

*Chesapeake
Executive
Council*

*The Second
Progress
Report
under
the 1987
Chesapeake
Bay
Agreement*

December 1989



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Foreword



Gerald L. Baliles

To the People of the Chesapeake Bay Region:

After a decade of sustained effort, we have made genuine progress toward protecting and restoring the water quality, habitats, and living resources of the Chesapeake Bay. We can be proud of what has been accomplished and optimistic about the future.

The evidence suggests that we may be turning the corner: recently collected data show reductions in phosphorus flowing into the estuarine system as a result of phosphate detergent bans, improved point source controls, and refined targeting of our nonpoint source control programs.

Also, through our cooperative efforts, baywide management plans have been established for blue crabs and other key species as well as management policies for wetlands and submerged aquatic vegetation. Major barriers to historic upstream spawning areas have been removed. These endeavors are making a difference.

But, perhaps as important, we have raised the level of concern, solidified the consensus for action, and lifted the level of debate. The report on regional growth and development to the year 2020 by a select panel of citizen volunteers has begun a critical baywide dialogue that can lead to policies and methods for protecting and restoring the Chesapeake Bay while accommodating continued growth and development.

Now, as in the past, the key factors in our struggle to save the Bay are widespread awareness and support. We have attracted significant support from the public and State and Federal leaders. We must continue to pursue greater partnerships between State governments and the private sector in this great endeavor.

As Chairman of the Chesapeake Executive Council, I have been impressed by the quality and intensity of our partnership, and I thank the other members of the Council: Governors Robert P. Casey of Pennsylvania and William Donald Schaefer of Maryland; Mayor Marion Barry of the District of Columbia; Lee M. Thomas, Administrator of the United States Environment Protection Agency, and his successor, William K. Reilly; Delegate Tayloe Murphy, Jr., of Virginia, Chairman of the Chesapeake Bay Commission, and his successor, Delegate James E. McClellan, of Maryland. Their commitment, cooperation, and friendship have made the work easier and brought the hope of Bay restoration and protection closer to reality.

I also thank, as well, the many others who have made 1989 a good year for the Bay and urge them all to continue the work which, I believe, will ultimately ensure the Chesapeake Bay's future health and productivity.

A handwritten signature in dark ink, reading "Gerald L. Baliles". The signature is fluid and cursive, with a long horizontal stroke at the end.

Gerald L. Baliles, Governor of Virginia
Chairman 1987-1989
Chesapeake Executive Council

The Second Progress Report under the 1987 Chesapeake Bay Agreement

Remote Sensing

The view of the Chesapeake Bay area that appears on the cover was made in the winter of 1977 by the National Aeronautics and Space Administration (NASA) using Landsat satellite imagery.

Images from space are one form of "remote sensing," a rapidly developing technology used increasingly in the Chesapeake Bay Program to record a broad spectrum of environmental conditions ranging from patterns of land use to surface water temperatures.

Remote sensing utilizes a variety of instruments deployed on satellites, aircraft, or buoys to gather data at appropriate frequencies—on an hourly basis for some measurements, at intervals of a year or longer to study long-range trends.

The National Oceanic and Atmospheric Administration (NOAA) has begun a program called Chesapeake Bay CoastWatch which includes both satellite and aircraft remote sensing. Landsat data are being analyzed this year to evaluate changes in tidal wetlands over the last decade. Such analyses will be carried out every three to five years to track losses or gains in tidal wetland acreage. Aircraft will make low-altitude, weekly flights over the mainstem of the Bay to track patterns in algal growth in the spring and summer. This information will help define seasonal links among nutrients, algal production, and oxygen depletion in Bay waters.

The Environmental Protection Agency (EPA) has been using a radio-equipped buoy to collect near-continuous underwater measurements of dissolved oxygen, temperature, and salinity. This information, transmitted from the buoy to the Bay Program computer information center, helps reveal hourly, daily, and weekly patterns of Bay water quality.

Local, State and Federal agencies also carry out periodic surveys with special airborne cameras to delineate nontidal wetlands, forest cover, floodplains, and land features. These photographs record long-term changes taking place in the watershed.

Remote sensing, in conjunction with other monitoring programs and computer tools such as models and geographic information systems, arm environmental planners with the information they need to evaluate interactions between land activities and conditions in the Bay.

Other photographs in this report were provided by the District of Columbia Department of Consumer and Regulatory Affairs, Maryland Department of Natural Resources, Pennsylvania Department of Environmental Resources, Virginia Council on the Environment, the Soil Conservation Service, Chesapeake Bay Foundation, Kent Mountford, Lynda Liptrap, and the library of the Chesapeake Bay Liaison Office.

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A Perspective on Progress

"...we commit to managing the Chesapeake Bay as an integrated ecosystem and pledge our best efforts to achieve the goals in this Agreement... We further commit to specific actions to achieve those objectives."

—Preamble to the 1987 Chesapeake Bay Agreement

With these words, the governments of the Bay basin (federal agencies included) embarked upon the enormously difficult assignment of weaving together a thousand and one environmental programs and actions into a comprehensive assault upon the problems besetting a 64,000-square-mile watershed.

The 1987 Bay Agreement is analogous to the proverbial pebble cast into a pond: the ripples move endlessly outward, their effects felt in an ever-widening circle.

This Second Progress Report attempts to track at least some of those ripples. It describes major efforts under way which contribute to the restoration of the Bay, though their cumulative effects are not yet fully defined. The task of "managing...an integrated ecosystem" is still more art than science, and the synthesis of the elements involved is far from complete.

This report to the citizens of the Bay watershed summarizes what has been done during the past year under the Baywide plans, policies and strategies developed to carry out specific commitments of the 1987 Agreement. In addition, this summary constitutes the first biennial report to Congress required under section 117 of the Clean Water Act. The organization of the report parallels that of the Agreement itself: Living Resources; Water Quality; Population Growth and Development; Public Information, Education and Participation; Public Access, and Governance.



Despite the uncertainties that abound in any exploration of environmental cause-and-effect relationships, it is possible now to see concrete evidence of progress in dealing with some of the known problems of the estuary system.

Striped bass juveniles were found in sufficient abundance in 1989 to permit at least restricted fishing for this popular species in the coming year. The resurgence was attributed primarily to the fishing moratorium first imposed in Maryland in 1985 and subsequently adopted in other jurisdictions.

The future return of American shad and other species to their historic spawning and nursery waters in Pennsylvania moved a step closer to reality in May 1989 when an agreement was signed for construction of a fish passage facility at Conowingo Dam on the Susquehanna River in Maryland.

Progress toward the Bay Agreement's ambitious 40 percent nutrient reduction goal was mixed. Dramatic reductions have been recorded since 1985 in phosphorus discharges from wastewater treatment plants as the result of phosphate-detergent bans and, to a lesser extent, greater use of specialized phosphorus treatment systems. Monitoring data suggest that the downward trend in phosphorus also is reflected in the Bay itself.

Nitrogen discharges, on the other hand, continued to rise in areas where rapid population growth increased wastewater volumes. On the plus side,

A Perspective on Progress

governments in the watershed are putting increasing emphasis on the application of nitrogen removal technology at treatment facilities. There was good news from Virginia in this regard with the announcement in October that the U.S. Patent Office is granting a public domain patent for the Hampton Roads Sanitation District's biological nutrient removal (BNR) process. The patent ensures that the process will be freely available to municipalities and industries throughout the Bay basin for their use in meeting nutrient removal requirements. Other BNR patents are held by private firms, which require royalty payments from treatment plants using these processes.

The control of nutrients from nonpoint sources—the runoff from farms, lawns, construction sites, and the like—is meeting current expectations, but projections indicate that these programs must expand to reach reduction milestones ahead in the 1990s.

The Bay monitoring program—regular readings of key indicators that define the health of the Bay system—continues to grow in importance as a measure of the effects of restoration actions. The emphasis now is on the integration of water quality and living resources monitoring, a combination calculated to reveal over time how changes in quality affect the health and abundance of life in the Bay. More comprehensive monitoring of toxics and their impact on the Bay system also has become a priority to support the objectives of the toxics reduction strategy.

Publication in 1989 of the Chesapeake Bay Basin Monitoring Program Atlas was a major milestone along the way toward coordination of existing environmental data collection programs. The two-volume directory of long-term monitoring programs in the watershed includes more than 190 program descriptions complete with listings and maps of station locations.

Modeling, like monitoring, will be a key tool in the reevaluation of the 40 percent nutrient reduction goal to be completed by December 1991. In 1989, phase one of the recalibration of the Bay watershed model was completed and work continued on development of the time-variable eutrophication model of the Bay.

The health and abundance of the species that dwell in the Bay and the effects of nutrients, toxic substances and other pollutants that reach its waters are immediate concerns of the restoration program, but the persistent pressures of population growth and development pose a larger challenge for the coming decade.

The Year 2020 Panel presented its recommendations for dealing with development to the Chesapeake Executive Council in 1989. This report outlines the first steps in response taken by Bay Program governments. Ultimately, however, the public as a whole must decide whether to accept the restraints on development and the changes in lifestyle that may be necessary to preserve for generations to come the productivity and vitality of the Chesapeake Bay.

Living Resources

Progress in 1989

The 1987 Chesapeake Bay Agreement describes the living resources of the Bay watershed as "the main focus of the restoration and protection efforts." The "productivity, diversity and abundance" of estuarine plants and animals, the Agreement said, "are the best ultimate measures of the Chesapeake Bay's condition."

In keeping with this priority, the adoption in January 1988 of guidelines defining water quality and habitat conditions necessary to support living resources was the first commitment fulfilled under the 1987 Agreement. Stock assessment, resource management, and living resources monitoring plans were subsequently completed in July 1988, and policies to protect wetlands and to provide upstream passages for migratory fishes were adopted in December 1988.

The 1989 living resources agenda spelled out in the Agreement also was carried out with the adoption in July of Baywide management plans for blue crabs, oysters, and alosids (shad and herring), and a policy for the protection and restoration of submerged aquatic vegetation (SAV).

The fishery management plans (FMPs), the first in a series of such plans required under the Agreement, were developed by a broadly representative workgroup of the Bay Program's Living Resources Subcommittee.

A fourth FMP—for striped bass—was ready for adoption at the end of the year, with FMPs for white perch, bluefish, weakfish, and spotted sea trout to follow in 1990.

The plans describe actions that will be taken by Bay jurisdictions to protect and enhance these fisheries. Strategies to implement the FMPs are now being developed.

The SAV Policy is aimed at achieving a net gain in distribution and abundance of submerged aquatic vegetation by protecting existing beds from further losses, achieving water and habitat quality objectives that will promote Baywide restoration of SAV, and establishing regional restoration goals on the basis of historical distribution records and estimates of potential habitat.

Collection, management and analysis of data on the Bay's living resources expanded in 1989 as a result of the Stock Assessment and Living Resources Monitoring plans developed the previous year.

Maryland and Virginia worked together on a trawl survey which is providing a comprehensive look at the distribution and abundance of several species of fish throughout the Bay. The States also are cooperating to complete a Baywide assessment of blue crab stocks. The assessment will include estimates of the abundance and long-term harvest potential of crabs, as well as providing recommendations for improved management. Through these efforts, scientists and managers are gaining a better understanding of how harvests affect populations of fish and shellfish and a more accurate index of their economic value.

Fishery Restoration/ Management

Initial implementation of the Living Resources Monitoring Plan has included the assignment of additional staff at the Maryland Department of Natural Resources, the Virginia Marine Resources Commission, and the Chesapeake Bay Liaison Office to the task of building an up-to-date, accessible data base. Data are being used to evaluate trends in the abundance, diversity, distribution, and health of fish, shellfish, submerged aquatic vegetation and other living resources. Biological monitoring programs will indicate whether efforts to improve management of the Bay watershed, its habitats and fisheries are meeting the Agreement goal to "restore and protect the living resources, their habitats and ecological relationships."

Striped Bass. A moratorium on catching striped bass, first imposed in Maryland in 1985 because of dwindling populations of the popular species, was adopted by Virginia and the District of Columbia as well in 1989. The prognosis for the future was brighter, however.

Maryland's juvenile striped bass index, determined from seine hauls in the upper Bay and the Choptank, Nanticoke and Potomac rivers, in 1989 reached the three-year average required to permit limited recreational and commercial fisheries in the Bay in 1990. The index requirement was established by the Atlantic States Marine Fisheries Commission.

Regulatory recommendations for taking striped bass in 1990 are being formulated by the Maryland Department of Natural Resources, the Virginia Marine Resources Commission, and the Potomac River Fisheries Commission, following the framework of the striped bass FMP drafted in 1989.

Maryland and Virginia continue to work with the U.S. Fish and Wildlife Service (FWS) to restore the striped bass population, catching brood fish and raising fingerlings for later release. More than three million hatchery-raised fingerlings have been released since 1985.

Oysters. Extensive spring rains in 1989 pushed salt water to the lower reaches of Virginia rivers. With salinity at lower levels, oysters in those tributaries were showing some signs of recovery from the diseases *Haplosporidium nelsoni* (MSX) and *Perkinsus marinus* (Dermo).

