed to remove phosphorus from wastewater, and (2) reduced sludge generation and the resultant sludge disposal costs.

Recommendation 32: As soon as possible, but in no case later than October 1, 1984, each state water pollution control agency should assess the environmental benefits and cost savings associated with a phosphorus detergent ban.

Recommendation 33: In areas where significant environmental benefits or cost savings are demonstrated, state and local governments should take the necessary legislative and regulatory actions to implement a phosphate detergent ban. Such bans should be implemented as soon as possible, but in no case later than October 1, 1986.

Chlorine Limitations

There is presently a great deal of concern over the use of chlorine to disinfect sewage effluents. Currently all Chesapeake POTWs disinfect throughout the year and such procedures are considered necessary for waters which are a

source of drinking water, which are used for shellfish harvesting, where water contact recreation occurs, or where water is used for irrigation of crops. Presently, it is estimated that POTWs in the Chesapeake discharge an estimated 12,500 lbs. of residual chlorine per day to tidal waters (below the fall line) (Table __).

In Maryland, the discharges of chlorine to natural trout waters are prohibited, discharges to class 4 waters (recreational trout waters) cannot exceed efflulent concentrations of 0.02 mg/L, with a maximum of 0.002 mg/L allowable in the receiving water, while the maximum concentrations allowable in efflents discharged to other waters is 0.5 mg/L. The latter concentration limit may be reduced in discharge permits depending on the particular aspects of the receiving water, e.g., nearness to an important spawning area, etc. (MD OEP, 1983). The State also has developed two innovative programs designed to reduce the amount of chlorine discharged to fish spawning areas. Under the first, Operation DO-IT (Disinfection Optimization-Innovative Techniques), special teams worked with selected plant owner/operators to make on site modifications and to help implement improved operation procedures. A second program, Operation TIDE, was implemented to provide those plants where modifications could not produce the necessary reductions with the temporary use of dechlorination equipment. In the first year of these programs, residual chlorine was reduced by an average of 66 percent in nine river basins.

The SWCB and the District of Columbia have also begun to incorporate chlorine limitations into the NPDES permits of several of the major POTWs under their jurisdiction. In Virginia, permitted chlorine residuals for POTWs discharging to shellfish waters are 1.5 to 2.5 mg/l; for other waters permitted levels range from 1.0 to 2.0 mg/l. Maximum levels of 4.0 mg/l are also specified in NPDES permits.

Recommendation 34: The states should continue the process of establishing numerical limitations for total residual chlorine in all POTW permits. Permitting agencies should review current limitations to insure their adequacy.

Recommendation 35: Using the Maryland programs as a model, Virginia and the District of Columbia should establish programs to encourage dechlorination, alternative biocides, different timing, and other methodologies, and to provide technical assistance to improve plant operations.

AGRICULTURAL RUNOFF

Over 16 percent of the land in the Chesapeake Bay Basin is used for agricultural purposes. Runoff from these lands represents the single largest source of nutrients in the drainage basin.

Much has been done to lay the groundwork that will be necessary to reduce the amount of nutrients that now reach the waters of the Bay and its many tributaries. Indeed, with a few modifications, existing programs provide the necessary mechanisms to implement the recommendations summarized below.

Identification of High Priority Water Basins

In order to avoid many of the problems of the past, it is important that efforts to control agricultural runoff utilize a "phased" or "staged" approach. Widespread implementation will dilute already scarce resources and reduce the overall effectiveness -- in terms of improving water quality in the Bay -- of regulatory efforts. Therefore, as part of each state's FY-84 efforts to identify priority water bodies, critical areas (i.e. those areas where BMPs will have the greatest impact on water quality) should be identified and initial efforts concentrated on making agricultural programs work in those regions. This should draw upon by local soil conservation districts to target agricultural critical areas based on the potential for soil erosion. The state's efforts should also draw upon information developed by the CBP, particularily pertaining to NPS loadings of nutrients. Later, as these programs are shown to be successful, they can be expanded to include additional areas.

Recommendation 36: As soon as possible, but in no case later than January 1, 1984, states should identify high priority water basins where water quality violations are due to agricultural nonpoint source pollution.

Agricultural 208 Plans

The Bay Program, in cooperation with the Soil Conservation Service, collected and evaluated several sets of agricultural data in an effort to measure the effectiveness of current agricultural programs. The results of that evaluation, presented in Appendix C of the CBP Management Report (CBP, 1983), indicate that soil loss exceeds acceptable levels in most areas of the basin; a very low percentage of the farmers in the Basin have implemented approved conservation plans; and that animal waste handling and storage facilities are needed in areas with concentrated livestock operations. As indicators, these data infer that the voluntary programs for agricultural nonpoint source control may not be adequate to achieve necessary levels of control.

Recommendation 37: As soon as possible, but in no case later than July 1, 1984, each state should complete an evaluation of all its programs that directly or indirectly result in reduced NPS pollution. In states where conservation plans are not fully implemented, the state should develop and implement mandatory control programs.

Recommendation 38: As soon as possible, but in no case later than July 1, 1985, states should revise agricultural 208 plans for high priority basins.

Conservation Agreements

Throughout the Chesapeake Bay Basin, the control of soil erosion and runoff from agricultural lands has long been a priority of Soil Conservation Districts (SCDs). The SCDs primary tool for reducing pollution loads are the development of long-term conversation agreements with individual farmers. These agreements specify the types of best management practices each farmer should use on his/her land. To aid the farmer, SCDs are able to provide technical and, in some cases, economic assistance.

The success of this effort has generally been poor. Summary data collected from SCDs in Maryland and Pennsylvania indicate that the percentage of farmers who have updated implemented plans is extremely low -- especially in rapidly developing areas where district resources are also used for sediment and erosion control on new developments (CBP, 1983).For example, in the upper Potomac

Basin less than 50% of the farmers have entered into conservation agreements (CBP, 1983). Less than half of those plans have actually been implemented. In the lower Potomac, the rate of plan implementation is even lower.

