

Chesapeake Bay Program Status and Workplan

1991 Report to the United States Congress

Environmental Protection Agency
Region III Chesapeake Bay Program Office
410 Severn Avenue - Suite 110
Annapolis, MD 21403

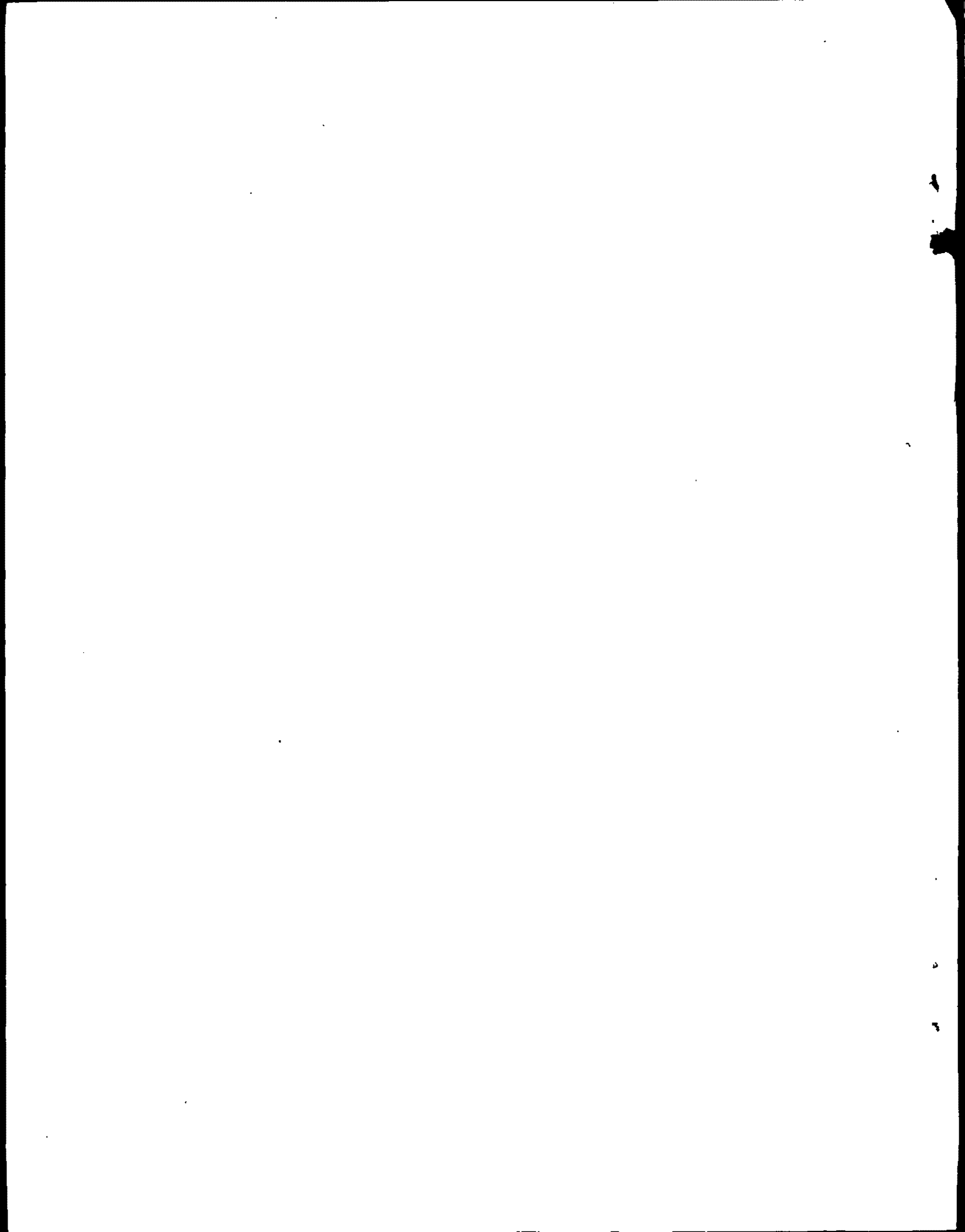
Requested by:

The Senate Appropriations Subcommittee
Chair: Barbara A. Mikulski

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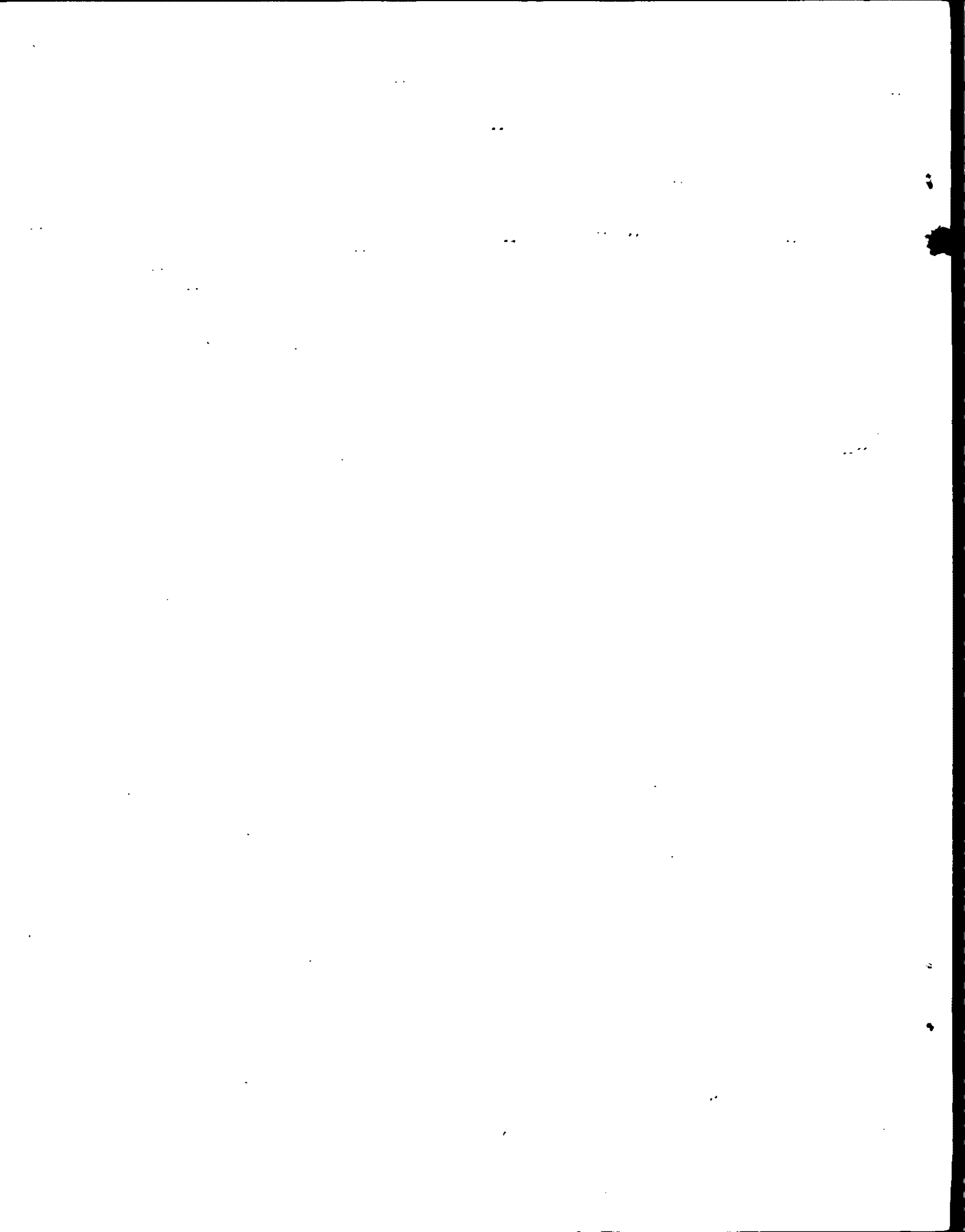
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Executive Summary

This report, prepared for the United States Congress at the request of the Honorable Barbara Mikulski, provides a snapshot view of the current Chesapeake Bay Program. Many of the management efforts under the auspices of the Bay Program have been in place for several years while others are still in development or in the early stages of implementation. This report assesses the current status of these efforts and their achievements to date while also providing a blueprint for future Bay Program planning. It also gives a platform on which to base the requisite 1991 reevaluation of the Bay Agreement goals.

As the Chesapeake Bay Program moves into its sixteenth year, significant strides have been made towards the goals laid out in the 1987 Chesapeake Bay Agreement. In each of the agreement categories—living resources, water quality, population growth and development, public access, public information, education and participation, and program management and governance—managers and scientists have pinpointed the strategies required to meet the ambitious objectives. Many programs and policies are now in place to achieve these goals.

In the area of living resources, managers have emphasized the need for establishing habitat requirements for a variety of important Bay species. As habitat criteria evolve, through the collation and analysis of scientific data, a more precise relationship between the Bay's animals and plants and its water quality also unfolds. As we lessen the harvesting pressures on many commercial species, remove blockages to historic spawning grounds, and improve water quality, the animals and plants should respond by increased population numbers through time.

One of the most publicly recognized goals of the Bay Agreement is the 40% baywide reduction of nitrogen and phosphorus by the year 2000. These reductions should ultimately reduce the seasonal declines of dissolved oxygen, required by plants and animals, in the Bay's bottom waters. While phosphorus levels in the Bay have declined 16% between 1985 and 1990, nitrogen is still rising because the control of this nutrient has not kept pace with the growth in wastewater treatment flows. Although nitrogen fertilizer use has declined, the effects of this lessened usage will only become apparent after several years.

The Basinwide Toxics Reduction Strategy commits to the reduction, by the year 2000, of toxic substances from all controllable sources to levels that have no toxic or bioaccumulative effect on the Bay's living resources or on human health. In addition to development of the first Chesapeake Bay Toxics of Concern List, work on a basinwide toxics loading inventory is largely completed, a basinwide survey of pesticide use has been finalized and several assessment and management programs have started or been expanded.