Maryland surveys also indicated a regression in MSX since 1988 with primary areas of infection centered in Tangier Sound and the mouth of the Potomac River. Dermo, however, increased in both intensity and geographic range in Maryland waters. Areas in which Dermo was found included the Potomac and Choptank rivers and Eastern Bay. Recruitment (spatfall) of oysters decreased in Maryland waters in 1988, with counts on natural bars averaging about 15 spat per bushel. Spatfall in seed areas was also lower than the previous year.

During the spring months of 1989, Maryland transplanted more than 569,000 bushels of seed oysters to growing areas of the Bay and tributaries where the risks of disease (MSX and Dermo) are considered low. The seed should be ready for harvesting in 1991. By the end of August 1989, about 6.6 million

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Planting oyster shell

bushels of fossil oyster shells dredged from upper Bay sites were planted for cultch on designated seed areas and natural oyster bars. Approximately 148,000 bushels of fresh shells, obtained from oyster processing plants, also were planted.

In 1989, 1,091,376 bushels of shell were planted in Virginia's Great Wicomico, James and Piankatank rivers and along the Eastern Shore under the State's program to provide additional beds for oyster larvae to set. In addition, 228,664 bushels of seed were transplanted to Currioman Bay, the James and Nomini rivers, and the upper Rappahannock. About 530 acres of shell were cleaned and turned.

Both Virginia and Maryland have research and experimentation under way seeking disease-resistant oyster strains and techniques to promote rapid growth and survival.

American Shad. Pennsylvania reported a record 8300 adult American shad were taken at the Conowingo fish lift in 1989; 6916 prespawned fish were successfully transported upstream and released into a freeflowing section of the Susquehanna River with suitable spawning habitat.

The Pennsylvania Fish Commission's Van Dyke Fish Cultural Station produced 21,807,577 American shad fry (also a record high). Ninety-five percent of them were stocked into the Juniata and Susquehanna rivers. An estimated 60,350 fingerlings were stocked from Commission facilities in 1989.

A District of Columbia study indicated that American shad are again spawning in the District waters after an absence of nearly two decades. It is not known whether the initiation of dechlorination of wastewater at the Blue Plains treatment plant or other factors encouraged the shad to migrate once more into District waters.

The American shad fishery remained closed in Maryland in 1989. There was no expectation that the ban would be lifted in the near future. Though the shad population in the upper Bay doubled from an estimated 26,000 in 1987 to 53,000 in 1988, no juvenile shad were found in 1988 surveys of the upper Bay and five rivers.

Flounder. The Virginia Marine Resources Commission as a conservation measure closed all trawling for flounder in March 1989. After a subsequent series of public hearings, a mandatory limit of 10 fish per person per day was established in July for recreational flounder fishing. Supplementing that action, the Commission requested that anglers voluntarily limit their take to six fish and distributed educational materials explaining the need for the limit and encouraging individual cooperation.

Other Species. Surveys indicated poor juvenile recruitment success of yellow perch in all Maryland systems but the Wye River, which received hatchery

Commercial Landings

augmentation. Approximately 490,000 hatchery reared juveniles were stocked in the Wye in 1989. Live catches from upper Bay tributaries, provided through the Watermen's Assistance Program, were used to stock 45,000 adult fish in the Tuckahoe and Patuxent Rivers.

Alewife and blueback herring reproduction in 1988 was the highest recorded in four of the five Maryland tributaries included in a survey program that started in 1985.

Shellfish. Fishery catch statistics for 1988—the latest available—show that blue crabs continue to be the most important commercial species by weight and value in the Chesapeake Bay.

Maryland's blue crab commercial harvest reported in 1988 was approximately 43 million pounds, worth more than \$21 million dockside. The total harvest, which included about 1.1 million pounds of soft crabs, was nearly the same as in 1987.

In Virginia, blue crab landings in 1988 rose slightly to 37 million pounds, valued at nearly \$12 million. Soft crab landings nearly doubled, increasing from 560,000 pounds to more than 1.1 million pounds.

Oyster production was down in 1988 in both Virginia and Maryland. The decline was attributed primarily to the prevalence of disease.

Maryland's commercial oyster industry produced 2.2 million pounds of oyster meats, valued at \$6.7 million, in 1988. These numbers were down from 1987 when 3.6 million pounds, valued at \$10.6 million, were produced.

Oyster production in Virginia in 1988 topped 2.9 million pounds of oyster meats, worth more than \$7.7 million. In 1987, about 4.8 million pounds of oyster meats with a value of \$11.7 million were harvested in the State.

Soft clam commercial landings in Maryland in 1988 were the largest since 1981, totaling 4.4 million pounds, worth \$8.7 million. On-vessel refrigeration was initiated to counter high bacterial levels detected in soft clams harvested during summer months.

Finfish. Virginia's commercial finfish landings in 1988 amounted to more than 40 million pounds with a value of about \$16 million. Species landed, in order of their abundance, were menhaden, flounder, bluefish, spot, croaker, and weakfish. The 1987 finfish catch totaled 57.6 million pounds, with a value of \$14.7 million. In addition, several hundred million pounds of menhaden were landed in Virginia for reduction to fish meal.

Commercial catches of finfish in Maryland reached 6.3 million pounds and were worth \$2.6 million in 1988, up from 4.9 million pounds and \$1.1 million in 1987. Menhaden was the most abundant fish species landed, followed by catfish, bluefish, white perch and sea trout, respectively.

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Fish Passages



Conowingo Dam

An agreement was signed in May 1989 for construction of a fish passage facility at Conowingo Dam on the Susquehanna River in Maryland. Scheduled for completion in 1991, the facility will open the way for American shad and other diadromous fishes to enter their historic spawning and nursery waters in Pennsylvania. The project is now in the design stage.

Though the Conowingo facility will be a major step forward, the lack of fishways upstream at Holtwood, Safe Harbor and York Haven dams still presents formidable problems for the successful restoration of American shad in the Susquehanna. The Pennsylvania Fish Commission, a signatory to the Conowingo agreement, is negotiating with upstream hydropower project owners for additional facilities, with the goal of achieving all necessary passages by the year 2000.

In another project, the Maryland Department of Natural Resources is working with the town of Elkton, the National Marine Fisheries Service, and the Fish and Wildlife Service to construct a demonstration fishway on Big Elk Creek. As part of this cooperative effort, the Pennsylvania Fish Commission has prohibited harvest of river herring eight inches or more in length from Big Elk Creek to promote their restoration within the watershed.

In Maryland, work was completed on removal of a dam on Deep Creek (Patapsco River) and the U.S. Geological Survey notched flow control weirs on Morgan Creek (Chester River) and Beaver Dam Branch (Choptank River). A fourth passage project was completed on Dogwood Run in Cecil County.

In Virginia, the first of three phases to open up fish passages at dams on the James River in Richmond got under way with a bang. Sections on the north side of Manchester and Brown's Island dams were blasted in January to make way for migratory anadromous species. The project was jointly funded by the Council on the Environment, the City of Richmond, and the Department of Game and Inland Fisheries. Subsequent monitoring indicated fish were able to pass the breached dams and approach William's Island Dam five miles upstream.

The Virginia legislature appropriated \$50,000 for biological studies of the William's Island Dam on the James and the Embury Dam on the Rappahannock River as the first step toward the design and construction of additional fish passages. The legislature also established a fund to provide grants and low-interest loans for fishway construction at municipally owned dams.

In the District of Columbia, a study by the Corps of Engineers showed that fish passage could readily be achieved on the lower portion of Rock Creek. Negotiations are now under way for construction of a fish ladder at Pierce Mill.

The District, Maryland and Virginia are working with the U.S. Fish and Wildlife Service (FWS), the National Marine Fisheries Commission, and the Corps of Engineers to achieve fish passage over the Little Falls Dam on the Potomac. Funding for construction of a fish ladder at the dam has been included as a special mitigation condition in a permit for a downstream waterfront development. A fish passage at Little Falls would open up 10 miles of spawning

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Waterfowl

habitat to white and yellow perch, four species of shad, and two species of herring.

A management plan for waterfowl, which are among the Bay living resources categorized as commercially, recreationally and ecologically valuable, is in development, with completion scheduled in July 1990. The plan builds on the North American Waterfowl Plan, focusing on habitat.

Meanwhile, waterfowl inventory and research programs are moving forward and action is under way to provide additional refuges and improve habitat in the watershed.

Under an agreement with the Maryland Department of Natural Resources, the Navy designated its transmitter facility at Greensbury Point in Annapolis as a wildlife preserve. The Fish and Wildlife Service is assisting the Navy in designing waterfowl habitat enhancement projects at the site.

FWS also is working with Maryland and the Corps of Engineers on plans to create additional nesting and brood habitat on Bodkin Island in Eastern Bay. The project is aimed at restoring habitat lost to erosion in areas which historically supported high densities of nesting birds.

The FWS Patuxent Wildlife Research Center is conducting a study of trends in the populations of black ducks and mallards in the Atlantic flyway. The black duck has been in a marked decline since the 1950s, while mallards have been on the increase. Theories for the dwindling number of black ducks include human disturbance, competition between the two species, and lack of suitable brood habitat close to nesting areas.

Submerged Aquatic Vegetation

The heavy rains in the spring of 1989 may have had a significant impact on submerged vegetation in parts of the Bay system. SAV, a key indicator of the health of the Bay, has been gaining in recent years, with total acreage up 31 percent from 1984 to 1987 following decades of drastic decline.

In 1989, increased turbidity, lower salinities and cooler water temperatures combined to shift populations of SAV downstream in tributaries and eliminated plant growth in some reaches of rivers where it had been abundant during the last few years. In the Potomac, beds moved further toward the mouth but remained healthy. In rivers lacking downstream shallow habitat, such as the Choptank, SAV beds disappeared.

Ground truth surveys, conducted by FWS, the Alliance for the Chesapeake Bay, the Chesapeake Bay Foundation, and the Maryland Waterman's Compensation Program, verified the disappearance of SAV from many areas but detailed monitoring data are not yet available. Additional information on SAV acreage will be available from the 1989 aerial survey. Programs to promote SAV growth continued in both Virginia and Maryland in 1989.

Virginia reported excellent success in the propagation of SAV through the use of seeds transplanted in 1988. A total of 257 acres of newly established

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widgeongrass beds, which had been overseeded with eelgrass, showed an abundance of eelgrass seedlings by the spring of 1989, compared with none in adjacent, non-seeded areas. Excellent germination success also was observed at test sites in the York River where four acres of barren bottom were seeded with eelgrass, widgeongrass, and a combination of the two species. Virginia transplanted five million SAV seeds in 1988 and monitored germination at 16 sites. SAV shoots containing ripening seeds were harvested and placed in holding tanks for transplanting during the summer of 1989.

In Maryland, submerged vegetation was transplanted to seven sites in the Upper Bay, Susquehanna Flats and Sassafras River. Eight sites received transplants of SAV in the lower Choptank River. In addition, a million eelgrass seeds were broadcast on the east side of Tilghman Island. Eelgrass was abundant in this area in the past; the seeding is an attempt to reestablish the beds. Germination of the seeds occurred and eelgrass was initially restored to the area at average densities of two plants per square meter. Subsequent summer water conditions in 1989 were not conducive to plant growth, however, and few, if any, seedlings survived. A renewed attempt to establish eelgrass by seed is planned for 1990.

The Army continued its SAV program at Aberdeen Proving Ground in Maryland, planting in areas where SAV beds had existed previously and in other locations considered suitable for successful transplanting. Fees paid by hunters fund the transplant program.

Habitat

Strengthened protection of wetlands was a key theme in the Bay watershed in 1989.

The Maryland General Assembly enacted the landmark Nontidal Wetlands Protection Act at its 1989 session, establishing a new standard for the protection of Maryland's wetland resources. Draft regulations to implement the new law were issued in August by the Department of Natural Resources and public meetings were held throughout the State to receive comments.

The Department's Water Resources Administration, with funding from the Coastal Zone Management program, also undertook two contractual efforts to further nontidal wetlands protection.

One project includes development of a comprehensive plan for protecting and augmenting nontidal wetlands in the watershed of the North Branch of the Patuxent River near Largo, Maryland. The plan will serve as a prototype for State and local agency efforts to determine which wetlands should be left undisturbed and where wetland creation/mitigation projects would have the greatest impact in ameliorating environmental problems.

The second project is the establishment of a computerized wetlands mitigation data base accessible to State and local wetlands protection personnel as well as research scientists and other persons.

In Pennsylvania, State agencies added staff and expanded education, training,

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permit and other programs following completion in 1988 of a Wetlands Protection Action Plan "to stop the loss and degradation of Pennsylvania's wetlands and to protect and enhance remaining wetlands ecosystems."

The Department of Environmental Resources gave public notice of proposed revisions to its wetlands regulations and followed up with meetings with representatives of government agencies, industries, and advocacy groups. The Department expected to publish proposed regulations before the end of 1989.