Recommendation 39: As soon as possible, but in no case later than July 1, 1985, all farmers in high priority basins must enter into conservation agreements and apply all BMPs called for in those agreements.

Program Coordination

As discussed in Chapter III, a wide variety of agencies and programs directly or indirectly affect agricultural practices, particularily those that impact water quality. Use of the SCS, extension and other agricultural networks are considered to offer the most effective mechanism for the implementation of accelerated programs for reducing agricultural nonpoint source loadings. It is unclear, however, whether these agencies have a sufficient understanding of the utility of water-quality based farming practices. Concerns have also been raised regarding the ability of agricultural agencies in many states to work effectively with each other or state environmental agencies.

Recommendation 40: As soon as possible, but in no case later than January 1, 1985, EPA, USDA, and the states should develop working agreements for coordinating and integrating information, resources, and technical assistance related to reducing agricultural runoff. These resources should be targetted to state-identified priority basins with agricultural NPS-related water quality problems.

Recommendation 41: EPA should continue to provide financial assistance for state program management, either as part of the 208 program or in an expanded Section 106 Clean Water Act program. This funding should be made contingent on the states developing implementation plans which establish priorities, staffing arrangements, management responsibilities, and milestones for reducing agricultural NPS pollution.

Mason-Dixon Erosion Control Project

The Maryland and Pennsylvania State offices of the United States Department of Agriculture (USDA) Soil Conservation Service (SCS) have included the lower Susquehanna drainage area in the "Mason-Dixon Erosion Control Area". They have proposed that the area receive "targeted" technical assistance. The primary

objective of the proposal is the protection of the soil resource base and improvement of productive capability through a significant reduction in annual soil loss in the 22 county area in Maryland and Pennsylvania. The SCS has included $700,000 and its current budget to provide technical assistance by way of soil conservation technicians and engineers required to identify appropriate BMPs and to formulate a strategy for cropland erosion/nutrient control. SCS officials estimate that an additional $8.0 million per year in cost sharing funds for the next ten years is needed to allow implementation of practices identified as necessary to adequately protect all land in the targeted area.

Erosion, however, is only part of the source of nutrients contributing to the Bay water quality. Commercial fertilizer application, animal waste application, and animal waste management also represent significant sources of nutrients. Preliminary results from the Conestoga RCWP project and the Pennsylvania statewide agricultural NPS studies under section 208 support this conclusion. Consequently, expanding the Mason-Dixon Erosion Control Project to include demonstration projects/cost sharing for other nutrient sources, would yield increased water quality benefits.

Recommendation 42: To address the tremendous amount of nitrogen and phosphorus entering the upper Chesapeake, EPA, USDA, Maryland, and Pennsylvania should immediately implement an intensive agricultural NPS control strategy in the Piedmont Region of the lower Susquehanna. To facilitate the development of effective control strategies, funding for Mason-Dixon Erosion Control Project should be increased by $1.5 million/year to provide for the immediate installation of demonstration projects to reduce nutrient (both phosphorus and nitrogen) losses.

Cost-Share Funding

Cost-sharing is one of the key incentives to accelerated implementation of agricultural nonpoint source control practices. Therefore, the limited availability of current cost-share funding is a major constraint on agricultural BMP installation.

To date, the principal source of cost-share funds has been the Agricultural Conservation Program, a branch of the U.S. Department of Agriculture. However, the funds available in any given year have always been limited. Indeed, at

current rates of cost-share assistance it would take over a 100 years to address conservation needs in the Bay area, assuming that other incentives for adopting BMPs remained constant.

In order to implement CBP recommendations, these levels will need to be increased. For example, it is estimated that farmers in Maryland will require $90 million over the next twenty years to abate agricultural runoff and animal waste problems in critical areas of the state. At present, the state funded cost-share program will provide $5 million. In Virginia, an estimated $30 million is needed to reduce soil and nutrient losses in the states priority agricultural watersheds draining to the Bay.

Recommendation 43: Agricultural Conservation Program Funding should be immediately increased by $10 million/year in order to provide increased cost-sharing to implement BMPs.

Program Expansion

Many areas in the Chesapeake Bay Basin have been identified has having considerable potential for water pollution problems resulting from agriculture NPS pollution. Research by the Chesapeake Bay Program indicates that the major agricultural NPS contributing areas are in the Piedmont area of the lower Susquehanna River basin, central Potomac River basin, Patuxent River, West Chesapeake basin, and the Upper Eastern Shore. With the exception of the three Rural Clean Water Program (RCWP) projects and the proposed Mason Dixon and Patuxent projects, no major implementation plans have been developed to deal with nutrient and sediment losses in these areas.

Recommendation 44: As soon as possible, but in no case later than January 1, 1986, USDA, EPA, and the states should develop implementation plans similar to the Mason-Dixon Erosion Control Project in other high priority watersheds in the Chesapeake Bay Basin.

Technical Assistance

Well trained soil conservationists who have gained the respect of farmers through performance are essential for convincing farmers to implement the needed management practices. Consequently, current funding and manpower

shortages in the Soil and Conservation Service, Agricultural Stabilization and Conservation Service, and Soil Conservation Districts will hinder the application of conservation measures. Without increased staffing in targetted areas, the local transfer of information and assistance will become an increasingly critical bottleneck.

It is also essential that people working at the local level, whether federal, state, or county employees, be adequately trained in the areas which are crucial to solving agricultural NPS problems. These include methods to control nutrient runoff, an understanding of the maze of institutional arrangements inevitably involved in agricultural NPS programs, and alternatives to cost-sharing such as loan and tax deductions, which could reduce the cost to the farmer of implementing BMPs.