The Bay Program's water quality monitoring program has accumulated almost seven years of data. With this many years of data, it is now feasible to characterize the current status of the Bay's water quality and assess long-term trends resulting from pollution control programs. Long-term data are required to distinguish between seasonal variability in water quality as opposed to long-term changes unaffected by climate. Much of the current thrust in this program is designed to address the 1991 reevaluation of the 40% nutrient reduction goal.

Public access to the Bay is essential to the long-term support of its restoration and protection. To this end, the Executive Council developed a Public Access Strategy to achieve several goals providing the public with increased opportunities for public appreciation and enjoyment of the Bay. Wise development of Bay access areas will include provisions for the protection of the Bay's resources, particularly in sensitive areas, and the control of boat-generated wastes from recreation vessels.

One of the Bay's most immediate problems is the stream of people who are continually moving into the Bay region to work, live and take advantage of the Bay's natural resources. Pollution control programs will quickly be rendered ineffective unless population growth is addressed simultaneously. To mitigate the effects of continued population expansion, state and local agencies are being provided with the technical tools to channel growth to environmentally acceptable areas where development controls can be applied.

Under the public information section of the Bay Agreement, the Executive Council recognizes the need to educate citizens on the importance and sensitivities of the Bay and its resources. Many public information and education programs have started up or continued to expand, reaching an ever-widening audience. With citizen education, presumably, comes wiser and more informed use of the Bay.

The Chesapeake Bay Liaison Office has traditionally provided program management for the Bay Program; in recent years, the states and the Chesapeake Bay Commission have taken over some of this role. Program management supplies the administrative and institutional structure to coordinate the technical task elements outlined in the workplan. The Chesapeake Bay Program, with federal, state and private participation, has prospered as a multi-state pollution control and resource management effort.

With continued cooperation both within and amongst each of the programmatic areas, the Chesapeake Bay Program should continue to thrive and move towards its ultimate objective of restoring and revitalizing the waters, plants, and animals of the Chesapeake Bay.

Chesapeake Bay Program Status and Workplan 1991

INTRODUCTION

In 1983, the U.S. Environmental Protection Agency (EPA) completed a five-year, \$27 million program to determine the causes of declining Chesapeake Bay productivity, representing the first step in the Chesapeake Bay cleanup effort. The goals of the project were to assess the damage done to the Bay, identify the major problems, and propose alternative strategies to begin their correction. "A Framework for Action,"¹ the main report from this effort, targeted several areas of concern including: nutrient enrichment, toxic materials, substantially increased areas of low dissolved oxygen, declines in living resources, substantial population growth, and changes in land uses. These general areas of concern form the basis of the planning and implementation program described in this document.

Though numerous federal and state pollution control and resource restoration programs were already in operation in 1983, there was no baywide institutional structure in existence that could respond to "A Framework for Action." The Chesapeake Bay Agreement,² signed by Maryland, Pennsylvania, Virginia, the District of Columbia, the Chesapeake Bay Commission, and the EPA in late 1983, provided the structure for this joint response. Augmenting the original agreement, 8 other federal agencies have since signed memoranda of understanding with the EPA: the Soil Conservation Service, Corps of Engineers, Department of Defense, Fish and Wildlife Service, National Oceanic and Atmospheric Administration, U.S. Geological Survey, Extension Service, and Forest Service.

Early phases of the cleanup are documented in the "1985 Chesapeake Bay Restoration and Protection Plan."³ The plan includes descriptions of established state and federal programs designed to improve habitat, restore fish and shellfish populations, and reduce nutrient and toxic substance inputs from industrial and municipal point sources and from agricultural and urban nonpoint sources. The significance of these programs is recorded in the Chesapeake Executive Council's annual progress reports.^{4,5}

Based on the progress in these areas, the Executive Council expanded the scope of the program and set specific goals for the future in the "1987 Chesapeake Bay Agreement."⁶ During 1988, many of the commitments for technical studies and organizational refinements were undertaken, and many are nearing completion.

Figure 1 shows the commitments made in the 1987 Chesapeake Bay Agreement in the following categories:

- Living Resources;
- Water Quality;
 - Nutrient and Conventional Pollutant Controls;
 - Basinwide Toxics Reduction;
 - Water Quality Monitoring;
- Population Growth and Development;
- Public Access;
- Public Information, Education, and Participation; and,
- Program Management and Governance.

Figure 2 illustrates how the major elements of the workplan fit together, connecting aspects of various program activities. The Chesapeake Bay Program Implementation Committee oversees all the program's technical work. Major subcommittees are delegated specific aspects of the program.

Figure 1. Implementing Chesapeake Bay Commitments

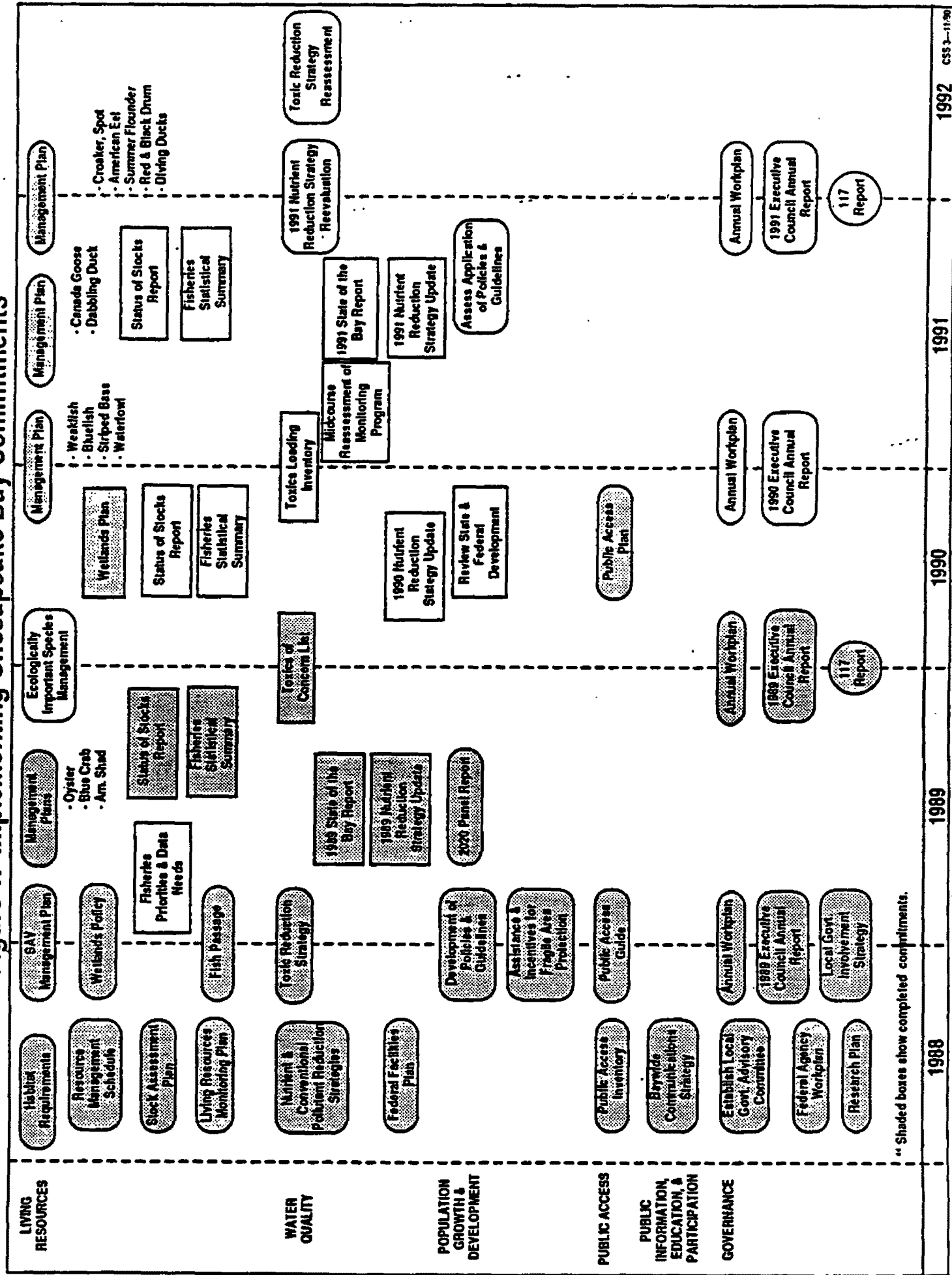
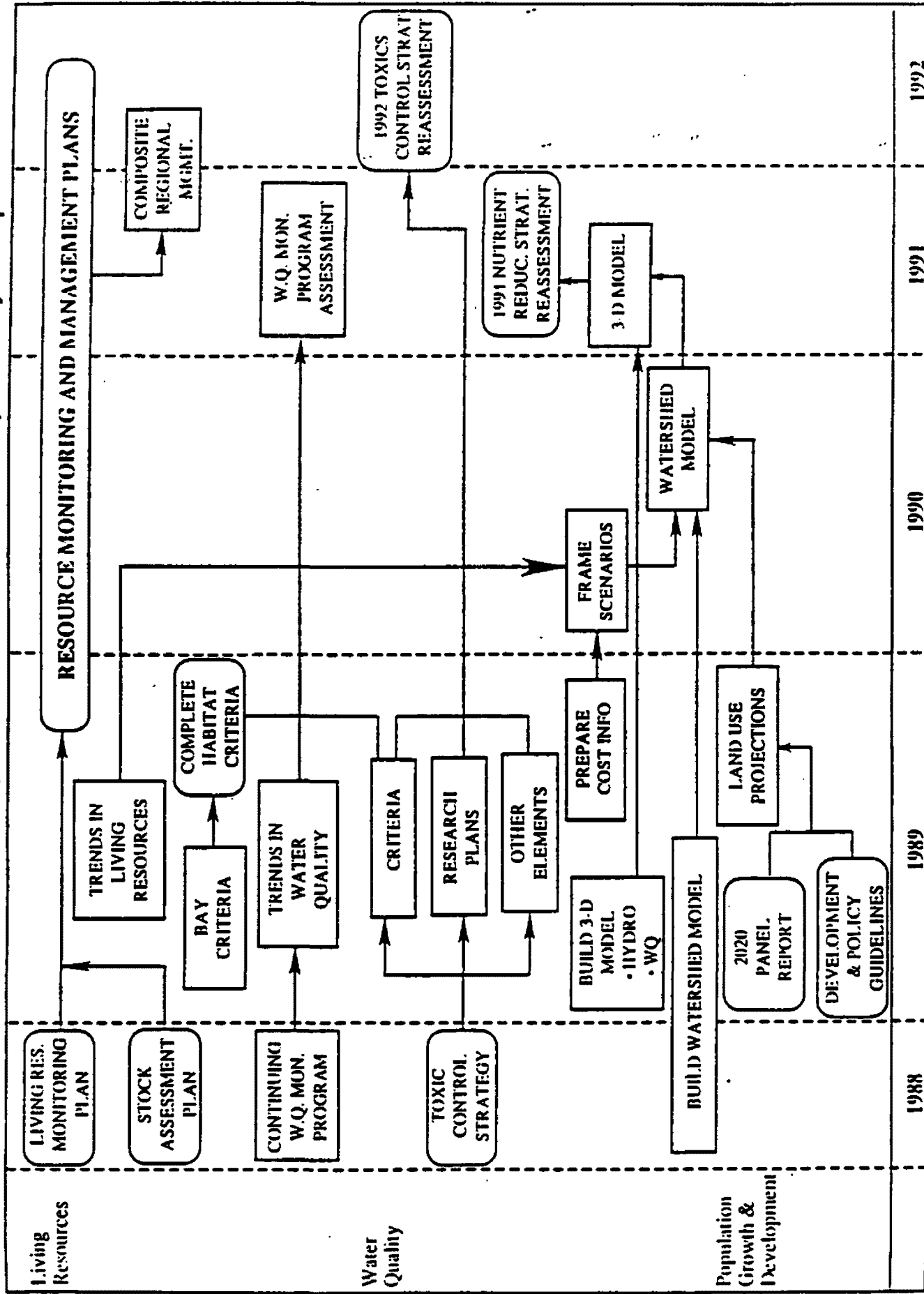