The Department adopted the Joint Federal Manual for Identifying and Delineating Jurisdictional Wetlands as a technical guide and trained 124 Federal, State, and local staff in use of the manual at four one-week sessions offered through the Chesapeake Bay Program. DER also contracted with the Environmental Law Institute of Washington, D.C., to produce a Wetlands Protection Guidance Manual for Local Governments to be published early in 1990.

The Virginia General Assembly provided funds in 1989 to give the State Water Control Board additional staff to strengthen protection of nontidal wetlands. The expansion enables the agency to review all fill permit applications and conduct site visits, if necessary, to evaluate possible impacts on nontidal wetlands. The legislature also established a roundtable committee representing a diversity of interests to consider issues related to nontidal wetlands. The committee is to submit recommendations for mechanisms to better protect these important areas to the 1990 General Assembly.

The District of Columbia and National Park Service began work on restoration of the Kenilworth marsh system, a 44-acre tract on the Anacostia River within the Park Service's Aquatic Gardens. The District is providing \$70,000 and the Park Service \$22,000 for the project.

The District also awarded a \$75,000 contract to the University of Maryland Horn Point Environmental Laboratory to reestablish wetlands at five locations along the Anacostia and Potomac rivers.

The Soil Conservation Service and local soil conservation districts are utilizing various State and Federal programs to support wetlands protection and enhancement in the Bay basin. SCS helped farmers identify more than 9700 acres of wetlands to be protected under provisions of the 1985 Food Security Act. Staff members of 61 soil conservation districts in the Bay basin were trained in wetlands identification.

In other Federal action, the Army's Aberdeen Proving Ground initiated a \$170,000 Geographic Imaging System to delineate wetlands and to track changes in land use. Another Army facility, Harry Diamond Laboratories at Blossom Point in Maryland, discontinued ordnance testing in certain areas as a measure to protect wetlands, woodlands and riverine habitat.

Habitat Requirements. The 1987 report, "Habitat Requirements for Chesapeake Bay Living Resources," is being updated by Bay area scientists to include added information on habitat conditions necessary to support 30 target species of fish,

shellfish, aquatic plants and wildlife. The information will be used in combination with living resources and water quality monitoring data to evaluate habitat conditions in each of 45 geographic areas of the watershed. The time-variable model of the Bay, to be completed in 1991, will eventually be used to evaluate levels of control needed for selected pollutants to meet habitat requirements in each of these various regions.

Artificial Fish Reefs. The Virginia Marine Resources Commission conducted five public meetings in 1989 to describe its artificial reef program and solicit suggestions for new reef sites. Two new sites (at the mouth of Back River and off the Eastern Shore near "the Cell") were subsequently selected. During the 1988 season, 3500 "tires-in-concrete" were placed offshore. Maryland's recreational fisheries also were enhanced in 1988 as three new quarry reefs were placed in the Bay. The reefs, which provide habitat for Bay species such as spot and croaker, are sited off Tilghman Island, near Cedar Point, and in Tangier Sound.

Estuarine Research Reserve. The Goodwin Islands in the York River were donated to Virginia under the National Estuarine Research Reserve Program, a State/Federal partnership to preserve representative estuarine ecosystems for long-term study. In cooperation with the Virginia Institute of Marine Science, the State's Department of Conservation and Recreation designated Taskinas Creek in York River State Park as an Estuarine Research Reserve site.

Other Virginia locations in the Rappahannock and Potomac watersheds have been identified as potential reserves, and preliminary information on site ecology, ownership, land use patterns, and research and education potential has been collected. Site descriptions and preparations for public meetings were under way. Maryland has proposed two additional sites as Estuarine Research Reserves: Otter Point Creek, in Harford County, and Jug Bay, in Anne Arundel and Prince George's counties.

Endangered Species Habitat . The Maryland Natural Heritage Program (NHP) has recommended adding sites in six Western Shore counties to the more than 100 areas in the State's coastal zone identified as habitat for rare, threatened or endangered species. Efforts are in progress to implement protection plans for these areas.



Virginia's Natural Heritage Program has identified 219 sites in the state's coastal plain as habitat for rare, threatened or endangered species. Eight areas in six coastal counties are now protected as Natural Area Preserves, and negotiations are in progress for buying or obtaining conservation easements on several other tracts. In partnership with local governments, the State also identifies coastal areas of regional or county-level significance through County Natural Heritage Inventories. Such inventories are under way in nine coastal counties and have been proposed in two others.

Water Quality

The 1987 Agreement cites the improvement and maintenance of water quality as the "most critical elements" in the overall program to restore and protect the Chesapeake Bay.

The commitment to achieve a 40 percent reduction by the year 2000 in nitrogen and phosphorus reaching the Bay is a major element in the effort to improve water quality. Basinwide strategies to reduce toxic discharges and to control conventional pollutants are other key pieces in achieving water quality conditions more hospitable to life in the Bay and its tributaries.

The strategies to control nutrients, toxics and conventional pollutants come in three separate packages, but control methods and technologies generally do not produce such neatly segregated results. Wastewater treatment, for example, may remove nutrients and toxics as well as controlling conventional pollutants. These overlapping effects will be largely ignored, however, in order to focus, in turn, on nutrient reduction and the control of toxic pollution in the balance of this chapter.

Nutrient Reduction

Nitrogen and phosphorus are essential to sustain aquatic life, but excessive amounts of these nutrients may trigger overgrowths of algae that shade out underwater vegetation and lead eventually to depleted levels of oxygen. The 40 percent reduction is aimed at achieving or maintaining dissolved oxygen concentrations adequate to support important Bay species.

The Baywide reduction strategy is divided into three phases: 1985 (the benchmark year) to July 1988, when the strategy was adopted; 1988 to 1991 (when a reevaluation of the goal is to be completed), and 1991 to 2000. The strategy calls for reductions in nutrient loads from both point sources (sewage treatment plants, industrial wastewater discharges) and nonpoint sources (runoff from fields, lawns, pavement, and building sites).

Major reductions in Bay watershed phosphorus discharges have been achieved since 1985, and monitoring observations suggest a downtrend trend in phosphorus levels in the mainstem of the Bay as well.

There have been no similar gains in controlling nitrogen discharges, however. Modest reductions in nitrogen loads from nonpoint sources were recorded, but levels in sewage flows rose from 1985 to 1988 as population increases outran the still limited, but growing, application of nitrogen removal technology.

Current and future data from the monitoring program will play a key role in the reassessment of the 40 percent nutrient reduction goal to be completed in 1991. Results from water quality and living resources monitoring will be used to build a series of basin profiles, providing a possible basis for establishing regional nutrient reduction goals to supplement Baywide objectives.

Computer modeling, which played a big part in establishing the 40 percent goal, also will feed new information into the reevaluation process. The Bay watershed model, which provides estimates of nutrient loads reaching the Bay, has been refined to factor in animal wastes and the effects of snowmelt. Further

Point Sources

refinements are planned, including enhancements of the model's ability to project the effects of "best management practices." Work also continued in 1989 on development of a time-variable eutrophication model, a sophisticated tool for evaluating the effects of nutrients after they reach the Bay. The time-variable model is scheduled to start running control scenarios in the fall of 1990.

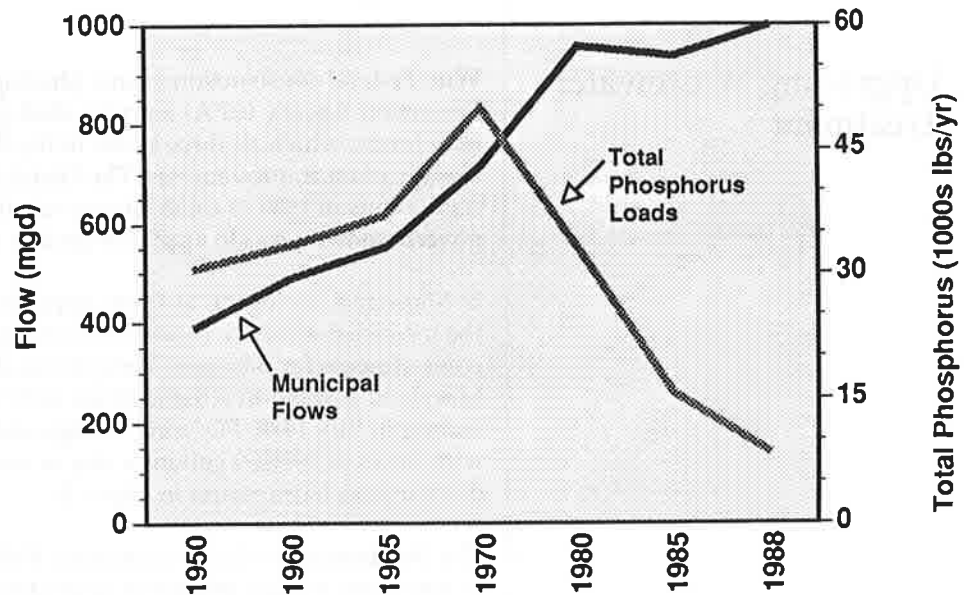
Phosphorus discharges from municipal and industrial wastewater treatment plants have been reduced by about 29 percent since 1985, primarily because of bans on phosphate-containing detergents. Installation of additional phosphorus treatment systems also contributed.

Pennsylvania joined other jurisdictions of the Bay basin in 1989 by banning phosphate detergents. The new legislation prohibits the use, sale, manufacture or distribution in Pennsylvania of cleaning agents containing more than 0.5 percent phosphorus incidental to manufacturing. The law takes effect March 1, 1990, in the 45 Pennsylvania counties wholly or partially within the Chesapeake watershed, and a year later in the other 22 counties of the State. Similar bans became effective earlier in the District of Columbia, Maryland and Virginia.

The ban is producing savings estimated at \$5 million a year at the District's Blue Plains Wastewater Treatment Plant, which also serves nearby Virginia and Maryland suburbs. Phosphorus levels in wastewater treated at the plant have been reduced by 30 percent since the District and Maryland bans were imposed. Virginia reported phosphorus concentrations in effluent discharges were down by 50 percent.

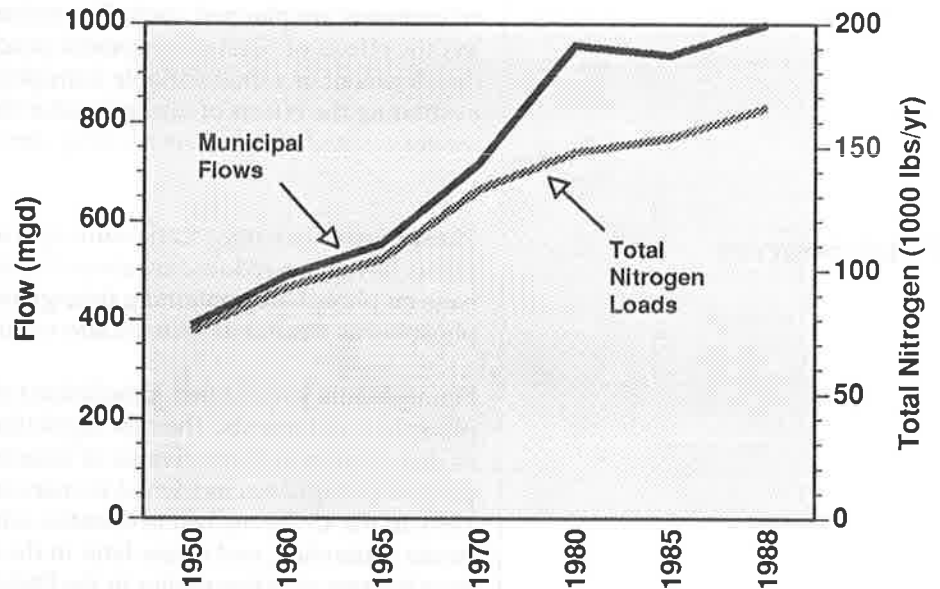
In Maryland, the ban has reduced phosphorus loads by an average of 1741 pounds a day at municipal treatment plants not equipped to remove the nutrient. At plants that were already removing phosphorus, the cost of

Trends in flows to municipal treatment plants and total phosphorus loads below the fall line in the Chesapeake Bay watershed, 1950 to 1988. Plants below the fall line handle about two-thirds of total municipal wastewater flow in the watershed.



Water Quality

Trends in flows to municipal treatment plants and total nitrogen loads below the fall line in the Chesapeake Bay watershed, 1950 to 1988.



chemicals used in the process was reduced by \$558,600 a year because of the lower levels of the nutrient in incoming wastewater.

In addition to the effects of the phosphate-detergent ban, specialized systems to reduce phosphorus levels have been installed at 33 major wastewater treatment plants in the Bay basin and are planned at 80 other facilities.

Point source nitrogen loads, in contrast to the phosphorus reductions, were about 8 percent higher in 1988 than 1985 for the basin as a whole. The increase was anticipated; wastewater flows to treatment plants went up in areas experiencing population growth, but the application of nitrogen removal technology, though expected to expand, is still limited now.