Recommendation 45: The number of personnel for technical assistance should be increased and assigned to state-identified priority basins with NPS water quality problems.

Nitrogen Controls

As part of their state 208 plans, each state has developed BMPs for sediment and animal waste control. While sediment BMPs have been shown to be effective in reducing phosphorus loads to nearby rivers, more research and demonstration projects are necessary to determine the effectiveness of BMPs for reducing the loss of soluble nitrogen forms. Research should include BMP effectiveness and fertilizer management on different cropping systems.

Recommendation 46: EPA and the states should undertake a joint effort to develop BMPs for nitrogen control as soon as possible, but in no case later than July 1, 1984. Demonstration projects for these measures should be included as part of the Mason-Dixon Erosion Control Project.

Incentive Programs

Runoff from agricultural cropland has been identified as a major source of nutrients to Chesapeake Bay. Under the new USDA Payment-in-Kind (PIK) program, farmers will receive up to 95 percent of their normal yield of corn, wheat, rice, and cotton crops in exchange for not growing these crops. Although, the program is designed to reduce USDA costs for storing surpluses and reduce the

glut that has caused prices to plunge, significant water quality benefits could be achieved if funds are properly targeted. It is estimated that almost one million acres of cropland within the Bay drainage area may be taken out of production and seeded with grasses or soil-stabilizing plants. The application of these conservation measures in place of intensive farming production will reduce the soil and nutrient losses from cropland.

The Commonwealth of Virginia recognized the potential for this type program and recently began offering a cash payment (.10/linear foot) to farmers if they establish a permanent vegatative filter strip along any free flowing stream on farms enrolled in the PIK program. The area where the filter strip is to be established must be designated at the time conservation acreage under the program is designated, and must be maintained for three years.

Additional incentives will be necessary to ensure that conservation measures on cropland idled through the PIK program, as well as additional areas identified by SCS as critical in mitigating soil and nutrient losses, are implemented. The 1980 final report of the Soil and Water Resources Conservation Act details the major types of incentives that could be used to improve conservation efforts. USDA currently supports the concept of cross compliance which would require an approved conservation plan before a farmer recieves other payments or loans from USDA.

Recommendation 47: USDA should develop and implement incentive programs to encourage farmers to utilize management practices which minimize surface runoff.

Recommendation 48: States should develop incentive programs to encourage farmers to utilize management practices which minimize surface runoff.

Recommendation 49: As soon as possible, but in no case later than July, 1, 1985, EPA, the Treasury Department, and the Council on Environmental Quality should evaluate the disincentives in the Internal Revenue Code and propose changes to encourage landowner investment in BMPs.

Integrated Pest Management

A recent survey by the U.S. Department of Agriculture (USDA, 1983) reveals that the use of no tillage and other conservation tillage techniques has substantially increased over the last ten years. Currently, no-till techniques are used on 28% of Maryland's farmlands, 14% of Virginia's, and _% of Pennsylvania. Farms in these states were also ranked very high in terms of their use of all types of conservation tillage. Maryland with 69% of it's farmland utilizing conservation tillage methods ranked second in the nation.

Much of this increase has been made possible by the increased use of herbicides. It is estimated that over 200,000 lbs of herbicides such as atrazine, arachlor, and 2,4-D, are applied to corn and soybeans in Maryland and Virginia (Stevenson and Conter, 1978). Due to the increase in conservation tillage utilization, this figure probably understates current application levels.

Although, it appears that herbicides have great economic (multicropping) and environmental (reduced soil erosion) benefits, their use is not without problems. First, increased herbicide use often amplifies the need for insecticides. They also diminish a farmers incentive to rotate crops. Finally, many herbicides are toxic to nontarget plants, humans, and other animals (NAS,1975).

These potential problems suggest that just as an integrated pest management approach is the best way to control insects, an integrated approach to weed management may be the most appropriate technique for controlling weeds.

Successful IPM programs are now found in several states including Maryland and Virginia. For example, in Maryland, an effective IPM program, run by the Maryland Department of Agriculture and the USDA, uses a parasitic wasp to suppress the Mexican bean beetle population and reduce the need for chemical controls. In Virginia, the Leafspot Advisory Program has resulted in reduced applications of fungicides to control Early and Late Leafspot.

Recommendation 50: USDA, EPA, and the states should encourage greater use of integrated pest management techniques.

URBAN RUNOFF

In urban areas, a major source of toxic compounds, including heavy metals and organics, is urban stormwater runoff. The Chesapeake Bay Program, in quantifying the loadings of metals to the Bay estimated that urban runoff contributed 16% of the lead, two percent of the cadmium, and lesser percentages of chromium, copper, and iron. In major urbanized areas these percentages are much higher.

Although most 208 plans recognize urban runoff as an important water quality problem, effective controls are often costly and hard to implement. Government efforts to date have largely focused on characterizing the problem and developing control methods. Demonstration projects funded by EPA and the states have been instrumental in identifying effective control measures for selected aspects of the urban runoff problem. In most cases, however, control strategies for ensuring the use of such measures have not been fully implemented.

Utilization of NURP Findings

EPA's NURP program was initiated in 1978 to provide additional information and insights needed to guide future policy development and regulatory action for urban runoff control. The program, now being completed, is designed to fill identified data gaps and to pull together in a systematic way what is known about urban runoff mechanisms, problems, and control efficiency, for use by state and local officials involved in the implementation of urban stormwater management plans.

Preliminary results from the NURP indicate the need for improvements in many traditional stormwater management practices. For example, results from the Washington NURP project, generally considered to be one of the more successful efforts, indicates that wet ponds and porous pavement are much more effective in reducing pollutant loadings than the more commonly employed dry ponds and grass swales.

Recommendation 51: Results from the recently completed NURP programs should be distributed to state and local planning agencies involved in stormwater management. As soon as possible, but in no case later than January 1, 1985, each Section 208 planning agency must revise urban BMPs to reflect the findings of EPA's NURP program.