Figure 2. Generalized Description of the 1989-1992 Chesapeake Bay Workplan



LIVING RESOURCES

Background:

The living resources of the Bay are what make it famous. The first explorers and colonists were attracted to this area by their wealth and abundance which later became the basis of a renowned seafood industry. Declines in productivity, diversity and abundance, however, have now made living resources a principal concern of the Bay Program.

Monitoring living resources has proved the best barometer for evaluating the Bay's restoration and protection program. While they act as barometer, the Bay's living resources are also subject to uncertainties in measurement of their response and to pressures that are independent of a degraded environment. Climatic changes, which have a tremendous influence on resource stocks, are largely beyond control. Disease, although sometimes connected to poor habitat quality, can cause widespread declines—witness the Bay's oyster populations. Natural population dynamics on scales of years to decades combined with fishing pressure are probably the most significant factors influencing stocks of commercially and recreationally important species. All these factors complicate the integration of the program's pollution control activities with planning for the restoration and protection of resources.

Objectives:

The long-term goal of the living resources workplan is to develop an array of activities that will attain the goals set forth by the 1987 Bay Agreement. Objectives chosen to meet the goals of the agreement focus on three areas. The first is habitat restoration including the removal of impediments to migratory fish, the restoration and protection of wetlands, and the restoration of the Bay's submerged aquatic grasses. Restoration efforts along with habitat protection programs are implemented by providing benchmarks for use by water quality planners. The third element of the program focuses on the coordinated management of the Bay's living resource stocks. A strong monitoring and data management program ensures that the information is available to meet the analytic needs of all aspects of the program.

Accomplishments and Milestones:

The Living Resources Subcommittee met the first commitment of the "1987 Chesapeake Bay Agreement" when its report, "Habitat Requirements for Chesapeake Bay Living Resources,"⁷ was accepted by the Chesapeake Executive Council. This report, now being revised and updated, established the program's guidelines for restoring and protecting suitable habitats for representative species of commercial, recreational, and ecological importance.

The first studies of living resource management requirements stressed the collection of data and the preparation of benchmarks useful to pollution control planners and to future living resource management efforts.⁷⁻¹⁰ A second set of studies began to define some of the basic requirements of programs to protect the most threatened Chesapeake Bay habitats.¹¹⁻¹⁵ A third series of studies defined the specific actions needed to coordinate the management of selected species that are of economic importance.¹⁶⁻²⁵

One baywide plan, the "Striped Bass Management Plan,"¹⁹ guided the opening of limited commercial and recreational fishery in 1990 (Figure 3). The "Blue Crab Management Plan"²¹ was the first baywide effort to plan for the management of an important fishery before declines in the resource forced more dramatic action (Figure 4). Other plans are targeted towards stabilizing and restoring populations which have historically declined (Figure 5).

Approach and Future Workplan:

Because a majority of the living resources commitments in the 1987 Bay Agreement have been met, the living resources component of the program will focus on implementation in the following areas:

- Continuing the development and implementation of baywide resource management plans;
- Setting living resources restoration goals for Chesapeake Bay and examining the wider use of surrogate measures to define goals where precise biological endpoints remain elusive;
- Establishing regional living resources habitat quality goals through the 1991 Baywide Nutrient Reduction Strategy reevaluation and targeting habitat restoration;
- Exploring opportunities for living resource habitat creation; and,
- Quantifying relationships and interactions between components of the ecosystem so that the Bay can be managed as an integrated ecosystem.

Relationship to Other Program Elements:

In working towards the long-term goals of the Chesapeake Bay Program, it is critically important to ensure that water quality improvements focus on the needs of the Bay's species, that ecological values be a vital concern in all aspects of planning for future population growth and development, and that the public be informed of progress towards meeting living resource goals. Just as living resource concerns influence other concerns of the Bay restoration effort, there is a growing recognition that more needs to be done to understand the relationship between living resources and their habitats. Future management will evolve beyond simple habitat restoration and preservation to include repair of broken and weak linkages imbedded deep within the food chain.

The need to repair food chain linkages has long been masked by overwhelming pollution and overharvesting pressures but is becoming more apparent as restoration efforts prove effective and diminish these stresses. Beyond the Bay's restoration, this knowledge of linkages will enable Bay managers to predict and prevent future stresses on the Bay's health. A systematic method needs to be developed to better understand and quantify: (1) the relationships between the lower and higher forms of living resources; (2) whether meaningful links can be made with the Bay water quality model between water quality and higher forms of living resources; and, (3) the interplay between living resources and water quality.