Upgrading Wastewater Treatment

With Federal construction grants phasing out, the U.S. Environmental Protection Agency (EPA) has provided grants as "seed money" for revolving loan funds, which all three states in the Bay Program are utilizing to finance sewage plant improvements. The District of Columbia drafted legislation and regulations in 1989 to establish a revolving loan fund and the District government expects to apply for its first capitalization grants in 1990.

In Maryland, biological nutrient removal (BNR) is getting priority attention as the most cost-effective means of meeting Phase II (1988-91) reduction commitments for nitrogen. Phosphorus discharges to Bay waters from Maryland sewage treatment plants were reduced by 29 percent during Phase I ending in July 1988. Planning, design and construction under way at plants with flows of 500,000 gallons a day or more are expected to reduce nitrogen discharges a like amount in Phase II.

The Department of the Environment BNR program, which uses bond revenues to help fund sewage treatment upgrades, provided \$7.2 million to localities in

FY1989 to plan, design and construct nutrient removal facilities. The FY1990 budget provides \$8.23 million for nutrient removal, and additional funds will be requested in subsequent years to continue this program. Localities match State funds dollar for dollar. Construction cost of BNR facilities at 37 treatment plants in Maryland has been estimated at \$210 million.

Overall, Maryland obligated nearly \$42 million in Federal construction grant funds since October 1, 1988, to start or continue work at 15 municipal treatment plants in the Bay basin. More than \$15 million was allocated to the State's largest facility, the Back River Treatment Plant at Baltimore. The Back River funding supports construction of shallow-bed sand filters, which are expected to reduce phosphorus concentrations by 80 percent to 0.2 milligrams per liter (mg/l), and a segment of an overall \$93 million nitrification/denitrification project to reduce nitrogen from 22 to 8 mg/l.

Two new treatment plants went into operation in Maryland during the year and remedial work was completed at eight others. Effluent discharges from these facilities total 264 million gallons a day (MGD). Maryland also is conducting nitrogen removal demonstration projects at Maryland City and Bowie treatment plants. Three of the largest industrial dischargers of nitrogen—Indian Head Naval Ordinance Station, W.R. Grace, and W.D. Byron—have started or completed major treatment upgrades to reduce their nitrogen discharges.

Maryland established a State revolving loan program in FY1989 with \$28.8 million in Federal and State funds and \$49 million from the sale of water quality financing bonds. Fifteen point source projects and one nonpoint source project are to be financed from these funds.

The Department of the Environment (MDE) and the Department of Natural Resources are implementing the new Maryland law requiring new or expanded marinas to provide sewage pumpout facilities. MDE also is sponsoring a study of the impact of sewage pumpout facility wastes on municipal treatment plants. The study is to document the types and toxicity of chemicals used in boat holding tanks and the volume and effects of wastes to be treated at municipal facilities. Study results will be available in late 1990.

Pennsylvania obligated nearly \$40.4 million in Federal construction grant funds since October 1, 1988, for work at 15 municipal sewage treatment plants in the Bay basin. The largest award, \$18.6 million, will help finance an upgrade of the 35 MGD Wyoming Valley Sanitary Authority plant. Construction work was completed and/or operations initiated at three treatment facilities with combined design flow of 10.75 MGD.

The Pennsylvania Infrastructure Authority (PENNVEST), established in March 1988 to support wastewater and drinking water projects throughout the State, provided \$30 million in 1989 to finance 21 sewerage projects in the Bay basin. Among the loans approved was \$11.2 million for an extensive upgrade of one of two treatment systems that serve Altoona City. The 5.5 MGD plant was sending untreated sewage directly into the Little Juniata River when heavy rains hit the area.

Several PENNVEST projects in the Susquehanna and Potomac watersheds involved sewerage of rural areas where malfunctioning septic tanks are polluting streams with raw sewage. PENNVEST-financed work in Luzerne County in northeastern Pennsylvania eliminated "wildcat sewers" that dumped raw waste into streams or abandoned mines draining into the Susquehanna River.

Since its beginning, PENNVEST has received over 500 applications requesting more than \$800 million for local projects. The PENNVEST board has approved loans totaling nearly \$430 million for 266 projects through 1989. An application for a Federal capitalization grant pending before EPA would provide an additional \$38 million for PENNVEST projects.

Virginia reported a 33 percent reduction in point source phosphorus loadings to Bay waters for the 1985-1988 period, with further reductions anticipated as a result of the State's Policy for Nutrient Enriched Waters adopted in March 1988. The Policy requires plants with permits allowing discharges of one million or more gallons a day to limit phosphorus in effluent to 2 mg/l. The State expects this limitation to lead to achievement of a 40 percent reduction in point source phosphorus loadings by the year 2000 despite anticipated population growth.

Virginia's second capitalization grant for sewer plant work was approved in March 1989 for a total of \$36.9 million in Federal and State funds. Virginia allocated \$15 million from the State Revolving Loan Fund for two new sewage treatment plants in the Bay Basin. One of these will be a 4 MGD, BNR facility in Stafford County. The other project is planned for Glasgow. Loans were closed in 1989 for upgrading at six other Virginia facilities in the Bay watershed.

The State's program to encourage use of biological nutrient removal also moved ahead in 1989 at Hampton Roads, where the Sanitation District is using the VIP process, a BNR system it developed, in upgrading its Lambert's Point plant. Construction was near the half-way mark in June 1989. When completed in 1992, the VIP plant will have a capacity of 40 MGD and provide secondary enhanced treatment with biological nutrient removal. Hampton Roads also is planning to use the VIP process in upgrading and expanding its Nansemond plant to a 20 MGD facility, with a potential for further expansion later.

The Hampton Roads Sanitation District announced in October that the U.S. Patent Office is granting a public domain patent for the VIP process, which ensures that it will be freely available to municipalities and industries throughout the Bay basin for their use in meeting nutrient removal requirements. Other BNR patents are held by commercial firms, which charge royalties that raise the operating costs of treatment plants using these processes.

Virginia contracted for a study of the feasibility and costs of retrofitting to provide various levels of nutrient removal at all large publicly owned treatment facilities within the Bay basin. The evaluation was to be completed in late 1989.

The District of Columbia is conducting a study to assess the feasibility of achieving additional nutrient reductions at its Blue Plains treatment plant through either chemical or biological processes. The work was to include an

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Blue Plains

evaluation of the cost and effectiveness of alternative processes and their compatibility with the existing facility. A draft report was expected by the end of 1989.

Meanwhile, the District has continued to expand and improve operations at Blue Plains, spending about \$36.5 million at the plant in FY1989. Blue Plains removed more than three million pounds of phosphorus from wastewater entering the plant in 1989. This level of removal—about 8300 pounds a day — was 22 percent above permit requirements which are among the most stringent in the Nation.

The District also awarded a contract for expanding and upgrading its sewage treatment plant at the Lorton Correctional Facility to meet Virginia State water pollution control standards.

The Department of Defense initiated or completed improvements in sewage treatment systems at a number of military installations in the Bay basin.

The Navy completed a \$1.2 million upgrade of the sewage treatment plant at the Naval Radio Station in Sugar Grove, West Virginia, which is within the Chesapeake Bay watershed. Effluent discharges into the South Branch of the Potomac River were eliminated.

Fort A.P. Hill in Virginia started a \$4.5 million project to expand and upgrade the sewage collection system for training campsites. Completion is scheduled for June 1990. A \$1.3 million project to repair and replace sewer mains at Fort Monroe in Virginia will help reduce the discharge of nutrients into the Bay. The Army expects to complete the work in September 1990.

The Naval Ordnance Station at Indian Head, Maryland, is upgrading septic tank systems at the Stump Neck Annex. The \$403,000 project is scheduled for completion in March 1990.

The 36 Army, Navy, Air Force and Marine installations in the Bay basin that were labeled "significant" in the Department's comprehensive Tetra Tech water quality assessment study have completed implementation plans under which they will track progress in carrying out study recommendations. Annual progress reports will be required.

Combined Sewer Overflow (CSO) Abatement. The District of Columbia is completing construction of a \$35 million swirl concentrator on the tidal Anacostia River. The facility, capable of removing debris and solids from up to 400 million gallons of combined sewer flows per day, is to be operational in late 1989 or early 1990. It is expected to lower biochemical oxygen demand (BOD) levels in the tidal river by more than 50 percent.

The Maryland Department of the Environment has identified six sewage treatment systems which may have combined sewage overflow problems. A \$3.1 million project is under way in Cambridge to correct overflows through separation of storm and sanitary sewers. EPA and MDE combined are paying \$2.5 million of the total cost.

Virginia localities with extensive overflows from combined sewers include Richmond, Lynchburg, Covington and Alexandria. Richmond's CSO plan was accepted by the State Water Control Board in March 1989, and the city is to begin engineering and design for Phase I of the plan. The Virginia General Assembly established a joint subcommittee in 1989 to consider the possibility of State funding to help correct CSO problems.

Stormwater Management. Maryland's stormwater pollution control cost share program, which helps underwrite innovative practices and retrofit projects proposed by local jurisdictions, was funded at \$2.5 million through FY1989, with a like amount budgeted for FY1990. The State is processing 25 new projects for funding in FY1990.

An additional \$1.2 million was allocated in FY1989 EPA Chesapeake Bay grant funds for stormwater management projects in Maryland. The projects include demonstrations at Fairland Regional Park of an extended-detention wet pond, a shallow marsh pond, infiltration facilities and an oil grit separator, all of which will contribute to improved water quality in Little Paint Branch, a tributary of the Anacostia River.

The District of Columbia developed and implemented a comprehensive, \$1 million program to control runoff into the Potomac and Anacostia rivers and their tributaries. Urban runoff in the District is estimated to contribute about 40,000 pounds of phosphorus, 40,000 pounds of heavy toxic metals such as copper, chromium, cadmium, lead and mercury, and about 40 million pounds of suspended solids to adjacent waterways.

As part of this project, the Metropolitan Washington Council of Governments received a \$393,500 grant from the District to identify potential sites for stormwater outfall facilities to reduce pollution of the Anacostia River. The first project is a peat-sand filter demonstration facility that will reduce nutrients and heavy metals in stormwater entering the river. Restoration of the Kenilworth Aquatic Gardens is also under study.

The Interstate Commission on the Potomac River Basin received funding from the Coastal Zone Management program to evaluate stormwater management measures which would reduce stream channel erosion in the Anacostia basin.

In Virginia, new regulations applicable to land development in Chesapeake Bay Preservation Areas prohibit any increase in runoff pollution over pre-development conditions. In the case of redevelopment of sites that did not previously utilize water quality best management practices as a calculated part of the projects, runoff pollution loads must be reduced 10 percent.

The Virginia Department of Conservation and Recreation also is developing regulations to implement stormwater management legislation enacted by the General Assembly in 1989. The new regulations will integrate runoff quantity and quality controls with major flood and erosion control programs, and encourage comprehensive, watershed-wide planning and management.

Compliance Trends. Maryland anticipated continued improvement in treatment plant compliance with permit requirements despite increased flows accompanying population growth. Compliance rates for Maryland municipal facilities were 50 percent in 1985, 58 percent in 1986, 68 percent in 1987, and 77 percent in 1988. The Department of the Environment projected a compliance rate of 83 percent in 1989.

Flows into municipal plants rose from 356 MGD to 389 MGD at the same time discharges of organic matter were reduced from 83,000 to 71,000 pounds a day and phosphorus discharges decreased from 8800 to 5700 pounds a day. Thirty-two plants in the State now have phosphorus limits written into permits; three have nitrogen limits. Nutrient limits are being phased into additional permits each year.

Pennsylvania's Department of Environmental Resources overhauled its enforcement processes to boost both the number and consistency of actions taken. The State initiated 192 enforcement actions in the past year within the Chesapeake basin, collecting more than \$387,000 in penalties.

Since initiating a Notice of Violation (NOV) program, the Virginia Water Control Board issued more than 3500 notices within the Bay watershed through June 1989. Originally aimed at violations of permit effluent limits, the NOV program has been extended to other regulatory areas including toxics, compliance schedules, laboratory deficiencies, pretreatment, underground storage tanks, and spills.

Sewerline Infiltration/Inflow. Grants by the Virginia Water Control Board have enabled several localities in the Bay basin to complete projects which substantially reduced infiltration/inflow (I/I) to defective sewer lines. In Colonial Beach, corrective work reduced flows from project areas from 23 percent to 10 percent in dry weather and from 42 percent to 20 percent in wet weather. Improvements in Newport News brought a substantial reduction in electrical costs for three pumping stations serving the project area.

Since the I/I program began in 1984, 16 Bay localities have received funding for corrective work. Funding was approved in 1989 for new projects in Smithfield, Dahlgren Sanitation District, Suffolk, Newport News, Hampton, Alexandria, Tangier and Norfolk.

Agricultural "best management practices" (BMPs) are the primary tools now employed to achieve reductions in nutrients reaching the Bay from nonpoint sources, though the number of urban BMPs and other programs to control nonpoint source pollution is growing. Both State and Federal funding for the installation of BMPs has increased since the Bay restoration program began, but projections into the next decade indicate further expansion will be needed to meet the 40 percent year 2000 goal.