Urban BMP Implementation

As described in Chapter III , the EPA, individual states and regional planning agencies have identified a number of urban "best management practices" that could be utilized to reduce urban runoff. In order to improve water quality in urbanized areas, these BMPs must be implemented as vigorously as possible and new strategy components need to be developed as results from the NURP projects and other studies become available.

Recommendation 52: Section 208 planning agencies should place greater emphasis on implementing urban BMPs.

Runoff Controls in Areas Being Developed and Redeveloped

It is estimated that the population in the Chesapeake Bay region will increase by __ % by the year 2000. Paralelling this increase will be the continued expansion of urban and exurban areas. Maryland and Pennsylvania have enacted legislation designed to minimze the water quality impacts of such development. Maryland has moved agressively to develop regulations to implement the law; program development in Pennsylvania has been delayed due to funding shortages. In addition to these state programs, there are a wide variety of local ordinances designed to protect water uses in developing areas.

Recommendation 53: State and local governments should immediately develop procedures to insure that all new construction and redevelopment projects incorporate plans for controlling urban runoff.

Mandatory Stormwater Management Laws

(To be added)

Recommendation 54: As soon as possible, but in no case later than October 1, 1986, mandatory stormwater management laws should be passed, implemented, and enforced in each Bay area state.

Maintenance of Stormwater Management Devices

As part of the Metropolitan Washington Council of Governments (COG) NURP project, an assessment of stormwater management pond construction and maintenance costs was prepared (MWCOG, 1983). Based on information from the Washington region and several other areas of the country, it was concluded that O&M costs average approximatedly 5% of construction costs. Maintenance practices identified included mowing, site inspections, debris removal, periodic structural repairs, and removal and disposal of sediments on a 10 to 20 year clean-out cycle.

COGs review of stormwater management programs around the U.S. indicate a trend towards greater public responsibility of maintenance programs. According to interviews conducted with SWM officials throughout the country, the primary reason appears to be a desire for better enforcement and coordination of maintenance programs. It also appears that officials consider it impractical to hold developers responsible for the full range of maintenance functions required to keep structures operating as designed over their useful life, particularily when major corrections or structural repairs are involved.

Recommendation 55: As soon as possible, but in no case later than October 1, 1986, local stormwater management agencies should develop finance mechanisms to allow public agency responsibility for the maintenance of stormwater control mechanisms.

WETLAND PROTECTION

Wetlands are prime spawning areas for fish, nesting grounds for waterfowl, natural water cleansing systems, and provide food sources and habitat for a wide variety of wildlife. As such, they have long attracted fishermen, hunters, and other outdoor users in the Bay region. They provide economic benefit to the shellfishing industry and to the forest product and agricultural interests that make use of wetlands in their nautral states. In the last 30 years,

however, as the population in the Bay has grown and technology has improved, wetlands have become increasingly utilized for other uses and purposes such as highways, ports, marinas, dredge disposalsites, channelization, industrial and residential development, all of which generally require some modification of natural conditions.

Section 404 Program Priorities

Despite the ecological importance of wetlands, considerable losses of these areas have occurred throughout the Chesapeake Bay watershed: It was estimated by _____ that ___ acres have been lost during the last 20 years. In Maryland, most losses, 52 percent, were attributable to agricultural drainage, 13 percent to residential development, six percent to industrial development, four percent to marinas, and five percent to dredge and fill activities. Losses in Virginia were estimated to be due to channelization (47 percent), residential development (27 percent) and industrial development (17 percent).

Recommendation 56: The EPA, COE, and the States should rank wetlands protection (Section 404) among their highest priority programs. Section 404 permit review mechanisms and EPA Section 404(c) authority should be utilized to assure that only those wetlands fills in compliance with the 404(b) Guidelines are permitted.

Wetlands Inventory and Trends Analysis

The National Wetlands Inventory Project, directed by the FWS Office of Biological Services, was first established in 1974, and later expanded by the Clean Water Act of 1977. The primary objective of the inventory was to provide comprehensive , scientifically sound data documenting the extent and nature of the nation's wetlands.

Although the inventory does identify for the first time the location, extent, and characteristics of wetlands in the Chesapeake region, the research-oriented definition of wetlands is much broader than the current regulatory definition. Therefore, despite the vast amount of information collected, the inventory cannot necessarily resolve current regulatory difficulties in determining whether a particular project falls within a regulated wetland.

Recommendation 57: The COE, FWS, and/or EPA would inventory wetlands and their characteristic impact on water quality. A Chesapeake Bay wetlands trends analysis should be performed. EPA should utilize existing and future wetlands characterization and trends data to complete 40 CFR 230.80 (404(b) Guidelines) predesignations of sites generally unsuitable for disposal of dredged or fill material. This trends data should also be utilized to ascertain the types of projects creating the greatest wetland impacts. The projects creating the greatest impacts should receive highest priority under the permit review.

Local Wetlands Protection Plans

Local regulation of wetland activities is required by Virginia's Wetland Protection Act. Pursuant to this law, more than __ Virginia communities have adopted such ordinances. A substantial number of communities have also adopted land use regulations for wetland areas pursuant to coastal zone or floodplain regulatory efforts or, alternately broader land use zoning or subdivision programs. Many of these programs, however, are faced with limited funds and personnel for wetlands mapping, site investigations, and enforcement efforts.

Recommendation 58: Local governments should develop comprehensive wetland protection plans.

Wetlands Acquistion

There are currently a number of governmental acquisition programs which serve to protect wetlands. For example, the Interior Department's land acquisition program for wildlife refuges often includes wetlands. In addition, approximately $15 million in annual proceeds from the sale of migratory bird hunting and conservation stamps, in combination with funds appropriated under the Wetlands Loan Act of 1961, can also be used to acquire wetlands. In the Bay area, approximately _____ acres have been purchased under these programs. Chesapeake Bay Program research highlights the need to increase the level of funding for these programs.

