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The 1987 Chesapeake Bay Agreement: A Model of Intergovernmental and Multi-State Cooperation in Estuary/Coastal Resource Management

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ABSTRACT

The 1980s witnessed an increased awareness of the problems of estuary and coastal water pollution. The publication of the report "Wastes in Marine Environemtns" by the Office of Technology Assessment in April of 1987 and passage of the Water Quality Act (P.L. 100-4) in that same year served to focus greater attention on the problem of coastal pollution. The medical waste problems of 1988 heightened public awareness of this problem and showed that coastal pollution is not just isolated but rather is a regional problem which requires regional solutions.

During the 1980s the Environmental Protection Agency (EPA), and the States of Maryland, Virginia, Pennsylvania, and the District of Columbia worked together to forge two agreements, one in 1983, and more significantly a broader agreement in 1987, in which they agreed to work together to develop specific goals and objectives to address and solve the problems confronting Chesapeake Bay. These agreements are significant because the signatories recognized that the Chesapeake Bay's importance and problems transcend regional boundaries and they commited to managing the Chesapeake Bay as an integrated ecosystem. The 1987 Agreement established a framework for governance through the Chesapeake Executive Council and outlined 29 specific commitment strategies, and deadlines, to work towards the protection and restoration of the Bay's significant living resources. This landmark agreement established new initiatives and specific goals, deadlines and objectives for addressing key issues such as nutrient and toxic pollution, the decline of the bay's aquatic resources, population growth and land use. All objectives which will set the course of efforts over the next several years.

In testimony before the Senate Subcommittee on Environmental Protection such organizations as the Sierra Club, Natural Resources Defense Council, and the Chesapeake Bay Foundation acknowledge the 1987 Agreement as a "model"

agreement of multi-state and intergovernmental cooperation in addressing estuary and coastal resource management problems. Because the Agreement is not single objective oriented, but instead looks at addressing problems in the areas of water quality, population growth and development, living resources, public information and education, public access, and governance, it is a document designed to formulate a comprehensive integrated, ecosystem approach to solving and managing the problems and resources of this great estuary.

"The Chesapeake Bay is a national treasure and a resource of worldwide significance. Its ecological, economic, and cultural importance are felt far beyond its waters and the communities that line its shores. Man's use and abuse of its bounty, however, together with the continued growth and development of population in its watershed, have taken a toll on the Bay system. In recent decades, the Bay has suffered serious declines in quality and productivity."

(From the Preamble 1987 Chesapeake Bay Agreement)

"Coastal pollution, particularly near-coastal pollution in our estuaries, is one of the major environmental degradation problems we face in this country. I think it has to receive our highest priority and I think it has to receive the same kind of long-term commitment we talk about in relating to the Chesapeake Bay. The degradation exists not just on the East Coast but on the West Coast and the Gulf of Mexico as well. The kind of solutions we talk about to deal with coastal pollution are the very kinds of solutions we talk about for the Chesapeake Bay."

(Lee Thomas, Administrator of the Environmental Protection Agency)[1]

"Our Chesapeake Bay Agreement is a model. Our experience in developing and implementing the Agreement provides us with many lessons to share with other estuaries. It provides examples of regional cooperation. It provides lessons on how to apply scientific knowledge to practical public policy. It provides lessons on how to channel and manage growth. Perhaps most important, it provides lessons on how to build a concensus -- a consensus of public opinion and a consensus for action among federal, state and local governments."

(Hon. William D. Schaefer, Governor of Maryland)[2]

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INTRODUCTION

The evidence of the decline in the environmental quality of our estuaries and coastal waters has been accumulating steadily. The stress from nearly four centuries of human activity becomes more clear as coastal productivity declines, habitats and wetlands disappear, and our monitoring systems reveal a multitude of problems. The medical waste problems of 1988 served to heighten the public awareness of coastal or near shore water pollution and the need to act.

However, the assault comes from many directions. Despite passage of the Federal Water Pollution Control Act [P.L. 92-500] nearly two decades ago, large quantities of toxic and conventional pollutants continue to be discharged from the pipes of industrial facilities and wastewater treatment plants along our coasts. Runoff containing pesticides, herbicides, metals and nutrients flows from farms and city streets into our estuaries and bays. Numerous embayments contain contaminated sediments which poison local fish and shellfish and present risks to public health. Toxic air pollutants, nitrogen, and sulphur from power plants and automobiles are carried by the winds to these waters. Development of seaside condominiums and marinas contribute to the loss of valuable wetlands which help to absorb and purify stormwater.

The dimensions of coastal pollution was thoroughly documented in a report by the Office of Technology Assessment (OTA), Wastes in Marine Environments (April 1987). As indicated in the report the coastal pollution problem is a national problem and one which will require a cooperative effort to solve. As indicated by OTA the sources and impacts of pollution know no government jurisdiction or territorial boundaries. As a result, we should be rethinking our strategy in terms of an ecosystem or basin wide approach and our polution control efforts should expand their emphasis on coastal ecosystems as single units.

During the 1980's the Environmental Protection Agency [E.P.A.], the States of Virginia, Maryland, Pennsylvania, and the District of Columbia worked together to forge agreements in 1983, and more significantly, in 1987 to work together from a basin wide perspective to begin and address and solve the problems confronting Chesapeake Bay. The purpose of this paper is to review the 1987 Chesapeake Bay Agreement and show how it is an ecosystem model approach to solving estuary and near shore problems.

GENERAL DESCRIPTION

Chesapeake Bay is the largest estuary in the United States and biologically, one of the most productive systems in the world [E.P.A. 1983]. It is part of an interconnected system which includes a portion of the Atlantic Ocean and rivers draining parts of New York, Pennsylvania, Maryland, Delaware, and Virginia. The main bay and all of its tributaries compose the Chesapeake Bay System [E.P.A. 1982], see Figure 1.

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 encompases more than 2,500 square miles. That figure almost doubles when its tributaries are included. However, the bay is a relatively shallow body of water, averaging 28 feet in depth, making it very sensitive to temperature and wind.

The bay draws from an enormous 64,000 square-mile drainage basis [see figure 2]. Of the more than 150 rivers, creeks, and streams flowing through portions of the six states and the District of Columbia, and contributing freshwater to the bay, fifty are considered major tributaries. Eight of these fifty rivers contribute about 90 percent of the freshwater contained in the bay main-stem; they are the Susquehanna, Patuxent, Potomac, Rappahannock, York, James, Choptank Rivers and the West

FIGURE 1
The Chesapeake Bay

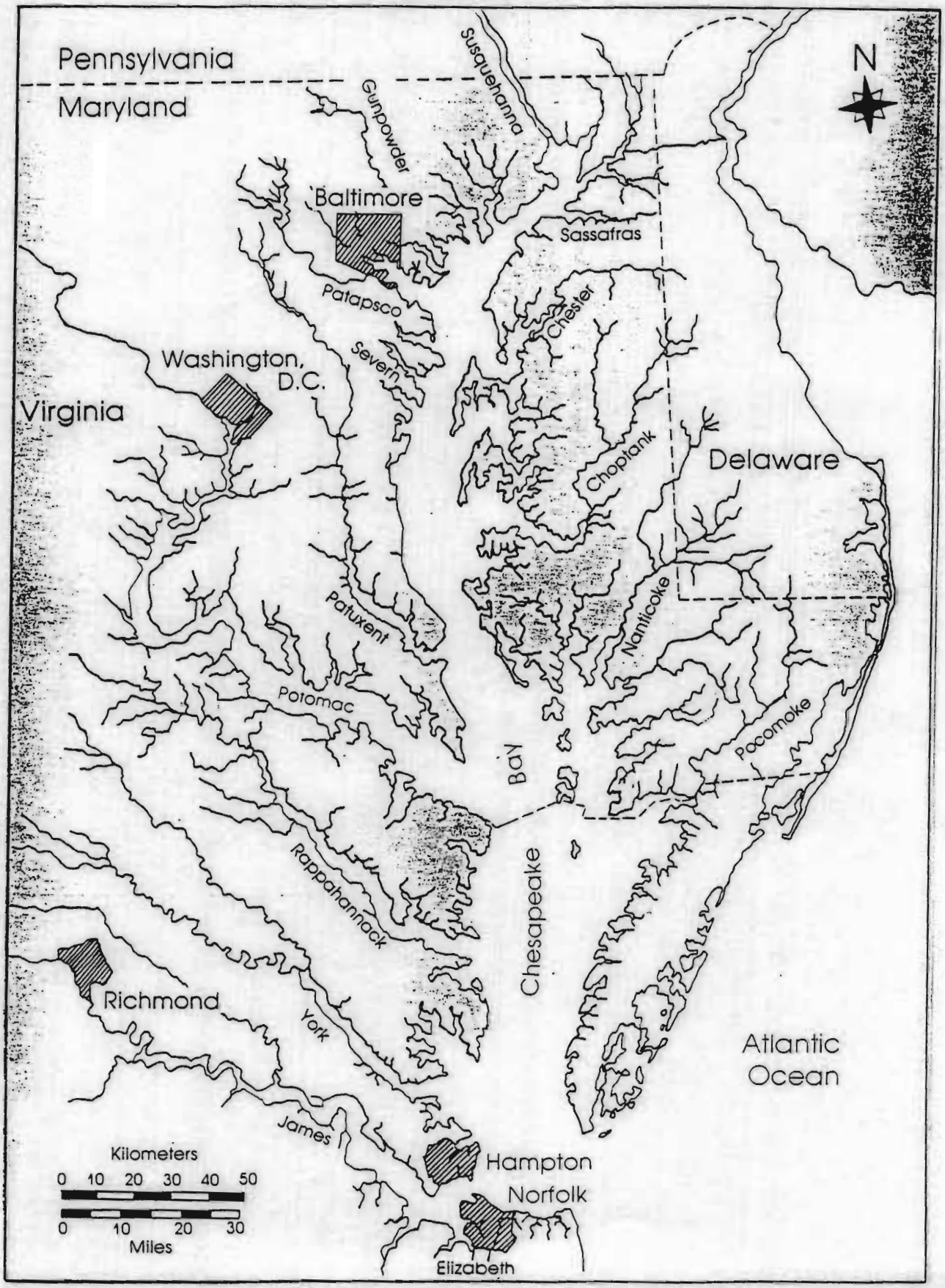
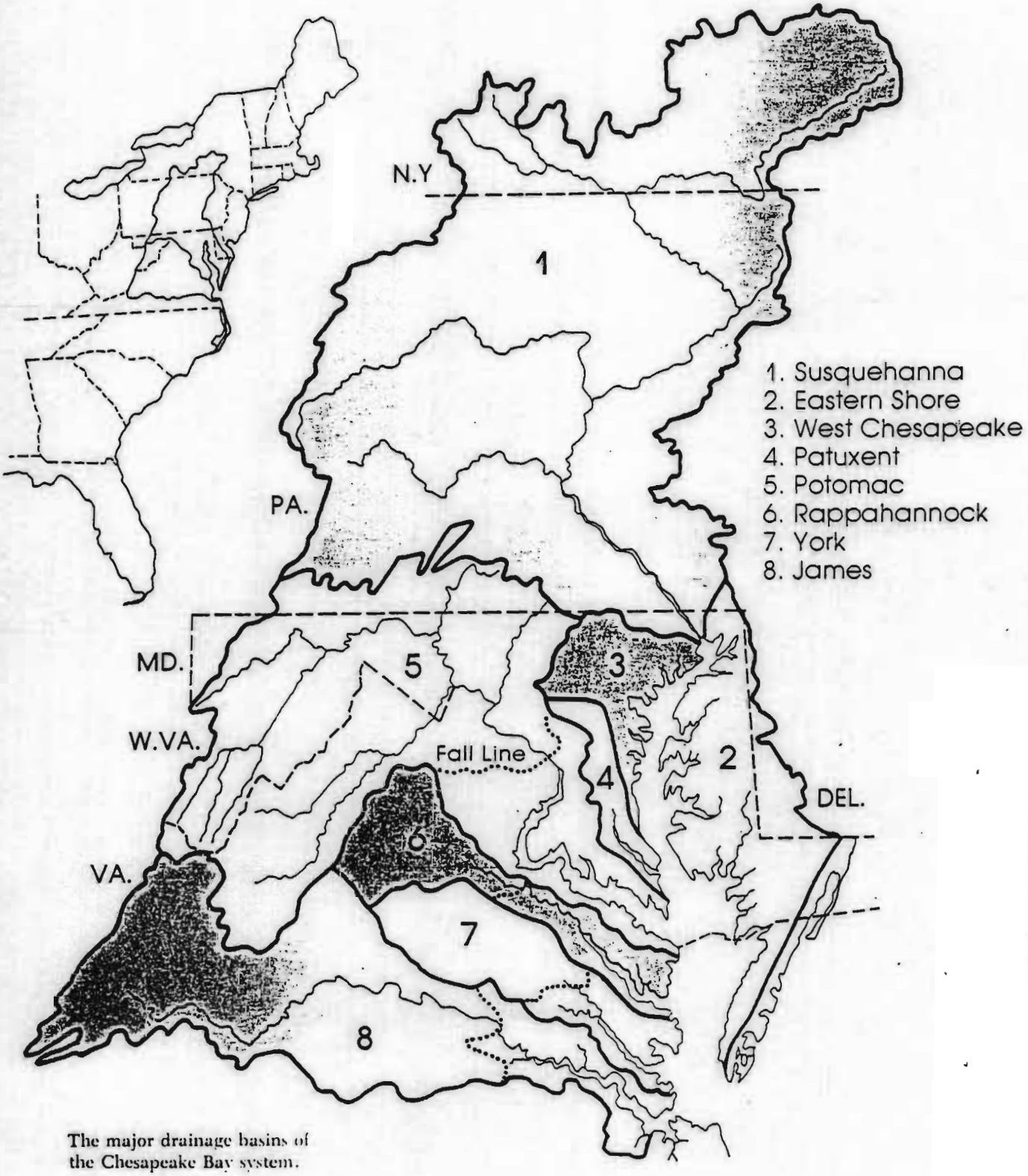


FIGURE 2
The Chesapeake Bay System



The major drainage basins of the Chesapeake Bay system.

Chesapeake Drainage Area. The Susquehanna is by far the largest river in the basin, discharging approximately 50 percent of the freshwater that reaches the bay. In addition, it has the highest freshwater discharge rate of any river on the East Coast of the United States with a mean annual rate of 40,000 cubic feet per second [E.P.A. 1983]. These eight major tributaries and the ocean shape the circulation and salinity characteristics of the estuary [NOAA 1985, E.P.A. 1989]. Thus, the way in which land is used and managed within each of the river basins largely determines the volume and chemical properties of the freshwater discharged to the bay.

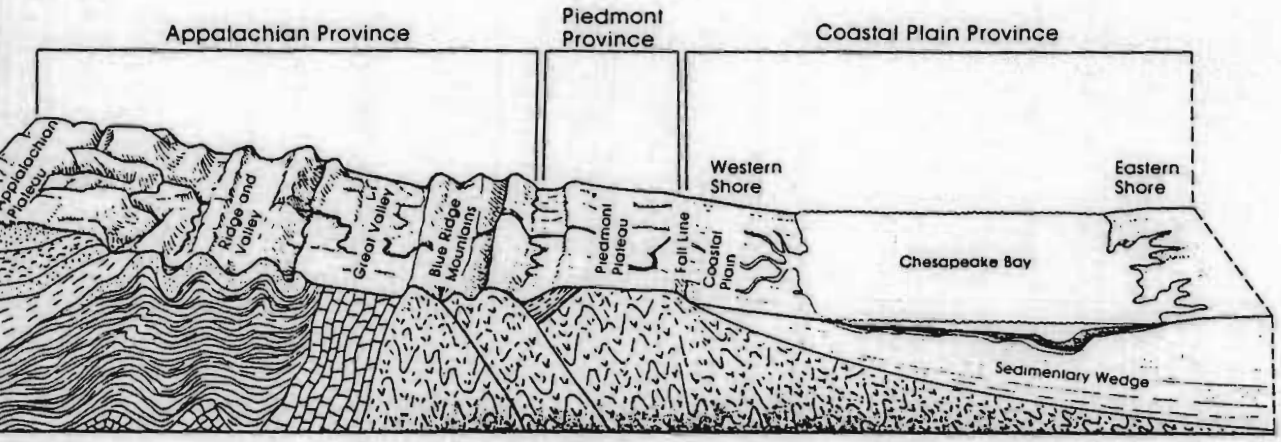
About eight thousand miles of shoreline testify to the Bay's intricacy. The tendrils of the bay, reaching far into the watershed, enable greater human access to the bay, and consequently, a greater opportunity for land uses to affect it. In addition, because shoreline areas are highly productive, the bay's exceptionally long shore line probably contributes significantly to the bay's productivity and biological diversity. The waters and shoreline of the bay are populated by more than twenty-seven hundred species of plants and animals. Even in its deteriorated state, the bay produces approximately fifty percent of the U. S. harvest of blue crabs and soft-shelled clams, and over twenty-five percent of the U. S. oyster harvest.[3] The bay and its shoreline support an extensive recreation industry, including swimming, fishing, hunting, and boating. The major

U. S. ports of Baltimore, Maryland, and Hampton Roads, Virginia, as well as, the cities of Washington, D. C., and Richmond, Virginia, are situated on the bay or its tributaries. Industry situated on the bay and its tributaries is vital to the economic health of the bay region.

Natural processes have subjected the Chesapeake ecosystem to unending modifications. In the Chesapeake's long history, beginning when sea level changes started to form it about 15,000 years ago, humans have only recently emerged as leading actors in this reshaping process. In geological terms, the Chesapeake is very young. The birth of Chesapeake Bay followed the most recent retreat of glaciers that once covered the North American Continent during the final part of the Pleistocene epoch. The melting glacial ice resulted in a corresponding rise in sea level that submerged coastal areas, including the Susquehanna River Valley and many of the river's tributaries. The complex of drowned river-beds now forms the basin of Chesapeake Bay and its tributaries.

The bay proper lies within the Atlantic Coastal Plain, a relatively flat, low land area with a maximum present elevation of about 3000 feet above sea level. The Coastal Plain 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 [E.P.A. 1983], see figure 3. The fall line forms the boundary between the

FIGURE 3
CHESAPEAKE BAY GEOLOGICAL FORMATION



Source; Chesapeake Bay Program; "Findings and Recommendations," September 1983 Page 7.

Piedmont Plateau and the coastal plain. Waterfalls and rapids clearly mark this line where the elevation sharply increases because of erosion of the soft sediments of the coastal plain. Cities such as Fredericksburg and Richmond, Virginia; Baltimore, Maryland, and Washington, D. C. have developed along this fall line for reasons that include the limits of navigability, the abundance of freshwater, and the water power potential of the falls and rapids.

The Chesapeake's shoreline has undergone constant modification by erosion and by the transport and deposition of sediments. Areas of strong relief, like peninsulas and headlands, are eroded and smoothed by currents, tides, and storms, and the materials are deposited in other areas of the bay. Seediments carried by a river are left on the floor of the bay and major tributaries, depositing mud and silt. Grasses and other plants 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.

SUBMERGED AQUATIC VEGETATION [SAV]

The Chesapeake Bay is a highly interactive ecosystem consisting of a complex web of living and non living resources. One of the key components of this system is the group of grasses known as submerged aquatic vegetation [SAV]. Commonly called,

"sea grasses," SAV is much more biologically productive that its landbound equivalent, grass meadows. While providing food and cover for many organisms, SAV also recycles nutrients and aerates the water, functioning as a critical link between the physical environment and the bay's organisms. It is a linkage that makes SAV, more than any other single group of plants or animals, a prime biological indicator of the health of the bay.

SAV, unlike other wetland plants, must be entirely submerged in water in order to thrive. SAV species can generally grow from the limit of low tide to a depth of approximately 9 feet in clear water [E.P.A. 1985]. Below this light levels are generally to diminished for adequate photosynthesis to take place. Although SAV may appear as a mass of weeds growing in the water, its importance in maintaining the ecological balance of the bay ecosystem cannot be overstressed. Not only is SAV the primary food source for several species of waterfowl, it also provides habitat for many other organisms. Some species use SAV as substrate, either growing on its leaves or depositing eggs on leaf surfaces. The abundance of a variety of lower level organisms within the SAV beds attacts higher level predators such as crabs, cow-nosed rays, and several types of fish to forage for food. Loss of SAV, in recent years, may be partially responsible for decreases of some fish species.

In addition to providing habitat, SAV interacts with the physical environment in ways which assist in the cleansing of bay

waters. Nutrients are taken up during the spring and summer growing season and slowly released by decomposition for use by other organisms in the fall when there are lesser quantities of nutrients in the water. SAV aerates the water through the release of oxygen as a by product of photosynthesis. Plant roots bind and stabilize the bottom sediment while the leaves buffer the energy of incoming waves, reducing shoreline erosion. Sediment suspended in the water is able to fall to the bottom in this reduced wave energy environment, resulting in clearer water.

There are 10 Species of SAV commonly found throughout the Chesapeake Bay and its tributaries with another 10 found less frequently [Table 1]. The distribution of these species is related to several variables including salinity, water clarity, composition of the bottom substrate, temperature, pH, and the availability of nutrients. In the lower zone of the Bay where salinity levels are high, eelgrass and widgeongrass are the two dominant species for waterfowl. The less saline mid bay is dominated by a greater variety of plants including redhead grass, sago and horned pondweeds along with widgeongrass and an introduced species, Eurasian watermilfoil [E.P.A. 1982]. The upper Bay with tidal freshwater has an even greater variety of submerged aguatic vegetation.