Animal wastes and chemical fertilizers contribute the nutrients that are carried into waterways from surface runoff or in ground water. Reductions in nitrogen and phosphorus from these nonpoint sources are calculated on the basis of soil saved and manure controlled by means of cost-shared BMPs.

Nonpoint Sources



Based on this arithmetic, it is estimated nitrogen and phosphorus from agricultural sources were reduced about 7 percent from 1985 to 1988. These results match, or exceed, the predictions for this first phase of the nutrient reduction strategy, and current programs are likely to maintain this pace through 1991. Straight line projections of existing programs show shortfalls, however, in meeting the more ambitious reduction targets in phosphorus and nitrogen scheduled for the late 1990s.

These projections underscore the significance of the nutrient reduction goal reevaluation which is to be completed by the end of 1991 as stipulated in the Bay Agreement.

Federal funding for Bay basin nonpoint source control programs includes more than \$6 million a year allocated in EPA grants to the three participating states and the District of Columbia. The jurisdictions match the EPA grants. The Soil Conservation Service obligated nearly \$1.6 million in FY1989 to support the Bay Program and accelerate technical assistance to plan, design and install BMPs benefitting water quality.

Agricultural BMPs. Pennsylvania, Maryland and Virginia have developed aggressive agricultural nonpoint source abatement and control programs with funding help from EPA and the Department of Agriculture. From 1985 through 1988, BMPs installed under these programs on cropland or for animal waste control have reduced the amount of nitrogen entering waters of the basin by 23.6 million pounds a year and the amount of phosphorus by 4.6 million pounds a year.

Twenty-eight Pennsylvania counties have been designated in whole or in part as eligible under the State's Chesapeake Bay Program for cost-share assistance to landowners implementing BMPs. Outlays of Federal and State funds for BMPs in those areas topped \$4.4 million through September 1989, and an additional \$2.5 million was invested by landowners.

A total of \$7.6 million has been obligated to help fund implementation of nutrient management programs by 343 landowners who signed contractual agreements with conservation districts.

The Pennsylvania BMPs are keeping more than 32,000 tons of sediment from entering streams every year. Nutrient management plans, in combination with the other BMPs, had saved more than 776,475 pounds of nitrogen and 616,238 pounds of phosphorus through June 1989.

Pennsylvania's Bureau of Soil and Water Conservation added five new employees—three nutrient management specialists, an engineer, and an enforcement specialist—to help meet nutrient reduction and erosion/sediment control goals. Twenty-five nutrient management technicians are employed by conservation districts in 19 counties.

Evaluations conducted by the State to identify nonpoint source pollution attributed to agriculture have now covered more than 7 million acres in 25 watersheds reaching into 28 counties. Reports compiled from the assessments

include information on animal numbers, soil losses, projections for BMPs, dollars needed to deal with nonpoint problems, and nutrient savings expected as a result of implementing BMPs.

The Maryland Agricultural Water Quality Cost-Share (MACS) Program, which provides financial assistance for the installation of BMPs statewide, allocated \$3.6 million in State and Federal funds to underwrite 726 BMP projects completed during the past year. Farmers also invested over \$500,000 of their own money to install BMPs through MACS. Over 850 applications for new projects were received.

Maryland Soil Conservation Districts (SCD) provided technical assistance in the development of 1361 soil conservation and water quality plans. SCD outreach efforts and plan implementation resulted in installation of over 7500 BMPs.

A nutrient management program initiated by the Maryland Department of Agriculture supports the University of Maryland Cooperative Extension Service's expanded efforts to assist farmers in implementing comprehensive nutrient management systems. Nutrient management consultants were hired to provide site-specific management and fertilizer application recommendations in 14 counties. Soil and manure testing by the university supports these outreach efforts.

The State Department of Agriculture also is funding research into the use of riparian vegetation to control nutrient movement. Different plant communities are being monitored to compare their effectiveness in controlling or reducing the movement of nitrogen in subsurface water. If the research shows riparian vegetation is a successful control strategy, data from the studies will assist in the development of standards and specifications for a new nutrient management BMP.

Seventy-eight public drainage associations in Maryland received cost-share funding in FY1989. These associations implement drainage maintenance plans to control sedimentation, flooding and runoff, and to protect wildlife. Maryland funds up to 50 percent of the cost of maintaining drainage channels under State-approved plans.

Maryland "bonus payments" to encourage enrollment of sensitive land in the Federal Conservation Reserve Program (CRP) boosted signups significantly in the past two years. The State program adds \$20 an acre annually to the Federal payments to owners who agree to take highly erodible land out of use for 10 years. Maryland's program targets the Critical Area, which is land within 1000 feet of tidal waters or wetlands and land in vegetated filter strips along waterways or wetlands. In 1988, when the State program began, total acreage enrolled in CRP rose to 11,006, compared to the 6832 acres set aside in the previous six enrollment periods. Preliminary figures for 1989 also indicate a substantial increase.

In Virginia, with the assistance of the Department of Conservation and Recreation, 117 farmers installed BMPs on over 5,900 acres of cropland within the Bay watershed during the first half of 1989. These BMPs retained an

Water Quality



Rainfall simulator

estimated 48,000 tons of soil on the farms and kept over 47,800 pounds of phosphorus and 264,000 pounds of nitrogen out of the region's waterways. Over 2,000 applications for cost-share projects were pending at mid-year.

The Department received EPA approval in July 1989 of Virginia's nonpoint source assessment report and management programs developed under the Federal Clean Water Act. (EPA also has approved the assessment reports of Pennsylvania and Maryland; their nonpoint source management programs are pending before the Agency.)

New regulations under Virginia's Chesapeake Bay Preservation Act require owners of agricultural land under active production located in designated Preservation Areas to adopt soil and water quality conservation plans by January 1, 1995.

Virginia continued the use of its rainfall simulator in 1989, providing visual evidence of the effectiveness of BMPs as well as generating useful data. In the demonstrations, no-till plots showed 41 to 87 percent less run-off, more than 90 percent less sediment loss, 90 to 96 percent less phosphorus loss, and 84 to 94 percent less nitrogen loss than conventionally tilled plots. In all cases but one, pesticide loss was reduced as well.

A study under way in Rockingham County, Virginia, is seeking economically viable uses for the 290,000 tons of poultry litter produced in the county annually. In addition to possible use of litter for crop nutrients and as cattle feed, the study will include an economic evaluation of exporting excess litter.

Federal Farm Program. Requirements of Federal farm legislation enacted in 1985 will contribute significantly to nutrient reduction in the Bay basin in the 1990s, though the short-term effect has been to emphasize planning at the expense of actual installation of BMPs, according to Baywide data compiled by the Soil Conservation Service.

The 1985 law requires agricultural producers to complete conservation plans by the end of 1989 for cropland designated as highly erodible if they want to continue to receive benefits from USDA agencies. Producers will then have five years (until December 31, 1994) to execute these plans.

In the Bay watershed, conservation practices will have to be implemented on roughly two million acres of cropland by the end of 1994.

During FY 1989, conservation plans for soil erosion and water quality BMPs were completed for 646,839 acres in the Chesapeake basin. Plans developed over the previous two years covered more than 1.6 million acres. SCS provided technical assistance on planning, design, or installation of BMPs to 53,166 individuals during FY1989.

Conservation practices implemented with Agricultural Stabilization and Conservation Service (ASCS) funding assistance since 1985 saved more than 1.8 million tons of soil annually, keeping 10.2 million pounds of nitrogen and 2.1 million pounds of phosphorus from entering the Bay system.

Erosion and Sediment Control. Pennsylvania initiated 74 enforcement actions, completed 48 actions and collected \$139,850 in civil penalties for violations of the Department of Environmental Resources' erosion control regulations and the State's Clean Streams Law. In addition, county conservation districts which have delegated enforcement responsibilities initiated 39 enforcement actions, completed 31 actions and collected \$64,750 in civil penalties. Enforcement actions were up 100 percent compared to the previous year.

Maryland also gave increased emphasis to compliance with its sediment control law, allocating 13 additional positions to inspection and enforcement in July 1989. The Department of the Environment requested further staff increases for the next year. The State has initiated 137 enforcement actions, completed 60 actions, and collected \$93,000 in civil penalties for sediment control violations. Maryland also is encouraging greater use of fines and fees by 18 local jurisdictions that have been delegated enforcement authority for sediment control.

Virginia's erosion and sediment control program added 14 employees, 10 of them in areas within the Bay basin. The expansion substantially accelerated complaint response, local program reviews, and training.

The District also has an Erosion and Sediment Control Program that complements the efforts of the Storm Water Management Program. Standards and Specifications for Erosion and Sediment Control devices were promulgated in early 1989.

The Army has drafted a sedimentation and erosion control plan to protect soil and water quality at Fort A.P. Hill in Virginia. The plan is scheduled for completion in May 1990. Erosion and sedimentation controls also are planned at Fort Meade in Maryland and at Andrews and Langley Air Force bases.

SCS reviewed the adequacy of 6224 erosion and sediment control plans proposed in FY1989 in connection with construction activities in the Bay basin.

Shoreline Systems. Maryland and Virginia completed the second year of the Chesapeake Bay Shoreline Erosion Study, a project supporting the Bay Agreement objective of protecting and restoring shoreline and riverine systems. The cooperative three-year Feasibility Study is being carried out with the U.S. Army Corps of Engineers (Baltimore and Norfolk Districts) to identify sites for possible Federal funding of shore erosion control projects.

Portions of shoreline systems in Solomons Island (Calvert County), Middle Hooper Island, and Elliott's Island (Dorchester County) have been identified in Maryland for inclusion in the final Feasibility Report. Demonstration Projects, initiated as part of the previous year's study tasks, were completed in 1989 at Elk Neck State Park (Cecil County) and Terrapin Beach (Queen Anne's County). These projects involve treatment of erosion problems with innovative techniques including offshore breakwaters, and vegetative wetland restoration. There will be a combined interagency effort to monitor the performance of these Demonstration Projects, to help in developing design criteria for future shoreline protection efforts.



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In other work, 47,331 feet of shoreline or streambanks within the Chesapeake Bay drainage basins were protected and stabilized through Soil Conservation Service technical assistance to conservation districts, property owners and Resource Conservation and Development Councils.

The Maryland Department of Natural Resources Shore Erosion Control Program is continuing to assess and make recommendations on the overall erosion problem in the Chesapeake Bay and its tributaries. One of the agency's responsibilities is the administration of the Shore Erosion Control Revolving Loan Fund, which provides interest-free money for the design and construction of qualified projects. Grants also are provided for non-structural shore erosion control projects which rely on vegetative techniques to stabilize and restore shoreline habitat.

In 1989, these programs provided technical and financial assistance to 53 projects where work was undertaken to protect and restore eroding shoreline systems. Of the 53 projects, 35 received loans totaling \$3.4 million for the protection of 1.74 miles of shoreline with structural measures. Another 18 projects involving shoreline stabilization of 8667 linear feet with vegetative techniques were completed with grants totaling \$479,714 awarded by the Department of Natural Resources (DNR) Shore Erosion Control Program.

DNR received a \$250,000 Chesapeake Bay Program grant from EPA (through the Maryland Department of the Environment) to design and undertake projects involving wetland restoration measures at 6 sites of public access throughout the State of Maryland: Hills Point and Horn Point Environmental Education Area (Dorchester County), Town of Rock Hall Park (Kent County), Broomes Howard Beach, St. Mary's City (St. Mary's County), Cedar Hill Park and Salisbury River Walk Park (Wicomico County).

The Virginia Department of Conservation and Recreation's Shoreline Erosion Advisory Service provided technical assistance to private landowners in Tidewater regarding both structural and non-structural options for halting shoreline erosion. Shoreline engineers provided on-site advice to 356 owners of property with 38 miles of shoreline.

Three Navy installations in Maryland implemented or completed shoreline erosion control projects in 1989.

A \$1.7 million program under way at the Patuxent River Naval Air Station will include grading, riprap, and a revetment at the Point Lookout tracking station. Air Station personnel also removed selected trees along several hundred feet of shoreline on inland tidal creeks to encourage stands of saltmarsh cordgrass and reduce erosion.

A four-phase, \$932,000 project to repair and stabilize tidal shoreline was started at the Naval Electronic Systems Engineering Activity at St. Inigoes. The first phase, to be completed by the end of 1989, was construction of 735 linear feet of stone revetment along the St. Mary's River. The revetment will prevent further erosion of the shore and siltation of the river by dissipating wave energy,

limiting wave overtopping and spray, and facilitating the discharge of storm drainage in a non-erosive manner.

The Naval Ordnance Station at Indian Head completed a \$240,000 shoreline project in 1989.