Recommendation 59: Congress should target additional funds for the acquisition of wetlands in the Chesapeake Bay region.

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Recommendations for Public Participation

This chapter ends with a brief discussion of the way in which citizens should continue and expand their involvement in the Bay region's effort to protect and restore Chesapeake Bay. The active, resolute nature of citizens' concerns and awareness related to the quality of Chesapeake Bay is a well known phenomenon. However, because the major purpose of this report is to address options and strategies for action on the part of governmental entities, this section does not attempt to cover in detail the many ways that citizens play a role in affecting the health of the Bay. Instead, this discussion summarizes information and ideas that may be considered and greatly expanded upon to decide upon specific steps for directing the public education and participation aspects of a Bay-wide effort. The responsibility for making such plans should properly rest with the existing governmental, private, and non-profit institutions interested in this area.

The recommendations below suggest ways of strengthening the involvement of citizens in governmental regulatory processes and programs, particularly those with explicit provisions for public participation. The other recommendations stem from a widely recognized notion; that, in general, by educating themselves and others on all aspects related to the Bay's state of health and the range of forms of pollution harming its condition, citizens are likely to respond by creating the climate for assisting in carrying out and supporting the allocation of financial resources for taking remedial and safeguard measures on behalf of the estuary.

Public Participation Efforts Affecting Regulatory Programs

Congress explicitly acted to ensure that the nation's citizens could participate in the planning and implementation processes developed to carry out the Clean Water Act. The mandate set forth by Section 101(e) of the Act made way for the public participation requirements included in subsequent parts of the law, making the Clean Water Act a strong protector and promotor of public participation in federal, state, and local water pollution control planning and management:

"Public participation in the development, revision, and enforcement of any

regulation, standard, effluent limitation, plan, or program established by the Administrator (EPA) or any state under this Act shall be provided for, encouraged, and assisted by the Administrator and the States."

The federal and state water pollution control laws covering the Chesapeake Bay region include a number of provisions for ensuring public participation in aspects of certain clean water programs. One example is the sequence of provisions concerning the issuance of a NPDES permit which are aimed at ensuring that citizens are fully informed of, and participate in a meaningful manner, the decisions made concerning the requirements imposed on a discharger and its effluent. As another example. a strong thrust towards public participation was included in the original requirements and processes during the development of 208 plans: the three states in the Bay watershed made provisions for public information staff and programs to operate once these plans were finalized. They exist today, and sponsor activities to inform and involve the public in areas related to reviewing and implementing all aspects of each state's 208 plan.

Finally, a major area established by the Clean Water Act lies within Section 505 of the Act. Section 505 authorizes any person "having an interest which is or may be adversely affected" to take civil actions against a discharger, for violation of any of the Act's effluent standards or limitations. Specific provisions also are made for the payment of attorney fees and expert witness fees. Legislative history records Congress's explicit interest in ensuring the opportunity for the public to assist in vigorous, effective enforcement of legal requirements for abatement of pollution problems.

Citizens groups and individuals have been engaged in a number of efforts to make use of these various provisions of the Clean Water Act and similar procedures required or voluntarily conducted by state and local authorities. Several organizations in the Bay watershed focus on working with government officials and the public in forming and developing policy, facilitating citizen participation in administrative proceedings, and challenging specific proposals, plans, or actions through legal and other forums or channels.

Recommendation 60: All federal, state, and local water pollution control regulatory authorities should increase and strengthen their respective public participation and information procedures or programs to protect the citizen's right and need to monitor and play constructive roles in preventing harm to the Chesapeake Bay.

Recommendation 61: Public and private sources of funds should expand financial support of training, technical assistance, and organizational programs dedicated to mobilizing and directing public participation in all aspects of water pollution control in the region.

Recommendation 62: A comprehensive list should be prepared and disseminated by the Office of Bay Liaison (see Chapter V), cataloguing the specific planning, programmatic, regulatory, and oversight forums and activities operating to protect Chesapeake Bay.This listing should then be utilized to prepare a workplan with specific goals, planned actions, deadlines, projected outcomes, and enforcement measures. The public should be apprised of, on a regular basis, the progress, failures, changes, and other types of results as they emerge in implementing the plan.

Education Programs

Many organizations in the watershed administer education programs concerning the Chesapeake Bay. The existing educational programs operate a diverse group of activities which give citizens direct exposure to the ecological workings and resources of the Bay. These activities are led by educators and scientists who teach citizen important lessons about how and why the Bay can be harmed by different forms of pollution. This education is given through sampling, experimenting, and looking at certain tangible parts of the Bay and their reactions to chemicals and substances of the types contained in industrial, sewage treatment plant, and other point source discharges and in run-off from farmland and other nonpoint sources.

Educational institutions in the watershed work to integrate field trips into the classroom curriculum. A range of programs conduct workshops designed to assist teachers of science and related subjects in developing an environmental education curriculum. Reading, vocabulary exercises, role-playing games, and other teaching aids are to stimulate student curiousity and in-class preparation for field trips.

Recommendation 63: Public and private sources of funding should continue and expand their financial support of educational programs centered on the ecological characteristics and problems of Chesapeake Bay.

Recommendation 64: The Office of Bay Liaison should establish public

information services as a top priority at the outset, and operate an ongoing program to complement and supplement existing educational programs in the region concerning the Chesapeake Bay.

Land/Wetlands Conservancy and Aquisition Programs

A number of private organizations carry out land aquisition and preservation programs that attempt to preserve natural areas, including wetlands, of land surrounding Chesapeake Bay. Depending on the purpose of an individual land conservancy organization, the classes of natural areas of most interest to it varies. For example, certain groups are dedicated to establishing and retaining wildlife sanctuaries, which frequently include marshes, other wetlands, and/or land on Chesapeake Bay's watershed. Other purposes directing land aquisition and conservance efforts include restoration and preservation of wetlands, environmental education, environmental protection from run-off and other releases of pollutants, and creation and expansion of estuarine sanctuaries and recreation sites.