Along with natural variables controlling SAV distribution and abundance a new set of factors have been superimposed in

Table 1. SPECIES ASSOCIATIONS OF SAV IN CHESAPEAKE BAY AND ITS TRIBUTARIES BASED ON THEIR SALINITY TOLERANCES AS WELL AS THEIR CO-OCCURRENCE WITH OTHER SPECIES (COMMON NAME OF EACH SPECIES GIVEN IN PARENTHESIS)

Group 1	Group 2	Group 3
Ceratophyllum demersum (coontail)	Myriophyllum spicatum (Eurasian watermilfoil)	Ruppia maritima (widgeon grass)
Elodea canadensis (common elodea)	Potamogeton pectinatus (sago pondweed)	Zostera marina (eelgrass)
Najas guadalupensis (southern naiad)	Potamogeton perfoliatus (redhead grass)	
Vallisneria americana (wildcelery)	Ruppia maritima (widgeon grass)	
	Vallisneria americana (wildcelery)	
	Zannichellia palustris (horned pondweed)	

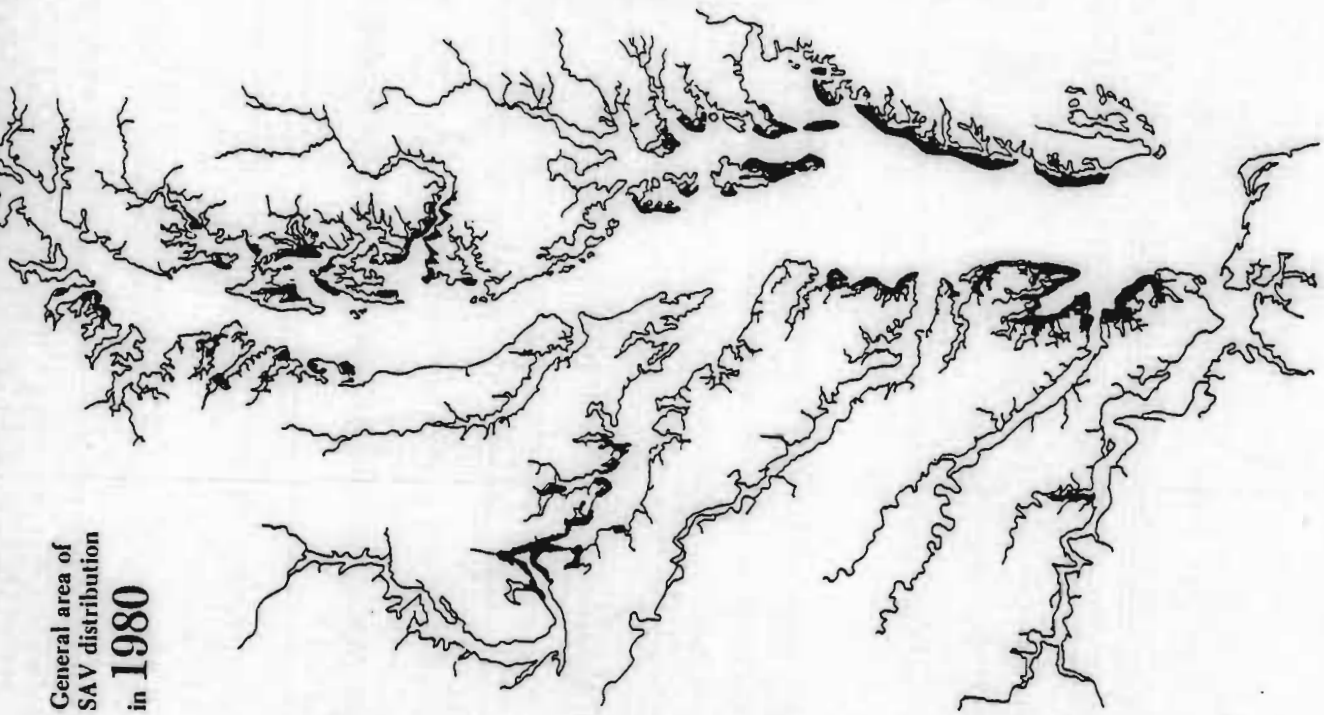
One of the main elements of the SAV program was to examine the current distribution and abundance of submerged grasses in Chesapeake Bay using aerial photography to map the vegetation. In addition, the historical record of aerial photography was examined for recent evidence (less than 40 years) of alterations in SAV abundance, and a biostratigraphic analysis of sediment was performed to detect evidence of longer term (greater than 40 years) alterations in the abundance or species composition SAV beds in several locations within the Bay. A comparison was made to answer basic questions on the magnitude of the present decline of SAV as compared with documented historic declines, and to determine whether the curent decline was part of a natural cycle or a decline attributed to recent non-cyclic perturbations.

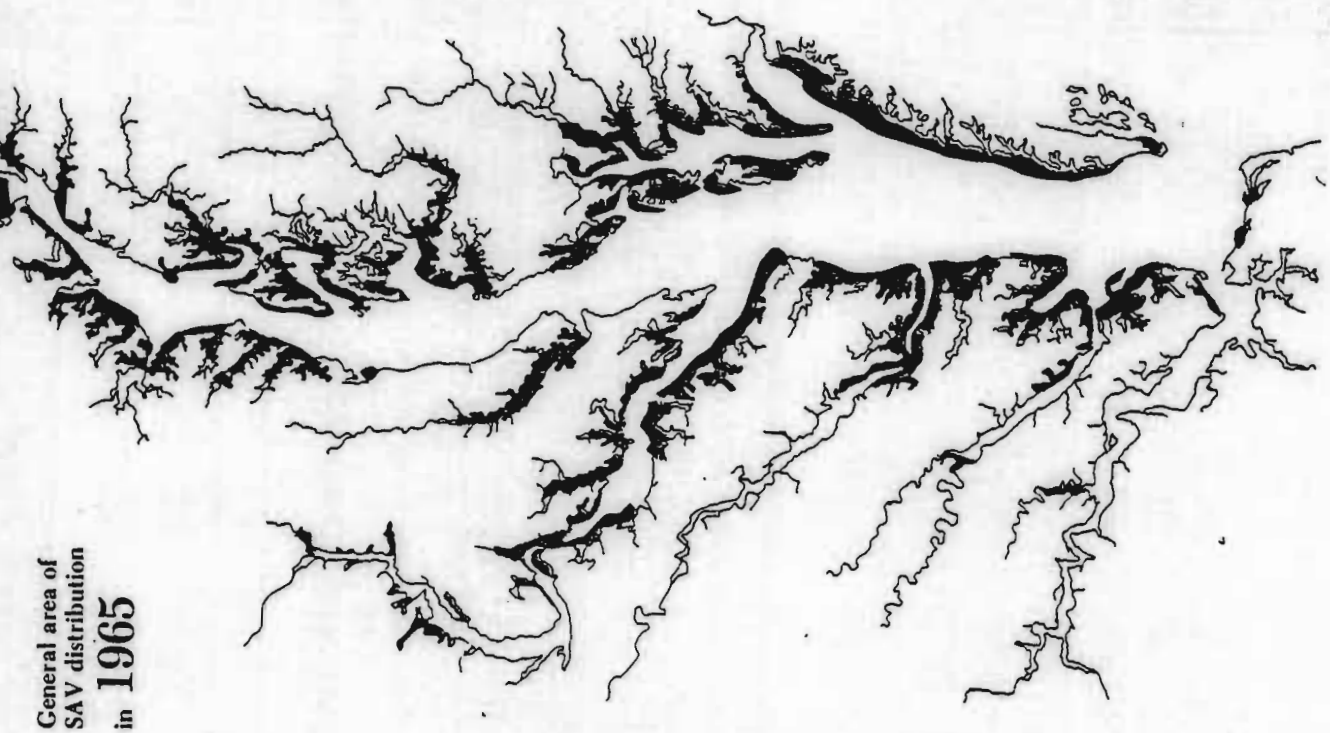
Source: Chesapeake Bay Program, "Technical Studies: A Synthesis," September 1982, page189.

recent years. These factors are due to changes induced by man; increased nutrient discharges resulting in overabundance of plankton and increased sediment input, causing decreased water clarity. In addition, other potentially important factors include farm chemical runoff and the introduction of foreign plants which may overwhelm native species.

Historically, SAV covered hundreds of thousands of acres throughout the Chesapeake Bay. As recently as 1965, Bay grasses were prolific. By the late 1970s and early 1980s, however, many changes brought on by man in addition to hurricane Agnew overcame the ability of SAV to adapt and SAV acreage plummeted drastically [Figure 4]. The 1982 E.P.A. Report implicated excessive nutrients and sediments as the two primary causes of decline. Recent information about the abundance of SAV in the Bay has indicated that some recovery of the populations may be occurring. Figure 5 shows graphs of SAV abundance for 1978 and 1984-86. While the upper bay has shown minor improvement through time, there has been a substantial increase in coverage in the lower bay. The mid bay decreased dramatically from 1978 to 1984 but showed remarkable recovery through the next year with and increase in coverage of 389 percent. Scientists are analyzing the data on an annual basis in an effort to decipher how much of the year to year change is due to uncontrollable factors such as climate and how much is a function of remedial efforts to clean up the bay.

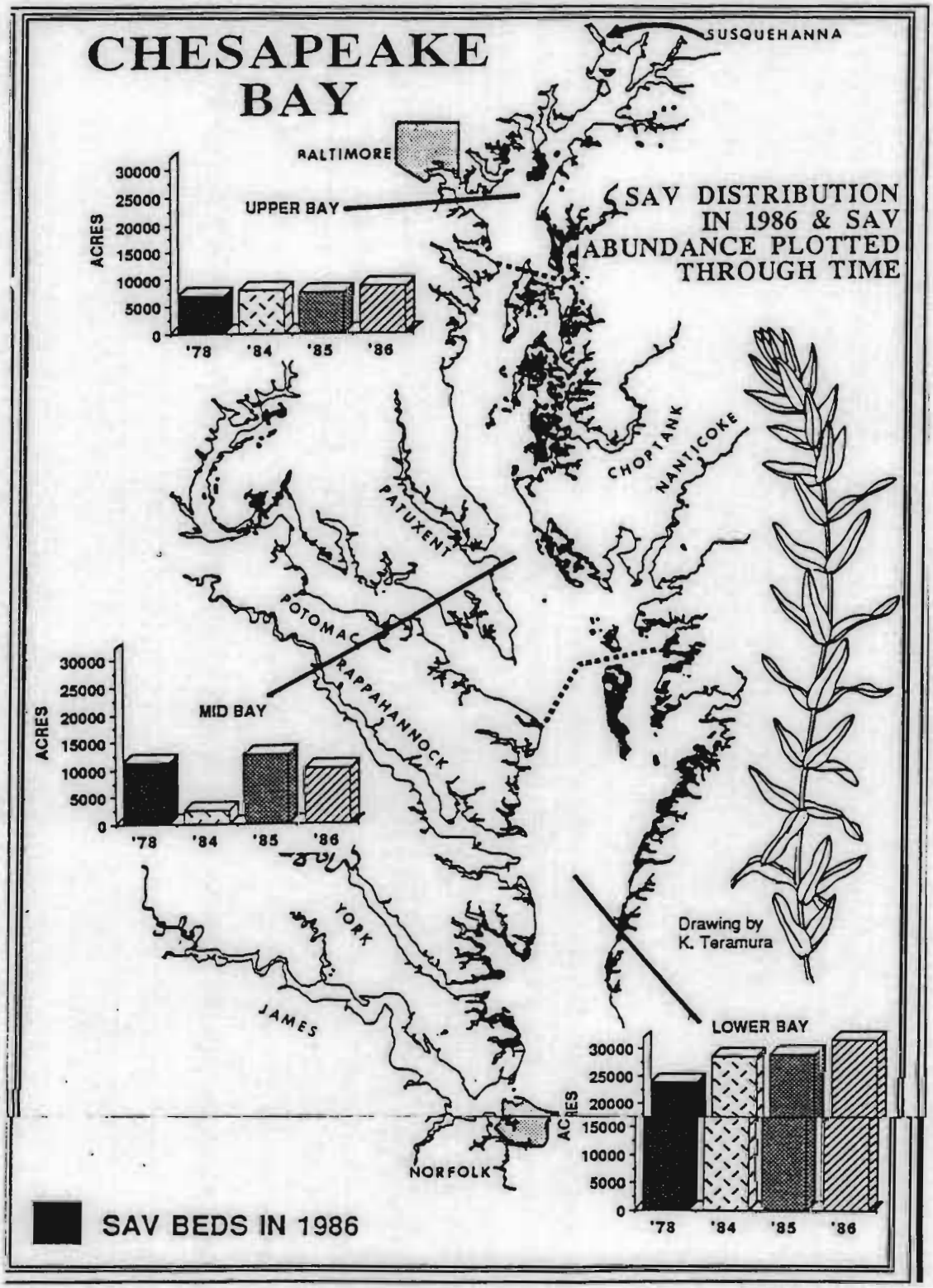
FIGURE 4





Source: Chesapeake Bay Program, "Findings and Recommendations," September 1983 Page 20.

FIGURE 5



Source; Chesapeake Bay Program, "Bay Barometer Series," September 1987

The monitoring of SAV populations along with studies designed to determine the complexities of SAV decline should yield information that will assist in making proper management decisions to nuture the recovery of SAV and water quality in the bay.

THE PROBLEM

The Chesapeake was first settled by the Susquehannock and other Indians over four hundred years ago [E.P.A. 1983]. Since the early colonial days the bay region has supported a number of regional interests and economic needs. Today the region supports virtually every type of Economic activity and land use, from various industrial operations to agriculture. Scientists have documented the slow evolution of the bay over the decades as the estuary has attempted to adapt to the demands of an increasing population in the drainage basis. Since 1950, these demands have been dramatically reflected in the deteriorating conditions of the bay.

The watermen of the Chesapeake Bay, fishermen who depend on the Bay's harvest for their livelihood, first alerted the federal government to the Chesapeake's plight. The watermen encountered firsthand evidence of the bay's deterioration, in particular, decreasing yields of shellfish and freshwater-spawning fish. Maryland Senator Charles Mathias spearheaded political action on the bay. Following a 1973 tour of the bay he

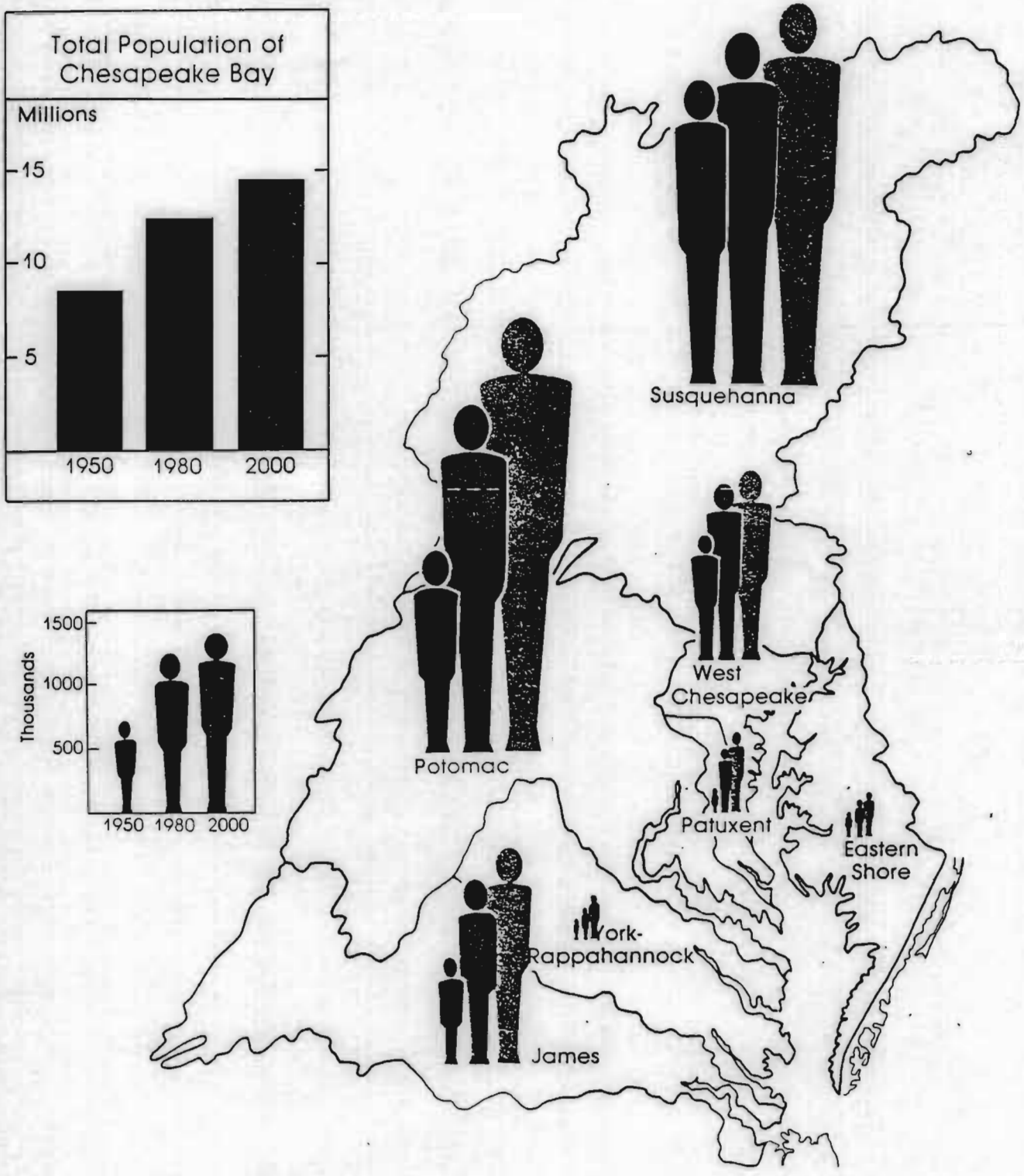
approached E.P.A. and Congress with the watermen's concerns [E.P.A. 1983]. Congress responded by directing E.P.A. to study the bay.[4]

In 1976, E.P.A. began five years of research to identify and study the ecological problems of the Chesapeake Bay. E.P.A. focused on three problems; the loss of submerged aquatic vegetation, increases in concentrations of toxic chemicals, and nutrient enrichment. In the course of the study, E.P.A. compiled an extensive inventory of the sources of nutrients and toxics, and developed mathematical models to replicate pollutant transport within the estuary. Research was completed in 1981, and conclusions and recommendations developed during 1982 and 1983. E.P.A. identified four major social phenomena that they considered to be contributing to the bay's deterioration; population growth, increased urbanization, intensified agricultural activity and wetland loss.[5]

The Chesapeake basin's population grew from 8.5 million in 1950 to over 12.7 million in 1980; additional population growth of 1.9 million is projected by the year 2000.[6] During the last thirty years, conversion of agricultural lands to residential, urban and surburban areas has accelerated.[7] While such areas constitute less than fifteen percent of the land in the bay's watershed, this represents and increase of 182 percent since 1950.[8] The combination of population growth and urban development has caused increased wastewater discharge from both

FIGURE 6

Comparisons of Chesapeake Bay populations in 1950 and 1980 to the projected population for the year 2000.



Source: Chesapeake Bay Program, "A Framework for Action," September 1983, Page 11.

municipal wastewater treatment plants and industrial sources. Point source discharges have caused increased concentrations of toxic organic compounds and metals in bay waters and bottom sediments, particularly in areas of concentrated industrialization, such as along the Elizabeth in Virginia and the Patapsco River in Maryland.[9]

Although the amount of agricultural land in the bay region has decreased over the last three decades, agriculture has had an increasingly adverse effect on the bay because of major changes in the manner of cultivation.[10] Land is being farmed more intensively, with increased use of fertilizers, pesticides, and herbicides, while basic soil conservation techniques are being neglected in order to harvest more quickly and efficiently. Pesticides, herbicides, nutrients from fertilizers, sediment and animal waste enter the bay as agricultural runoff, a form of nonpoint source pollution.

Although wetlands along the bay and its tidal tributaries were disappearing at an alarming rate during the 1960s due to agricultural drainage, commercial and residential development, and dredge and fill activities, federal and state legislation enacted in the early 1970s has substantially diminished the rate of loss.[11] However, the federal and state legislation does not apply to nontidal wetlands, and therefore an absolute decline in the remaining tidal and nontidal wetlands continues.

The E.P.A. studies have documented the serious impact of increased nutrient and toxic chemical discharges from point and nonpoint sources on the bay's waters and sediment quality and on the vitality and abundance of its living resources. E.P.A. findings not only verified what was already suspected, but also warn that unmanaged future growth and development will compound the problem. E.P.A. provided a prescription for the bay's ills;

> "First the bay ecosystem must be understood; then patterns of growth must respect the capabilities of the bay's system to assimilate human pressures and, finally, areas and resources which are particularly vulnerable must be ardently protected through controlling pollution." [12]

THE CHESAPEAKE BAY CONFERENCE

In December of 1983, seven hundred legislators, administratorsd, scientists, and bay users met at the "Governors' Summit" in Fairfax, Virginia. The purpose of the conference was to convert a consensus that the bay must be saved into a concensus on a strategy to save it.

During the previous summer, five workshops had convened to formulate policy recommendations regarding habitat management, land activities, water activities, fisheries management, and monitoring. The workshop recommendations served as the conference working papers. Workshop chairmen and committee members from Maryland, Virginia, and Pennsylvania represented the scientific community, government, academia, industry, agriculture, and public interest groups. The workshops examined

existing programs, policies, laws, and regulations in view of emerging scientific information on the condition of the bay.

At the conference, the Governors of Virginia, Maryland, and Pennsylvania, and the Mayor of Washington, D. C., and the Administrator of E.P.A. announced their "Action Agendas" for the bay. In a joint statement, these leaders committed themselves to "a historic joint initiative for the protection and enhancement of the Chesapeake Bay and its living resources." The joint initiative culminated in the Chesapeake Bay Agreement of 1983. Under this agreement, a Chesapeake Executive Council composed of designates of the State Governors, the mayor of Washington, D.C., and the E.P.A. Regional Administrator, are to meet twice yearly to review the progress of bay programs, and to report annually to the Agreement's Signatories. The Agreement directed the Council to establish and Implementation Committee and a liason office [Appendix 3]. The implementation Committee is to meet as needed to coordinate technical efforts and management plans. The liaison office, established at E.P.A.'s Central Regional Laboratory in Annapolis, Maryland is to advise and support the Council and the Committee. The Chesapeake Bay Conference marked the end of the E.P.A. directed research phase and the beginning of a coordinated, visible assault on identified problems. It was significant on two counts. First, it facilitated a concensus among scientists, government managers, and private citizens that

the bay needs remedial attention. Secondly, substantial progress was made toward a multi-faceted agenda of initiative to restore the bay.