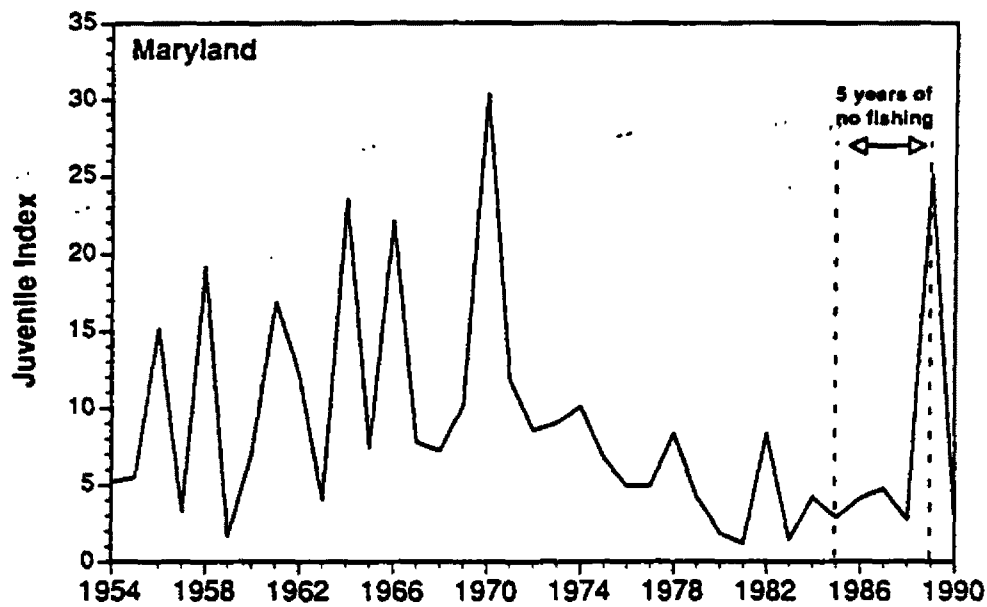


Figure 3. **Striped Bass: Responding to Protection**

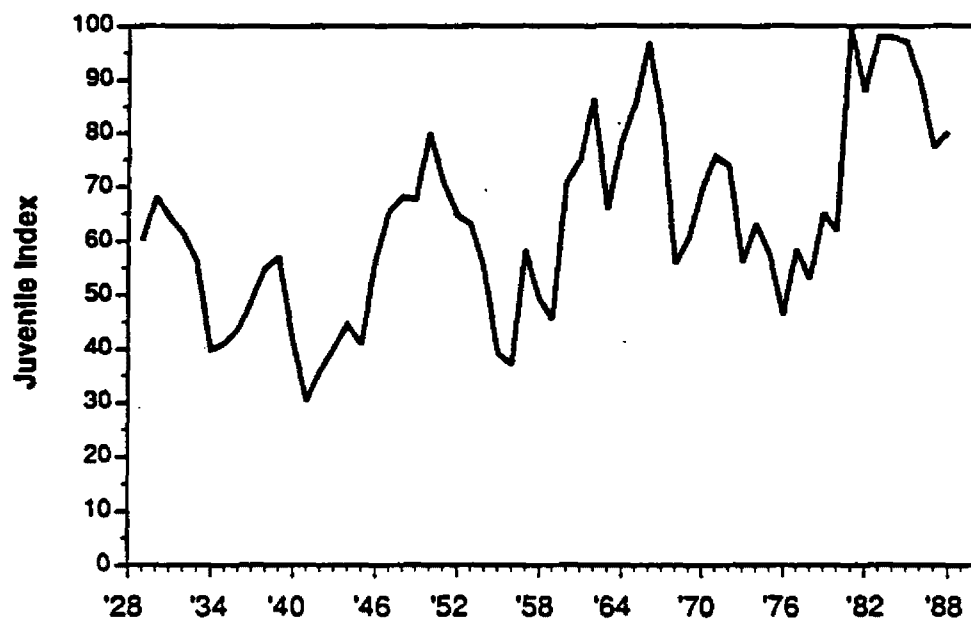


Figure 4. **Blue Crabs: Maintain Harvests Over Time**

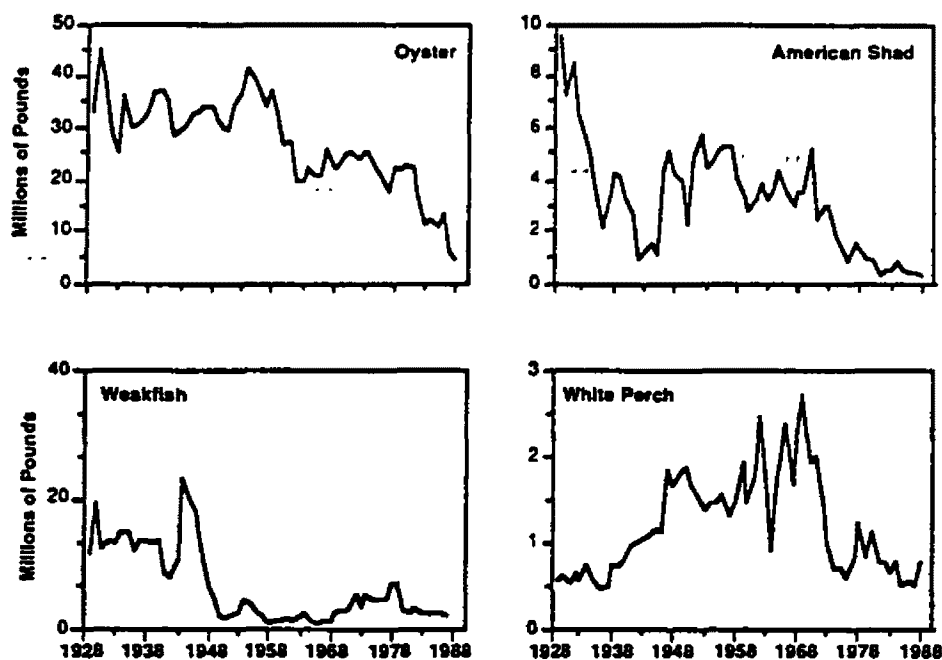


Figure 5. **Other Species Continue Their Decline**

WATER QUALITY

Nutrient and Conventional Pollution Controls

Background:

Nutrient and selected conventional pollution control measures receive the greatest emphasis among the activities in the Bay Program. Two programs form the backbone of this area of Bay restoration. The "Nutrient Reduction Strategy"²⁶ charts the implementation of a 40% baywide reduction in nitrogen and phosphorus discharges by the year 2000. These ambitious reductions will be accomplished through additional treatment measures at municipal and industrial treatment plants and focused implementation of nonpoint source control programs. The second program, the "Conventional Pollutants Control Strategy,"²⁷ outlines ongoing efforts to reduce point and nonpoint source pollutants baywide.

Implementation of the "Nutrient Reduction Strategy" through 1990 involved clarifying assumptions used to estimate point and nonpoint source loads thereby obtaining more refined, reliable information. By the end of 1990, the development of the Chesapeake Bay Water Quality Model by the Corps of Engineers was nearing completion. This model and supplementary statistical analyses relate the load reduction goals to the Bay's future water quality. The model's simulations will be used extensively in the upcoming reevaluation of the 40% nutrient reduction goal.

Objectives:

The objective of the nutrient control program is to reduce inputs of these pollutants to levels that will deter algae growth. Excessive algae threatens submerged aquatic vegetation and depletes dissolved oxygen upon which living resources depend.

Accomplishments and Milestones:

Progress in nutrient reduction efforts was first seen in reduced discharges from point sources and can now be seen in improvements to the Bay's water quality.

- Phosphorus levels are dropping in the Bay; and,
- Submerged grasses are slowly recovering—most effectively in the mid-Bay where stringent point source controls have existed the longest.

There are other signs of progress; nitrogen controls are beginning to work and fertilizer use is down 30% in Maryland, Virginia, and Pennsylvania.

The Chesapeake Bay Program is fortunately able to measure and document improvements to water quality due to its heavy investment in water quality monitoring and data management. These techniques are combined with the more common methods of tracking control actions and construction progress as surrogates for environmental progress. These activities are discussed in a later section of this report.

Figure 6 shows a 16% decrease in the Bay's phosphorus between 1985 and 1990. This drop is attributed to extensive point source and nonpoint source control efforts as well as a ban on phosphate detergents in all three agreement states and the District of Columbia. These reductions were achieved despite a significant growth in wastewater flows during the same period (Figure 7).

One of the most sensitive indicators of overall water quality in the Bay are the acres of submerged aquatic vegetation. The Bay Program has inventoried these grasses and researched the relationship between the health of the grasses and water quality. Since 1985, their coverage has increased in the mid-Bay 130% (Figure 8).

While there are signs of improvement, there are still several areas that require additional work. Nitrogen levels have not gone down in the past few years (Figure 9) because the control of nitrogen has not kept pace with the growth in wastewater flows. Although seven Publicly Owned Treatment Works (POTW) have complied with important sections of the "Nutrient Reduction Strategy" by installing nitrogen treatment systems, nitrogen load reduction has fallen behind nitrogen load increases caused by population growth. Nitrogen loads will be reduced when an additional 45 POTWs scheduled for nitrogen treatment systems are upgraded. Eighteen of these upgrades are currently in the planning stages.

Progress in reducing nitrogen is not confined to point source controls. Across the watershed, a major emphasis is being placed on nutrient management.²⁸ Technical and financial assistance programs are being established to implement this technique which utilizes nutrients already on the farm to meet crop requirements. Fertilizer is regarded as a supplement under this system and its use is prescribed sparingly. Utilizing this procedure, fertilizer usage has dropped 30% in the three Bay Program states during a period in which its use has decreased only 1% nationwide. Figure 10 illustrates this decline.

Because nitrogen is a major focus of nutrient management, extensive results are anticipated. Results will take some time, however, because nitrogen travels from field to Bay predominantly through groundwater, a process that takes several years. Even though fertilizer use has recently decreased, therefore, reduced levels of nitrogen in the Bay will not appear in the near future.

The tables presented in Appendix A show the results of the Chesapeake Bay's unique nonpoint source nutrient control and abatement efforts. This information is supplied by the state grantees to EPA-Chesapeake Bay Liaison Office (EPA-CBLO) quarterly as a deliverable under the programs implementation grants. The purpose is to track the use of grant funds that financially assist farmers and local jurisdictions to install best management practices (BMPs) to reduce nonpoint source nutrient loads.

Appendix A also shows the distribution of funds expended by the state grantees. These data illustrate that slightly less than half of the funds actually go into BMP construction. A significant portion of funds are allocated to technical assistance and education programs. This is an important expenditure not only because it supports a largely voluntary program to achieve the 40% reduction goal, but because this assistance also leads to BMP construction without government financial assistance.

The Chesapeake Bay program has provided grants to the states and the District of Columbia to implement nonpoint source abatement and control programs beginning in early 1985. Through FY90, \$43.73 million in federal funds (Appendix A, Table 1) was granted to the states, which they matched dollar for dollar, bringing the total to \$87.46

million. The majority of these funds (\$48.17 million—Table 2) assist farmers in installation of agricultural BMPs that comprise a combination of nutrient (fertilizer and manure) management, animal waste storage, and sediment erosion control devices which, together, control nonpoint source pollution.

From 1985 through the first half of 1990, the Chesapeake Bay nonpoint source pollution control program has helped farmers (Appendix A):

- Install over 11,900 individual BMPs;
- Treat over 268,436 acres of farm land, 8% of the basin identified by the USDA as high erosion cropland, reducing sediment loss by over 1 million tons per year;
- Install 1300 systems to store and manage 2.7 million tons of animal wastes or 9% of the waste produced in the basin; and,
- Prepare over 600 nutrient management plans for 66,000 acres of cropland.

Approach and Future Workplan:

The point and nonpoint source control programs are supported by an intense program of management and planning. Program management consists of such activities as targeting areas needing controls, educating landowners, contracting for designs, installation, inspection and reporting. Program planning consists of a series of investigations outlined in the original "Nutrient Reduction Strategy."^{29,30} The most significant of these was the report of the independent NPS Evaluation Panel,³¹ commissioned to evaluate the adequacy of current programs to achieve the 40% nutrient reduction goal by the year 2000. The panel's report concluded that although current programs are effective, they are insufficient to meet the year 2000 goal and proposed several refinements including:

- Improvement of targeting systems;
- More effective education programs;
- States adopting a common conceptual framework for nutrient management;
- States more aggressively ensuring the effective management of animal wastes;
- States continuing to increase their emphasis on controlling urban sources of nutrients;
- A greater effort be made to ensure that information requested and gathered supports policy and program decisions; and,
- A program management framework be adopted which accounts for the full range of nutrient inputs and outputs within the basin.