One major difficulty encountered by the Bay Program when an effort was made to determine the nature and environmental impact of wetlands loss in the region conerned the lack of adequate, consistent data measuring this trend. For example, the agencies which monitor the lands, such as the Fish and Wildlife Service and the National Geological Survey, measure different types of trends. The lack of consistent, comprehensive information on wetlands disappearance patterns hampers the attempt to establish a conservation agenda.

A link between land conservancy and environmental education in the Bay region appears to be strengthening. The related organizations in the region have indicated to the Bay Program a growing interest in this connection. This pattern is clearly emerging from an recognition that individuals exposed to the Bay's natural state are likely to donate time, financial support, and assistance to restoring and preserving wetlands and land in a manner that helps to restore the ecological health of the Bay.

Recommendation 65: Citizens groups should mobilize citizen help for Corps of Engineers' inventorying of the Chesapeake Bay's wetlands. They should focus on devising a priority system identifying, areas meriting priority attention: 1) wetlands where all private actions must be prohibited

because of the unique feaatures of the lands, such as habitat for rare or endangered species; 2) wetlands performing important natural functions that are subject to development threats; and 3) wetlands needed for active public use (e.g. recreation or scientific study).

Recommendation 66: Citizens should support financially and participate in efforts of existing conservancy and aquisition programs to assist in purchasing or acquiring easements or development rights of lands and wetlands surrounding the Bay.

CHAPTER V

AN INSTITUTIONAL MECHANISM FOR THE IMPLEMENTATION PHASE

HOW IT SHOULD BE DONE

INTRODUCTION

The previous chapters have discussed the nature and extent of water and sediment quality problems in the Chesapeake Bay. A range of actions has been suggested to solve these problems. It is clear that more effort is necessary at all levels of government to control the sources of nutrients and toxic materials reaching the Bay and its tributaries. Responsibility for the recommendations presented in this report will not rest solely with EPA, the states, individual local governments, or private individuals. All must play a role in improving the water quality of Chesapeake Bay, and the most appropriate institutions must be charged with specific responsibilities.

Congress's 1975 mandate to EPA included the directive quoted below:

> "...determine what units of government have management responsibility for the environmental quality of Chesapeake Bay and define how much management responsibility can best be structured so that communication and coordination can be improved not only as between the respective units of government but also between those units and research and educational institutions, and concerned groups and individuals on Chesapeake Bay."

As presented in some detail in this report, hundreds of governmental bodies and agencies exist today in the Chesapeake Bay region with some level of authority or program related to studying, restoring, and/or protecting the quality of the Bay. By virtue of the Clean Water Act authorities, the U.S. Environmental Protection Agency plays a major role in overseeing and implementing strategies or actions developed to affect the water quality of the Bay. As discussed in Chapter III, other federal, regional, state and local entities possess important related and independent powers as well.

An assessment of existing organizational structures and consideration of new or additional governmental bodies has been conducted by the Bay Program, drawing upon the input and suggestions of a wide spectrum of governmental, private, and public interest representatives. The Bay Program's response to Congress's request concerning management responsibility is presented below.

BACKGROUND

A report prepared under contract to the Bay Program ("Governing Chesapeake Bay Waters, a History of Water Quality Controls on Chesapeake Bay, 1607-1972," October 16, 1981) traced the early attempts to manage the Bay. The following brief review will help aquaint the reader with the most recent institutional approaches developed to address water quality objectives on an interstate or regional basis.

In 1965, the Congress authorized the U.S. Army's Corps of Engineers

> "...to make a complete investigation and study of water utilization and control of Chesapeake Bay Basin...including...navigation, fisheries, flood control, control of noxious waste, water pollution, water quality control, beach erosion and recreation."

To aid in this study, the Corps was authorized to build a hydraulic model of the Bay. The resulting study covered a span of approximately ten years, and led to the publication of the multi-volume Existing Conditions Report and Future Conditions Report.

In 1978, the General Assemblies of Maryland and Virginia passed resolutions creating the Chesapeake Bay Legislative Advisory Commission for the purpose of evaluating existing and potential management institutions for the Chesapeake Bay. The Commission reviewed six general types of alternative management institutions which might conceivably be adapted for use in improving and co-ordinating Bay management activities in the two states, in addition to the possibility of adapting existing institutions. The alternatives considered were: (1) reliance upon existing government agencies, with no new entity being created, (2) a bi-state commission without federal participation, (3) a federal-interstate commission, (4) a commission created under Title II of the Water Resources Planning Act of 1965, (5) a commission or agency created pursuant to section 309 of the Coastal Zone Management Act of 1972, (6) an interstate planning agency created under section 208 of the Federal Water Pollution Control Act Amendments, and (7) a federal regional management authority.

The Chesapeake Bay Legislative Advisory Commission concluded that: a greater level of cooperation was needed between state policymakers; the primary responsibility for governing the Chesapeake Bay should remain with the states and their political subdivisions; and management difficulties arising from intra- and interstate jurisdictional boundaries should be resolved through efforts of the states. Accordingly, in 1980, the Maryland and Virginia General Assemblies created the Chesapeake Bay Commission, which consists primarily of legislative members from both states, with one executive agency and one citizen member from each state.

In 1979, the Governors of Virginia and Maryland formalized an agreement to coordinate research, planning, and management activities affecting the Bay through the formation of a "Bi-State Working Committee" of executive agency representatives from both states.