THE 1987 BAY AGREEMENT

The 1983 Agreement was a crucial first step in committing the signatories to a cooperative approach to fully address the extent, complexity, and sources of pollution entering the bay. In additional is also laid the organizational groundwork through the formation of the Chesapeake Executive Council, an Implementation Committee, and the E.P.A. Liaison Office, for a basin wide approach to a restoration program. However, by 1987 it was apparent that a more broader based agreement with specific goals and objectives was necessary. The passage by Congress of the Water Quality Act of 1987 [P.L. 100-4] in February of 1987 and the statutory authorization of the Chesapeake Bay Program under Section 117 of the statute provided further incentive to establish a broader agreement. As a result on December 15, 1987 Virginia Governor, Gerald L. Baliles, Pennsylvania Governor, Robert P. Casey, Maryland Governor, William Donald Schaefer, District of Columbia Mayor, Marion Barry, Kenneth J. Cole, Chairman of the Chesapeake Bay Commission, and for the Federal Government, Lee M. Thomas, Administrator of the U. S. Environmental Protection Agency signed the broad based 1987 Chesapeake Bay Agreement. This Agreement goes well beyond the 1983 Agreement, listing specific goals, objectives and 29

specific committments in six important categories: Living Resources, Water Quality, Population Growth and Development; Public Information, Education and Participation, Public Access, and Governance. This landmark agreement has resulted in the establishment of new initiatives and specific deadlines for addressing key issues such as nutrient and toxic pollution, the decline of the bay's aquatic resources, population growth and land use, all objectives which will set the course of efforts in the years ahead.

Among the 29 committments is the challenging assignmeent of reducing levels of nitrogen and phosphorus reaching the bay by 40 percent by the year 2000. A basin-wide strategy to reach that target was adopted in July of 1988. More than a dozen other committment plans, policies or strategies were developed in 1988 and subsequently approved by the Chesapeake Executive Council. These included strategies to control or reduce toxic and conventional pollutants, a wetlands protection policy, and development policies and guidelines. It is not possible within the scope of this paper to discuss all of the strategies being developed under the 1987 Agreement, but rather to focus on some of the key issues to try and show how the Agreement is working as an intergovernmental tool to address some of the more significant problems confronting Chesapeake Bay.

WATER QUALITY; NUTRIENT REDUCTION

Two basic elements of maintaining and restoring the Chesapeake Bay, as well as, other estuaries in the Nation are evident; [1] maintaining and protecting the chemical quality of water essential to support the Bay's biological resources, and [2] maintaining and protecting the critical physical watershed of the estuarine system, including its tributary rivers.

The chemical water quality in the bay and its tributary rivers essential to the support of the bay's biological resources is characterized by numerous parameters: dissolved oxygen, chloride levels, pH, suspended solids and turbidity inorganic and organic nutrients, including particular and dissolved plant detrital material, and toxic metal and organic compounds. Water quality investigations and living resource assessments conducted by the E.P.A. and the states since before 1970 have demonstrated that the Chesapeake Bay ecosystem is deteriorating, and that high levels of nutrient imputs are a major cause of these trends. Excessive amounts of nutrients, primarily phosphorus [P] and nitrogen [N], continue to enter the Chesapeake Bay system from a variety of sources: municipal and industrial point source discharges, nonpoint source runoff from agricultural and urban areas, and atmospheric deposition. Scientific research, monitoring, and modeling now relate these excessive levels of nutrients to many of the Bay's water quality and living resource problems. Excess nutrients promote excess levels of algae, which

in turn cause problems of aesthetics, low dissolved oxygen levels, reduction in the amount of light reaching submerged aquatic vegetation, and shifts to algal species that do not support desirable aquatic life.

As already indicated the centerpiece of the 1987 Agreement is the Water Quality Committment to reduce by 40 percent nutrient pollution to the bay by the year 2000. The Baywide Nutrient Reduction Strategy adopted in July of 1988, calls for a 40 percent reduction in the "controllable" loads of both nitrogen and phosphorus to the bay by the year 2000. Controllable loads refer to sources such as discharges from municipal and industrial plants, cropland, pasture and feedlot areas that have already been treated with best management practices [BMP], and urban runoff. Not counted are sources of nutrients that are difficult to control: Atmospheric deposits, groundwater flows, and sediment fluxes.

The burden for achieving the 40 percent reduction has, for the time being been accepted evenly; that is, each jurisdiction is working to achieve a 40 percent reduction within its boundaries. The strategies developed by the states and the district, which are part of the overall bay plan, share many similarities on the surface, but are quite different in content. Amoung the similarities, each jurisdiction's strategy includes:

- an estimate of a baseline nutrient load from which the 40 percent reduction will be measured. The baseline includes 1985 point source loads of nutrients and nonpoint source loads during a year of average percipitation.

- a description of nutrient control measures undertaken since 1985 and an estimate of how much nutrient reduction has already been achieved.

- a listing of measures either now underway, or expected to be underway between now and 1991 and an estimate of further reductions that are anticipated by that time. The year 1991 is the date set in the agreement for a bay wide re-evaluation of progress toward the 40 percent goal.

- an outline measure that will likely be undertaken beyond 1991 to reach the year 2000 target of a 40 percent reduction.

Beneath the surface similarities, the individual strategies of the states and the district differ when it comes to specific details and proposals for nutrient reduction. In the long run, such differences may be unimportant as long as each jurisdictions finds some way to meet the 40 percent reduction goal. Some jurisdictions appear to be further along the road to meeting this goal than others. Most everyone is in agreement that reducing nutrients by 40 percent won't be an easy task for anyone. While significant progress has been made on reducing phosphorus levels, much work still lies ahead, and nitrogen reduction looms as an even more vexing problem. Yet it is also seen as encouraging that the states have committed to the 40 percent target and are now making sincere efforts to meet that goal.

SPECIFIC PROGRAMS

The following are brief summaries from the Baywide Nutrient Reduction Strategy of the strategies developed by each of the Bay States and the District of Columbia.

The State of Maryland is focusing attention initially on removing nutrients from several major sewerage treatment plants, including the Back River plant near Baltimore and several plants along the Pawtuxet River. Currently many of these plants are under a legal mandate to implement stringent phosphorus control measures. A committment of state funding has been made to assist in this work and additional federal dollars will be sought. State officials anticipate that technological and design factors will encourage plant operators to adopt measures to control nitrogen as well as phosphorus.

Maryland's nonpoint efforts are directed at agricultural and urban sources of nutrients. The focus has been on implementing agricultural best management practices [BMP] and controlling urban stormwater runoff.

The State of Virginia has built much of its nutrient reduction strategy around a new state regulation that calls for a phosphorus limit of 2 mg/1 within three years of permit modification at all major treatment plants and industrial discharges. According to state estimates, 16 of the 22 major municipal treatment plants east of the geographical fall line will need to upgrade facilities to meet this requirement. As an

incentive for those plants to also adopt nitrogen control, the regulation allows four years for making necessary improvements if both means of control are implemented. However, as in Maryland, there is no mandate forcing plant operators to control nitrogen.

As for nonpoint controls, Virginia's nutrient strategy proposes to add more than two dozen additional state staff positions by 1991 in order to bolster programs aimed at controlling sediment loss at urban sites and the use of fertilizer in agricultural areas. Virginia will also be working to improve its efforts to educate homeowners about the proper use of lawn fertilizers and pesticides.

Pennsylvania, which since 1970 has had a 2 mg/1 limit on phosphorus discharges from any facility that discharges over one million gallons per day in the lower Susquehanna River basin, and will place great deal of emphasis on solving persistent problems of permit violations at those facilities. While the regulations have so far reduced point sources through improved compliance, but at a high cost estimated at $350 million according to state officials.

Overall, including both point and nonpoint sources, tighter compliance would account for 5 percent of the 40 percent phosphorus reduction required by the agreement, meaning that significant reductions will also be needed from nonpoint sources of phosphorus.

In order to achieve nitrogen reductions, Pennsylvania's nutrient strategy opts for the time being to depend on nutrient management and other nonpoint controls. However, Pennsylvania's strategy proposes to re-evaluate that policy in 1991, depending on the results of nonpoint program efforts, to determine whether nitrogen removal is needed at point source facilities.

The District of Columbia pens its strategy for nutrient reduction largely upon the operation of the huge Blue Plains treatment plant, which also handles wastes from Maryland and Virginia. Blue plains has already achieved a remarkable 98 percent reduction in phosphorus levels. However, nitrogen removal is a considerable more sensitive issue. While no plans exist to implement nitrogen removal, D. C. officials have agreed to examine new technologies in the coming years to evaluate their cost effectiveness and applicability at Blue Plains.

D. C. Officials are also in the process of completing the first phase of a program that will reduce nitrogen levels from combined sewer overflows by 20 percent and phosphorus levels by 55 percent. Programs to address surface runoff from urban streets and parking areas are less promising; current efforts are projected to amount to only a 6 percent reduction in these sources by the year 2000. The District is currently evaluating alternatives to increase the effectiveness of the urban runoff program.

Basically the goal of the Basinwide Nutrient Reduction Strategy is to equitably achieve by the year 2000 target loads for phosphorus and nitrogen using a mix of control programs: some underway, some planned, and some yet to be developed implemented by cooperating independent jurisdictions. The Strategy adopted in July of 1988 cannot possibly forsee events of the mid 1990s and select the best course of action for current or new programs for that time. Therefore, the Strategy was developed using a phased approach [see Appendix IV].

PROGRAM CONSIDERATION

Environmental Groups such as the Sierra Club, Environmental Defense Fund and the Chesapeake Bay Foundation in testimony before Congress feel that the Nutrient Reduction Strategy provides an ambitious framework and program to attempt and reduce nutrient pollution to the Bay by 40 percent by the year 2000. However it is unclear if the program in the strategy will go far enough. To take the 40 percent reduction goal seriously and to assure the implementation of the Agreement these groups feel that several other events must also take place.

First and foremost it is felt that the Nutrient Reduction Strategy will have to develop uniform and enforceable water quality standards throughout the Chesapeake Basin. Under section 303 (c) of the Clean Water Act, all states have adopted, and every three years must revise, water quality standards for their fresh and estuarine waters. The E.P.A. has to approve these

standards which are supposed to be set and progressively strengthened to attain the goals and objectives of the Clean Water Act, including protection of aquatic life. These standards consist of designated uses for particular waters - portable water supplies, aquatic life, and contact or noncontact recreation - and numerical or descriptive criteria for water quality parameters appropriate for those uses. While the Clean Water Act's primary emphasis is on restricting effluent discharges from point sources through technology based permits limits, state water quality standards can be used to justify controls in a number of Clean Water Act programs.

All states have numerical criteria for dissolved oxygen and PH for surface waters designated for aquatic life, as well as other uses. Many states have descriptive criteria for the major nutrients, nitrogen and phosphorus. However, few states have set specific numerical criteria for nitrogen or phosphorus compounds or for nutrients as a whole. To provide a strong legal basis to accomplish the reduction in total nutrient loading that the signatories to Bay Agreement are proposing, and to control discharges of both nitrogen and phosphorus from point and nonpoint sources, the Chesapeake Bay states must first adopt numerical water quality criteria for phosphorrus and nitrogen pursuant to section 303 (c) of the Clean Water Act to assure protection and propagation of indigenous aquatic plant and animal

life. Adoption of such standards under section 303 (c) of the Clean Water Act provides a clear legal framework for their enforcement. The establishment of such standards certainly would have an economic impact. However, the process of attempting to establish such standards would provide a significant political and economic benchmark to determine the actual degree of committment by the bay states and District of Columbia in addressing the problems confronting the Chesapeake Bay.

A second important step which needs to be taken in order to meet Bay and tributary nutrient standards is to identify all sources of these nutrients in the Bay watershed and control them to a point where standards will be attained. As a practical matter the major problem is nitrogen. Phosphorus can be controlled effectively, through phosphate detergent bans, as implemented in Maryland and Virginia, and by removing it from effluents of publically owned treatment works (POTWs). Nitrogen on the other hand poses greater difficulty. There are four major sources of nitrogen in the Chesapeake Bay watershed; sewerage treatment plants, commercial fertilizers, animal wastes, and atmospheric inputs. The first three are also major sources of phosphorus (EPA 1983).

While most attention has been paid to municipal sewerage treatment plants and commercial fertilizers as sources of nitrogen, atmospheric inputs in the form of wet desposition of nitrogen; acid rain, and dry desposition are considerable and can

result in significant stimulation of phytoplankton production in estuarine or marine waters. As a result an effective nutrient loading reduction program for the Chesapeake Bay system must include reductions in atmospheric sources of nitrogen, as well as sources of nitrogen from POTWs, agricultural and lawn runoff, and animal waste. To this end, the Chesapeake Bay Agreement signatories should adopt an atmospheric deposition standard for nitrogen set at a level that will help attain the bay's nitrogen standard as well as protect terrestrial and water supply resources. With such a deposition standard in place the signatories would then have in place a legal basis for implementing programs designed to limit nitrogen from all sources. However as has recently been seen in talks over the reauthorization of the Clean Air Act establishing such air deposition standards will not be easy for the Bay States or for EPA on a national level.

If the signatories are sucessful in adopting appropiate numerical water quality standards for nitrogen and phosphorus, as well as an atmospheric nitrogen deposition standard, then they must finally develop and implement programs to reduce discharges of nutrients from all of theses sources.

It is generally recognized by environmental groups that the Clean Water Act programs to date have had limited sucess in controlling pollutants from dispersed urban and agricultural

nonpoint sorces of pollution. This lack of success points to the need to consider a couple of other rather different implementation strategies.

One approach is to attain nutrient water quality and loading requirements by imposing strict command and control regulations appicable to all sources. Such regulations might involve setting strict effluent limits for both nitrogen and phosphorus for all point source discharges, requiring farmers to limit fertilizer applications by mandatory best managenent practices, banning the use of agricultural and residential lawn cemicals within designated portions of the watershed, and prohibiting alterations of wetlands.

Another approach is to allow market signals to determine the most economically efficient way of limiting the discharges of nutrients from all sources so as to meet the nutrient reduction schedule. Rather than prescribe precise nutrient limits for each identifiable source, the parties to the agreement could develop a plan that could auction off the right to discharge nutrients from POTWs, or they could impose fees on loadings of nitrogen and phosphorus from POTWs above effluent limits reflecting the total loading reduction schedule. The POTWs could meet these loading limits without paying fees or auction price by installing denitrifcation technologies, purchasing nutrient discharge rights from other point sources, paying for wetland restoration on agricultural land representing a set level of nutrient loadings,

financing fertilizer reduction programs, or some combination thereof. The states could also set fees on the sale of products such as fertilizers and gasoline, which produce nitrogen wastes. The schedule of fees would increase progressively each year to assure compliance with the nutrient reduction schedule.

This type of a system would seem to maximize opportunities for trading nutrient discharge and product use rights so as to facilitate gradual but significant reductions in loading of both nitrogen and phosphorus from all sources in the most economically efficient and equitable manner. While institutionally complex, the system would send clear market signals to all dischargers and emitters as to the cost they are imposing on the bay system and the cheapest way of reducing those costs. It would allow discharge and user groups to decide through market choices the most efficient way of meeting total nutrient reduction loading requirements. This approach would also generate fee revenues that the states could then use to pay for nutrient control research and programs, including wetland restoration - a primary technique for buffering agricultural runoff and recycling inorganic wastewater nutrients.

There is some concern that the nutrient reduction strategy can result in the development of new more costly nutrient reduction technology which should not be the case since technologies and non-structural techniques capable of reducing

loading of both nitrogen and phosphates into the Chesapeake Bay watershed are already available. Processes for denitrifying sewerage treatment plant effluents are on hand, and far less expensive technologies are under development. Land application methods, including use of restored or man-made wetland systems can be used to recycle wastewater nutrients.

In addition nutrient loading associated with fertilizer application can be greatly reduced through cost effective fertilizer practice and reestablishment of substantial wetland buffers in critial watershed areas of the bay and its tributary river systems. Organic farming practices that utilize organic animal manure wastes can also greatly reduce nutrient, as well as pesticide loading. Automotive technologies exist that can greatly reduce nitrogen oxide emissions. And finally catalytic reduction technologies in power plants exists which can reduce emissions of nitrogen oxides to below the current performance standards.

Implementing strict nitrogen oxide air pollution source control programs by the signatories may not be adequate to attain and environmentally protective nitrogen atmospheric deposition standard because of contributions to the problem from other states, particularly in the mid west. The Ferderal Government will therefore have to take a lead role in setting national atmospheric nitrogen oxide air pollution standards.

New technologies and land resource techniques for significantly reducing nutrient loading to the bay system are available. In implementing the Nutrient Reduction Strategy the signatories should take advantage of inovative regulatory and market techniques which would help to attain the goal of a 40 percent reduction in total nutrient loading by the year 2000.

CONCERNS

All three states nutrient reduction strategies, and to an extent, the strategy of the District of Columbia, are vulnerable in the long run to several uncertainties. A lack of funding is an obvious one. Projections of progress in the nutrient reduction plans are built upon assumptions that current levels of funding will continue, and in some cases, increase between now and the year 2000. However, concern about the federal deficit could lead to cutbacks in programs that now provide assistance to farmers and others who are implementing nutrient reduction practices. States and municipalities will also be under pressure to provide money for sewerage treatment plant upgrades since federal dollars for this work is being gradually phased out.

The cooperation of local government may prove to be a second critical factor in the sucess or failure of nutrient reduction efforts. In particular nitrogen removal efforts now depend to a great extent upon the good will of local treatment plant operators. Even where regulatory mandates exist, it is unclear

how effictive they are without an equal commitment of state dollars and other incentives to help implement such regulations. Finally it will be important to maintain and enhance the integrity of the data that is used in calculating progress toward 40 percent reduction goal. It has been pointed out that the state and district strategies are only as good as the EPA water quality model on which they are based. It will be important to update and revise estimates of progress of existing programs if the results of the nutrient cleanup are to be measured in truly meaningful terms. In this sense the current nutrient plan is very much a "living" document, that will and should change in the coming years.

WATER QUALITY - TOXIC POLLUTION

A second major concern of the 1987 Bay Agreement was to address the toxic pollution problem. "Toxics", chemicals that in sufficient quantities can poison humans and other organisms, are now one of the most hotly debated aspects of the ongoing Chesapeake Bay restoration efforts. Again the EPA reports published in 1983 detailed the findings of the seven year study of the Bay jointly conducted by the Bay Area states and the federal government, including an assessment of the problems caused by toxics. Researchers found high concentrations of metals and organic compounds in some portions of the bay, most notably in highly industrialized areas such as the Elizabeth and Patapsco

Rivers. High levels of metal contamination were discovered in sediments in the upper Potomac, upper James, small sections of the Rapppahannock and York Rivers, and the upper mid-bay area (see Figure 7). Research and monitoring have shown a relationship between the levels of toxic compounds found in the sediment and the survival of individual organisms and the resulting health of the system.

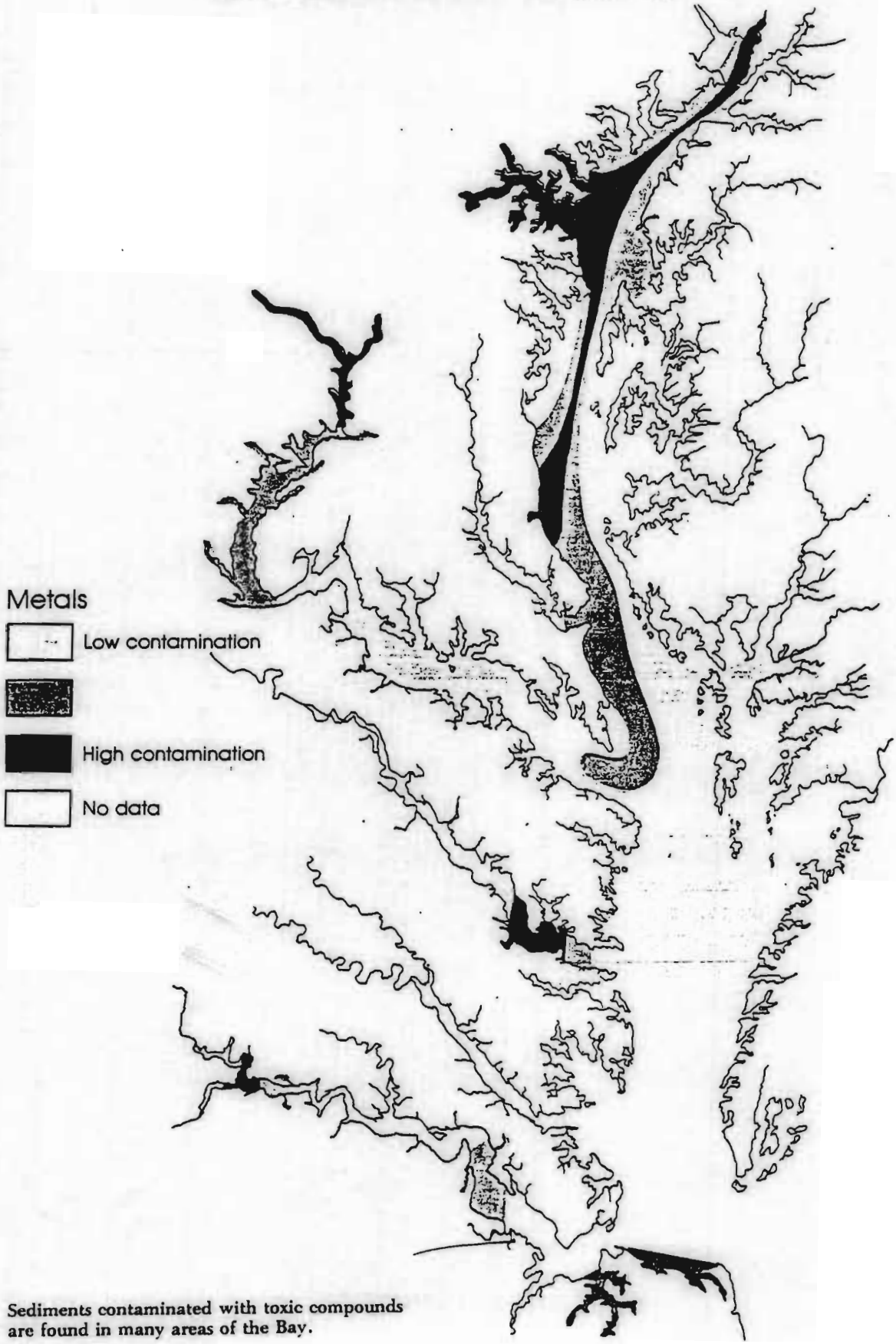
OVERVIEW OF THE TOXIC PROBLEM

The EPA determined that toxic materials enter the bay from a variety of sources, including industrial effluents and other point sources, runoff from urban areas and agricultural lands, atmospheric inputs, and disposal of contaminated dredge spoil (Table 2). Except for long range atmospheric deposition, the primary sources are located within the basin. The materials include heavy metals, synthetic organic compounds (including pesticides and herbicides), petroleum hydrocarbons, and other chemical substances such as chlorine. While some of these materials are transitory, others have been shown to accumulate in the sediments or water column, or within tissues of bay biota. The variety of toxic materials already present in the estuarine environment as well as continued inputs, represent potentially serious threats to the integrity of the Chesapeake ecosystem.