While the panel's report will guide the refinement of these already impressive programs, studies are underway to confirm the goal toward which they are working.

Overall planning for the nutrient reduction program will examine whether the 40% reduction is still the target and how it or a new goal can best be met. This effort is guided by two computerized models:

- The Watershed Model to simulate the discharge and transport of pollution from sources across the watershed to the Bay, including estimates of the contributions from atmospheric deposition of nitrogen; and,
- The Time-Variable Water Quality Model to predict what projected loads will mean in terms of future Bay water quality.

The latter will be linked with air program models and utilized to determine the water quality benefits which will result from reductions in atmospheric nitrogen deposition through the implementation of the new Clean Air Act. A joint air/water strategy to abate atmospheric nitrogen deposition is in the initial stages of development.

Joining the numerous assessments of the effectiveness of nonpoint source controls, additional technical information³²⁻³⁶ has been developed to evaluate the effectiveness, cost, and feasibility of biological nutrient removal at sewage treatment plants throughout the basin.

Relationship to Other Program Elements:

Work under this heading is associated with the control of conventional pollutants because controls implemented for nutrients often control conventional pollutants as well. Monitoring programs are essential to refine and guide nutrient reduction programs; therefore, Modeling and Nonpoint Source subcommittees work closely with the control program. Control programs for nutrient and conventional pollutants are intended to improve water quality to protect and revitalize the Bay's living resources. The Living Resource Subcommittee is establishing water quality objectives for the protection of living resources as the central focus of the pollution reduction program.

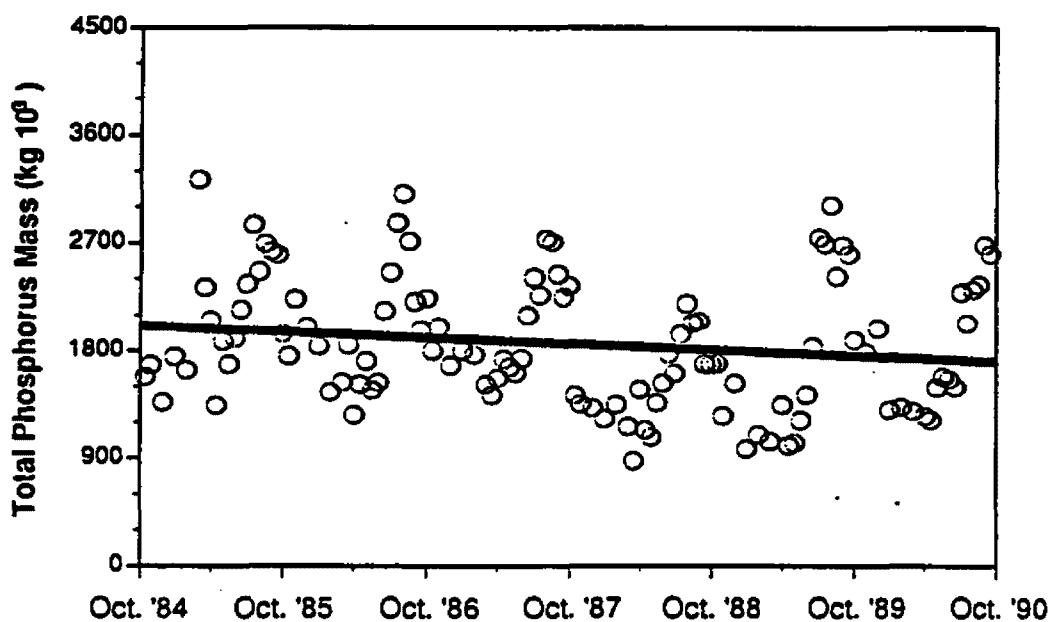


Figure 6. **Phosphorus in the Bay is Going Down**

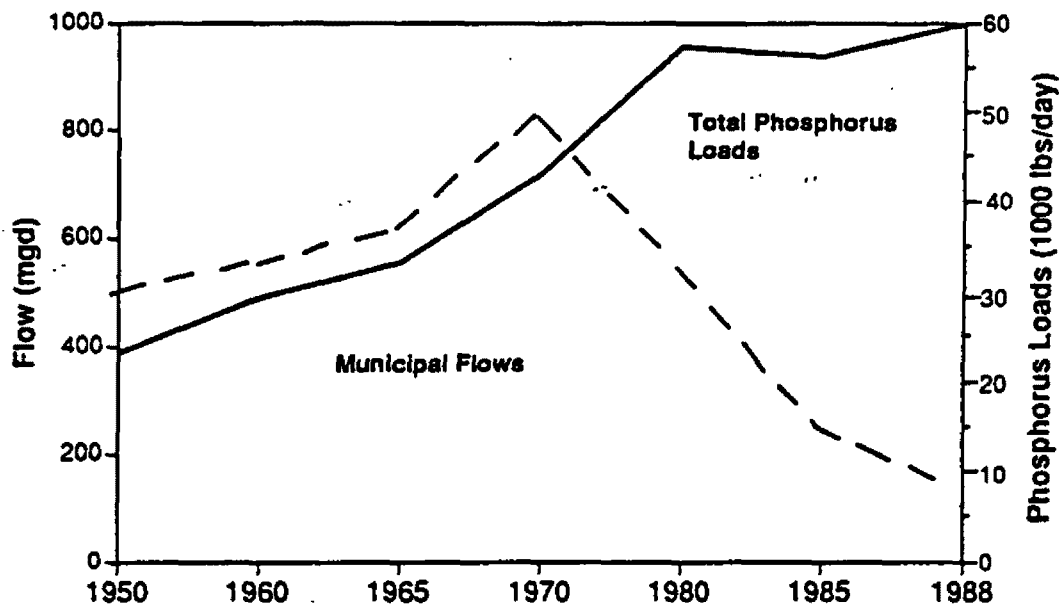


Figure 7. **Municipal Flows and Total Phosphorus Loads Originating Below the Fall Line 1950-1988**