Forests. The U.S. Department of Agriculture's Forest Service assigned a staff person to the Chesapeake Bay Liaison Office full-time in 1989 to provide continuing liaison between the Forest Service and state foresters of Virginia, Maryland, and Pennsylvania (as well as New York, West Virginia and Delaware, which also have areas within the Chesapeake watershed). The assignment reflects the increased awareness of the importance of forest management and conservation in restoring the Bay's water quality and living resources. Despite the inroads of agriculture and urban development, 60 percent of the land in the Bay watershed is still forested.

Virginia's Department of Forestry, supported by the State Board of Forestry, established the goal in 1989 of reducing silvicultural sedimentation to the Bay by 40 percent by the year 2000, and developed a water quality action plan to support this effort. A study produced by the Department in June 1989, concluded that the use of BMPs on logged forestland would reduce erosion by approximately 42 percent and sedimentation by approximately 48 percent.

The Department sponsored eight meetings with some 200 local forest industry leaders to enlist their support for the water quality program. The industry contributed more than \$30,000 to support 30 training workshops attended by 1900 loggers, foresters, forest technicians, tree farm landowners, and associated Federal and State agency representatives. BMP field training sessions have been held in 5 locations for industry and consulting foresters. More than 400 woods workers and forest managers participated in five other field training sessions on forestry BMPs.

In Maryland, the Department of Natural Resources' Green Shores Program has a supporting role in achieving the target of a 40 percent reduction in nonpoint source pollutants running off agricultural and urban lands into the Bay. In 1989, Green Shores planted trees on 70 sites encompassing 300 acres and provided forested streamside buffers along 23 linear miles of shoreline.

The program also recruited more than 1500 volunteer conservationists—school and community groups, scouts, and local government employees and officials—to plant forest buffers on public land in the spring of 1989. As an incentive to encourage private landowners to plant forest buffers, Green Shores provided \$25,000 for a one-time, \$100-per-acre payment to farmers who enrolled in the Conservation Reserve Program during the July/August 1989 signup.

The Department's foresters provided technical assistance to counties and developers as they began to implement local area protection programs in Chesapeake Bay Critical Areas. They also worked with private landowners to develop 160 resource management plans while planting over 1600 acres of trees within the Critical Areas.

Maryland's urban forestry program will provide grants totaling \$100,000 to local governments in the Chesapeake Bay Critical Area for innovative uses of trees, vegetation and topography to control stormwater and urban runoff and to provide non-structural solutions to traditional engineering problems. The Department of Natural Resources and the Department of the Environment also are utilizing \$200,000 in EPA grant funds to demonstrate the water quality benefits of tree planting and other forestry best management practices.

The Bureau of Forestry in the Pennsylvania Department of Environmental Resources has established a series of on-farm demonstration projects in the middle and lower Susquehanna River Basin. The projects focus on:

- conversion of highly or potentially erosive farm fields from annual cropping to forest cover.
- efficient use of streamside or cross-field wooded buffer strips to filter agricultural runoff.
- application of manure to woodland to stimulate tree and shrub growth and to utilize excess nutrients in the manure.

The Bureau gave high priority throughout 1989 to direct contact with landowners. More than 70 landowners were provided with planting plans, and Bureau foresters are following up with assistance in ordering seedlings and facilitating signups for appropriate cost share programs.

Acid Precipitation/Deposition. Acid deposition is among the sources of excess nutrients in the Chesapeake Bay. Virginia, which has been collecting precipitation at eight locations since 1982, has found that acidity levels in the State (annual average pH of 4.0 to 4.4) are similar to those of other areas in the eastern United States. A few chemical parameters, such as pH and sulfate deposition, are in line with national trends but Virginia's monitoring also has shown significant local differences. The influence of sea salts, for example, is evident at coastal sites. Increased concentrations of nitrates have been noted at some near-urban collection stations in the Richmond-Washington, D.C., corridor.

Virginia's sampling network includes seven sites currently, but the State Air Pollution Control Board is seeking to expand monitoring to better assess the chemical composition of atmospheric deposition. Additional data would help determine the contribution of atmospheric deposition to nutrient concentrations in the Bay, improve understanding of the role of atmospheric deposition in relation to nutrient contributions from other nonpoint sources, and provide a measure of the relative effectiveness of the State's pollution control programs.

In Maryland, the Department of Natural Resources has singled out for further study 600 areas considered sensitive to acid rain. Long-term monitoring stations are to be set up at these sites to detect the effects of acid rain on stream conditions. In addition, rain samples are gathered and analyzed for a number of constituents of acid rain such as chloride, nitrogen oxide and sulfate. Data from

Toxics Reduction

these programs will provide the basis for development of an acid rain control policy.

The comprehensive Basinwide Toxics Reduction Strategy adopted by the Chesapeake Executive Council in December 1988 set the course for a far-reaching, integrated effort to identify, assess and control toxic impacts on the Chesapeake Bay system. Not since the research phase of the Bay Program ended in 1983 has there been a comparable emphasis on confronting toxics issues.

The long-term goal of the strategy is "to work towards a toxics free Bay by eliminating the discharge of toxic substances from all controllable sources." As an interim step toward that ultimate goal, the strategy stipulates that "by the year 2000 the input of toxic substance... 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."

Establishing an organizational structure to carry out the Basinwide Toxics Reduction Strategy was a primary focus in 1989.

As called for in the strategy, a cross-section of experts was convened as an ad hoc panel in March 1989 to begin development of an implementation action plan and to suggest spending allocations. Among other recommendations, the panel proposed creation of a standing subcommittee to assume lead responsibility for carrying out the toxics reduction plan.

The Implementation Committee formed the Toxics Subcommittee in July. The new Subcommittee started its work in September under the chairmanship of Katherine Farrell, Assistant Secretary for Toxics, Environmental Sciences and Health in Maryland's Department of the Environment.

The Toxics Reduction Strategy outlines a series of projects that shape the agenda of the Subcommittee. These commitments include:

- Building a Basinwide Toxics Loading Inventory to provide a measure of the volumes of toxics substances discharged in the Bay watershed.
- Creation of a Chesapeake Bay Toxics of Concern list to identify substances that merit priority attention because of their presence and impact in the Bay system.
- State implementation of point source toxics management programs that include both chemical and biological monitoring, compatible definitions of toxicity, and compatible requirements for initiating toxicity reductions.
- A Baywide pesticide use survey and expanded implementation of integrated pest management (IPM) programs in each of the States and in the District of Columbia.
- Creation of permanent air monitoring stations to measure long-term trends in atmospheric deposition of toxics.

- Promotion of hazardous waste minimization programs.

Other elements of the strategy detail commitments to achieve better coordination and a more comprehensive approach basinwide in implementing toxics reduction programs.

Congress added its own support to these effort with a \$750,000 FY1989 appropriation specifically allocated to Chesapeake Bay toxics studies. The supplemental Federal dollars are supporting integrated pest management programs, completion of a basinwide pesticide use survey, toxics data base development, a survey of analytical capabilities, development of standardized techniques for estuarine sediment bioassays, and compilation of the toxics loading inventory.

An increase in the Federal toxics allocation to \$1.1 million was proposed for FY1990.

Assessing Toxicity in the Chesapeake Bay

A three-day workshop in Annapolis in July provided a forum for wide-ranging discussions of toxicity assessment methods and techniques. The workshop, mandated by the Basinwide Toxics Reduction Strategy, was aimed at achieving consensus on making the best use of biological systems to monitor toxic contaminants' effects on Chesapeake Bay habitats and the life they support.

Research scientists from around the nation met with Bay-area environmental managers to share their knowledge in four areas of toxicity assessment: population-risk assessing, sediment testing, whole organism testing, and sub-organismal (biochemical and cellular) testing.

Proceedings of the workshop will help Bay Program managers develop a work-plan for coordinated toxicity testing in several tributaries of the watershed.

Agencies of three States—the Maryland Department of Natural Resources, the Virginia Council on the Environment, and the Susquehanna River Basin Commission—joined with the Scientific and Technical Advisory Committee in sponsoring the workshop. The National Oceanic and Atmospheric Administration (NOAA) provided financial support through grants to the three States. Staff support was provided by the Chesapeake Research Consortium.

Pesticide Index and Registry

Preparation of a Chesapeake Bay Pesticide Index and Registry was initiated in late summer as a special project funded under EPA's national pollution prevention initiative.

The "hazard index" will rank the relative potential environmental impacts of pesticide active ingredients. Using the index results, an implementation strategy will be developed in concert with appropriate Federal, State and local agencies to encourage the use of those pesticides which pose the least threat to water quality and living resources of the Chesapeake Bay. Completion of the project is scheduled for 1991, with results available for use in implementation activities the following year.

State and Federal Toxics Programs

Virginia. Statewide water quality standards for the protection of aquatic life were adopted in September 1989 for 34 toxic chemicals. Standards to protect human health will be considered during a triennial review process that began in late 1989.

Virginia received authorization from EPA in April 1989 to administer the pre-treatment program. Twenty-seven sewage treatment plants in the State have approved pretreatment programs; six other facilities are still developing their programs.

The State Water Control Board continued to expand its toxics data base with historical and newly acquired information. The Board's mobile bioassay lab was stationed at the Sewells Point Naval Complex in Norfolk for a six-month special study. The lab carried out chemical testing at 34 of 116 permitted outfalls and biological testing at 16.

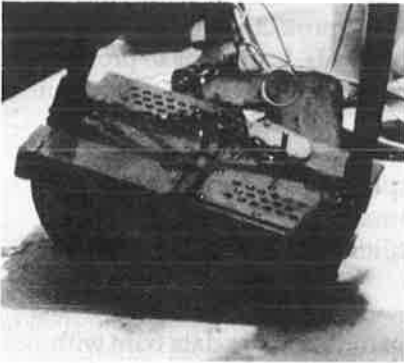
Information on atmospheric emissions of toxic pollutants is being gathered by the State's Air Toxics Program to assess the effects of atmospheric deposition on the Bay. Data will be drawn from emissions inventories at selected facilities and by monitoring the air for contaminants.

More than 4000 facilities in Virginia, ranging from small dry cleaning operations to major industries, have the potential to emit harmful chemicals. The contribution of atmospheric deposition to toxic concentrations has yet to be determined for the Bay, but it has been found to be significant elsewhere. An estimated 80 percent of the toxics in Lake Superior, for example, are deposited from the air.

A series of actions were undertaken during the first year of a comprehensive Elizabeth River restoration initiative. Among these activities:

- The rate of facility inspections in the watershed doubled during the year (to a total of 156) with the addition of another inspector.
- A Best Management Practices Manual was developed for the use of SWCB staff in regulating the highly complex shipbuilding and repair facilities.
- An oil/water separator study was initiated to assess the effectiveness of different technologies in removing oil and grease, which appear to be a predominant source of toxic organics in the Elizabeth.
- A search of toxic data bases was begun to identify and rank toxic compounds with the greatest potential for causing harm to aquatic life or human health. Findings will serve as a guide for the development of water quality standards.
- A long-term, comprehensive monitoring program was initiated with an assessment of the extent of sediment contamination throughout the Elizabeth River basin. Subsequent phases of the program will include studies of conventional and toxic pollutants in the water, benthic and plankton organisms, aquatic life toxicity, and bioaccumulative potential.

Water Quality



Sediment sampler

The Elizabeth River also was a focus of the State's marine pathology/toxicology research program. Sediments from a site heavily contaminated by polycyclic aromatic hydrocarbons (PAH) proved to be highly toxic to spot exposed to various dilutions. The results demonstrated the extreme toxicity of the pollutants in the sediments, though there is no evidence of such direct and immediate mortality in the river. Reduced hematocrits and body weights also were seen in spot exposed to full-strength Elizabeth River sediments. Hyperemia, fin erosion, ulcerations, and cataracts induced in spot in the laboratory were observed in feral fish at sites where PAH concentrations in sediments were as high as 30 parts per thousand.

Early results of the State's fish health monitoring program show that Elizabeth River oysters suffer from immune suppression and an increased susceptibility to neoplasms (the infection *Perkinsus marinus*). The study compared Elizabeth River oysters, James River oysters and oysters taken from the James but suspended above PAH-laced sediments on the bed of the Elizabeth. Seven other Bay species are represented in the 300 samples taken under the health monitoring program.

In other Virginia toxic control activities, chlorine discharge control systems were certified for operation at four sewage treatment plants—the city of Richmond, Colonial Beach, and the Hampton Roads Sanitation District's James River and Boat Harbor facilities. Three new chlorine control projects—in Ashland, Petersburg, and Surry—were approved for funding in FY1990-91. Since 1984, \$4 million in grant funds allocated to 26 treatment plants has resulted in the removal of almost 3900 pounds of chlorine per day from effluent discharged in the Bay watershed.

The State's Department of Waste Management has instituted a waste reduction program to help industries in the Chesapeake Bay watershed find ways to reduce the amount of hazardous waste generated, which can cut their disposal costs as well as lessening potential environmental impacts.

District of Columbia. The District of Columbia's Blue Plains wastewater treatment plant, largest in the Bay basin, was identified in a national water quality survey as a potential source of toxics. A pretreatment program implemented by the District's Department of Public Works was expected to reduce the toxics attributed to the plant (lead, chromium, copper, mercury and cyanide). The 40 pretreatment permits issued to business concerns account for most major sources within the city.