POINT SOURCES

Industrial facilities and sewerage treatment plants discharge a variety of metals and synthetic organic compounds,

FIGURE 7
TOXIC SEDIMENTS WITHIN CHESAPEAKE BAY



Sediments contaminated with toxic compounds are found in many areas of the Bay.

TABLE 2

MAJOR SOURCES OF ORGANIC AND INORGANIC TOXICANTS

Source	Inorganic	Organic
INDUSTRY	most metals	PNAs
POTWs	most metals, chlorine	PNAs, chlorinated organics
RIVERS	most metals	pesticides
ATMOSPHERE	zinc, lead	
URBAN RUNOFF	lead, cadmium	hydrocarbons
SHORE EROSION	iron, chromium	
MARINE ACTIVITIES	copper	hydrocarbons, organotins

Note; PNAs stands for polynuclear aromatic hydrocarbons, which are produced in part by high temperature combustion of fossil fuels.

Source: Chesapeake Bay Program; "A Framework For Action," September 1983 Page 89.

such as polynuclear aromatic hydrocarbons (PNA), which are produced in part by high temperature combustion of fossil fuel. Chlorine and chlorinated organics are also common constituents of effluent from industries, publicaly owned treatment works (POTWs), and power plants. Point sources of toxics appear to be most significant in industrialized areas such as Baltimore and Norfolk.

NONPOINT SOURCES

The three major tributaries to the Chesapeake Bay, the Susquehanna, Potomac, and James deliver metals and organic compounds from urban and agricultural lands. In addition, deposits of air pollution are delivered directly to bay waters and also indirectly through urban runoff. One example is automobiles which contribute large amounts of lead from gasoline and which hopefully can be reduced with conversion to unleaded gasoline. Another important source is shore erosion which contributes significant amounts of iron and other metals to the bay. Also maritime ships and leisure and work boats occasionally leak or spill petroleum and used to be regularly treated with copper-based anti-fouling paints. The toxicants associated with marine activities reach their highest levels in harbors and marinas where these activities are obviously most concentrated and natrual flushing is low.

LOADING OF TOXIC COMPOUNDS

The Chesapeake Bay Program (CBP) estimated metal loadings delivered to the bay from the entire drainage basin. Although the CBP was unable to quantify the loadings of organic compounds to the bay, it is probable that the relative contribution of different sources would be similar to that estimated for metals. In general the Susquehanna, Potomac, and James Rivers are major sources of toxicants entering the tidal bay. Effluent from industries and sewerage treatment plants located directly on the bay are also important. In urbanized areas such as Baltimore, Washington D.C., Hampton Roads, urban runoff can contribute significant loading of toxicants. Toxic contaminants to the bay are considered to fall under two general categories; organinc compounds such as napthalene, pyrene, or polychlorinated biphenyls (PCB), or a second category of metal, with metal being of the greater concern.

The James, Potomac, and Susquehanna River systems are by far the major suppliers of each metal examined by the CBP. Collectively they account for 69 percent of the Cadmium (Cd), 72 percent of the Chromium (Cr), 69 percent of the Copper (Cu), 80 percent of the Iron (Fe), 51 percent of the lead (Pb), and 54 percent of the Zinc (Zn) discharged into the bay system.[13] The other principal source of each metal is Cd, industry (13 percent), Cr and Fe, shore erosion (13 percent and 18 percent, respectively); Cu, industrial and municipal point sources (21

percent); Pb, urban runoff (19 percent); and Zn, atmospheric (31 percent); see Figure 8.

BASINWIDE TOXICS REDUCTION STRATEGY

Because of the concerns over toxics in the Chesapeake environment the following commitment specific to toxics was added to the 1987 Chesapeake Bay Agreement;

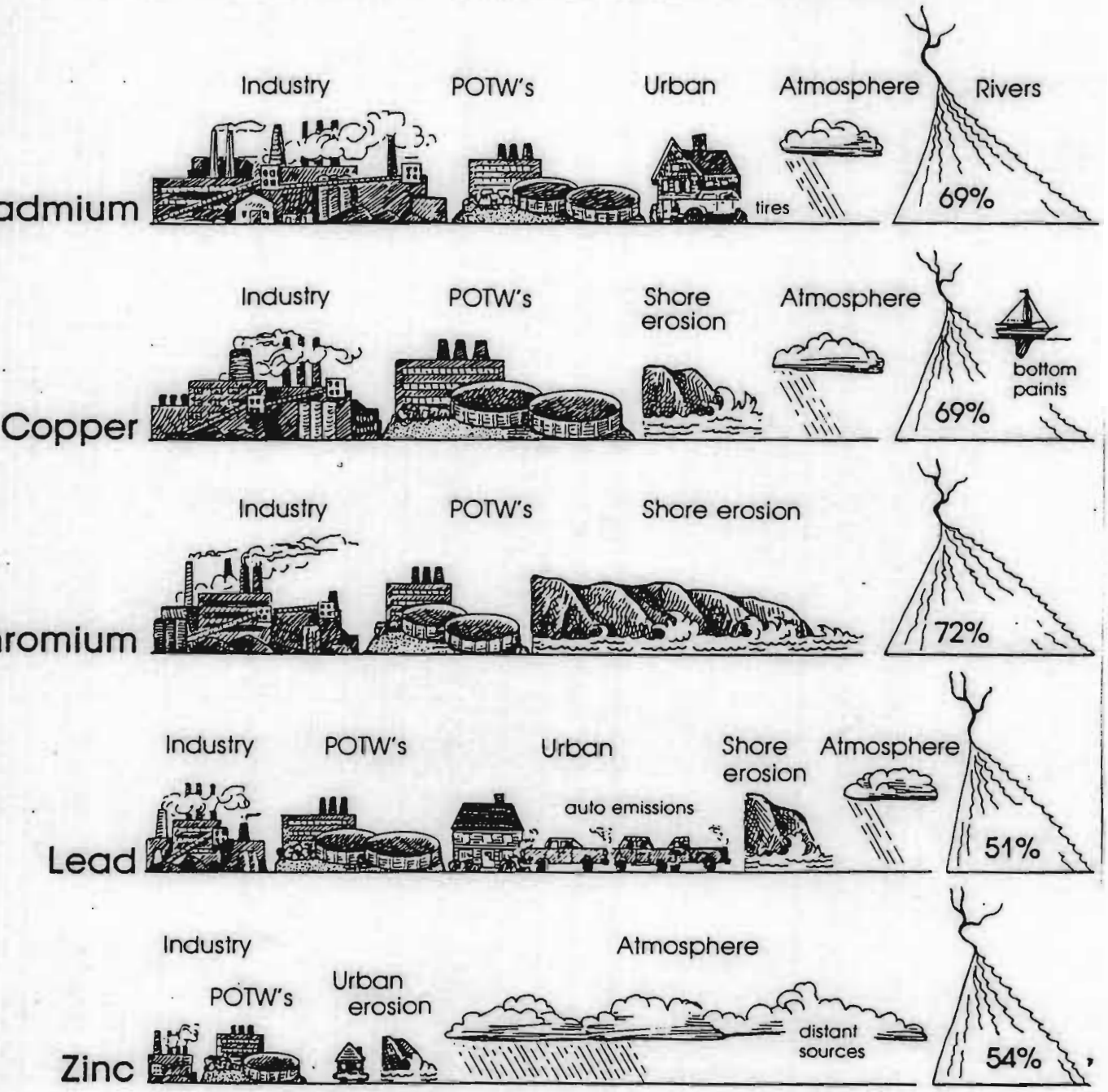
> "By December of 1988, to develop, adopt and begin implementation of a basinwide strategy to achieve a reduction of toxics consistent with the Water Quality Act of 1987 which will ensure protection of human health and living resources. The strategy will cover both point and nonpoint sources, monitoring protocols, enforcement of pretreatment regulations and methods for dealing with inplace toxic sediments where necessary."

The long term goal of the strategy which has been adopted in December of 1988 is to work towards a toxics free bay by eliminating the discharge of toxic substances from all controllable sources. By the year 2000 the toxic input of toxic substances from all controllable sources to the the Chesapeake Bay will be reduced to levels that result in no toxic or bioaccumulative impacts on the living resources that inhabit the bay or on human health.

In order to meet this goal the strategy uses the requirements of the 1987 Clean Water Act as a foundation for action. The Act requires states to do the following:

- Develop lists of impaired surface waters due to toxics identify point sources and amounts of pollution they discharge that cause toxic impacts, and develop individual control strategies for each of these point sources.

FIGURE 8
MAJOR SOURCES OF METALS TO CHESAPEAKE BAY
Size of symbol indicates relative importance of each source



Source; Chesapeake Bay Program, "A Framework for Action," September 1983, Page 92.

- Adopt standards for cetain pollutants listed as toxic. At this time there are 126 priority pollutants listed in the Act.
- Develop State nonpoint source management plans that identify statewide management programs designed to quantify, control and limit the effects of nonpoint source pollution on the attainment of water quality goals.

However, the signatories to the 1987 Agreement and Basinwide Toxics Reduction Strategy believed that in order to fully protect the Bay they had to go beyond the legal requirements of the Clean Water Act in order to deal more effectively with the full spectrum of toxic compounds, as well as cross-media problems caused by toxics. To do that, the signatories felt they needed better information and sources and loads of toxics, effects on biota and human health, and the efficacy of control actions. As a result the strategy establishes a number of major new commitments on the part of the signatories.

- Developing a Toxics loading inventory to better establish loading of toxic substances to the bay.
- Creation of a Chesapeake Bay Toxics of Concern list that will provide a basis for assessing and then controlling substances that are toxic to the Bay or human health.
- Agreement to have point source toxic management programs include both chemical and biological monitoring, compatible requirements for initiating toxicity reductions.
- Conducting a Baywide pesticide use survey and developing appropriate pesticide programs.
- Creating permanent air monitoring stations to measure long term trends in atmospheric deposition of toxics.

- Promoting hazardous waste minimization programs.
- Taking a multimedia perspective in developing and implementing this strategy.

CONTROL AND REGULATION

The main vehicle for controlling point source loading of toxic substances in the bay's waters is the Federal Clean Water Act (CWA) originally enacted in 1972, but amended as recently as 1987. The goal of the Clean Water Act is "to restore and maintain the chemical and physical and biological integrity of the nation's waters." The Act, which is administered primarily by EPA in cooperation with the States, has evolved over the years to meet the changing water pollution threats in the nation's waters. EPA's primary focus for controlling toxics under the Clean Water Act is the National Pollution Discharge Elimination System (NPDES), which establishes a state-by-state permit system for industrial and municipal dischargers of pollution. The NPDES program can be viewed as a three-step process; 1) define desired water quality goals; 2) determine the amount of pollutants, if any, that need to be reduced to reach that goal; and 3) allocate those reductions to various polluters through permits. As a whole, the NPDES process can be thought of as the engine that drives the Clean Water Act's pollution control efforts; if it fails to work properly, the nation's waters will probably never arrive at the Clean Water Act's goals.

In addition to the NPDES permit program the 1987 Water Quality Act included a program requiring states to identify and address toxic "hotspots" such as Baltimore harbor and the Elizabeth River that do not meet water quality criteria for the 126 priority pollutants that were defined in Section 307(a) of the Clean Water Act. By Febuary of 1989 states were to have developed Individual Control Strategies (ICS) for these "hotspots," including tighter permit limits on effluent discharges and greater attention to nonpoint sources of toxic contamination. The goal of the program is to bring such areas into compliance with EPA water quality criteria by June of 1992.

To federal administrators, these new toxic control requirements will be the mainstay of the Baywide toxics strategy. Some environmental organizations however feel, that while the toxic hotspot approach is an encouraging first step toward addressing toxic threats, it is by no means, sufficient. A truly comprehensive Baywide strategy mus include measures that will reduce pollution of all types, not just the 126 priority pollutants identified by EPA.

In addition, the hotspots approach, by itself, is criticized as basically a "reactive" strategy that responds only to current crises rather than a "pro-active" strategy to improve water quality as mandated in the Clean Water Act. A hotspots approach will do little, critics say, to improve or protect water quality

in areas that are not now considered hotspots, but which may rapidly be approaching that status. To that end, environmentalist and others would like, as part of a comprehensive baywide strategy on toxics, to see EPA and the states agree on strict regional water quality standards for those particular substances that are known to be harmful in the bay. This is a shortfall of the current strategy which currently does not require the establishment of such standards. Hopefully this may be overcome when it is reevaluated in December of 1992.

TOXIC STRATEGY CONCERNS

One of the main objectives of the Baywide Toxics Reduction Strategy is to create the framework and the concrete commitments for coordinated toxics control by the signatories. A Baywide strategy must reflect jointly-coordinated actions in every field of the toxics control endeavor, from monitoring to standard setting to compliance enforcement. It should eliminate dublications of effort, so that limited resources can be stretched as far as possible. And is should ensure that all bay states benefit from one another's pollution control efforts. At the same time, the strategy should ensure that no one bay state becomes the dumping ground for the other States' toxic problems, or the recipient of apparent economic benefits from allowing industry, agriculture or developers to undertake in one bay state environmentally degrading activities that are prohibited in another.

Unfortunately the current Baywide Toxics Reduction Strategy does not accomplish these goals. Instead, it tends to focus on describing the problem of bay toxics and on describing the states individual existing toxic control programs. While an understanding of existing programs is helpful, and is an important prerequiste for deciding how to move beyond meeting the basic Clean Water Act program requirements, it does not go far enough. In addition to lacking a creative approach to regional coordination, the toxic reduction strategy is also missing two other key elements: commitments of time and money.

The strategy's statement of collective commitment should go beyond agreeing to "develop, adopt and begin implementation of" a baywide strategy. It should include firm, continuing commitment, over time, to implement fully and to enforce vigorously the basinwide strategy. Specific timetables should be included for attainment of each element of the strategy. To ensure the States' continued commitment to shared goals, the strategy should include long term concrete commitments to reconvene the toxic reduction decision makers periodically in order to monitor progress and to establish the next set of firm timetables and milestones.

To achieve ambitious toxic reduction goals the bay states will have to spend more money. Because all bay states benefit from the toxic control activities of their fellow signatories, it

is appropriate for each participant to make, and to receive, dollar and staffing commitments for the bay cleanup. The toxics reduction strategy should, but currently does not, include firm commitments to seek necessary funding, whether from states' legislative bodies, from Congress, through existing CWA grants, or from other sources. This commitment must in turn be based on collective commitments to provide minimum agreed-upon levels of, inspection, frequency, enforcement personnel, and research funds.

It is known that providing a dedicated source of funding for important programs can be a helpful way to ensure stable progress. The signatories should incorporate into the strategy a commitment to develop dedicated funding sources to support Bay toxics reduction programs such as watershed wide fertilizer and pesticide surcharges; land sale transactions fees, stormwater utilities, or other such devices.

The multi-faceted nature of managing toxics from research to monitoring to control and reduction means that a truly comprehensive Baywide toxics strategy needs to address a multitude of complex issues. It is important, therefore, in the face of such an imposing assignment, to remember to keep a "big picture" view of what a strategy should accomplish and to establish clear priorities for action at each step of the way. Such vision and planning is necessary not only for the benefit of administrators and decision makers, but also for the benefit of

the general public, who must be able to understand in simple terms what a toxics strategy is all about.

To that end, it seems apparent that there is a succession of steps that the toxic strategy must follow: inventory, assessment, control and reduction. In testimony before Congress most witnesses agreed that the immediate priority for addressing the bay's toxic problems is through inventory of toxics found in the bay. EPA has suggested the establishment of a Chesapeake Bay Priority Pollutants list, which would include the 126 substances regulated under the Clean Water Act, but would also include additional compounds that may pose special concern for the bay. Such an inventory would also include a comprehensive estimate of toxic loadings to the bay from all sources, including atmospheric and nonpoint sources.

The next step, assessing the impacts of toxics that are discovered, is often easier said than done. A lack of satisfactory knowledge about the biological effects of toxics, as well as increasingly sophisticated detection equipment and general disagreement about what levels of toxics pose an acceptable risk, all contribute to the uncertaintuy. An important role for the bay scientific community to play in the further development and implementation of the toxic strategy will be to develop a uniform definition of what constitutes a toxic

problem and to recommend a test, or series of tests, that can detect those problems quickly, cheaply and accurately.

The toxic problems that are identified, must then be addressed by appropriate control measures and reduced to acceptable levels. The Clean Water Act's NPDES and toxic "Hotspots" programs are two mechanisms already at hand to deal with known problems of excess toxics. Toxic load reductions could also be initiated on a basin-wide level to reduce the loading of certain toxic substances by a certain percent over time throughout the bay, as is now called for in regard to nutrients under the current agreement. Progressive schedules for completing the evaluation and if necessary, reduction, of a given number of chemicals by a certain date would help ensure that a toxics strategy can have a real impact. The development of reliable indices of improvements achieved throgh NPDES, pretreatment and other toxic reduction programs will also be an indispensable part of this process.

TOXIC STRATEGY CONCLUSION

The implementation of a Baywide toxics strategy lies at the center of all efforts to address toxic contamination in the Chesapeake over the next several years. While the development of a truly comprehensive coordinated strategy is a formidable task, it is encouraging that the bay states are indeed cooperating in this process. It won't get any easier. Even greater cooperation will be necessary in the future. Fundamental changes have to be

made in existing state toxic programs in order to move them closer to the level of sophistication that a baywide strategy demands.

It will also be, as already noted, an expensive process. The state and federal officials who administer the Chesapeake Bay Program will need to find innovative ways to fund programs called for in the toxics strategy and to accelerate the overall pace of toxics research and monitoring. They will also be making tough decisions about how limited resource dollars will be spent. And finally public and legislative scrutiny of the decisions that are, or are not, made will be a vital element in assuring that the process works to the ultimate benefit of the bay.

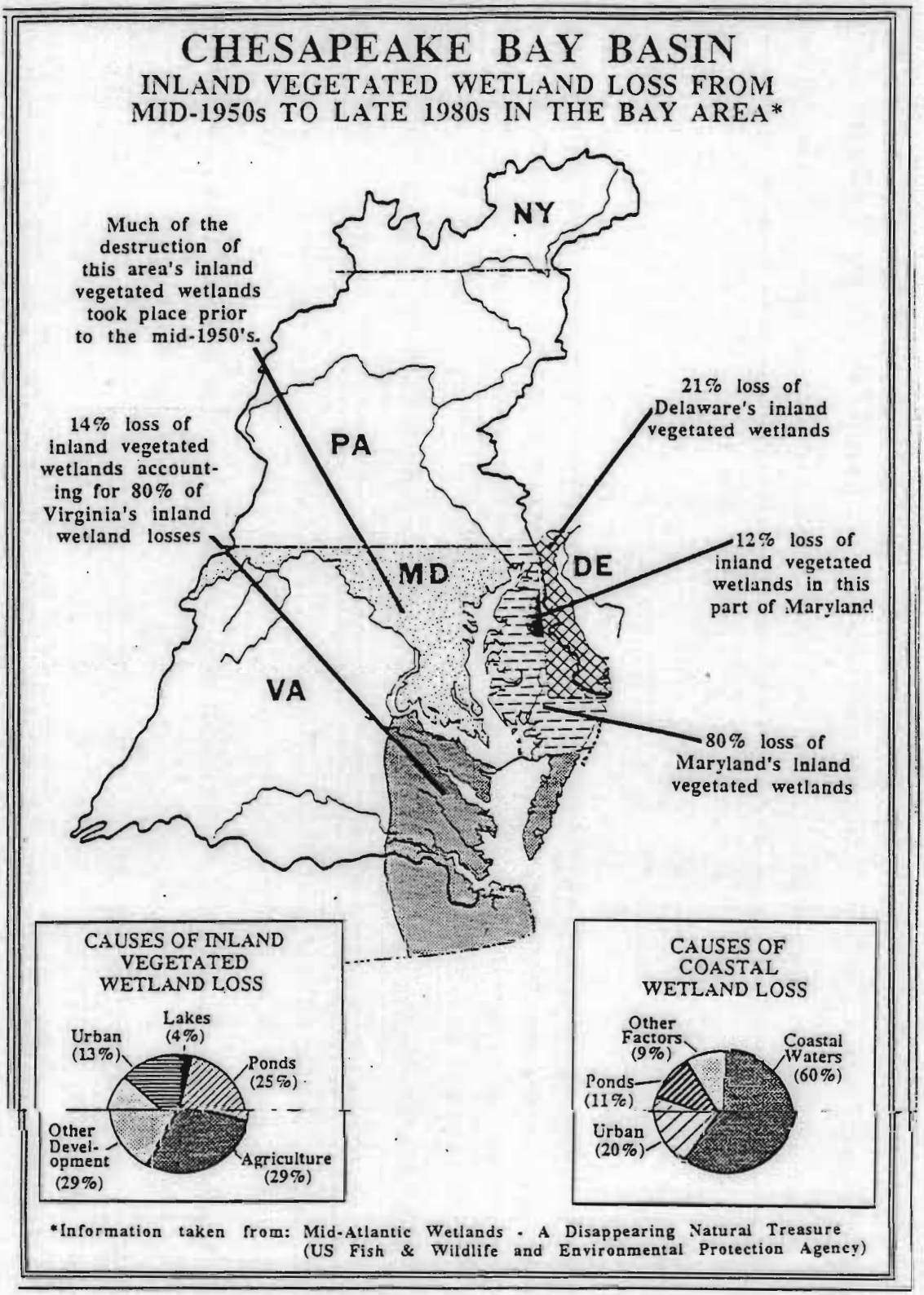
WETLANDS MANAGEMENT

The second basic element in restoring the Chesapeake will be maintaining and protecting the critical physical watershed of the estuarine system, including its tributary rivers. The critical physical watershed of the Chesapeake Bay includes at a minimum, the estuarine and tributary riverine waters themselves and the original estuarine and freshwater wetland systems adjacent and integral to the bay and its tributary rivers. Wetlands play a vital role in providing habitat and food energy for fish and wildlife. They can also play a critical role in controlling nutrients entering the bay system, because wetlands are the natural system most adept at processing nutrient waste into plant

material in a biologically useful fashion.[14] Unfortunately many of the bay's watershed wetlands have been substantially filled and otherwise converted for urban development and agriculture (figure 9). In all likelihood, such loss of wetlands is continuing, although more slowly than 18 years ago when Congress adopted the Clean Water Act, or even seven years ago when the first Chesapeake Bay Agreement was adopted in 1983. These wetlands are necessary to prevent further deterioration of the bay system. Restoring the bay entails reclaiming at least some of its original watershed wetlands that have been converted to other uses. One measure of the effectiveness of the 1987 Bay Agreement, as well as subsequent Bay Agreements and programs, will be the extent to which it protects the remaining estuarine and riverine wetlands within the bay's entire 64,000 square mile watershed and begins the process of restoring wetland areas now under other uses.