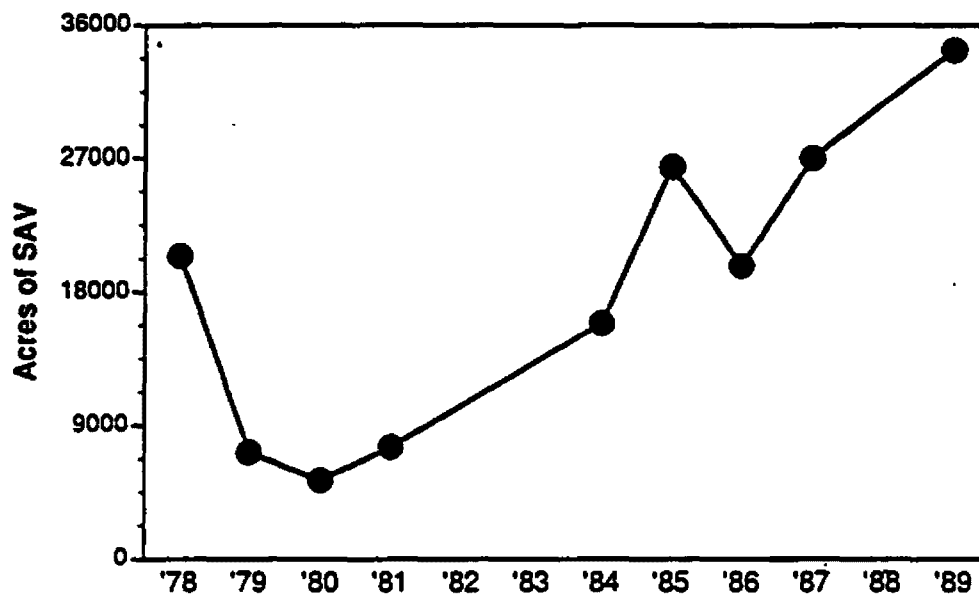


Figure 8. **Submerged Grasses are Slowly Recovering in the Mid-Bay**

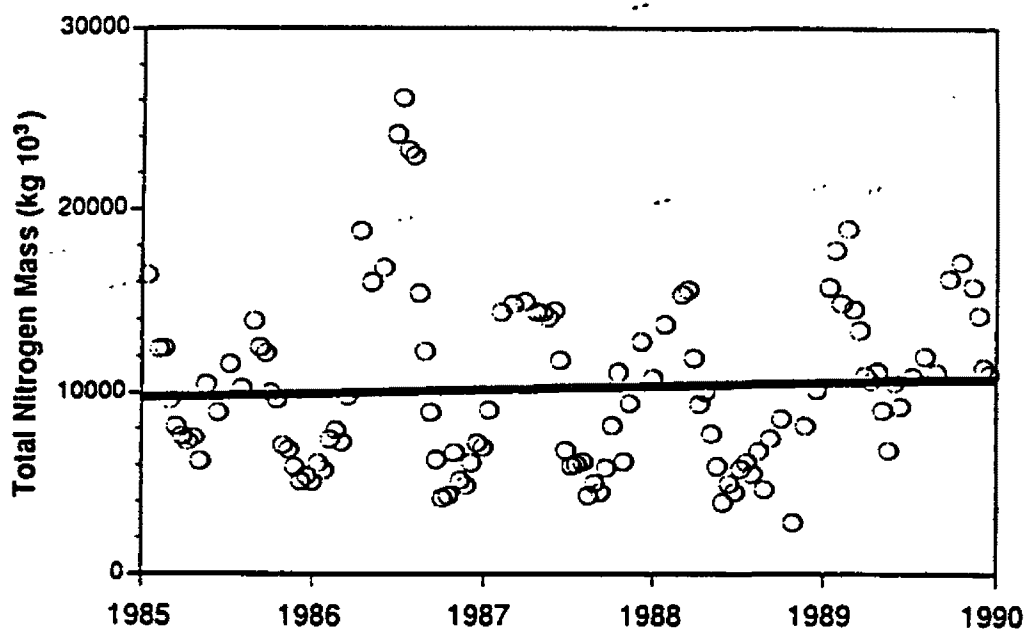


Figure 9. **Nitrogen in the Bay is Still Rising**

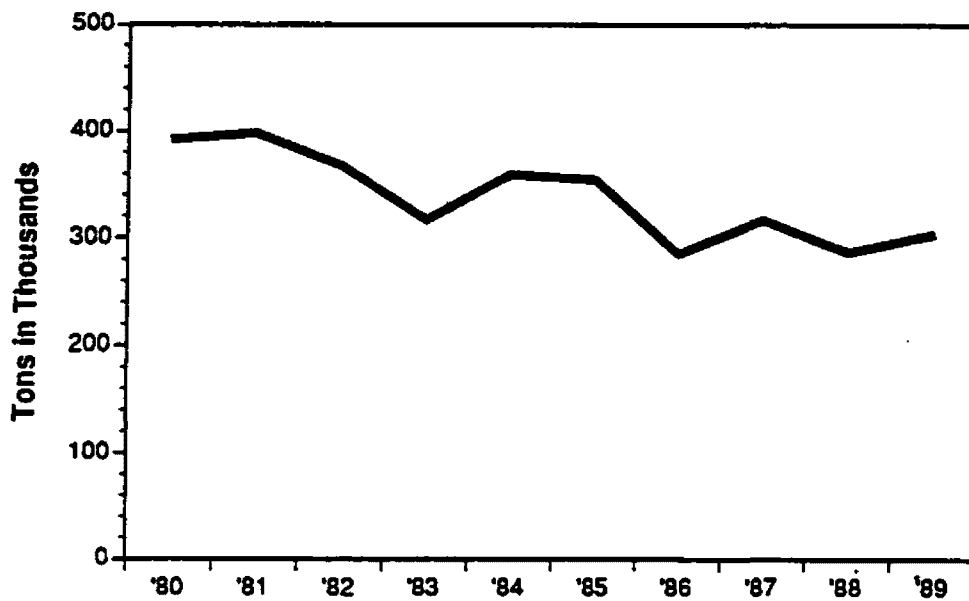


Figure 10. **Nitrogen Controls Have Begun to Work
Fertilizer Use is Down 30%**

WATER QUALITY

Basinwide Toxics Reduction

Background:

The 1988 "Chesapeake Bay Basinwide Toxics Reduction Strategy"³⁷ builds on toxic control activities originating from federal laws and programs undertaken in the 1970s and pursued by the states with increasing intensity through the 1980s. The strategy commits the signatories to take a comprehensive approach in working "towards a toxics-free Bay by eliminating the discharge of toxic substances from all controllable sources."³⁷

Toxic reduction programs recognized by the "Basinwide Toxics Reduction Strategy" include state and federal programs under the Clean Water Act, related media-specific pollution control legislation, and special initiatives under the Chesapeake Bay Program. Controls on toxic discharges to the Bay include regulation of industrial point sources under NPDES permits, pretreatment requirements for industrial discharges flowing into municipal treatment plants, stormwater controls, state and federal regulation of specific pesticides, and an increasing number of pollution prevention programs. Under the new Clean Air Act, additional controls will be imposed.

Research needed to more accurately characterize sources, exposures, and effects of toxics is noted in the Toxics Research Strategy, part of the "Basinwide Toxics Reduction Strategy Appendices"³⁸ adopted by the Chesapeake Executive Council. This research strategy will be updated periodically over the next several years.

Objectives:

In addition to the long-term goal stated above, the "Basinwide Toxics Reduction Strategy" includes an interim goal:

"By the year 2000, the input of toxic substances from all controllable sources to the Chesapeake Bay will be reduced to levels that result in no toxic or bioaccumulative impact on the living resources that inhabit the Bay or on human health."³⁷

The strategy contains a number of commitments and milestones to assess progress toward the long-term goal. Intermediate goals include the phased elimination of acute and chronic toxic discharges from major municipal and industrial point sources by 1996. The point source toxics reduction goals mandated through the Clean Water Act will be achieved through the Individual Control Strategies at specific discharges identified under section 304(l) of the Act. Achievement of the point source goals will also be pursued through application of consistent criteria for defining toxic discharges and initiation of toxicity reduction evaluations.

Defining sources and loads will be the first step in reducing nonpoint sources of toxics. Regulation of stormwater discharges will reduce urban runoff of toxics. Further understanding of the magnitude of atmospheric deposition of toxics has led to more specific targeting of air emissions. A list of 18 compounds targeted by EPA for nationwide pollution reduction and prevention actions focus on air sources.³⁹ Additional

educational and outreach efforts will concentrate on a baywide implementation of Integrated Pest Management—an approach that carefully surveys pests, proposes the selective use of pesticides, and initiates control programs to reduce reliance upon chemicals. While this technique has been applied most commonly in agriculture, there is now widespread interest in urban areas.

Accomplishments and Milestones:

Since implementation of the strategy in September 1989, there has been significant progress towards achievement in several of the most critical toxics reduction strategy commitments.

- The first Chesapeake Bay Toxics of Concern List⁴⁰ was developed;
- Work on the basinwide toxics loading inventory began and is scheduled for completion by May 1991;
- The first year of a joint EPA/NOAA toxics research program, yielding a total of \$800,000 for 10 directed research projects, has already produced significant findings;
- The first basinwide survey of pesticide use was completed;
- Bay basin states' integrated pest management programs were expanded;
- Baywide atmospheric deposition and fall line toxics monitoring programs were initiated; and,
- A baywide pilot ambient toxicity assessment program was initiated.

In FY89, FY90, and FY91 appropriations were directed towards implementing the Basinwide Toxics Reduction Strategy. The funds supported research and assessment of the impact of toxics on the Bay system, with a portion of the funds directed towards preventative actions. In FY92, the President's budget proposes to continue directing resources towards implementing the Basinwide Toxics Reduction Strategy.

Approach and Future Workplan:

To prepare for the reevaluation of the "Basinwide Toxic Reduction Strategy" in 1992, increasing emphasis will be placed on providing the data, information, and institutional mechanisms necessary to:

- Build on existing regulatory programs;
- Define the extent of the Bay's toxic problems and the impact they have on living resources and human health;
- Develop a more aggressive, cost-effective pollution prevention program;
- Investigate opportunity for a pollution prevention waste exchange program;
- Expand the existing Integrated Pesticide Management program to control pesticide

nonpoint source runoff;

- Acquire data and information necessary to guide future reduction decisions;
- Assess non-traditional sources of toxics and toxicity with emphasis on cross-media problems;
- Target toxics of concern;
- Reduce loadings of toxics to all media from inventoried sources; and,
- Develop and validate tools for targeting and quantifying toxic problems and measuring progress.

Relationship to Other Program Elements:

Due to the nature of toxic problems, the basinwide strategy implementation activities will continue to be integrated with most of the other components of the Chesapeake Bay Program. Research and assessment studies and resultant reduction targets will be closely associated with efforts to improve Chesapeake Bay habitats. Monitoring and data management activities will be coordinated with similar activities already underway in other aspects of the program. Point source inventories, already developed to guide nutrient reduction programs, will continue to be used in toxic reduction programs.

Addressing the implications of multi-media transfers and impacts of toxics will require new emphasis of agency personnel involvement and consideration of regulatory mandates. The Clean Air Act amendments and the significance of atmospheric deposition as a potential source of toxics to the Bay basin provide important examples of the need to assess multi-media transfers.

Significant efforts will be made to increase the role of federal agencies and their facilities in strategy implementation. Involving the federal partners in the Bay restoration program will create additional opportunities for attaining common objectives by integrating resources.

WATER QUALITY

Water Quality Monitoring

Background:

The Chesapeake Bay Monitoring Program, as originally described within "A Framework for Action—Appendix F,"⁴¹ has expanded its definition to include other monitoring activities within the Bay basin not directly associated with sampling the Bay's tidal waters. The Chesapeake Bay Program Monitoring Subcommittee has correspondingly expanded its coordination efforts to include fall line, non-tidal tributary, and small watershed monitoring programs. These efforts are enumerated and mapped in the "Chesapeake Bay Basin Monitoring Program Atlas."^{42,43} This coordination includes locations, timing, methods used, quality assurance, and correlation between living resource survey programs and water quality data. As a result, the role of the baywide Monitoring Water Quality Program has become more closely linked to the short and long-term needs of the Chesapeake Bay Program management agencies.

Objectives:

The overall objectives of the baywide Water Quality Monitoring Program are to:

- Characterize the present state of the Chesapeake Bay, including spatial and seasonal variability, in terms of water quality parameters;
- Determine long-term trends or changes that develop in response to pollution control programs; and,
- Integrate the information collected in the baywide Water Quality Monitoring Program with other components of the Chesapeake Bay Monitoring Program to gain a more comprehensive understanding of water quality and how it might impact living resources.

In the near term, the program will focus on collecting and analyzing information useful to the 1991 Nutrient Reduction Strategy Reevaluation. The Monitoring Program's role will involve detecting water quality changes resulting from the nutrient management efforts and developing recommendations as to whether nutrient management should be reoriented after 1991. With a recommendation to redefine the management strategy, the program must determine how to meet living resources habitat objectives by the year 2000.

Accomplishments and Milestones:

The water quality and living resources data collected and compiled through the Chesapeake Bay Monitoring program has been applied to: characterize the current state of the Bay's ecosystem;⁴⁴ document the response of total phosphorus in the upper Bay to recent control measures;⁴⁵ and, examine historical variations in dissolved oxygen.⁴⁶ As a result of the Chesapeake Bay Coordinated Split Sample Program,⁴⁷ the measurement variability among the 10 different laboratories involved in the Monitoring Program has

decreased. In addition, the Monitoring Subcommittee has revised its charge to meet the changing management needs of the Chesapeake Bay Program.