In 1980, Congress enacted the Chesapeake Bay Research Coordination Act, creating a Chesapeake Bay Research Board, composed of state and federal members, to coordinate research efforts in the Chesapeake Bay region. This Act, although never funded, is a responsibility of the Research Board in the National Oceanographic and Atmospheric Administration (NOAA) in the U.S. Department of Commerce.

There are two other regional institutions operating in the Chesapeake Bay region. These are the Susquehanna River Basin Commission, and the Interstate Commission on the Potomac River Basin. The latter is a federal-interstate compact commission organized in 1940, for the purpose of promoting interstate cooperation in the prevention of stream pollution through water quality and land planning measures. The Susquehanna River Basin Commission is also a federal interstate compact commission, created in 1970, to coordinate federal, state, local and non-governmental plans for water and related land resources, through centralized comprehensive planning, programming, and management.

Thus, a series of institutional structures have evolved to address the environmental problems of the Bay and each has improved upon its predecessor. The challenge then is to take this evolution one step further and fashion an institution capable of assuring that the problems discovered and analyzed by

the Bay Program's study are addressed by effective action on the part of the institutions charged with restoring and protecting the Chesapeake Bay's waters.

RECOMMENDATIONS FOR NEXT INSTITUTIONAL STEPS

The development of existing institutions described above was for the most part in response to an emerging set of findings about problems affecting the Bay. The Chesapeake Bay Program, as detailed in the previous chapters, has now completed an in-depth documentation of the interrelated problems related to environmental quality and ecological health of the Chesapeake Bay. These findings call for mobilizing the existing network of laws, ordinances and institutions throughout the Bay area into a comprehensive set of immediate actions.

This network has the authority and capability to take action. The Federal Clean Water Act; the states' implementation of the Act (particularly water quality standards and their own statutes); and local government use of planning mechanisms must be mobilized towards one objective: to reduce the flow of pollutants into the Bay and restore and maintain its health. In many cases this has begun and must only be continued.

A Proposed Chesapeake Bay Water Quality Policy Council

Among the options considered and discussed through the course of the Chesapeake Bay Program, one additional mechanism emerged as being specifically appropriate and useful to this next phase of implementation. A Chesapeake Bay Water Quality Policy Council supported by three active, substantive committees, should oversee and manage the implementation of actions to bring one of the nation's most valued resources--Chesapeake Bay--back to full ecological health.

This institution will be charged to:

- maintain a strong role for the federal government and the affected states;
- mobilize and build upon existing laws and institutions;
- involve all appropriate institutions in specific activities in the most effective manner possible;
- set policy and make resource allocation decisions at the highest levels of government;

- o accommodate the diverse needs of the federal, state and local governments;
- o implement strategies to bring the basis of the findings of the Chesapeake Bay Program into day-to-day decisions;
- o provide a continuing forum for discussion and resolution of issues and disputes over policy affecting the ecological health of the Bay.

The Chesapeake Bay Water Quality Policy Council will be composed of senior gubernatorially-appointed officials from Pennsylvania, Maryland, Virginia, and the District of Columbia, the Chair of the Susquehanna River Basin Committee, and the Chairman of the Interstate Compact of the Potomac River Basin, and will be chaired by the EPA Region III Regional Administrator.

A charter should establish provisions directing the Council members to convene on a regular basis, no less than four times a year for at least its initial three years of existence. The charge to the Council calls upon it to engage in a maximum effort to make policy, develop and implement programs, practices and technology, and direct the allocation of resources necessary to restore and maintain the chemical, physical, and biological integrity of the Chesapeake Bay ecosystem.

The Council will be responsible for coordinating the work of appropriate federal and state agencies to carry out certain planning and implementation components of a Bay-wide effort to ensure adequate control of all sources of pollutants. Therefore, the EPA Regional Administrator would initiate cooperative activities with National Oceanographic and Atmospheric Administration, the Corps of Engineers, the Department of Agriculture and other federal jurisdictions affecting the quality of Chesapeake Bay. Likewise, senior regional, state and District of Columbia officials would coordinate and organize efforts of their respective counterparts to carry out mutually affirmative ends.

Three Committees to the Council

Three separate and related committees will underpin the Council:

1. The Management Committee will continue, and build upon the work already formulated through its existence of the past several years. It should consist of Council-appointed members, including directors of the water quality management and control agencies of the three states and the District of Columbia and the principal officials of other institutions with administrative regulatory, and/or enforcement authorities related to protecting Chesapeake Bay's waters and resources. The Committee's major purpose should be to advise and recommend to the Chesapeake Bay Water Quality Policy Council detailed strategies and actions needed to fulfill the goals agreed upon by the Council.

At the same time, this role ensures that the Council members are continually apprised of both the constraints to effective pollution control and evolving management and technical changes in the region's institutional structure which improve the capacity and performance of pollution control.

2. The Monitoring Committee will be responsible for: assessing compliance with pollution control requirements and achievement of objectives; providing information and recommendations for measuring the response by the whole Bay and parts of the Bay to control measures; and identifying emerging problems. Its purpose in carrying out these tasks would be directly tied to the program development and implementation activities of the Management Committee and the Council. Adequate and effective monitoring, as set forth in the recommendations included in the previous chapter, is mandatory to ensure continual assessment of and adjustment to Chesapeake Bay programs on management, regulation and enforcement, planning and research.

The Monitoring Committee should aspire to develop flexible tools and plans for responding to new issues and changing priorities as time progresses. The impact of monitoring activities is reliant on sufficient flow of information and insights among the principal water quality institutions and agencies. Therefore, the Monitroing Committee should provide data and findings to give program managers a systematic view of progress and problems in the existing strategies to affect the quality of the Chesapeake Bay. At the same time, the Committee should collect and analyze information that evaluates and makes known the need for new programs or major reorganizations of existing programs.