Wetlands within the Chesapeake Bay watershed lie within the transition areas between better drained, rarely flooded uplands and permanently flooded deep waters of streams, rivers, ponds, lakes and coastal embayments. Two basic wetland types, coastal and inland, occupy about 3 percent of the Chesapeake Bay drainage area or approximately 1.2 million acres. Over 80 percent of these wetlands are inland and the remainder are coastal wetlands. Coastal wetlands consist largely of tidal marshes and mud flats found along the margins of tidal rivers and saltwater embayments.

FIGURE 9



Source; Chesapeake Bay Program, "Bay Barometer Series," December 1987.

Inland wetlands within the region are predominately forested wetlands, followed by shrub and emergent wetlands, most of which are nontidal or not effected by ocean driven tides.

Wetlands are of importance to the protection and maintenance of living resources associated with the Chesapeake Bay ecosystem as they provide essentiual breeding, spawning, nesting and wintering habitats for a major portion of the region's fish and wildlife, including migratory birds, endangered species and commercially and recreationally important wildlife. In addition wetlands protect the quality of surface waters through retarding the erosive forces of moving water, trapping waterborne sediment and associated pollutants. Ther also protect regional water supplies by facilitating the purification of surface and groundwater resources. Wetlands play a crucial role in maintaining critical base flow to surface waters through the gradual release of stored waters and groundwater, particularly during periods of drought. Wetlands provide a natural means of flood control and storm damage protection through the absorption and storage of water during high runoff periods and through the reduction of flod crests, thereby protecting against the loss of life and property.

The Chesapeake Bay watershed experienced substantial losses of wetlands between the mid 1950's and the late 1970's. Annual losses averaged 2,800 acres. Tidal marshes declined about 9

percent, whereas nontidal vegetated wetlands fell by 6 percent. Wetland losses continue to occur as a result of man made causes and natural losses.

Virtually all coastal states have tidal wetland acts, and in an increasing number of states there are also freshwater wetlands acts. These acts typically establish permit programs which are similar to the Clean Water Act section 404 program, requiring applicants to show that there are no available practicable alternatives that do not involve wetland loss and to provide some kind of mitigation of loss. The Federal section 404 program and state programs are typically constructed so as to allow incremental piecemeal loss of wetlands. The State of Maryland's Critical Area Law contains strong language for wetlands protection, but this regulatory protection is by no means absolute; further, it extends only to wetlands within 1000 feet of Bay waters and tidal portions of tributary rivers.[15] Virginia and Pennsylvania are considered to have weak programs for protecting nontidal, and freshwater wetlands. However the 1987 Chesapeake Bay Agreement calls for strong wetlands protection measures. As a result in December of 1988 the Chesapeake Executive Council approved a "Chesapeake Bay Wetlands Policy".

OVERVIEW OF THE WETLANDS POLICY

Although not a strategy as such the wetlands policy develops specific policy statements in four major focus areas which will be used to guide in the development of a basinwide wetlands

managment strategy by June 30, 1990. As stated in the wetlands policy the goal of the wetland protection and managment strategy when it is adopted will be "to achieve a net resource gain in wetland acreage and function over present conditions by; 1) protecting existing wetlands; 2) rehabilitating degraded wetlands, restoring former wetlands, and creating artificial wetlands."

The four major focus areas of the wetland policy are; 1) Inventory and mapping; 2) Protecting existing wetlands; 3) Rehabilitating, restoring, and creating wetlands; and 4) Education and Research. Within each of the four focus area specific policy statements have been made to guide the development of the comprehensive strategy. Specific actions associated with each policy or group of policies, are considered fundamental to successful achievement of the previously stated goal.

Focus Area 1; Inventory and Mapping

The Executive Council realized that to track the progress towards the net resource gain goal required the establishment of an effective means of monitoring wetland distribution by type, acreage, and function. In additon they realized that effective resource protection and managment is predicated both on the availability of information regarding wetland status and trends and the ability to identify and monitor specific wetland area.

As a result the Council adopted the following policy statement and list of proposed actions to accomplish this specific policy.

- Policy; The signatories shall collectively design and institute a wetland resource monitoring strategy which will provide for a continuing quantitative evaluation of wetland distribution and functional characteristics.

- Action; Formulate and begin execution of a comprehensive inventory, mapping, and monitoring plan which at a minimum, includes;

- A cooperative, comprehensive mapping of all wetland areas at a time interval of not less than every ten years.

- A statistically valid status and trend analysis every five years.

- A continuing cumulative impact assessment.

- A monitoring program for existing wetland sites of various types within selected physiographic regions to quantify functions and values and document changes occuring over time within these systems.

- A monitoring program for invasive or exotic species and appropriate control methods.

- A regional data base of permitted activities.

Focus Area 2; Protecting Existing Wetlands

The Executive Council agreed that central to a strategy to achieve a net resource gain in wetland acreage and function there must be strong programs to hold the line by protecting existing functioning wetlands. The underlying principal behind this wetland protection is the need to control direct, indirect and cumulative impacts which result in losses of wetland acreage or function. Guided by this principal the Council recommends that various tools, including, but not limited to,

regulation and protection standards, incentives, and land acquisition, should be used to protect wetlands. As a result the Council adopted the following policies and action statement towards the protection of existing wetlands;

Policies:

- The signatories to this agreement will use existing programs and develop new programs to limit permanent and irreversible direct and indirect impacts to wetlands. Only in rare instances will losses of wetland acreage or function be allowed or considered justifiable.

- The signatories to this agreement will minimize indirect alterations within the water shed which have the potential to adversely impact wetlands.

- The signatories will implement management practices designed to reduce cumulative wetland loss

Actions:

- The signatories agree to incorporate the principal of wetlands protection and the management of other sensitive Chesapeake Bay living resource habitats into various strategies, policies and guidelines which will result from the Population Growth and Development Commitments of the 1987 Bay Agreement.

- To eliminate or minimize indirect impacts to wetlands, the signatories will coordinate permitting and management programs and the use of protective buffers and other techniques which serve to maintain important functional characteristics of wetlands.

- The signatories agree to develop a Bay-wide planning process for wetlands with the goal of protecting wetlands and associated resources through innovative land use controls.

Regulatory and Protective Standards

The Executive Council felt that existing regulatory standards and other programs at both the federal and state level do not adequately protect existing wetlands from individual and

cumulative losses in acreage and function, particularly in regards to nontidal wetlands. The Council therefore adopted the following policy and action statements concerning regulatory and protection standards.

> Policy: The signatories will, at a minimum implement protection standards for those areas and activities not adequately protected under federal law and programs. These protection standards will address, but not be limited to; enforcement buffers, protection of wetland functions, "best management practices," alternative actions, and water-dependent uses.
>
> Actions:
>
> - Review the effectiveness of existing regulatory programs and recommend corrective actions to honor the policy commitment and monitor and revise such programs as necessary over time.
>
> - Where not otherwise in place, develop a projected implementation schedule by June 1990 to establish protection standards which honor the policy commitment.
>
> - Cooperatively develop a process to identify and protect wetland areas of special concern, and consider, where appropriate, the institution of procedures under Section 404(c) of the Clean Water Act.
>
> - Work toward the development of a single bay-wide field manual for the delineation of vegetated nontidal wetlands.
>
> - Develop a guidance document for the regulatory and protection standards.

Incentives

The Chesapeake Executive Council further recognized that regulatory programs alone could not be relied on to achieve comprehensive protection of wetlands. Therefore they felt that incentives aimed at the private sector would have to be developed

to complement and reinforce the regulatory programs. In addition, programmatic inconsistencies or incentives within state and federal government which directly or indirectly contribute to wetland losses would have to be eliminated. The Council adopted the following policies and action statements concerning incentives:

Policies:

- The signatories will collectively develop and execute a range of private sector incentive programs which support wetland protection.
- Government sanctioned programs which are counterproductive to wetland protection will be eliminated whenever possible.

Action: Formulate and begin execution of an incentiuve policy implementation plan which at a minimum, includes:

- Indentifying state and federal programs or policies which result in wetland losses and correcting program deficiencies.
- Enhancing existing incentive programs to encourage wetland protection.
- Creating new incentive programs to encourage wetland protection.
- Investigating the use of penalties or other disincentives to reduce wetland loss.

Land Acquisition

The Executive Council also took into consideration the important role that acquisition can play in a comprehensive wetlands protection program. The Council also realized that limited funding requires a strategy for targeting the acquisition of wetlands for the purpose of preserving the public's use and

enjoyment of wetland resources. The Council felt that acquisition may be necessary to protect significant educational, scientific, or ecologic values. or where wetlands provide some broader public use including maintaining open space and providing recreation opportunities. The Council adopted the following wetlands acquisition policies and action statement;

Policies:

- The signatories will identify priority areas for wetland preservation.
- The signatories will provide for acquisition of lands for the purpose of protecting significant wetland values or the public's right to use and enjoy such lands are a part of acquisition programs administered by public agencies.

Action:

- Develop a strategic plan for land acquisition which includes wetlands and appropriate adjacent uplands and aquatic areas as a part of new or ongoing public acquisition programs.

Focus Area 3; Rehabilitating, Restoring, and Creating Wetlands

The Executive Council realized that they would not be able to attain a net resource gain in wetland acreage and function by protecting existing wetlands alone. Rather efforts have to be made to build the base by rehabilitating degraded wetlands. While mitigation can be an important tool the Council also feel that incentives and land acquisition are useful tools for building the base of functioning wetlands.

Mitigation

The Executive Council considers mitigation to be a sequential process of avoiding, minimizing, rectifying, reducing over time, or compensating for wetland losses. The sequence in which mitigation procedures are considered and applied in practice is crucial to realizing the protection and management strategy. The Council recognizes that compensatory mitigation must not substitute for efforts to avoid or minimize losses or prejudice an agency determination affecting wetlands. The following is the Executives Council's mitigation policy and action statement;

Policies:

- Mitigation will be included for any project conducted by or subject to review or approval by the signatories.
- Compensatory mitigation shall proceed from the presumption that "in-kind, on-site" is the preferred solution. Other solutions, including off-site and out-of-kind mitigation will only be allowed when acceptable to public/government agencies and performed in the context of watershed management planning or other specific objectives.
- The signatories will require that compensatory mitigation projects incorporate public or private arrangements for long term management.
- Compensation projects will generally be designed and evaluated cooperatively among project sponsors, the signatories, and appropriate public and private entities.
- Monitoring and evaluation of the success of compensatory mitigation replacement projects shall be incorporated by the signatories as a fundamental part of the mitigation process.

Action:

- The federal signatory, in consultation with appropriate governmental agencies, will develop updated standards and criteria in compliance with the overall wetland protection goals and specific mitigation policies incorporating state of the art technology , ecological and biological applications.

Incentives

Since mitigation arises from the unavoidable loss of wetlands, it alone cannot be relied upon to build a base of functioning wetlands. Therefore the Council recognized that incentives aimed at the private sector should be developed to encourage rehabilitation, restoration, and creation of wetlands, and formulated the following policy and action statements concerning incentives.

Policy:

- The signatories will collectively develop and execute a range of private sector incentive programs which encourage rehabilitation, restoration, and creation of wetlands.

Action: Formulate and begin execution of an incentive policy implementation plan which, at a minimum includes:

- Enhancing existing incentive programs to encourage rehabilitation restoration and creation of wetlands.
- Creating new incentive programs to encourage rehabilitation, restoration, and creation of wetlands.

Land Acquisition

The Executive Council felt that to further increase the net resource base beyond that achieved through compensatory mitigation requirements they would develop acquisition plans which support wetlands rehabilitation, restoration, and creation.

Policy:

- The signatories will facilitate acquisition of lands for wetland rehabilitation, restoration, and creation projects beyond that achieved through compensatory mitigation.

Action:

- Develop criteria for the identification of areas where rehabilitation, restoration and creation projects can be undertaken.

- Develop a plan for the acquisition of land and property interest in areas where wetlands, rehabilitation, restoration, and creation projects will be undertaken.

Focus Area 4; Education and Research

The ultimate success of a comprehensive strategy for wetlands protection and management in the Chesapeake Bay will depend on education and research. Research is essential to refine the knowledge of wetland values and improve the states ability to protect and manage these resources. Education is used to build the necessary support for resource protection as well as ensuring efficient implementation of wetland protection.

Education

The Chesapeake Executive Council recognized that wetland protection will depend on public awareness of wetland values and management needs and also upon landowner support for protection policies. The Council adopted the following policy and action statements concerning wetland education.

Policy:

- The signatories will develop and maintain on-going education and training programs, technical assistance services, and wetland data base systems to improve our

understanding of wetland values, functions, management techniques, status, and trends.

Action:
Formulate and begin execution of an education plan which at a minimum, includes:

- A current information program available to the public on the values of an need to protect wetlands.
- Development of a bay-wide library system and data base for wetland information.
- Technical training programs for government representatives consultants, land developers, and interested parties in the areas of wetland identification, delineation, functional assessment, and mitigation practices.
- Development of technical assistance programs to support local government protection efforts, including mapping, management programs, model ordinances.
- Development of wetland curricula for academic institutions.

Scientific Research

The Chesapeake Executive Council recognizes the role of scientific research in determining the effectiveness of current management practices as well as the potential for using research findings to improve management techniques and the general need for better understanding of how natural changes to wetlands may necessitate appropriate management responses. In terms of scientific research the Executive Council has adopted the following policies and action statements.

Policies:
- The signatories to this agreement will, to the extent possible, facilitate the undertaking of research projects which have the potential to improve wetland mangement.

- The signatories will evaluate and adjust their wetland management practices and regulatory standards such that they reflect principles validated through scientific research.

  Action:
  The signatories will collectively update a prioritized listing and description of those research projects which offer significant opportunities for improving wetland management practices. At a minimum, the research plan shall consider the following;

- Continued research of basic wetland structure and function.

- Research to quantify the relationship between upland, wetland, and aquatic natural processes including chemical, ecological, and hydrological processes in various watersheds.

- Evaluation of the potential individual and cumulative effects the following factors have upon wetlands including;

  - Current best management practices designed to reduce nutrient and sediment loads to wetlands.
  - Alteration of the land/water interface.
  - Increased boating activity.
  - Shallow water dredging impacts on biologic and hydrologic functions of wetlands.
  - Structural shore erosion pratices.
  - Stormwater managment practices.

- Evaluation of the design, effectiveness and success of artificial wetlands.

- Comparison of natural and artificial wetlands.

WETLANDS STRATEGY SUMMARY

The Chesapeake Bay wetlands policy seems to incorporate most of the recommendations of the Conservation Foundation from its final report on the National Wetlands Policy Forum. If implemented into a viable working strategy to maintain and

restore the wetlands of Chesapeake Bay I beleive it would be one of the first interstate, cooperative programs for wetlands management and preservation. However to date it is only a policy statement and has not been adopted as a working document or plan.

If a basinwide wetland strategy is adopted several other factors will have to be taken into consideration. First, the definition of wetlands, as used in the policy, needs to be broadened to include floodplains (the entire 100 year plain), forested wetlands, isolated waters (many of which are connected to interstate or navigable waters via groundwater), and headwaters. All of these make up important components of the Chesapeake Bay wetland system. Secondly, in order to protect wetlands, all activities which impact wetlands must be regulated including degradation, flooding, vegetation alteration, etc. In addition in deciding which activities should be permitted, the public benefit of wetlands, the protection of the ecosystem, open space, wildlife habitat, water quality, aesthetics, etc. must be given equal weight to the economic benefits of the activity. Further, assessment of the cumulative impacts must be part of the permit granting process. Where permitted uses have unavoidable losses, criteria and standards are necessary to ensure no net loss, requiring compensation through the creation of new wetlands. The compensation policy must not allow alternatives, such as providing a striped bass hatchery, in lieu of wetland construction. The fact that mitigation or compensation will be

provided MUST NOT be considered a benefit of the project, and thereby used as a justification for its approval, rather the intent must be to avoid any unavoidable impact, and allow only those, with appropriate mitigation and compensation, from permitted activities. An finally monitoring and enforcement of the mitigation or compensation activities must be part of the strategy, with penalties for non compliance.

On the Federal level there is also some concern for review of the Army Corp of Engineers "nationwide permits" program. It is beleived that some of these general permits subvert the intent of section 404 of the Clean Water Act by allowing broad categories of activities with potentially large impacts to occur on a national basis within a framework of permits designed for specific activities with limited impact. No information is available on the impacts of activites on these areas, yet the activities are blindly presumed to be insignificant, both individually and cumulatively. It seems appropriate that a review of the impacts of the "nationwide permit" program be undertaken not only interms of impacts in the Chesapeake Bay but also in terms of impacts on wetlands around the country.

FISHERIES MANAGEMENT IN THE BAY

The real focus of the restoration efforts in the Chesapeake Bay is to work towards the protection and restoration of the bay's living resources, especially the commercially valuable

species of striped bass, blue crabs, oysters, and american shad. As stated under the Living Resources section of the Agreement the goal is to "provide for the restoration and protection of the living resources, their habitats, and ecological relationships. The productivity, diversity and abundance of living resources are the best ultimate measures of the Chesapeake Bay's condition."

PERSPECTIVE

The Chesapeake Bay has long been recognized for its productivity. For example in the late 1800s commercial landings in the Chesapeake peaked at about 17,000,000 pounds.[16] Unfortunately American shad were overfished during those peak harvest years. Pollution and the building of dams subsequently wiped out critical spawning and nursery habitat in bay tributaries. As a result both shad and river herring stocks declined dramatically after 1970. By 1985 only 632,984 pounds of American shad were harvested in Virginia. Neither Maryland or Pennsylvania currently permit the taking of American shad.

The same fate may be awaiting the bay's oyster industry. Oyster harvest peaked at over 110,000,000 in the 1880s.[17] Large harvests were stimulated by the development of canned oysters and the opening of markets newly accessible by rail. With the help of new technology such as deep water dredges, oysters were not so much fished as mined. Harvests exceeded reproduction rates, immature oysters were not protected, and shell was not returned to the oyster beds. With the exception of a few respites a trend

of declining catches has continued to this day. Pollution, disease and fluctuating salinity patterns have added significantly to the downward trend. Less than 10 million pounds of oysters were pulled from the bay in 1988.

The decline of the striped bass, or rockfish, has probably received the most public attention. From peak commercial landings of nearly 8 million pounds in the 1960s and 70s harvests dropped to 1.6 million pounds in 1984 prompting officials in Maryland to ban all harvest. Virginia officials severly restricted harvest and ultimately enacted their own ban in 1989. The striped bass decline is thought to result from some combination of pollution, loss of spawning habitat, overfishing, and other factors. Recent data however, show some encouraging signs of recovery, and Maryland and Virginia have proposed a partial lifting of the ban in 1990. Nevertheless even if the trend is toward recovery, significant harvesting will have to wait until the maturing fish can produce enough offspring to ensure a comeback.

It must be noted that there have been some positive signs. Despite the overall declines, hundreds of millions of pounds of seafood are pulled from the bay annually by commercial and recreational fishermen. And some bay fisheries are doing better than ever. The blue crab population, has proven to be relatively stable and, on average, blue crab landings (and fishing effort)

have increased over time. As oysters have declined the bay's fishing based economies have become dependendent on crabs instead. Virginia and Maryland account for some 87 million pounds of crabs, almost 50 percent of the nation's harvest and about half of the bay's seafood production.[18]

MANAGEMENT ISSUES

Protecting and enhancing the value of a bay fishery, that even in hard times is worth over a billion dollars to the region's economy, can't be left to chance. As a result the bay states have cooperated in numerous Chesapeake Bay Initiatives including the development of bay-wide fisheries management plans. During 1989 plans were adopted by the Executive Council specifically on blue crab, oyster, alosid and striped bass managment. These plans were developed by teams of federal and state fisheries managers, scientists and key citizens and then endorsed by the Chesapeake Executive Council. Through the Executive Council and the Bay Commission, fisheries managers can recommend specific actions. However, implementation of the FMPs recommendations still depends in large part on the decision of state agencies and legislatures because the Bay Agreement itself provides no legal authority for independent management. It will therefore be imperative for both state agencies and legislatures to closely follow the recommendations of the FMPs if an effective regional approach to managing fisheries is to develop.