The District is meeting dechlorination requirements at Blue Plains through an interim chemical addition process. The chlorine residual in the effluent has been below the level of detection. A permanent dechlorination facility, being built at a cost of \$3.8 million, was expected to be operational in late 1989 or early 1990. Biomonitoring tests for chronic toxicity were conducted on unchlorinated and dechlorinated effluents at Blue Plains. Eleven of the first twelve samples analyzed indicated no toxics reduction program would be required.

The District issued a health advisory to consumers in 1989 because of high levels of PCBs and chlordane found in channel catfish, carp and eels from local

waters. Sediment studies were initiated to determine the sources of the toxic materials.

Pennsylvania. The Department of Environmental Resources has published final pretreatment regulations while continuing negotiations with EPA on assuming responsibility for administering the program in the State. Meanwhile, the Department continues to assist EPA in implementing the program in Pennsylvania. The 38 municipal dischargers in the Bay basin required to implement pretreatment all have EPA-approved programs in place.

Comprehensive language to provide a stronger legal basis for controlling toxics has been written into the Department's rules and regulations and parts of its toxics management strategy were adopted as a statement of policy in the Pennsylvania Code. The revisions and the statement of policy became effective May 11, 1989.

Pennsylvania also initiated a new process for the reissuance of discharge permits that accounts for cumulative impacts of toxic (as well as conventional) pollutants. The process includes a screening phase, follow-up field surveys where they are needed, and detailed analysis to establish water-quality based effluent limitations. In the Chesapeake Bay drainage basin, screenings have been completed in the lower West Branch Susquehanna River, the Lackawanna River, and the Conodoguinet Creek basin.

Biomonitoring and related reporting requirements were incorporated into 20 permits statewide, including 10 permits within the Chesapeake Bay drainage basin. The Pennsylvania Department of Environmental Resources also is developing and implementing a Whole Effluent Toxicity Testing program, which is expected to result in new requirements in selected permits.

Pennsylvania's Storage Tank and Spill Prevention Act, which became effective August 5, 1989, establishes a comprehensive regulatory program covering the installation, operation, and maintenance of above ground and underground tanks. The law includes financial responsibility requirements applicable to owners of underground storage tanks.

Enforcement actions were taken against three Federal facilities to correct ground water contamination problems due to hazardous waste/PCB disposal. Administrative orders were issued to the New Cumberland Army Depot and the Navy Ships Parts Control Center, both in Cumberland County. A Consent Order and Agreement was signed with the Letterkenny Army Depot in Franklin County.

The State's Department of Agriculture launched a comprehensive educational program to promote broader use of integrated pest management. The Department created an advisory committee to help on its IPM initiatives and met with key leaders of the Pennsylvania Farmers Association, Pennsylvania State Grange and the Pennsylvania Farmers Union to seek support for implementation of IPM programs.

The Department and the College of Agriculture at Penn State University signed

an agreement pledging cooperation in research projects, educational programs and other efforts to help ensure judicious use of agricultural pesticides through IPM and to reduce such use wherever possible.

The State agency joined in sponsorship of an IPM symposium in October 1989, and is working with the USDA Soil Conservation Service in developing a training program for conservation professionals to be inaugurated early in 1990.

Other educational activities included production of a slide/tape show which has been distributed to the Department's regional offices and cooperating agencies. An agricultural IPM exhibit was in use in 1989 and an urban IPM exhibit is under development for use in malls and elsewhere in 1990.

Maryland. Maryland's Department of the Environment expects to promulgate new regulations to control the discharge of toxic substances to surface waters by February 1990. The regulations will include numeric criteria to protect human health and aquatic life covering 28 toxic pollutants. The Department also will promulgate as the first in a planned series a numeric criterion for the protection of estuarine species from acute copper toxicity.

The Department found levels of toxics exceeding EPA recommended criteria in 13 of 27 stream segments investigated for possible toxic impairment. Individual control strategies will be developed for these areas. Investigation of other suspect stream segments is to be completed by May 1990. Control strategies also will be prepared for 16 industrial and nine municipal dischargers identified as exceeding EPA recommended criteria for toxic substances.

Maryland has greatly expanded its industrial biomonitoring program, completing 330 acute and 41 chronic tests by late 1989. Most new industry discharge permits issued in the State require biomonitoring and some include whole effluent toxicity limits. Maryland's goals are to eliminate acute toxicity from industrial discharges by the end of 1992 and to reduce chronic toxicity to acceptable levels by the end of 1995. All but 10 of the Maryland municipal wastewater treatment plants using chlorine have completed installation of dechlorination systems in compliance with State legislation enacted in 1986. Dechlorination at the remaining 10 plants is expected by the summer of 1990.

Maryland and Baltimore officials, working with EPA, reached a settlement with Allied Signal Corp. in 1989 on the cleanup and restoration of the firm's aluminum plant site at the Inner Harbor. Allied will spend an estimated \$61 million on the four-year effort to ensure that the site is environmentally safe and suitable for future development. In cooperation with the Johns Hopkins University, the Department of the Environment is sponsoring a study to document background levels of tributyltin in Bay clams and oysters. Study data will establish a baseline for evaluating the success of the ban on the use of tributyltin paints on recreational vessels. A report on the study will be available in the summer of 1990.

The Department also is preparing a report, to be available in January 1990, summarizing data on levels of heavy metals and chlorinated hydrocarbons found in Chesapeake Bay oysters over a period of several years. Information on

the 10 pesticides used most heavily in Maryland will be covered in a joint report to be issued in January 1990 by the Departments of Agriculture and the Environment. Pesticide products are evaluated on the basis of the probability of their reaching surface waters and their relative impact on aquatic environments. Data will be included on each pesticide's use throughout the State, its toxicity, and its chemical characteristics.

Federal Facilities. The Naval Ordnance Station at Indian Head, under an agreement with the State of Maryland to reduce toxics discharges from industrial operations, will spend an estimated \$12 million on wastewater treatment construction projects now under design. Meanwhile, work was started in 1989 on an interim treatment system using carbon filters to remove nitroglycerine and other explosive compounds.

The Ordnance Station also has work under way to eliminate toxics leaks from underground storage tanks. Twenty-seven underground tanks 15 years old or older have been tested. Tanks or piping systems that failed leak tests are being removed or repaired. The Army's Fort Belvoir, Virginia, has started a \$200,000 study to test more than 200 underground tanks. Leaking tanks will be repaired or replaced. Eleven underground tanks that failed tests at the New Cumberland Army Depot in Pennsylvania will be removed and replaced in 1990.

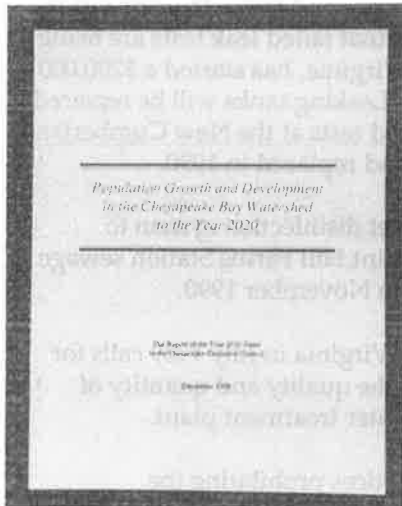
Design work was started in 1989 for an ultraviolet disinfection system to eliminate chlorine discharges from the Army's Vint Hill Farms Station sewage treatment plant. The system is to be completed in November 1990.

A new discharge permit issued to Fort Eustis in Virginia in July 1989 calls for additional monitoring and a survey to evaluate the quality and quantity of discharges received by the installation's wastewater treatment plant.

Fort Meade implemented best management practices prohibiting the application of fertilizers and herbicides within 75 feet of drains and waterways.

Population Growth and Development

Year 2020 Report



A 20 percent increase in population anticipated in the Chesapeake Bay basin over the next 30 years poses a key challenge to the success of the Bay restoration and protection program.

"...unmanaged new growth has the potential to erase any progress made in Bay improvements, overwhelming past and current efforts," the Year 2020 Panel said in a report presented to the Chesapeake Executive Council in January 1989.

The Panel offered specific recommendations to support its own visions for the future of the Bay and urged "bold leadership at all levels of government" to achieve "better stewardship and management of the land and better direction and incentives for appropriate growth."

Creation of the Panel and its subsequent study of future development and the environmental implications for the Bay were called for by the 1987 Agreement.

Two related commitments were met in January when the Council adopted (1) development policies and guidelines designed to reduce adverse impacts on water quality and living resources, and (2) a strategy to provide incentives, technical assistance and guidance to local governments to encourage their protection of wetlands and other fragile natural areas.

In accepting the Year 2020 Report in January, the Executive Council asked the Panel to recommend priorities among the steps to be taken and to offer "realistic, but still challenging, ambitious deadlines" for action.

The Panel responded with a follow-up report in June that included three recommendations "central to achieving our visions." In summary, these recommendations called upon each jurisdiction of the Bay watershed to:

- Establish a commission or agency charged with the responsibility of translating Panel proposals into actions.
- Develop State and regional planning processes and systems for coordinating public investment in highways, sewers, and other infrastructure elements that affect growth.
- Undertake an educational initiative to promote greater understanding of threats to the Chesapeake Bay and to the environment generally deriving from projected growth.

Both Maryland and Virginia have established special commissions to explore the environmental ramifications of projected growth and to formulate recommendations for State action. In Pennsylvania, the Chesapeake Bay Coordinating Committee has the responsibility of reviewing 2020 Panel recommendations and suggesting opportunities for state action.

Maryland Commission

Maryland Governor Schaefer appointed 18 Maryland citizens in October 1989 to make up the Governor's Commission on Growth in the Chesapeake Bay Region. Representing a broad spectrum of groups and organizations, the

Population Growth and Development

Maryland Commission has been charged with preparing specific recommendations for the management of growth and environmental resources in Maryland through the year 2020. Specifically, the Commission, which is being staffed by the State Office of Planning, has been asked to:

- Review the findings of the Year 2020 Panel and evaluate their application to Maryland.
- Prepare a comprehensive listing of growth issues the State must address to the year 2020.
- Develop specific recommendations and an action agenda outline steps Maryland must take to provide for a healthy economy and to improve the environmental quality of the Bay.

The Commission intends to complete these tasks in about a year. At its initial meeting in late October the Commission planned a four-month series of semi-monthly public meetings across the State beginning in November. A draft report is expected to be ready in late summer.

Virginia Commission

In Virginia, the General Assembly established a Commission on Population Growth and Development during its 1989 session. Charged with recommending a process for statewide planning for population growth and development to the year 2020, the Commission is to report to the 1990 session of the legislature.

The 19-member Virginia panel heard from a variety of officials at monthly meetings starting in July. At a retreat in October, the Commission agreed that the complexity and importance of growth issues warrants expansion of the Commission's membership and the extension of its study. These will be among the recommendations the Commission presents to the 1990 General Assembly.

Pennsylvania Committee

Pennsylvania's Chesapeake Bay Coordinating Committee, which is reviewing the Year 2020 recommendations, includes representatives of 12 State agencies and two intergovernmental agencies. Agency recommendations will be considered in the course of State budget deliberations. The Pennsylvania legislature also re-established the State Planning Board in July 1989 to consider statewide planning issues, collect data, and offer recommendations in the form of strategic plans.

The Department of Community Affairs presented a conference, "Preparing for Growth and Development," in December at Shippensburg University. In addition to the participation of Community Affairs personnel, staff members of the Departments of Transportation and Environmental Resources also took part as panelists and facilitators.

A Broader Forum

The Bay Agreement focus on growth issues and the Year 2020 Report stimulated a series of conferences that brought private citizens and public officials together to discuss future courses of action.

Population Growth and Development

In February, a Chesapeake Bay symposium on population growth and development was organized by students in the law school and the planning department of the University of Virginia. Residents of Pennsylvania and Maryland, as well as Virginia, were among the participants.

The Alliance for the Chesapeake Bay sponsored a two-day conference in June on "The Growth Dilemma: The Chesapeake in the 21st Century." The session brought together some 300 people from throughout the watershed to take part in workshops and to hear speakers who are dealing with growth management issues in the Bay region and elsewhere. A white paper, *Managing Growth in the Chesapeake Region: A Policy Perspective*, was published by the Alliance as a corollary to the conference.

In September, the Virginia Growth Management Forum was held in Williamsburg to further an exchange of information among various economic sectors having a stake in Virginia's future. This forum was an outgrowth of concerns shared by a number of non-profit organizations in the State.

Later the same month, the Executive Council's Local Government Advisory Committee focused on growth issues at its annual conference in Baltimore. About 100 government officials, planners and other participants took part in discussions of growth management, planning, cost issues and other topics related to development and the Bay restoration program.