Finally, the Monitoring Committee should play a lead role in improving the quality of related techniques by recommending methods for baseline data collection, sample analysis, evaluation, and quality assurance. The objective is to increase the effectiveness of the performance of monitoring activities throughout the Bay by achieving greater consistency and quality among all institutions and facilities involved in monitoring the quality of Chesapeake Bay.

3. The Research Committee will be responsible for developing and carrying out demonstration and research activities that do not include monitoring and surveillance of the environmental quality of Chesapeake Bay.

One principal activity of the Research Committee should be to oversee the continual upgrading and refining of existing scientific research data (published and unpublished) and to, as is equally important, provide guidance on making this information widely available and accessible to the appropriate users and readers.

A second activity of the Research Committee should be to advise the Council on new research projects related to suspected or potential problems affecting Chesapeake Bay. Attention should focus on studying areas that appear to need to be better understood in order to devise certain steps for remedying or preventing water quality and related problems.

To assist in providing a scientifically-sound foundation for determining appropriate management and control strategies, the Research Committee should oversee the development and use of predictive models evaluating the effectiveness of various pollution controls of point and nonpoint sources discharging to Chesapeake Bay. Using results and insights from examining different scenarios, the Council could initiate steps such as new adaptations to existing programs, special demonstration programs in certain areas, or new broad-based programs.

The Research Committee should give full weight to recommending and providing direction to demonstration programs, particularly in the case of nonpoint source controls, that support and study the application of innovative technology and programmatic approaches to address Bay problems. Positive results and reasons for failures should be continually documented, collected, and disseminated in usable forms, in order to ensure the replication of improved pollution control methods in appropriate circumstances throughout the Bay.

The membership for all three committees should be drawn from appropriate federal, state and local governments, regional and interstate commissions, scientific and academic institutions, the private sector, and the public. The Management Committee is, in effect, already constituted.

Office of Chesapeake Bay Liaison

The Office of Chesapeake Bay Liaison has already been proposed to Congress as an entity to ensure the smooth transition of the Bay Program's information, computer capability, data collection, monitoring resources, and other developed tools to the region's policy makers and program managers. This office, if established, should provide support staff to the Chesapeake Bay Water Quality Policy Council and its committees.

It should be organized to provide executive secretariat support to the Management Committee; monitoring expertise and staff support to the Monitoring Committee; and related data collection and analytical support to the Research Committee. It also should play the principal role in involving and serving the public. A public information director should perform tasks related to making information readily and widely available on all aspects of efforts encompassed in the work of the Council, its Committees, and the Office of Chesapeake Bay

Liaison to ensure full-fledged public participation in all aspects of controlling pollutants related to the Bay. This function of the Office is also crucial to stimulating self-improvements and efforts among citizens to help clean up and abate pollution relating to the Bay.

DISCUSSION OF NEW MECHANISM

This option retains the best of the present successful system developed by the Bay Program's Management Committee and provides a forum on policy where issues can be raised, resolved and directed. The option focuses on implementing research and monitoring to focus on determining the effectiveness of control programs for the important purpose of determining additional needs and actions.

If after a trial period, the Policy Board does not function efficiently, or serious problems exist with state, local, regional, or federal implementation processes, the establishment of a new institution to coordinate Bay water quality and resources should be considered. Because the new institution in this alternative scenario would be a federally mandated entity, a joint Congressional-executive branch committee could be convened to further evaluate the new institution alternatives. However, if a new institution should be decided upon at some point in the future, that entity must be given adequate regulatory and enforcement authority to address the shortcomings determined during the course of the council's existence and operations.

The merits of the recommended Chesapeake Bay Water Quality Policy Council rests with the fact that its members already possess the capacity to synthesize and apply existing laws and institutions into an integrated, regional plan of action, mobilize all the necessary participants around the plan of action and assure that the plan is carried out. The combination of leadership from senior officials, technical and scientific expertise and staff support should enable the council to accomplish its purpose effectively and efficiently.

CONCLUDING CALL FOR ACTION

Through the proposal for a new institutional mechanism described above, all jurisdictions continue to share responsibility to deliver. Existing agencies and institutions are organized to better achieve the region's common purpose of

maintaining the ecological health of its prized estuary. Thus, the issuance of permits throughout all jurisdicions must be timely and equitable. They must cover a full range of pollutants and call for similar monitoring requirements. Similarly, construction grants must follow a priority scheme directed to maximize elimination of waste and installation and enforcement of pretreatment controls. Nonpoint source controls must be applied in a coherent and equitable fashion to begin the long-term task of abating the release of pollutants from these diverse and diffuse sources.

The Council is assigned basic responsibility to deliver all EPA oversight authority, state/EPA agreements, program grants, NPDES permit review, construction grants, planning grants, and technical assistance to the respective states in a manner calculated to clean up of the Bay on a cost-effective basis. The process set forth in this report suggests that the three states and the District of Columbia work together each year to devise their respective jurisdiction's objectives to most effectively help in the achievement of clean-up of the Bay. If significant disagreement develops, then the matter should be referred to the Administrator of EPA who shall meet with the appropriate governor or governors in order to achieve consistent, coordinated, and fair actions throughout the Bay. These highest levels of authority possess various forms of assistance and oversight to bring this national resource--the Chesapeake Bay--back to full ecological health.

Finally, the Bay will be protected only if there is accountability on the part of the region's leadership. Thus, it is recommended that every other year the governors of the Bay states and the Administrator of EPA meet in a public forum to review the state of the Bay, progress or regression in the two year interval between meetings, and summarize actions to be taken by each jurisdiction to further restore and maintain the Bay. Only with the governors' personal involvement will there be the sustained political resolve and dedication to accomplish the difficult tasks ahead.

More than anything else the Bay and its future require vigorous and fair implementation of existing laws. This can only be achieved if the public and private leadership along with the citizens of the surrounding states declare, act on, and renew periodically their support for full implementation of the laws and programs dedicated to saving and maintaining the Chesapeake Bay.