Collectively the FMPs form a well structured management

program that has several components to address several management issues. Specifically the program has to have clearly stated goals. It must also address factors such as economic considerations, improved stock assessment methods and research. It should include effective mechanisms for managing harvest allocation and regulation, water quality and habitat, and stock replenisment. Most importantly, it should be able to respond to dynamic and changing information about environmental and economic conditions. The following is a discussion of the management issues which weave a common thread through all of the FMPs developed for the bay's living resources.

Issue 1; Management Goals and Priorities

Many goals have been proposed for Chesapeake Bay fisheries programs including;

- maximize food production
- maximize the economic value of the resource
- protect current industry
- promote new or expanded industry
- protect, restore and enhance fish populations
- promote recreation and tourism

All of these are worth while goals but the difficulty comes in when the path to one goal seems to block fulfillment of another. Political realities often dictate that resource managers must attempt to be all things to all people. In the process, clear program goals can be considerably muddied.

However, that doesn't mean that fisheries managers must operate without any guidance. Short term quantifiable targets

can still be set to measure the progress of management programs. Maryland uses and index of "Young-of-the year" for striped bass populations as a trigger in deciding when the state's moratorium will be lifted. Likewise the new baywide management plan for shad includes a provision that a Maryland ban on American shad fishing will be lifted once populations reach a certain level. These planning targets are hardly the same thing as an all encompasing long-term goal. However they can prove to be useful management tools as competing interest work to achieve consensus on broader goals.

Another fundamental issue facing managers, citizens and legislatures alike is what are the priority species to be managed? Should attention be focused on species that have great commercial value or should attention be directed to species of great ecological importance. These priorities have been established in the FMPs. However as the plans are implemented on a regional and state level many question will undoubtedly surface. The input of citizens and scientists, and the informed choices of legislatures, will be vital to the task of ensuring that limited resources are used wisely.

Issue 2; User Conflicts

In the Chesapeake Bay as elsewhere as fisheries thrive or decline in the years ahead, managing conflicts between bay fisheries users will become an increasingly complicated issue.

Policies will have to be developed to fairly apportion fish and shellfish resources among commercial and recreational anglers. However this does go against the view that the bay's resources belong to no individual group or individual.

A proposed management scheme for the reopening of Maryland's striped bass fisheries attempts to grapple with some of these issues. Now that the population has recovered enough to support limited fishing pressure, a seasonal allocation will be established. The available fish will be divided among commercial fishermen (42.5%), recreational fishermen (42.5%), and the charter boat industry (15%). Once the total allocation of available fish has been caught the season will end.

Competition within a particular fishery is another issue which will need to be addressed. In a given year only so many fish can be caught without damaging the resource. The question is how many competing fishermen can be supported by that limited number of fish. A proposed solution has been to limit entry into bay fisheries by dividing fishing rights among existing participants. These rights could then be sold to allow new entrants. Advocates say that with a stable number of fishermen, fishing pressure could be more easily managed. Opponents say this would encourage monopoly control of resources. Although no state has yet to adopt a "cap" on the number of fishermen Maryland has a two year delay entry requirement for previously

unliscensed commercial fishermen that is designed to help regulate fishing effort.

Issue 3; The Bay As Common Ground

Aquaculture is another topic that poses difficult questions about fairness and equity. About 400 million pounds of seafood is reportedly now produced by aquaculture in the U.S. In the Chesapeake Bay areas that once trailed in seafood production now lead instead, in part because of aquaculture development in those regions. Despite recent studies in Maryland showing the state's current $10 million per year aquaculture industry could be expanded to $100-$200 million aquaculture has been slow in gaining acceptance in the Bay Region.

In Virginia aquaculture is somewhat more established, but hardly a dominant force in the seafood industry. Most observers agree that commercial watermen in both states have been effective in reserving the bay's best oyster bottom (and seed oyster stocks) for themselves. Many watermen fear the development of aquaculture industries would result in large conglomerates that would literally displace independent watermen from waters of the bay. Aquaculture proponents meanwhile argue that aquaculture would complement the wild fishery rather than supplant it. Aquaculture boosters say their new role will create steady markets that will benefit watermen. The basic question is whether aquaculture will utimately out compete watermen by producing fish more efficiently and forcing watermen out of the

market entirely. Clearly changing political, social, and economic forces are heightening the tension between different sectors of the bay's seafood based economy.

Issue 4: Who Decides

The basic question of who should make the decisions about the management of bay fisheries is a rather complex one.[19] As already indicated the 1987 Agreement has generated several FMPs but it is ultimately the responsibility of the states. Each state (Maryland, Virginia, Pennsylvania) and the District of Columbia has a lead fisheries agency that monitors fish populations, administer regulations and carries out restoration programs. However the bay region's fisheries are also strongly influenced by other government bodies. State water quality agencies, for example, make decisions that exert considerable influence on the state of the bay's fisheries. State and local health departments also have significant powers to open and close fishing areas.

In many instances, legislatures also take a very active role in making decisions about fisheries managment. Predictably, the involvement of the legislature can quickly inject a great deal of political heat into fisheries management issues. It can lead to charges that legislative actions are motivated by politics and not by science. It can represent the threat of an unwelcome intrusion by "non experts" into matters that may be best

addressed by technical scientists and professional managers. On the other hand it can also be seen as a way of ensuring that management decisions which effect the livelihoods of thousands, are made in public, and not behind closed doors. In theory, it helps ensure that competing public interest are represented and balanced in a public forum by officials who can be held readily accountable.

The bay states differ notably in regard to the balance of power between agencies and legislatures. In Maryland, the Department of Natural Resources has only limited rulemaking authority and the legislature often plays a highly visable role in managing fisheries. Virginia's Marine Resources Commission has greater rulemaking authority since the enactment of new fisheries management legislation in 1985, but the VMRC can still be overruled by the General Assembly and it depends significantly on the legislature for funding.

Of all the bay state fisheries agencies, Pennsylvania's Fish Commission probably enjoys the greatest degree of independence from the legislature. Fish Commission budgets are funded almost completely through liscense revenues and the commission also has the authority to establish harvest limits by regulatory action.

In all likelihood, there is no single outstanding formula for managing fisheries. However citizens and legislators can enhace management efforts by scrutinizing how effectively their

particular management structure is working and by keeping an open mind about improvements to the process. One improvement that many people have suggested and even attempted, with limited success, over the years is greater regional coordination and management. Bay fisheries don't divide into neat political and geographic boundaries. The management of fisheries in one state can affect stocks in another. Migratory species can run the length of the bay from headwaters in Pennsylvania to out beyond the Atlantic seaboard. Yet to date, the bay states have varied greatly in how they define catch limits, seasons, size limits and harvest methods.

Some effective regional management mechanisms are already in place in parts of the Bay region. The Potomac Fisheries Commission (PRFC), for example oversees management of fisheries in the Potomac and includes Maryland and Virginia members from either side of the river.[20] The PRFC has clearly established independent rulemaking authority. Only a joint resolution of both state legislatures can overturn a PRFC decision and that has never happenend.

On a larger scale, the Atlantic States Marine Fisheries Commission (ASMFC) is a multi state planning agency for migratory species that depend on state-controlled tidal habitats up and down the Atlantic coast. Maryland, Virginia, and Pennsylvania are all members. The ASMFC adopts interstate management plans, which are

largely advisory. It is up to each state to take the regulatory or legislative action needed to implement the plan. However in the case of striped base, compliance with the ASMFC plan was mandated by Federal law. Many observers would like to see more formal regional cooperation along those lines.

Issue 5: Preventive Management

The 1987 Chesapeake Bay Agreement provided a good platform and starting point to help avoid future declines in the bay's fisheries and the subsequent bans and moratoria which wreak havoc on the region's fishing industries. In addition to mandating baywide fishiers management plans, it triggered several other initiatives that could have tremendous potential to give a boost to the bay's fisheries. Although it may be still be too soon to detect any significant improvements, the impacts of these initiatives, if properly implemented, could be notable.

One of the first initiatives is to remove impediments to fish migration. Impediments to fish migration - dams, road culverts, etc. - exist on nearly every bay tributary and are a major loss of spawning habitat that has been a big factor in the decline of shad and other anadromous fish in Chesapeake Bay.[21] Providing passage around large dams can be very costly, but the benefits of restoring fisheries are substantial. The 1987 Agreement contains a commitment to "provide for fish passage at dams, and to remove stream blockages where ever necessary to restore passage for migratory fishes." However with several

thousand blockages in the bay watershed, fish passage projects will have to be prioritized.

The commitment report makes several recommendation including creating cooperative federal, state and local programs to remove blockages, designing future road and highway culverts to assure fish passage, and reintroducing migratory fishes to habitat above existing blockages.

A second major initiative is to restore the important submerged aquatic vegetation (SAV). As discussed earlier SAV plays an important role in the bay ecosystem. Molting crabs and small fish find some protection from predators in the bay grass beds. SAV, like emergent wetland plants helps to clarify the water and slow the erosion of banks. This is valuable because sediment can smother oysters and clog fish gills. Sediments also carry pollutants into the water. Research is underway to better understand the cause of the decline in bay grasses, and to develop methods for re-establishing SAV.

Fisheries Management Summary

In summary managing the bay's fisheries effectively will require both citizens and government officials to consider and address a number of key points. The 1987 Bay Agreement has provided an impetus for state and federal agencies to work together. As committees work to meet the Agreement's ambitious timeline, the groundwork is being laid for continuing joint

endeavors to improve water quality, protect wetlands and remove stream blockages and to establish a better coordinated system for reporting and collecting fisheries information to better manage the fisheries resources of the bay.

MANAGING GROWTH

It is recognized that in the Chesapeake Bay region as well as other coastal regions around the U.S. that the heart of the coastal pollution problem is simple demographics.[22] People crowded onto the water's edge are both the cause of the decline in coastal environmental quality and one of the major reason why solving the problem is so critical, because the health and quality of life for so many depends on it.

As the 21st century draws near, more and more people are calling the Chesapeake Bay basin home. By the year 2020 it is projected that twice as many people will live in the bay region (16 million) as did in 1950 (8 million), a doubling in one lifetime.[23] Many people would view such growth as an economic blessing. But many are also concerned how the region can accomodate 16 million people without spoiling the qualities of the Chesapeake region that makes it so attractive. Growing populations along the coastal zone mean more residential, commercial, and industrial development, more roads and infrastructure, and an increase in every type of environmental assault on the land, air and water of the coastal zone.

As the bay states move into the 1990s, a call to better manage some of the impacts of growth is being heard, not only from environmentalists, but also from a broad spectrum of citizens, municipal officials, and even developers. The new impetus for "growth management" stem from a concern not only about the impacts of development on the bay's ecology, but also from concerns about traffic congestion, a lack of affordable housing, overcrowded schools, and limited government budgets. Growth management is founded on the principal that economic development and a healthy environment are mutually dependent. Managing growth is seen as a sensible way of directing development to areas where it is desirable and keeping it out of areas where it is inappropriate.

In January 1989, the Chesapeake Executive Council unveiled a provocative report calling for a new growth management policy to better balance economic development with increased protection of the bay region's natural resources. The report "Population Growth and Development in the Chesapeake Bay Watershed to the year 2020" was a collaborative effort among a specially appointed panel of developers, environmentalists, elected officials, academics and planners. Among the "Year 2020" more compelling proposals;

- state wide comprehensive development and infrastructure planning.
- mandatory protection of wetlands, floodplains and other environmentally sensitive areas.

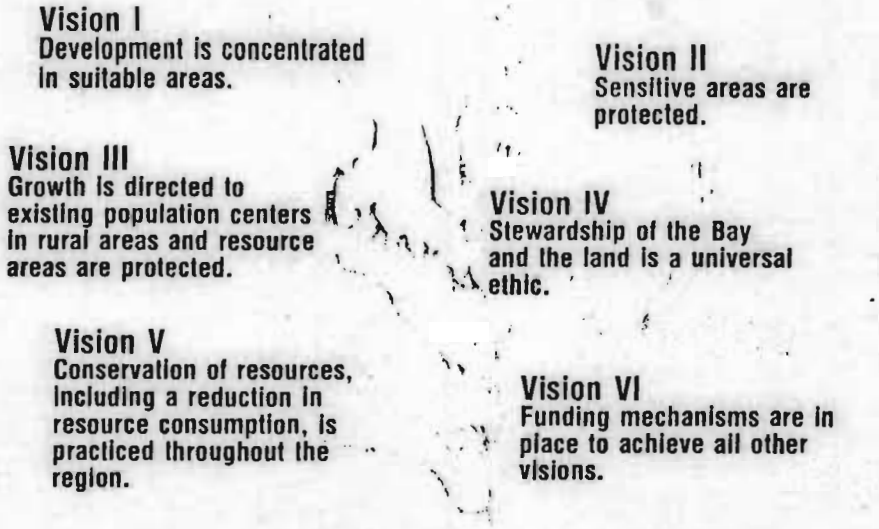
- new state development and conservation trust funds for growth management initiatives, including the purchase of parkland and open space, incentives to developers, and funding of infrastructure needs such as transportation and water treatment.
- new funding mechanisms, such as taxes on fuel, land sale profits, property transfers, and utility bills.
- mandatory best management practices for development, agriculture, and forestry.

As the bay region continues to grow, more and more people will be searching for the best of both worlds and the conflicts between development and other public values, such as environmental protection and cultural and historical preservation, is likely to intensify. New growth management policies could ease the conflict and indeed could help to provide for the best of both worlds. They could fairly balance the rights of the individual and the needs of the community, they could sensibly assign authority for growth management decisions to appropriate levels of government, most of all they could provide new sources of funding for growth management initiatives that would utimately save billions of dollars and save the bay.

What is needed is a coherent "vision" of the region's future. Future efforts to manage growth could be quickly fragmented and work at odds with one another if policy makers in different jurisdictions are working toward different objectives. The Year 2020 report suggests a series of "visions" that represent the best thinking of the panel about the bay's future [Figure 10]. The 2020 panel forsees "efficient land development patterns that concentrate growth and development in urban,

FIGURE 10
Year 2020 Panel Growth Management "Visions"

VISIONS OF A NEW CHESAPEAKE BAY



Vision I: Development is concentrated in suitable areas

• States develop and keep a Comprehensive Development and Infrastructure Plan.

• Local planning and zoning is mandatory and must be consistent with criteria in the state plan.

• States provide incentives for re-development of urban areas and for locating new development in areas served by public transportation.

Vision II: Sensitive areas are protected

• sensitive areas, including wetlands, floodplains, aquifer recharge areas, etc., are defined and mapped.

• state comprehensive development and infrastructure plan includes criteria for protection of sensitive areas and provides for technical training and assistance to local governments.

• state land acquisition and protection programs are coordinated and better incentives for conservation easement donations are in place.

• federal, state and local buffer zone programs around sensitive areas are established.

Vision 3: Growth is directed to existing population centers in rural areas and resource areas are protected

• State and local plans define and map areas where growth is to occur.

• Public investment in sewer and water systems is limited to designated service areas.

• State and local plans define and map resource protection areas that are used by agricultural, forest and water-dependent industries.

• Water supply watersheds are protected by management plans and through land acquisition and easements.

• Park and recreation systems are expanded, including green belts near urbanized areas.

• Transferable development rights programs afford protection from development in farm and forest resource areas.

Vision IV: Stewardship of the Bay and the land is a universal ethic

• Environmental curriculums are required in schools.

Vision V: Conservation of resources

• Recycling of used motor oil is mandatory, as are BMPs for agriculture, forestry and development.

• Programs to reduce water and power use, including sliding scale levies, are in place, as are energy efficiency standards.

Vision VI: Funding mechanisms

• state Development and Conservation Trust Funds are in place and provide funds for infrastructure, development incentives and land acquisition.

• Sources of funds used to capitalize the funds include: higher fuel taxes, taxes on profits from land sales, utility surcharges, property transfer taxes and voluntary income tax check-offs.

• Revenue sharing arrangements among municipalities and counties are common in areas affected by growth.

suburban and already developed rural centers," with population densities that "support mass transportation, van pooling, or other forms of ride sharing to reduce traffic." The panel also sees "large open areas, located within walking, bicycling, or short drive distances of most people...wetlands and lakes, rivers and other water bodies are protected from upland impacts by undisturbed vegetated buffers." In additon "resource based industries, such as agriculture, forestry, mining, and seafood harvesting are protected from encroachment of incompatible land uses...outside rural centers, residential developments limited so as to retain the economic, ecological, and scenic values of the countryside."

Taken together, the visions of the 2020 report offer an appealing picture of what the bay region could be like in 30 years. They could serve as a guide and a foundation for setting policies that make those visions a reality. Acting on such a shared vision of the future could produce wholesale changes in both the way in which land use decisions are made and the way in which individuals live their lives.

The recommendations of the 2020 panel and the experience of other states, that are involved in growth management, provide a substantial foundation for making policy choices about the future of the bay region. From this foundation several ideas emerge as important themes that need to be discussed and debated

as citizens and government officials begin to grapple for a new policy on growth management.

- Should local comprehensive planning and zoning be mandatory?
- Should state governments set development goals and review the adequacy of local plans?
- Should state approval of all local plans be required?
- Should all new development be contingent on the existence of adequate public infrastructure?
- Should taxpayers dollars provide developers with incentives to locate development in desirable areas?
- Should new state trust funds be created to finance growth management initiatives?

The answer to these questions will shape the future of growth management in the Chesapeake region.

GROWTH MANAGEMENT CONCLUSIONS

Growth and development have been a part of the bay region since the moment English settelers raised the first hut at Jamestown almost 400 years ago and it will continue to be a part of the bay's geographic and economic landscape for some time to come. However, the context in which growth happens, from an environmental and cultural standpoint, is rapidly changing. Under the impact of 13 million people, the natural resources of the bay have become a remnant of the bounty that awaited the first settlers. Cherished cultural and historical traditions, bay watermen, for one are disappearing, and many rapidly growing communities are losing their character and charm.

As a result, "growth management" may become the watch words of the 1990s. Throughout the country, the sentiment is building

that all the protective ordinances, financial resources and pollution control devices in the world may be of limited value in protecting natural, cultural, and economic resources unless policy planners begin to pay careful attention to managing growth. The Year 2020 panel has sounded the alarm that unrestrcicted, unplanned growth cannot continue. The Panel's recommendations for integratred statewide planning and other growth management initiatives need to be heeded.

ENFORCEMENT RIGHTS AND TAKING CLAIMS

For the Chesapeake Bay Agreement, including its nutrient loading reduction, toxic reduction, and wetland protection measures, to be credible and viable, its enforcement provisions must be clear and strong. As a first step, third parties, including conservation groups, fishermen associations, and other individuals or association who benefit economically or otherwise from the biological and recreational resources of the bay and its tributary systems, must have undisputed standing to participate in state and federal administrative and judicial proceedings. Only then can they provide evidence about what the numerical standards should be to protect the bay's resources, and challenge the adequacy of specific permits and programs for controlling point and nonpoint sources of pollution in light of those numerical standards.

Also, groups with specific economic interest in bay resources should be allowed to claim that they have an

enforceable right to enjoy the resources which the standards are intended to protect. More specifically, such groups should be legally enpowered to assert that this right is being abridged when state agencies propose to grant permits or approve programs for controlling nonpoint pollution sources or atmospheric inputs which do not assure compliance with the numerical standards and the goals for reduction in nutrient loadings.

One of the most formiable obstacles to full implementation of nonpoint source pollution abatement programs is the threat of taking challenges by local property owners. After all, these abatement programs may entail constraints on land use or mandatory reforestation in buffer areas, retention of wetlands or other natural vegetative systems within critical bay watershed areas, or mandatory reforestation in critical bay and tributary watershed areas. Taking challenges do occur, and the Supreme Court apparently has become more sympathetic to these claims (Nollan v. California). But where constraints on economic uses of land are part of a comprehensive program for attaining numerical water quality standards to protect the reasonable uses of other economic resources, fish and shellfish, the traditional nuisance principle that one may not use his property so as to injure another would seem to apply. In this context the courts may be far less willing to uphold taking or other challenges to such regulations.

What is needed is a system of rights in the bay's resources such that those with an economic interest in the bay's biological resources may institute comparable taking claims against Chesapeake bay states if they fail to enforce nutrient and wetland protection standards. For example bay states could pass legislation expressly recognizing that commercial fishermen, who are properly liscensed and operate in accordance with applicable management regulations, have a "property right" in the bay's fish and shellfish resources. At the very least, those with such economic interest should be allowed to intervene in judicial actions brought by landowners facing restrictions on the use of their lands, including wetlands, which challenge state action on a taking theory.

In short, if the law of regulatory taking against the local and state land use regulatory agencies is to be expanded for the benefit of upland property owners, then the law should be expanded concomitantly to give correlative rights to those with economic interst in the biological resources of the bay. Otherwise, so long as the present imbalance in regulatory taking law remains politically and legally "free" estuarine resources will always suffer relative to "costly" land resources in which traditional property rights reside.

CONCLUSIONS

It is becoming increasingly apparent that our estuaries and near shore waters are facing a multitude of problems. It is

also apparent that these problems do not know any geographical or jurisdictional boundaries. As we enter the 1990s we must redirect our thinking from a single objective approach to a broader ecosystem approach in addressing coastal zone management problems. The establishment of Management Conferences under the National Estuary Program in the Environmental Protection Agency is an example of trends in this direction.

The Chesapeake Bay Program and 1987 Chesapeake Bay Agreement provides a more detailed model of how a multi-state, intergovernmental approach can be established to address such complex problems as nutrient and toxic pollution, wetland preservation and management, fisheries management, and managing population growth. The Chesapeake Bay States confront an enormous challenge in their efforts to protect and restore the bay. They must be prepared to use innovative regulatory strategies and to support independent scientific, economic, and policy research linked to active programs.