Approach and Future Workplan:

The Monitoring Subcommittee is currently assessing the ability of the existing monitoring network and sampling frequency to detect progress towards meeting the specific water quality goals recommended for living resource habitat. The assessment will also explore the role of non-traditional sampling techniques such as remote sensing and buoy deployment and the role Environment Monitoring and Assessment Program (EMAP) can play in supplementing monitoring efforts directed at meeting management information needs. In addition, the Monitoring Program will support the 1991 reevaluation of the 40% nutrient reduction goal.

During the next year, the following products will be prepared:

- A report reassessing the current monitoring program;
- The 1991 Water Quality Characterization Report; and,
- A guidance document for the analysis of water quality trends.

The following activities will be undertaken:

- Evaluate the results from near field pilot BMP and small watershed monitoring programs and discern the relationship to adjoining tributary and fall line water quality monitoring programs;
- Define management information needs as data quality objectives to guide the ongoing monitoring program;
- Assess and document the ongoing water quality monitoring programs in detecting anticipated rates of changes in regional water quality and meeting management information needs;
- Develop a baywide data analysis, interpretation, and reporting strategy;
- Review existing toxics monitoring programs and develop a schedule for the design and implementation of new toxics monitoring programs;
- Design and implement a long-term sediment monitoring program (with Toxics Work Group of the Water Quality Commitment Team); and,
- Reinstitute, in cooperation with the Toxics Subcommittee, sampling sediment trace metals and organic analysis in the Bay's mainstem.

Relationship to Other Program Elements:

The water quality component of the Chesapeake Bay Monitoring Program will continue to be closely coordinated with the sample collection and data interpretation efforts of the living resources and toxics monitoring programs. The Living Resources Monitoring Plan, adopted by the Chesapeake Executive Council in July 1988, targets better integration

between living resources and water quality monitoring programs through a two-year implementation of programmatic and technical recommendations.

PUBLIC ACCESS

Background:

The "1987 Chesapeake Bay Agreement" calls for increased opportunities for public appreciation and enjoyment of the Bay and its tributaries. Access to the Bay is central to the public's appreciation, and public appreciation is essential to the long-term support of Bay restoration and protection. The Bay's access points, though numerous and varied, need to be more visible and their number expanded to fully accomplish these goals.

Objectives:

The goal of promoting increased opportunities for public appreciation and enjoyment of the Bay and its tributaries includes four objectives:

- Improve and maintain access to the Bay including public beaches, parks, and boat ramps;
- Increase opportunities for recreational and commercial fishing;
- Secure shoreline acreage to maintain open space and provide opportunities for passive recreation; and,
- Secure necessary acreage to protect unique habitat and environmentally sensitive areas.

Accomplishments and Milestones:

To help achieve their goals, the Executive Council adopted a "Public Access Strategy"⁴⁸ which includes an inventory of current access opportunities. "Bay and River,"⁴⁹ a subsequent report, is a comprehensive guide to facilities around the tidal Chesapeake Bay system and the Susquehanna River.

In December 1990, the Bay area states and the District of Columbia completed the "Chesapeake Bay Area Public Access Plan."⁵⁰ The plan shows existing public and private access sites and identifies locations where additional access is needed. The document contains information on what is available at each existing site. In addition, it identifies important planning factors which need to be considered in the development of future access areas. This information is enhanced by the "Chesapeake Bay Area Public Access Technical Assistance Report,"⁵¹ a companion document which details the selection and development of public access sites.

The "Public Access Plan" will be distributed to Bay area localities and will be an important tool in directing the development of public access and in maintaining existing access opportunities. It will also track the progress made in meeting the high demands for public access to the Bay, its tidal tributaries, and the Susquehanna River.

Approach and Future Workplan:

Special coordinating work under this category has been completed. State and local agencies are responsible for implementing access plans.

Relationship to Other Program Elements:

As plans are made to secure necessary acreage for Bay access, provisions to protect unique habitat and environmentally sensitive areas are instigated. Working in conjunction with the Living Resources Subcommittee, access plans are reviewed to safeguard designated Estuarine Research Reserves and other sensitive habitats.

Special emphasis of the Public Access Program is given to the control of waste discharges from recreational boats.⁵² This will be directed, in part, by the public facilities that need to provide pumpouts and other land-based waste handling facilities.

POPULATION GROWTH AND DEVELOPMENT

Background:

Commitments in this category reflect the recognition that unless major changes in development patterns occur, pollution control programs intended to substantially improve the Bay's water quality will eventually be overtaken by the increasing watershed population. The critical nature of this projection was underscored in the report "Population Growth and Development in the Chesapeake Bay Watershed. Year 2020 Panel."⁵³

Objectives:

The objectives of the Bay Program's emphasis on population growth and development is to diminish the impact of land development by making those involved more aware of environmental concerns. The approach is to provide local, state and federal agencies with technical tools that protect environmentally sensitive areas by channeling the population's growth to environmentally acceptable areas where development controls can be applied. Innovative techniques are promoted to avoid or mitigate any adverse impacts of growth. Government projects are also regulated to ensure that they exemplify sound environmental management. These objectives will be met through incentive programs, technical assistance to local governments, careful planning of state and federal development projects, the application of the "Chesapeake Bay Development Policies and Guidelines,"⁵⁴ and increased state-level responsibility for such growth-related activities as land preservation, capital budgets, and infrastructure planning.

Accomplishments and Milestones:

To aid in implementing programs and ensuring that growth and development are sensitive to the Bay's need for protection, the Executive Council adopted the "Chesapeake Bay Development Policies and Guidelines" which is directed towards state and federal activities. The "Technical Assistance and Incentives to Local Governments"⁵⁵ was also drawn up to inform and assist local governments in their attempts to minimize the adverse affects of population growth and development.

Both Maryland and Virginia have recognized the need to play increasingly stronger roles in working with local governments to manage growth in sensitive areas. Each state established standards, adopted regulations, and began aggressive programs of technical assistance to implement them. Maryland adopted its "Critical Area Law"⁵⁶ in 1984 and Virginia adopted the Chesapeake Bay Preservation Act in 1988. Both of these laws mandate the strong involvement of local governments in the discharge of their land use control responsibilities. Due to a lack of projected growth and development, Pennsylvania and the District of Columbia have not implemented similar programs.

"Population Growth and Development in the Chesapeake Bay Watershed. Year 2020 Panel," a report produced by a blue ribbon panel as part of the 1987 Agreement, has been very influential in highlighting the problems of growth and present development patterns within the watershed. Consequently, both Maryland and Virginia established their own study groups to examine further growth and development measures that may be needed to

implement the themes accepted in the 2020 Panel's report. In Virginia, the Commission on Population Growth and Development has been at work for some time, transforming itself from a legislative study group to a full legislative commission with an executive director and an emerging multi-year workplan. Maryland recently completed the reports of the Governor's Commission on Growth in the Chesapeake Bay Region.

Approach and Future Workplan:

The management of population growth and development impacts is a state and local government responsibility. Federal involvement is confined to providing technical information and planning tools to state and local governments. To this end, a substantial FY91 and FY92 EPA effort is planned to inventory land uses and land cover and refine computerized watershed models useful in planning nonpoint source control programs. This inventory, in conjunction with the inventories of point source dischargers, will allow the future condition of the watershed to be simulated as an aid to planning.

State and federal compliance with standards of good practice is essential in providing models for local governments to follow. Reviews of these practices, therefore, are planned.

Relationship to Other Program Elements:

Population growth and development activities are directly associated with plans for wetland protection noted under the Living Resources Workplan. These concerns for habitat protection are also related to wastewater treatment and nonpoint source control programs and to review processes established for environmental impact assessment and funding coordination. With new programs under the Clean Air Act, the program will examine the water quality impacts of discharges to the air through motor vehicles.

PUBLIC INFORMATION, EDUCATION, AND PARTICIPATION

Background

Commitments in this category reflect the importance the Executive Council places on information and education of the public about the Bay's resources. The 1987 Agreement declared that "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..."

Objective

Creation of state, federal, and baywide communication plans were priority commitments to support the Public Information, Education and Participation goals of the agreement. Joint efforts were framed to coordinate and broaden the reach and effectiveness of information and education activities carried out by participating state and federal agencies. These have included state and federal communications plans that implement the baywide plan's general proposals, a public review and comment process, and annual Bay awareness events.

Accomplishments and Milestones

The Public Information and Education Subcommittee was created to involve the public in the Bay's welfare through awareness and understanding. The kit, "The Chesapeake Bay—It Starts With You," includes activity cards targeted for different ages which describe projects that demonstrate the role of nutrients, wetlands, and other facets of the Chesapeake ecosystem. The kits are distributed to schools, scout units, civic groups and other organizations throughout the region.

The Chesapeake Regional Information Service (CRIS) gives residents of the watershed toll-free telephone access to up-to-date reports on Bay Program activities, publications, and other resource materials. CRIS also responds to specific information requests.

"Citizen Report," the Alliance newsletter is regularly distributed to more than 16,000 readers in the Bay region, providing timely information about current restoration activities and in-depth features on topics such as global warming, reforestation, and the threat from oil spills. The Alliance also produced "white papers" on selected subjects important to the program. The Alliance "Baybook: A Guide to Reducing Water Pollution at Home" went into its fourth printing.

The Bay Program Monitoring Subcommittee and EPA continued distribution of "Bay Barometer," a monthly feature highlighting environmental topics and reporting on water clarity and dissolved oxygen levels in the Bay. The feature is distributed to newspapers, a magazine, newsletters, and some 400 schools, colleges, businesses, museums, libraries and government agencies.

The Alliance continues to support its citizen monitoring program which uses volunteers to monitor the Bay. This monitoring began in 1985 on the James River in Virginia and the

Patuxent River in Maryland, and expanded in 1986 to include the Conestoga River in Pennsylvania. Information collected by the citizen volunteers feeds into the Bay Program data center, supplementing measurements from mainstem and tributary monitoring stations maintained by state agencies.