Adopting numerical standards for nitrogen and phosphorus , including total loadings, which are adopted and enforceable under section 303(c) of the Clean Water Act, and adopting a scientifically sound nitrogen deposition standard, represent an enormous scientific task. Scientific uncertainty should not justify delay in beginning this work, but intensified research is essential to support periodic revision of loading figures. No

less a hurdle is establishing and enforcing an effective implementation program with adequate controls on all sources of inorganic nitrogen and phosphorus. The Chesapeake Bay states must be prepared to support economic and technological research to promote cost-effective nutrient control technologies. They must also be willing to experiment with a range of techniques - from prohibitions on the use of fertilizers in certain critical areas to economic incentive systems, incorporating fees and tradeable permits - which will facilitate the accomplishment of environmental goals in a cost efficient manner.

The Chesapeake Bay States must also be prepared to utilize innovative regional land use planning techniques which protect wetlands, floodplains, and critical forested habitat; promote wetland restoration; and facilitate concentration of growth in traditional urban core areas and community centers. Such techniques include mandatory clustering of developments and transfers of development rights.

The Bay States should also enpower persons who benefit economically from the biological resources of the bay to initiate regulatory taking actions comparable to those that landowners may bring. Only then can these states establish a legal system that should facilitate societal acceptance of an agressive bay protection program.

Review of the Chesapeake Bay Program and 1987 Agreement has also provided valuable lessons which others may find useful.

First, it is essential to build a broad based cooperative effort from the outset to define the problems and articulate possible solutions. It is important to bring together the full range of players, including state legislators, local officials, citizen groups such as farmers, businessmen and developers. Drive home the fact that problems of estuary management are everyone's responsibility. It is important to hold seminars for these groups to educate them on the problems and very important to find scientific people who can communicate and make the scientific issues comprehensible to these groups.

A second lesson from the CBP is to determine what level of effort can be sustained over the long haul. It is important to build the expectation of a long term effort into the program. Plan realistic, affordable solutions and then prepare for progress to be slow and not readily apparent. In the Chesapeake Program the watchword has been that centuries of abuse to the Chesapeake cannot be reversed in just a few years.

A third important lesson from the program is to take time to create a strong scientific basis for management actions to be undertaken. One should collect, organize, and analyze the existing data before spending time and funds on new data collection efforts. Missing this step runs risk of setting priorities too early and wasting valuable resources. On the other hand one should not allow scientific uncertainties to be

used as an excuse for inaction. The State of Maryland has undertaken a number of initiatives in light of this balance, such as a phosphorus ban in the Upper bay and a moratorium on taking of striped bass.

A fourth lesson is to concentrate limited resources where they can do the most good. For example the Chesapeake experience has shown that tributaires, where the direct streses of pollution are concentrated, and where the key life stages of fisheries take place, are where significant research and management resources need to be targeted. One should avoid the temptation to single out a perceived technical problem, such as toxics, too early in an effort. Before defining the technical problems one should give pragmatic consideration to intended uses and expectations of users and frame the problems accordingly.

A final lesson from the CBP is that fiscal incentives and technical assisstance for local governments and special groups such as farmers are crucial, not just from a technical pollution control standpoint, but also for genrating momentum in public education and involvement. The State of Maryland's stormwater management, industrial pretreatment, and agricultural cost-share programs have all been particularly effective in this regard. By finding new ways to sell pollution control the state of Maryland has helped farmers see nutrient management as good economics, business to see that resource recovery can be afforable and cost-effective, and local governments to begin and see water quality

as an important target of their stormwater managemet efforts.

These are some of the important lessons that have been learned to date from the efforts in the Chesapeake Bay. Hopefully, the 1987 Chesapeake Bay Agreement will prove to be a model for others as the projected results of the strategies implemented under this agreement begin to take effect in the 1990s. However it seems fitting to close with the words of Maryland Governor William Schaefer from his testimony before the Senate Subcommittee on Environmental Protection in September of 1988, in which he said:

> "We will be known in the future by what we preserve today. If the Chesapeake Bay Agreement becomes an empty promise and not an existing reality, then our children will not know the pleasure of siting beside unspoiled streams, or experience the great Maryland tradition of feasting on crabs and oysters. That option is unacceptable. Our failure to preserve our nation's bays for our children will impoverish their lives, their dreams and our legacy."

FOOTNOTES

1. Testimony before the Senate Subcommittee on Environmental Protection, September 20, 1988, S. Hearing 100-883, page 40

2. id., page 58.

3. Chesapeake Bay Program, Executive Council, "Stock Assessment Plan", Agreement Commitment Report, July 1988.

4. Funds for the study were authorized by the Department of Housing and Urban Development - Independent Agencies Appropriations Act of 1976, P.L. 94-116, 89 Stat. 581. Although the Act makes no expressed reference to the Bay, Congress directed EPA to study the bay and to expend funds for abatement and control of bay problems in the Senate Report to accompany the Act.

5. E.P.A., Chesapeake Bay Program, "Findings and Recommendations", September 1983, pages 14-16.

6. id. at 14

7. id. at 15. The conversion of land to residential areas has been primarily through expansion of already developed ares, such as the PawtuxetRiver River Basin. The percentage of developed land in the basin increased from 3% in 1950 to 35% in 1980, at theexpense of cropland, pasture, and forest.

8. id at 4

9. id at 22

10. id at 15

11. Tidal wetlands have been regulated under section 404 of the Federal Water pollution Control Act 33 U.S.C., 1344 (1982), since 1975, under the Maryland Wetlands Act, Md. Nat. Res. Code Ann. 9-101 to 9-502 (1983 & Suppl. 1984), since 1975; and under the Virginia Wetlands Act, Va Code 62.1-13.1 to 13.20 (1982 & Suppl 1984) since 1972.

12. Testimony of Lee Thomas, Administrator, EPA, before Senate Subcommittee on Environmental Protection, September 20, 1988, page 38.

13. E.P.A., Chesapeake Bay Program, "A Framework For Action", September 1983, page 91.

14. Information from The Conservation Foundation Report, "Protecting America's Wetlands: An Action Agenda, The Fianl Report of the National Wetlands Policy Forum", 1988, Washington, D.C.

15. Information from the State of Maryland, Chesapeake Bay Critical Area Commission Report, "A Summary of the Chesapeake Bay Critical Area Commission's Criteria and Program Development Activities 1984-1988", prepared by J. Kevin Sulivan, August 1989, Annapolis, Maryland.

FOOTNOTES

16. Chesapeake Bay Program, Executive Council, "Chesapeake Bay Alosid Management Plan", Agreement Commitment Report, July 1989, pages 7-14.

17. Chesapeake Bay Program, Executive Council, "Chesapeake Bay Oyster Management Plan", Agreement Commitment Report, July 1989, pages 3-8.

18. Chesapeake Bay Program, Executive Council, "Chesapeake Bay Blue Crab Management Plan", Agreement Commitment Report, July 1989, pages 4-6.

19. The problems of fisheries management in the Chesapeake bay are covered in some detail in an article by Susan J.B. Cox, "Interjurisdictional Management in Chesapeake Bay Fisheries", Coastal Management, Vol 16., 1988, pp. 151-166.

20. id at p. 153.

21. Chesapeake Bay Program, Executive Council, "Strategy for Removing Impediments to Migratory Fishes in the Chesapeake Bay Watershed", Agreement Commitment Report, December 1988, pages 3-7.

22. The problem of growth in the Coastal Zone is covered in some detail in the Oversight Report of the Committee on Merchant Marine and Fisheries, "Coastal Waters in Jeopardy: Reversing the Decline and Protecting America's Coastal Resources", U.S. House of Representatives, Serial 100-E, December 1988.

23 Chesapeake Executive Council, Report of the Year 2020 Panel, "Population Growth and Development in the Chesapeake Bay Watershed to the Year 2020", December 1988, page 25.

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1) Chesapeake Bay Program Executive Council Reports

A. Living Resources Commitment Reports

- August 1987, "Habitate Requirements for Chesapeake Bay Living Resources", 63 pages.

- July 1988,"Schedule For Developing Baywide Resource Management Strategies", 25 pages.

-July 1988, "Stock Assessment Plan", 66 pages

-December 1988, "Strategy for Removing Impediments to Migratory Fishes in the Chesapeake Bay Watershed", 22 pages.

- December 1988, "Chesapeake Bay Wetlands Policy", 14 pages.

- July 1989, "Chesapeake Bay Oyster Management Plan", 28 pages.

- July 1989, Chesapeake Bay Blue Crab Managment Plan", 29 pages.

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B. Water Quality Commitment REports

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APPENDIX I

The Chesapeake Bay Agreement

1987 CHESAPEAKE BAY AGREEMENT

The Chesapeake Bay is a national treasure and a resource of worldwide significance. Its ecological, economic, and cultural importance are felt far beyond its waters and the communities that line its shores. Man's use and abuse of its bounty, however, together with the continued owth and development of population in its watershed, have taken a toll on the Bay system. In recent decades, e Bay has suffered serious declines in quality and productivity.

Representing the Federal government and the States which surround the Chesapeake Bay, acknowledge our stake in the resources of the Bay and accept our share of responsibility for its current ndition. We are determined that this decline will be reversed. In response, all of our jurisdictions have em-rked on ambitious programs to protect our shared resource and restore it to a more productive state.

In 1980, the legislatures of Virginia and Maryland established the Chesapeake Bay Commission coordinate interstate planning and programs from a legislative perspective. In 1985, Pennsylvania joined Commission. And, in 1983, Virginia, Maryland, Pennsylvania, the District of Columbia, the U.S. En-onmental Protection Agency, and the Chesapeake Bay Commission formally agreed to a cooperative ap-oach to this undertaking and established specific mechanisms for its coordination. Since 1983, our joint mmitment has carried us to new levels of governmental cooperation and scientific understanding. It has med a firm base for the future success of this long-term program. The extent and complexity of our task w call for an expanded and refined agreement to guide our efforts toward the twenty-first century.

Recognizing that the Chesapeake Bay's importance transcends regional boundaries, we com- to managing the Chesapeake Bay as an integrated ecosystem and pledge our best efforts to achieve the ls in this Agreement. We propose a series of objectives that will establish a policy and institutional framework continued cooperative efforts to restore and protect Chesapeake Bay. We further commit to specific ac-s to achieve those objectives. The implementation of these commitments will be reviewed annually and litional commitments developed as needed.

GOALS AND PRIORITY COMMITMENTS

This new Agreement contains Goals and Priority Commitments for Living Resources; Water Quality; Population Growth and Development; lic Information, Education and Participation; lic Access; and Governance.

parties to this 1987 Agreement are the U.S. En-nmental Protection Agency, representing the Federal government, the District of Columbia, the State of Maryland, and the Commonwealths of Pennsylvania and Virginia (hereinafter the "States"), and the Chesapeake Bay Commission. This Agreement may be amended and attachments added in the future by unanimous action of the Chesapeake Executive Council.

WATER QUALITY

GOAL: *Reduce and control point and non-point sources of pollution to attain the water quality condition necessary to support the living resources of the Bay.* The improvement and maintenance of water quality are the single most critical elements in the overall restoration and protection of the Chesapeake Bay. Water is the medium in which all living resources of the Bay live, and their ability to survive and flourish is directly dependent on it.

To ensure the productivity of the living resources of the Bay, we must clearly establish the water quality conditions they require and must then attain and maintain those conditions. Foremost, we must improve or maintain dissolved oxygen concentrations in the Bay and its tributaries through a continued and expanded commitment to the reduction of nutrients from both point and nonpoint sources. We must do the same for toxics and conventional pollutants. To be effective, we will develop basin-wide implementation plans for the control and reduction of pollutants which are based on our best understanding (including that derived from modeling) of the Bay and its tributaries as an integrated system.

OBJECTIVES:

- Provide timely construction and maintenance of public and private sewerage facilities to assure control of pollutant discharges.
- Reduce the discharge of untreated or inadequately treated sewage into Bay waters from such sources as combined sewer overflows, leaking sewage systems, and failing septic systems.
- Evaluate and institute, where appropriate, alternative technologies for point source pollution control, such as biological nutrient removal and land application of effluent to reduce pollution loads in a cost-effective manner.
- Establish and enforce pollutant limitations to ensure compliance with water quality laws.
- Reduce the levels of nonpoint sources of pollution.
- Reduce sedimentation by strengthening enforcement of existing sediment control regulations.
- Eliminate pollution discharges from recreational boats.
- Identify and control toxic discharges to the Bay system, including metals and toxic organics, to protect water quality, aquatic resources and human health through implementation and enforcement of the states' National Pollutant Discharge Elimination System permit programs and other programs.
- Reduce chlorine discharges in critical finfish and shellfish areas.
- Minimize water pollution incidents and provide adequate response to pollutant spills.
- Manage sewage sludge, dredged spoil and hazardous wastes to protect the Bay system.
- Manage groundwater to protect the water quality of the Bay.
- Quantify the impacts and identify the sources of atmospheric inputs on the Bay system.

COMMITMENT:

To achieve this goal we agree:

- by *July 1988*, to develop, adopt, and begin implementation of a basin-wide strategy to equitably achieve by the year 2000 at least a 40 percent reduction of nitrogen and phosphorus entering the main stem of the Chesapeake Bay. The strategy should be based on agreed-upon 1985 point source loads and on nonpoint loads in an average rainfall year.
- by *December 1991*, to re-evaluate the 40 percent reduction by target based on the results of modeling, research, monitoring and other information available at that time.
- by *December 1988*, to develop, adopt, and begin implementation of a basin-wide strategy to achieve

COMMITMENT:

To achieve this goal, we agree:

to commission a panel of experts to report by December 1988, on anticipated population growth and land development patterns in the Bay region through the year 2020, the infrastructure requirements necessary to serve growth and development, environmental programs needed to improve Bay resources while accommodating growth, alternative means of managing and directing growth, and alternative mechanisms for financing governmental services and environmental controls. The panel of experts will consist of twelve members: three each from Virginia, Maryland, and Pennsylvania, and one each from the District of Columbia, Environmental Protection Agency, and the Chesapeake Bay Commission.

by *January 1989*, to adopt development policies and guidelines designed to reduce adverse impacts on the water quality and living resources of the Bay, including minimum best management practices for development and to cooperatively assist local governments in evaluating land-use and development decisions within their purview, consistent with the policies and guidelines.

- to evaluate state and federal development projects in light of their potential impacts on the water quality and living resources of the Chesapeake Bay, and design and carry out each State and Federal development project so as to serve as a model for the private sector in terms of land use practices.
- by *December 1988*, to develop a strategy to provide incentives, technical assistance and guidance to local governments to actively encourage them to incorporate protection of tidal and non-tidal wetlands and fragile natural areas in their land-use planning, water and sewer planning, construction, and other growth-related management processes.

PUBLIC INFORMATION, EDUCATION AND PARTICIPATION

GOAL: ***Promote greater understanding among citizens about the Chesapeake Bay system, the problems facing it and policies and programs designed to help it, and to foster individual responsibility and stewardship of the Bay's resources.***

GOAL: ***Provide increased opportunities for citizens to participate in decisions and programs affecting Bay.*** The understanding and support of the general public and interest groups are essential to sustaining the long-term commitment to the restoration and protection of the Chesapeake Bay system and its living resources. Citizens must have opportunities to learn about that system and associated management policies and programs and must be given opportunities to contribute ideas about how best to manage that natural system.

OBJECTIVES:

- Provide timely information on the progress of the restoration program.
- Assure a continued process of public input and participation in policy decisions affecting the Bay.
- Enhance Bay-oriented education opportunities to increase public awareness and understanding of the Bay system.

GOVERNANCE

GOAL: ***Support and enhance the present comprehensive, cooperative and coordinated approach toward anagement of the Chesapeake Bay stem.***

GOAL: ***Provide for continuity of management efforts and perpetuation of commitments necessary to nsure long-term results.*** The cooperation cessary to sustain an effective Chesapeake Bay storation and protection effort requires a formal rking arrangement involving the states and the deral government. That institutional arrangement ust allow for and promote voluntary individual acns coordinated within a well-defined context of the lividual responsibilities and authorities of each state d the federal government. It must also ensure that ions which require a concerted, Bay-wide apach be addressed in common and without duplican. One of the principal functions of the coordinating titution is to develop strategic plans and oversee ir implementation, based on advice from the blic, from the scientific community, and from user oups.

addition, the coordinating body must exert leaderp to marshal public support, and it must be accounle for progress made under the terms of this agreent. The coordinating body will continue to be called Chesapeake Executive Council. The Chesapeake ecutive Council shall be comprised of the Govers, the Mayor of the District of Columbia, the Adnistrator of the Environmental Protection Agency, d the Chairman of the Chesapeake Bay Commisn. The chairmanship of the Council shall rotate anally as determined by the Council. The term of the airman shall be one year. The Administrator of the vironmental Protection Agency shall represent the deral government, and the Chairman of the Chesake Bay Commission shall represent its members.

OBJECTIVES:

- Continue to demonstrate strong, regional leadership by convening an annual public meeting of the Chesapeake Executive Council.
- Continue to support the Chesapeake Executive Council and provide for technical and public policy advice by maintaining strong advisory committees.
- Coordinate Bay management activities and develop and maintain effective mechanisms for accountability.
- The Chesapeake Bay Liaison Office shall provide staff support to the Chesapeake Executive Council by providing analyses and data management, and by generating reports related to the overall program. The Implementation Committee shall provide guidance to the Chesapeake Bay Liaison Office Director in all matters related to support for the Council and their supporting committees, subcommittees, and work groups including the development of all plans and other documents associated with the Council.
- Examine the feasibility of joint funding support of the Chesapeake Bay Liaison Office.
- Track and evaluate activities which may affect estuarine water quality and resources and report at least annually.
- Develop and maintain a coordinated Chesapeake Bay data management system.
- Continue to implement a coordinated Bay-wide monitoring system and develop a Bay-wide living resource monitoring system.
- Develop and implement a coordinated Bay-wide research program.

COMMITMENT:

To achieve these goals we agree:

- to develop an annual Chesapeake Bay work plan endorsed by the Chesapeake Executive Council.

By this Agreement, we reaffirm our commitment to restore and protect the ecological integrity, productivity, and beneficial uses of the Chesapeake Bay system. We agree to report in *January 1989 on the progress made in fulfilling the commitments in this agreement, and to consider at that time additional commitments. The implementation strategies which will be developed pursuant to this agreement will be appended as annexes, and annual reports will include an accouting of progress made on each strategy.*

December 15, 1987
(Date)

THE COMMONWEALTH OF VIRGINIA

THE STATE OF MARYLAND

THE COMMONWEALTH OF PENNSYLVANIA

THE UNITED STATES OF AMERICA

THE DISTRICT OF COLUMBIA

THE CHESAPEAKE BAY COMMISSION

APPENDIX II

Graphic Overview
of the Chesapeake Bay Program

Source: Chesapeake Executive Council, "Second Annual Report Under the 1983 Chesapeake Bay Ageement," Febuary 1987.

APPENDIX III

Chesapeake Bay Program Organizational Structure 1988

Source; Chesapeake Executive Council, "The First Progress Report Under the 1987 Chesapeake Bay Agreement," January 1989, pp. 30-31.

Chesapeake Bay Program 1988

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ıld L. Baliles, Chairman
ernor of Virginia

iam Donald Schaefer
ernor of Maryland

ert P. Casey
ernor of Pennsylvania

ion Barry
or of Washington, D.C.

M. Thomas
ninistrator of the U.S. EPA

Tayloe Murphy, Jr.
sapeake Bay Commission

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es M. Seif, Chairman
onal Administrator Region III

trict of Columbia

ıld Murray
ctor, Dept. of Consumer & ılatory Affairs

ryland

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ernor's Chesapeake Bay Coordinator

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in W. Walsh, Jr.
etary, Dept. of Environment

nsylvania

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ernor's Office of Policy Development

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John Daniel (Chairman)
etary of Natural Resources

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Anantha Padmanabha
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Rosemary Roswell
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Paul Swartz
Dept. of Environmental Resources

Virginia

Richard Burton
Executive Director, State Water Control Board

Keith Buttleman
Administrator, Virginia Council on the Environment

Roland Geddes
Director, Division of Soil and Water Conservation

William A. Pruitt
Virginia Marine Resources Commission

Robert Stroube
Virginia Dept. of Health

Federal

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Associate Regional Director, U.S. Fish & Wildlife Service

Peter Boice
U.S. Dept. of Defense

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Assistant Director, Forest Management Utilization, USDA Forest Service

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National Oceanic and Atmospheric Administration

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Director, Water Management Division, EPA Region III

Pearle Reed
State Conservationist, USDA/Soil Conservation Service

Stanley Sauer
U.S. Geological Survey

Bernard E. Stalmann
District Engineer, U.S. Army Corps of Engineers

Regional

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Chesapeake Bay Commission

Robert Bielo
Susquehanna River Basin Commission

Lee Zeni
Executive Director, Interstate Commission on the Potomac River Basin

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Marguerite Foster
Dianne Dale

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Clifford Falkenau
Levi B. Miller, Jr.
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Mary Walkup

Pennsylvania

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Cranston Morgan
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Gerald R. Prout
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Donald Spickler

Chesapeake Bay Program 1988 (cont.)

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eith Bull
Hicks
ld W. Hyland (Chairman)
y K. Parker
hen K. Whiteway
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Dr. James Ebert, Chesapeake Bay Institute

James Hannaham, University of the District of Columbia

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Richard Jachowski, U.S. Fish & Wildlife Service

A. Jose Jones, (alternate - Harriet Phelps), University of the District of Columbia

Dr. Billy Lessley (alternate - Dr. Alan Taylor), University of Maryland

Robert Lippson/Aaron Rosenfield, National Oceanic and Atmospheric Administration

Maurice Lynch, Chesapeake Research Consortium (chairman), (alternate Joseph Mihursky, University of Maryland)

Archie McDonnell, Pennsylvania State University

Ian Morris (deceased), 1987, (alternates - Wayne Bell and Thomas Malone), University of Maryland

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Clifford Randall, Virginia Polytechnic Institute, SU

William Rickards, University of Virginia

Louis E. Sage, Academy of Natural Sciences of Philadelphia

Martha Sager, American University

Gordon Smith (alternate - Charles Schemm), Johns Hopkins University

Wilbert Wilson, Howard University

John Woodson, retired

Subcommittee Chairman

Data Management
Charles Spooner, EPA

Living Resources
Verna Harrison, Maryland

Modeling and Research
James Collier, District of Columbia

Monitoring
Robert Perciasepe, Maryland

Nonpont Source
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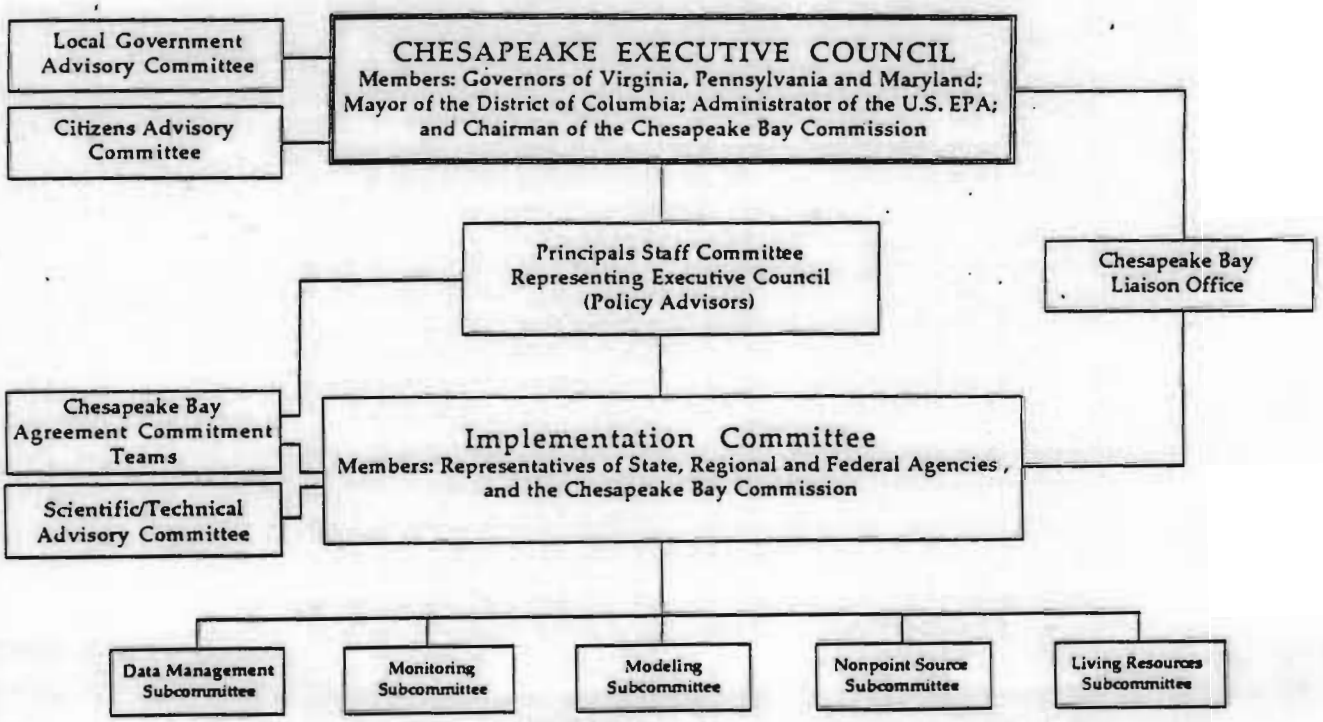
CHESAPEAKE BAY PROGRAM



APPENDIX IV

Summary of the Phased Approach in the Nutrient Reduction Strategy

Source; Chesapeake Executive Council, "Baywide Nutrient Reduction Strategy," Agreement Commitment Report, July 1988, pages 3.2-3.4.

The Basinwide Nutrient Reduction Strategy is presented in the following three phases;

PHASE I

The period between the benchmark loading year of 1985 and July of 1988. Significant nutrient reductions occurred during this period which must be accounted for in reaching the 40 percent reduction goals.

PHASE II

The period between the adoption of the Strategy (July 1988) and the reevaluation date (December 1991) contained in the Agreement. This will allow the signatories to gauge progress to the point the reevaluation will occur.

PHASE III

The period following the reevaluation in 1991 until the year 2000. This represents the period of time following the major mid course correction in the baywide effort made in 1991.

The following is a summary listing of programs used by the States and District of Columbia to meet the goals of the Strategy under Phase I, as well as new programs or modifications of programs under Phases II and III.

PHASE I

Point Source Programs

* Municipal Wastewater Treatment Plant Phosphorus Removal
* Permit Compliance Programs
* Phosphate Detergent Bans
* Dual Biological Nutrient Removal Demonstration Projects
* Water Quality Standards
* Patuxent River Basin Nitrogen Removal

Nonpoint Source Programs

Agricultural

* Agricultural Conservation Program
* Watershed Protection Projects
* Conservation Reserve Program
* Rural Clean Water Projects
* Education Assistance Funding Program
* Technical Assistance
* Animal Waste Control Programs
* State Agricultural Cost Share Programs

Urban

* Soil Erosion and Sedimentation Laws
* Storm Water Management Regulatory Programs
* Retrofit and Demonstration Projects
* Combined Sewer Overflow Controls

Other

* Critical Areas/Riparian/Wetlands Laws

PHASE II

Point Source

* Continued Installation of Phosphorus Removal
* Policies Encouraging Nitrogen Removal
* Coupled with other permit required upgrades
* State Revolving Loan Fund Programs
* Nitrogen Removal Feasibility/Targeting Studies

Nonpoint Source

Agriculture

* Increased Staffing For Existing Programs
* Nutrient Management Plans (Manure and Fertilizer)
* Forested Buffer Strips
* Targeting of Control Program
* Incentives for Conservation Compliance
* Increased Inter-Program Coordination
* Improved Geographical Information Systems.

Urban

* Expanded stormwater management regulatory authority
* Stormwater utility (grant) program for targeted installation and maintenance of BMP's
* Combined Sewer Overflow Effectiveness Evaluation
* Increased implementation/enforcement of existing and new storm water laws.

Other

* Improved/Increased nutrient monitoring and reduction tracking.
* Chesapeake Bay Preservation Areas

PHASE III

Point Source

* Regulatory Programs for Nitrogen Removal
* Financial Assistance Programs.

Nonpoint Sources

* Expansion of Agriculture Control Programs
* Expansion of Urban Control Programs

APPENDIX V

Toxic Reduction Strategy Milestones

Source; Chesapeake Executive Council, "Chesapeake Bay Basinwide Toxics Reduction Strategy," December 1988, pages 4.2 - 4.7.

A. Commitments and milestones - Point Sources

NPDES Permit Program

1. By Febuary of 1989, each state will develop and submit to EPA in accordance with Section 304(1) of the Clean Water Act their lists of waters impacted by toxics. Each state will develop and submit to EPA Individual control strategies for those discharges appearing on the 304(1) list.

2. By December of 1989, each state and EPA commit to have Toxics Management Programs in place that will include the following components;

   * A Schedule for including appropriate toxics monitoring programs (biological and chemical) in the permits of all priority dischargers. Priority dischargers will include both major and minor dischargers.

   * Criteria that are compatible with the other bay states and consistent with EPA requirements for defining acute toxicity and chronic toxicity.

   * Requirements for initiating aquatic life and human health toxicity determinations and reduction evaluations that are compatible with the other bay states and consistent with EPA requirements.

3. By January 1990 or upon completion of the present studies, EPA commits to provide guidance to the states for including the control of bioaccumulative compounds in toxics management programs. The states will pursue incorporation of this guidance into their management programs as appropriate.

4. By July 1990, the states commit to develop a workplan for conducting a program to "fingerprint" effluent, sediment and tissue samples at selected point source discharges to the Bay. Data from this program will be incorporated into the Toxics Database.

5. By July 1990, the states commit to develop a workplan for conducting a program of toxicity studies at selected point source discharges into the bay. Data from these toxicity and chemical tests will be incoporated into the Toxics Database.

6. By July 1991 all priority discharges will have chemical and biological toxics monitoring programs included intheir permits. Priority discharges will include both major and minor discharges

7. By June of 1992, all discharges identified on the 1989 304(1) list will be in compliance with their individual control strategies for toxics, as required by their permits.

8. By July 1996, all major dischargers not included on the 1989 304(1) list will be in compliance with their toxicity reduction evaluations

9. the states commit to take timely and appropriate enforcement action, conduct spot checks of self-monitored permittees, and take follow-up actions against non-complying dischargers.

10. The state commit to continue development and implementation of the permit compliance system (PCS) for NPDES permits to include archival of data.

11. By December 1989, EPA, inconsultation with the states, commits to examine the feasibility of requiring that chemical and biological evaluations be performed, and appropriate remedial measures implemented, before allowing a discharge to the bay or its tributaries of 1) a significantly changed waste from an existing facility or 2) any discharge from a new facility. By July 1990, the states commit to collectively respond to the conclusions and recommendations of EPA's feasibility study.

Pretreatment

1. Delegated states will inspect, and audit as needed, those POTWs with pretreatment programs on an annual basis. For non-delegated states, EPA will conduct these inspections and audits.

2. Delegated states will inspect selected categorical discharges on an annual basis and the remaining significant dischargers at least once during the term of the POTW permit.

3. Delegated states will take appropriate enforcement and follow up action against non-complying POTWs.

4. New candidate POTWs for pretreatment program development will be investigated and included as necessary.

5. Delegated states will conduct sampling at priority POTWs at least annually, and at the significant dischargers when necessary.

B. Commitments and Milestones - Nonpoint Sources

Urban

1. By December 1989, the states commit to develop consistent methodologies for estimating loads and/or load delivery calculations, for developed urban land uses.

2. By December 1990, the states commit to use the developed methodology to quantify and characterize toxic loads from urban areas into the Bay Basin.

3. Following promulgation of stormwater regulations by EPA, the states commit to develop programs to regulate urban stormwater discharges.

Pesticides

1. By December 1989, the signatories commit to summarize and analyze the baseline demonstration watershed data relative to pesticides.

2. By December 1989, the signatories commit to completing a pesticide use survey of the Chesapeake Bay Basin through a comprehensive review of existing use information; collection of new data where necessary; incorporation of survey findings in the toxics data base; and utilization of the findings to target Integrated Pest Management Programs.

3. By December 1989, the signatories commit to review existing Integrated Pest Management and Sustainable Agriculture programs and develop alternatives for increasing utilization of the concepts in agricultural production.

4. By December 1990, the signatories commit to implement necessary new and/or expanded monitoring programs for pesticides within the basin.

5. By December 1991, the states commit to identify additional pesticide programs as necessary, for example IPMs for urban areas.

6. EPA commits to review methods for improving coordination between the Toxic Substance Control Act Process and the information needs on aquatic toxicity for water quality programs so that more information on the toxicity of chemicals to aquatic life is developed prior to the use of approved chemicals. The signatories commit to explore the development of a Basinwide and national toxics registry of chemicals that are preferred for use due to their more limited potential for causing environmental harm.

Air Deposition

1. By December 1989, the signatories commit to ensure that pertinent monitoring data is supplied to the Chesapeake Bay Program Toxics Data Base, and utilize that information to redirect ongoing and future monitoring programs to focus on those cross media toxic pollutants which are present in the Chesapeake Bay system and the ambient air.

2. EPA and other federal agencies commit to continue national research efforts on atmospheric deposition in the Chesapeake Bay basin. EPA commits to develop a national atmospheric pollutant deposition monitoring network and computer model to interpret the data. Results of the work will be supplied to the Chesapeake Bay Program as part of the national strategy to reduce the deposition of airborne toxics.

3. The signatories commit to continue building toxic emissions inventories. When sufficient emissions information exists it will be possible to generate muti-media dispersion models which predict expected concentrations of pollutants and their impact on the environment of the bay.

4. The signatories commit to take full advantage of innovative technologies which may become available in the long-term. Such technologies might include satellite measurement of pollutant concentrations or improvements to the minimum detectable levels of analytical equipment.

5. The signatories commit to support long-term research into the mechanisms for pollutant transfer between air and water as it relates to the Chesapeake Bay.

6. The signatories commit to designate and maintain permanent monitoring stations in the bay to measure the long term trends in atmospheric deposition of toxic pollutants.

Solid and Hazardous Waste

1. The states commit to promote hazardous waste minimization by conducting information exchange and other public education activities and setting reduction targets where appropriate.

2. The states commit to comply with the Superfund Amendments and Reauthorization Act of 1986 (SARA) 104(k) capacity assurance certification requirements in accordance with schedules promulgated by EPA.

3. By October 1989, the states commit to develop and initiate an inspection program for Resource Conservation and Recovery Act (RCRA) facilities within the Bay watershed.

4. The states commit to comply with SARA 104(k) assurance requirements with the Federal facilities in the basin

5. EPA commits to coordinate SARA Title III reporting requirements with the Federal facilities in the basin.

6. EPA and the states commit to prioritize site cleanups for solid and hazardous waste sites where there is evidence or the likelihood of an impact on living resources.

C. Commitments and Milestones - Contaminated Sediments

1. By December 1989, the signatories commit to design and implement a long-term sediment monitoring program to identify the location and extenet of contaminated sediments within the bay and its tidal tributaries and to track multiple year trends in sediment concentrations of toxics.

2. EPA commits to promote the technology transfer of information on sediment toxicity testing to the scientific and regulatory communities by having the appropriate EPA research laboratories evaluate and modify existing sediment toxicity tests within the Chesapeake Bay basin as part of the process of validating these testing protocols.

3. After reviewing the EPA testing protocols, the states commit to implement toxicity testing of sediments within the Bay watershed.

4. Following recommendations by the EPA Science Advisory Board on the scientific validity of methodologies to estimate sediment toxicity and biological impacts of in-place contaminated sediments, EPA will work with the states and other federal agencies in using the above methodologies to develop a Chesapeake Bay specific sediment quality evaluation protocol by December 1991.

5. The states commit to pursue incorporating appropriate sediment protocols into their toxics management programs.

6. By December 1990, EPA commits to complete a study of the feasibility of developing a Superfund Type program for contaminated sediments.

- to continue to support Bay-wide environmental monitoring and research to provide the technical and scientific information necessary to support management decisions.
- to strengthen the Chesapeake Bay Liaison Office by assigning as appropriate, staff persons from each jurisdiction and from participating federal agencies to assist with the technical support functions of that office.
- by *July 1988*, to develop and adopt a comprehensive research plan to be evaluated and updated annually to address the technical needs of the Chesapeake Bay Program.
- by *July 1988*, develop a Bay-wide monitoring plan for selected commercially, recreationally, a ecologically valuable species.
- by *March 1988*, to establish a local governme advisory committee to the Chesapeake Executi Council and charge that committee to develop strategy for local government participation in t Bay program.
- to consider and review the feasibility of establishi an independent Chesapeake Bay Executive Boar
- by *July 1988*, the Environmental Protection Age cy, acting for the Federal government, will develo a coordinated, federal agency workplan whi identifies specific federal programs to be integrate into a coordinated federal effort to support t restoration of the Chesapeake Bay.

- Provide curricula and field experiences for students.
- Promote opportunities to involve citizens directly in Bay restoration efforts.
- Coordinate the production and distribution of Bay information and education materials.

COMMITMENT:

To achieve these goals, we agree:

- to conduct coordinated education and information programs to inform the general public, local governments, business, students, community associations, and others of their roles, responsibilities, and opportunities in the restoration and protection efforts, and to promote public involv ment in the management and decision-maki process.
- to provide for public review and comment on implementation plans developed pursuant to th agreement.
- by *March 1988*, to develop state and federal cor munication plans for public information, educatio and participation, and by *May 1988*, to develc a unified, Bay-wide communication plan.
- to promote Chesapeake Bay restoration efforts b establishing an annual Bay-wide series Chesapeake Bay Watershed Awareness events, include a Governors' Cup Fishing Tournamen

PUBLIC ACCESS

GOAL: ***Promote increased opportunities for public appreciation and enjoyment of the Bay and its tributaries.*** Interest in and commitment to the Chesapeake Bay and its tributaries are greatly affected by personal contact with that natural system. Consequently, improved opportunities for access to the shores and waters of the system are essential if public awareness and support are to be maintained and increased.

OBJECTIVES:

- Improve and maintain access to the Bay including public beaches, parks and forested lands.
- Improve opportunities for recreational and commercial fishing.
- Secure shoreline acreage to maintain open space and provide opportunities for passive recreatio
- Secure necessary acreage to protect unique habit and environmentally sensitive areas.

COMMITMENT:

To achieve this goal we agree:

- to intensify our efforts to improve and expan public access opportunities being made availabl by the federal government, the states, and loc governments, by developing a strategy, which i cludes an inventory of current access opportunitie by *July 1988*, which targets state and federal a tions to secure additional tidal shorefront acres b *December 1990* along the Bay and its tributarie
- by *December 1988*, to prepare a comprehensiv guide to access facilities and the natural resourc system for the tidal Chesapeake Bay.

a reduction of toxics consistent with the Water Quality Act of 1987 which will ensure protection of human health and living resources. The strategy will cover both point and nonpoint sources, monitoring protocols, enforcement and pretreatment regulations and methods for dealing with in-place toxic sediments where necessary.

- by *July 1988*, to develop and adopt a basin-wide implementation strategy for the management and control of conventional pollutants as required by the Water Quality Act of 1987, entering the Chesapeake Bay system from point and nonpoint sources.
- by *July 1988*, the Environmental Protection Agency, acting for the federal government, will develop, adopt, and begin implementation of a strategy for the control and reduction of point and nonpoint sources of nutrient, toxic, and conventional pollution from all federal facilities.

POPULATION GROWTH AND DEVELOPMENT

GOAL: ***Plan for and manage the adverse environmental effects of human population growth and land development in the Chesapeake Bay watershed.*** There is a clear correlation between population growth and associated development and environmental degradation in the Chesapeake Bay system. Enhancing, or even maintaining, the quality of the Bay while accommodating growth will frequently involve difficult decisions and restorations and will require continued and enhanced commitment to proper development standards. The States and their Federal government will assert the full measure of their authority to mitigate the potential adverse effects of continued growth.

Local jurisdictions have been delegated by authority over many decisions regarding growth and development which have both direct and indirect effects on the Chesapeake Bay system and its living resources. The role of local governments in the restoration and protection efforts will be given proper recognition and support through State and Federal resources.

States will engage in an active partnership with local governments to establish policy guidelines to manage growth and development.

OBJECTIVES:

- Designate a state-level office responsible for ensu ing consistency with this Agreement among th agencies responsible for comprehensive oversigh of development activity, including infrastructur planning, capital budgets, land preservation, an waste management activities.
- Provide local governments with financial an technical assistance to continue and expand the management efforts.
- Consult with local government representatives i the development of Chesapeake Bay restoratio and protection plans and programs.
- Identify and give public recognition to innovativ and otherwise noteworthy examples of loca government restoration and protection-relate programs.
- Assure that government development projec meet all environmental requirements.
- Promote, among local, state, and federal govern ments, and the private sector, the use of innovativ techniques to avoid and, where necessary, mitigat the adverse impacts of growth.

LIVING RESOURCES

GOAL: ***Provide for the restoration and protection of the living resources, their habitats and ecological relationships.*** The productivity, diversity and abundance of living resources are the best ultimate measures of the Chesapeake Bay's condition. These living resources are the main focus of the restoration and protection efforts. Some species of shellfish and finfish are of immense commercial and recreational value to man. Others are valuable because they are part of the vast array of plant and animal life that make up the Chesapeake Bay ecosystem on which all species depend. We recognize that the entire natural system must be healthy and productive. We will determine the essential elements of habitat and environmental quality necessary to support living resources and will see that these conditions are attained and maintained. We will also manage the harvest of and monitor population of commercially,recreationally and ecologically valuable species to ensure sustained, viable stocks. We recognize that to be successful, these actions must be carried out in an integrated and coordinated manner across the whole Bay system.

OBJECTIVES:

- Restore, enhance, protect and manage submerged aquatic vegetation.
- Protect, enhance, and restore wetlands, coastal sand dunes, forest buffers and other shoreline and riverine systems, important to water quality and habitat.
- Conserve soil resources and reduce erosion and sedimentation to protect Bay habitat.
- Maintain freshwater flow regimes necessary to sustain estuarine habitats, including, where appropriate, establishing minimum in-stream flows.
- Develop compatible Bay-wide stock assessment programs.
- Develop Bay-wide fisheries management strateg and develop complementary state programs a plans to protect and restore the finfish and shellf stock of the Bay, especially the freshwater a estuarine spawners.
- Provide for the restoration of shellfish stocks in t Bay, especially the abundance of commercially i portant species.
- Restore, enhance and protect waterfowl and wi life.

COMMITMENT:

To achieve this goal we agree:

- by *January 1988*, to develop and adopt guidelir for the protection of water quality and habitat co ditions necessary to support the living resour found in the Chesapeake Bay system, and to u these guidelines in the implementation of wa quality and habitat protection programs.
- *by July 1988*, to develop, adopt, and begin to i plement a Bay-wide plan for the assessment commercially, recreationally, and selected ecol ically valuable species.
- *by July 1988*, to adopt a schedule for the develo ment of Bay-wide resource management strateg for commercially, recreationally and selected ec logically valuable species.
- *by July 1989*, to develop, adopt and begin to i plement Bay-wide management plans for oyste blue crabs and American shad. Plans for other m jor commercially, recreationally and ecologica valuable species should be initiated by 1990.
- *by December 1988*, to develop and begin to i plement a Bay-wide policy for the protection of ti and non-tidal wetlands.
- provide for fish passage at dams, and remo stream blockages wherever necessary to reste passage for migratory fish.