State education programs have grown in support under the agreement. Virginia's Bay Team Teachers travel throughout the Bay area each academic year providing instruction to thousands of students. Sponsored by the Council on the Environment, these teachers from the Virginia Institute of Marine Sciences cover a wide range of topics related to Bay cleanup.

Other activities included distribution to teachers of instructional materials on the Bay Program and a soils and land use curriculum. A library resource file about Pennsylvania's Chesapeake Bay Program was established at 12 central Pennsylvania public libraries. The Pennsylvania Bay Education Resource List was updated in October 1989, and now includes over 120 items in 12 categories. The list has been distributed to more than 300 individuals and organizations.

In Maryland, the One Million Marylanders for the Bay program continued to grow in 1989 with tens of thousands of residents now pledging to undertake Bay-saving measures in their homes. Participants also receive a quarterly newsletter, "Chesapeake," which provides updates on Bay Agreement commitments, information about state restoration activities, tips on pollution control, and a Bay calendar.

Maryland sponsored a 10-day festival, Party on the Bay, in August 1989 to call attention to the restoration program. Volunteers handed out educational materials to more than 60,000 citizens at craft shows, crab feasts, fishing tournaments and other events in more than two dozen communities.

A storm drain painting project, which originated in Anne Arundel County, uses stencils to mark storm drains with the message, "Chesapeake Bay Drainage/Don't Dump," as a reminder to citizens that the drains carry water to local streams and eventually to the Bay.

Maryland's income tax checkoff for the Bay raised \$964,000 in its first year of operation. The revenue is split between the State Endangered Species Fund and the Chesapeake Bay Trust, which uses the checkoff funds as well as other contributions to expand citizen involvement projects in the Bay watershed.

The Interstate Commission on the Potomac River Basin (ICPRB) sponsors an education program funded by District grants to encourage public interest and involvement in the Anacostia River basin restoration.

The Pennsylvania Bay Education Office continued to promote the Bay Program through public information, education and outreach projects, starting with participation in the annual Pennsylvania Farm Show.

The office produced several new fact sheets and technical notes and published a brochure on the Pennsylvania Chesapeake Bay Program and the role of county conservation districts. Regular issues of the newsletter, "Keystone in the Clean-up," were distributed to individuals and organizations.

Approach and Future Workplan

While the specific content of the Communication Plan is being reviewed, it is expected that future programs will consist of many of the elements currently found in the program.

Relationship to Other Programs

Public information and education programs are related to all other elements of the program. This aspect of the program gives the public opportunities to get involved in the Bay Program. This area of the program educates the public on the value of the Bay and the programs underway to restore and protect it, leading to more informed choices when supporting Bay projects.

PROGRAM MANAGEMENT AND GOVERNANCE

Background:

The Chesapeake Bay Liaison Office traditionally provided program management services to the Bay Program. Over the past few years, the states and the Chesapeake Bay Commission have also provided some of these services to a far greater degree than in the recent past. Whichever organization provides them, the objectives remain the same.

Objectives:

The objective of program management is to provide administrative and institutional structures which facilitate the conduct and the completion of the technical tasks enumerated under other elements of the workplan, and to provide public understanding of the program to foster sustained support.

Accomplishments and Milestones:

The Chesapeake Bay Program has prospered as a major multi-state pollution control and resource management effort involving more than 40 committees and standing work groups. This multi-dimensional effort involves nine federal agencies and local governments and numerous private groups. Over the years, this program has been credited with many technical achievements, and the recognition that its formula for cooperation and coordination produces management results. Program management is intended to ensure that immediate as well as long-term needs are met so that progress can continue.

Approach and Future Workplan:

Program management includes activities involving research, public information, education and participation, data management, budget preparation, grant and contract administration, and committee support. Tasks in these categories include:

- Implementing the "Comprehensive Research Plan"⁵⁷ approved by the Executive Council in 1988. Under this plan, the Scientific and Technical Advisory Committee will develop and annually update:
 - A "Chesapeake Basin Research Directory"⁵⁸ with system design and data compilation. This directory is now in draft form;
 - An assessment of the previous year's Bay Program research achievements; and,
 - A list of research priorities and estimates of funding and resource requirements.
- Preparing public information, education and participation activities outlined in the "Baywide Communication Plan"⁵⁹ that provides for:

- Continuing public review of the Bay Program reports and their implementation;
 - Implementing projects to increase public awareness and knowledge of the Bay Program;
 - Improving coordination among agencies and jurisdictions which will increase the effectiveness and efficiency of information and education programs; and,
 - Supporting the Citizen Advisory Committee and the Local Government Advisory Committee.
- Funding the Implementation Committee's budget, data management services for the monitoring program, water quality and living resources programs through documentation of the historic data base, and further development and use of the Geographic Information System;
 - Providing grant and contract administration for EPA funds to the program, including grant awards, grant modifications, monthly status reports, monthly financial reports, and closeouts of current grants; and,
 - Supporting the Executive Council through its Implementation Committee, subcommittees, and workgroups and by preparing the Council's Annual Report.

Relationship to Other Program Elements:

As noted in the "Objectives" section, program management supports all elements of the program and, therefore, must have an integral relationship with all committees, subcommittees, and workgroups.

APPENDIX A
**TABLE 1. CHESAPEAKE BAY GRANT FUNDING FOR STATE
NONPOINT SOURCE ABATEMENT AND CONTROL PROGRAMS**

Funding Provided For:

	Program Admin. & Planning ¹ (\$ million)	Technical Assistance ² (\$ million)	Education & Research ³ (\$ million)	Financial Assistance ⁴ (\$ million)	Habitat Restoration ⁵ (\$ million)	Total State & Federal Grant Funds ⁶ (\$ million)
FY 84-88						
PA	2.88	3.45	4.58	8.08	0.0	18.99
MD	0.03	0.12	0.07	18.72	0.0	18.94
DC	0.68	1.75	0.2	1.94	0.0	4.57
VA	3.02	4.19	3.36	7.95	0.0	18.52
TOTAL	6.61	9.51	8.21	36.69	0.0	61.02
FY 89						
PA	0.796	1.593	0.796	0.796	0.0	3.981
MD	0.0	0.12	0.8	3.781	0.0	3.981
DC	0.667	0.199	0.53	0.398	0.0	1.327
VA	0.47	1.767	0.544	1.2	0.0	3.981
TOTAL	1.933	3.679	2.67	6.175	0.0	13.27
FY 90						
PA	0.418	1.972	0.24	1.025	0.175	3.83
MD	0.046	0.16	0.195	3.205	0.199	3.805
DC	0.074	0.663	0.623	0.0	0.085	1.447
VA	0.336	2.024	0.656	1.074	0.0	4.091
TOTAL	0.874	4.819	1.714	5.304	0.459	13.173
Program Total FY 84-90						
PA	4.094	7.015	5.616	9.901	0.175	26.801
MD	0.076	0.4	1.065	25.706	0.199	26.726
DC	1.421	2.612	1.353	2.338	0.085	7.344
VA	3.826	7.981	4.56	10.224	0.0	26.592
TOTAL	9.417	18.008	12.594	48.169	0.459	87.463

1. Activities and staff necessary to arrange, plan, and oversee contracts for nonpoint source abatement and control practices.
2. Technical assistance necessary to plan, design, and install abatement and control practices.
3. Education and research necessary to support the program.
4. Financial assistance to land owners to subsidize a portion of capital cost of abatement and control measures.
5. Financial assistance to cover a portion of the capital cost necessary for installing practices that restore wetlands, SAV beds and other habitats.
6. Funds are 50% state and 50% federal. States may have additional program funds that are used but are not tracked by EPA.

**TABLE 2. NONPOINT SOURCE ABATEMENT AND CONTROL
IMPLEMENTATION PROGRESS IN THE CHESAPEAKE BAY**

Nonpoint Source Abatement and Control Measures	No. of Agric. Practices Installed	Agric. Acres treated (acres)	Sediment Reduced (tons/vr)	Animal Waste Stored (tons/vr)	Program Spending (\$)
1985-1987					
Management Measures	3,269	70,548	421,909	NA	2,089,971
Structural Measures	2,039	40,181	92,419	NA	570,653
Animal Waste Management	563	NA	NA	1,646,089	6,479,328
Nutrient Management	73	5,114	NA	NA	307
TOTAL	5,944	115,843	514,328	1,646,089	9,140,259
1988					
Management Measures	1,643	27,864	234,813	NA	1,199,012
Structural Measures	794	19,992	61,685	NA	2,448,216
Animal Waste Management	438	NA	NA	517,394	6,683,072
Nutrient Management	80	2,701	NA	NA	2,305
TOTAL	2,955	50,557	296,498	517,394	10,332,605
1989					
Management Measures	1,104	20,865	176,691	NA	771,252
Structural Measures	500	11,160	24,401	NA	1,811,686
Animal Waste Management	218	NA	NA	450,752	3,458,911
Nutrient Management	256	43,271	NA	NA	2,825
TOTAL	2,078	75,296	201,092	450,752	6,044,674
1990 (first half year)					
Management Measures	568	10,131	14,607	NA	277,555
Structural Measures	118	1,035	6,884	NA	249,624
Animal Waste Management	72	NA	NA	140,074	1,275,254
Nutrient Management	217	15,574	NA	NA	2,562
TOTAL	975	26,740	21,491	140,074	1,804,995
Program Total					
Management Measures	6,584	129,408	848,020	NA	4,337,790
Structural Measures	3,451	72,368	185,389	NA	5,080,179
Animal Waste Management	1,291	NA	NA	2,754,309	17,896,565
Nutrient Management	626	66,660	NA	NA	7,999
Unexpended Financial Assistance Funding*	NA	NA	NA	NA	20,846,467
TOTAL	11,952	268,436	1,033,409	2,754,309	48,169,000

* Also includes minor funding for urban nonpoint source controls that are not accounted for on this table.

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