Two conferences on growth and land policy were sponsored in 1989 by the Pennsylvania Environmental Council. About 120 people attended the first, held in Allentown in April. Attendance at the second session, near Pittsburgh in October, was about 100. Participants sought to create their own vision of what they want Pennsylvania communities to be in future years. A workshop focusing on the tools available to plan for and manage growth was sponsored in September by the Pennsylvania Planning Association.

State agencies began implementation in 1989 of two other growth-related commitments met by the Executive Council in January with adoption of Chesapeake Bay Watershed Development Policies and Guidelines and the report, *Technical Assistance and Incentives to Local Governments*.

In follow-up action, Maryland's Office of State Planning is updating its guide covering all financial and technical assistance programs of the State. The revision is expected to be completed in January 1990.

Virginia expanded the listing of incentives and technical assistance in the Commitment report to add State programs initiated during the 1989 legislative session and those offered by non-profit organizations. The State distributed 5000 copies of the revised listing, including those distributed as an insert in the Virginia Natural Resources Newsletter.

Virginia State agency heads have been asked to make an assessment of technical assistance currently available to local governments and to develop strategies to meet additional needs. This project was linked to the State budget

Other Commitments Related to Growth

development process. Additional resources for assistance are expected to be included in spending requests for the next biennium.

In Pennsylvania, the Department of Environmental Resources expanded the inventory of technical assistance programs to include those offered by non-profit organizations. The expanded inventory will be available to local governments in January 1990.

Pennsylvania also initiated education efforts in 1989 to increase awareness of the Watershed Development Policies and Guidelines and to disseminate related information. The Chesapeake Bay Education Office, in cooperation with the Chesapeake Bay Commission, is producing a slide/video presentation for local officials demonstrating best management practices applicable to development projects. The Department of Environmental Resources is currently reviewing State development practices.

Maryland's Office of Planning provided financial and technical assistance to support production by the Maryland Citizen Planners Association of a videotape, "Raising Your Sites," demonstrating design techniques to achieve higher densities in residential developments. The video and accompanying design guidelines were presented to local planning and development officials.

Virginia's Council on the Environment is using the Development Policies and Guidelines in environmental impact assessment reviews. The document also was distributed to all State agencies and strategies to tie the guidelines more closely to the State development process are planned.

Current Protection Programs

Both Maryland and Virginia have programs under way that provide a regulatory basis for protecting sensitive Bay and tidal tributary shorelines from adverse environmental impacts.

Maryland enacted legislation in 1984 requiring local governments to regulate development within the Critical Area — a 1000-foot strip of land around the Bay and its tidal areas. Sixty Maryland counties and municipalities lie within the Critical Area.

Fourteen of the 16 Maryland counties with tidal shorelines and all but three of the municipalities affected have received approval of their critical area protection programs. The State Critical Areas Commission is expected to endorse proposed programs of the other two counties by the end of January 1990. Thirteen counties have put their critical areas programs into effect through legislation or resolution.

The Virginia General Assembly enacted the Chesapeake Bay Preservation Act in 1988 to protect the water quality of the Chesapeake Bay and its tributaries from the negative consequences of development and other intensive uses of land. In September 1989, the Chesapeake Bay Local Assistance Board approved regulations requiring Tidewater local governments to designate Preservation Areas and to manage land use and development in those areas in a manner that protects water quality.

Population Growth and Development

The criteria for designating Preservation Areas were the product of a year-long research, development, and review process which included monthly Board sessions, discussions with local government officials and planning district commission members, meetings to hear views of citizens, and the preparation and review of draft materials.

During this period, nine public hearings attracted some 3,000 people. More than 300 citizens gave oral presentations, and over 1,500 written comments were received and summarized by the Chesapeake Bay Local Assistance Department.

Tidewater Virginia local governments have until September 20, 1990, to designate Chesapeake Bay Preservation Areas and to adopt mechanisms to apply performance criteria. These local governments will be allowed an additional year for transforming current land use plans and ordinances into comprehensive management programs. The Local Assistance Department will provide mapping resources and other help and guidance to support this implementation process.

Pennsylvania has begun implementing several legislative initiatives enacted to reduce negative environmental impacts related to development. In recognition of the role infrastructure in guiding growth, PENNVEST, the State's revolving loan program, requires the development of a comprehensive state plan for wastewater disposal and public drinking water facilities by December 31, 1990.

Other Shoreline Protection Programs

Coastal Resources Management Programs, funded in part by National Oceanic and Atmospheric Administration grants to the States, contribute to the protection of tidal shorelines in both Virginia and Maryland. (Pennsylvania, which has no tidal waters, is not eligible for federal Coastal Zone Management grants.)

Virginia's Coastal Resource Management Program provides funding to Tidewater Planning District Commissions to help support technical services related to coastal management and also funds selected local government projects such as updating comprehensive plans, developing zoning ordinances, conducting natural resource inventories, and controlling erosion.

The State's Council on the Environment also provides technical assistance upon request to help local governments in reviewing the environmental impact of large scale development projects or with the preparation of plans for environmental protection. During the first half of 1989, the Council assisted with 14 projects in eight Tidewater jurisdictions.

Maryland's Coastal Resources Program allocated \$440,000 in Coastal Zone Management funds during fiscal 1989 to assist local governments with environmental reviews; the development of comprehensive plans, zoning ordinances and subdivision regulations, and special projects such as habitat assessments and wetlands protection programs.

Another \$244,000 was allocated to local jurisdictions for construction and acquisition projects designed to preserve, restore, and enhance coastal resources and to provide increased shorefront access.

Population Growth and Development

Waste Management and Recycling

Coastal Zone Management funding also enabled the Maryland Environmental Trust to undertake a cooperative project with the Chesapeake Bay Foundation to promote the establishment of local land trusts. The trusts are set up to accept easements to preserve sensitive forest, wetland, farmland, and shoreline areas. More than a dozen local trusts were established during the past year under the cooperative program, which facilitates the acceptance of easements on small tracts and those which further implementation of local Chesapeake Bay Critical Area Programs.

Recycling wastes is one method of minimizing the adverse environmental impact of population growth and development.

Since March 1989, Pennsylvania has provided \$17.8 million in grants to aid in implementation of the State's new municipal waste planning and recycling law. The total included \$4.75 million in grants to 77 communities in the Chesapeake Bay watershed. To meet requirements of the statute, about 400 communities must begin recycling programs — some by September 1990 and the others by September 1991.

A new recycling law became effective in the District of Columbia in October 1989. It requires residents and businesses to separate glass, aluminum cans, newspapers, and yard wastes for recycling. The law is intended to reduce the tremendous amounts of solid waste that previously were landfilled or incinerated.

The Virginia Department of Waste Management adopted stringent regulations for the storage, treatment and disposal of solid waste. The regulations require that new and existing landfills install natural or synthetic double liners and leachate collection systems to protect ground and surface waters. Groundwater monitoring also is mandatory to ensure that the protective measures are working.

Public Information, Education and Participation

Baywide Communication Program

The initiation of basinwide communication projects and the creation of a standing committee on information and education in 1989 supported development of a coordinated approach to broaden public awareness and encourage citizen participation in the Bay restoration.

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.. ." Creation of State, Federal, and Baywide communication plans were priority commitments to support the Public Information, Education and Participation goals of the Agreement.

Since the Executive Council adopted the Baywide plan in mid-1988, the workgroup that produced the Commitment report has initiated a series of joint efforts to coordinate and broaden the reach and effectiveness of information and education activities carried out by participating State and Federal agencies.

In 1989, the workgroup produced a Chesapeake Bay Activity Kit which was distributed through agencies across the watershed to provide a flexible educational tool showing students and adults how their own actions can and do affect the Bay system.

The kit, "The Chesapeake Bay—It Starts With You," includes activity cards pegged to different age levels which describe projects that demonstrate the role of nutrients, wetlands, and other facets of the Chesapeake ecosystem. References to other information sources also are part of the package. The kits are being distributed to schools, scout units, civic groups and other organizations throughout the region.

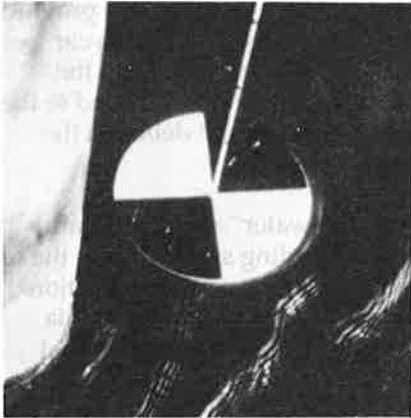
Other joint communication projects included a calendar of Bay-related events, a combined media mailing list, and the development of an electronic catalog of information materials to ensure Baywide access to resources and eliminate unnecessary duplication.

In September 1989, the Bay Program Implementation Committee approved creation of a Public Information and Education Subcommittee to assume continuing responsibility for meeting the communications objectives of the 1987 Agreement. The Subcommittee will take the lead in developing information materials, promoting Bay-related special events, and facilitating citizen involvement in the Bay Program. The Subcommittee's membership, like that of the communications workgroup it replaces, is broadly representative of agencies and groups—State, Federal and private—that carry out information and education programs in the Bay basin.

Alliance for the Chesapeake Bay

The Alliance for the Chesapeake Bay, which has spearheaded public participation in the Bay Program for more than a decade, expanded its program in 1989 with initiation of the Chesapeake Regional Information Service (CRIS). The service gives residents of the watershed toll-free telephone access to up-to-date reports on Bay Program activities, publications, and other resource materials, as well as responding to specific information requests.

Public Information, Education and Participation



Measuring water clarity

CRIS, has been averaging about 250 calls a month. A special campaign to promote wetlands protection will be initiated early in 1990 with distribution of a television public service announcement encouraging viewers to call CRIS for information on how they can help to preserve these sensitive areas.

The Alliance, whose activities are supported through EPA grants, also sponsored the first Baywide public forum on growth management issues following the report of the Year 2020 Panel. More than 300 people came to Baltimore for the June conference at which speakers and panelists from across the nation shared their ideas and experiences.

Citizen Report, the Alliance newsletter distributed to more than 16,000 readers in the Bay region, was published bi-monthly in 1989, providing timely information about current restoration activities and in-depth features on topics such as global warming, re-forestation, and the threat from oil spills. The Alliance also produced "white papers" in 1989 on growth management and Bay fisheries. Its series of river fact sheets was expanded to 13 with the addition of reports on the Choptank and Patuxent rivers in Maryland and Condoguinet Creek in Pennsylvania. The Alliance "Baybook: A Guide to Reducing Water Pollution at Home" went into its fourth printing.

At the grassroots level, the Alliance provided technical assistance and guidance to support the organization of two new citizen organizations, the Condoguinet Creek Watershed Association, near Harrisburg, and the Friends of the Middle James, in Richmond. The new groups will help ensure that these two waterways which feed the Bay are kept clean and healthy. The Alliance also sponsored two Bay field trips for local government officials during the year.

The Alliance expanded its citizen monitoring program in 1989 to include regular sampling on four additional rivers in Virginia—the Rappahannock, the Elizabeth, the Piankatank, and the York (including its Pamunkey and Mattaponi tributaries).

Grants from NOAA to Virginia and Maryland enabled the Alliance to add monitoring program coordinators to its staff in those States. In Maryland, the coordinator is recruiting and training volunteers to extend the monitoring program to as many as five additional watersheds.

Use of volunteers to monitor Bay system waters 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.

Overall, there are now 70 or more volunteers collecting weekly samples from Bay tributaries to record five water quality factors: temperature, pH (acidity), clarity, dissolved oxygen, and salinity.

In addition to water quality measurements, the Alliance is exploring the feasibility of using citizen volunteers to monitor living resources and their habitat and to track the effectiveness of projects initiated to control pollution from farmland.

Public Information, Education and Participation

State Programs

Virginia. Virginia's Bay Team teachers traveled over 27,000 miles and provided instruction to more than 15,000 students during the 1988-89 academic year. Sponsored by the Council on the Environment, the team teachers from the Virginia Institute of Marine Sciences cover a wide range of topics related to the Bay cleanup, with special emphasis this past year on litter and debris in the water.

Some 5800 Virginia students took part in an "on-the-water" study program operated by the Chesapeake Bay Foundation with funding support from the Commonwealth to defray costs and provide scholarships and transportation grants to students unable to finance their participation. Nearly 675 Virginia students also participated in other Chesapeake Bay Foundation educational programs at Port Isobel near Tangier Island.

During the year, Virginia's Chesapeake Bay Youth Conservation Corps, administered by the Department of Conservation and Recreation, carried out 10 projects, including erosion control work, trail maintenance, dock and boat ramp improvements, and water quality testing.

Eight river basin citizen committees supported by the Coastal Resources Management Program were active during the year. More than 100 persons attended the RBC's annual meeting in Richmond March 28 to take part in discussions on coastal resources management, the Chesapeake Bay Preservation Act, nontidal wetlands legislation, and nutrient management.

Two field trips were conducted for Virginia local government officials during the spring and early summer. The elected and appointed officials visited sites on the James River and took part in discussions on land use, water quality, shoreline erosion and other environmental issues.

Maryland. The One Million Marylanders for the Bay program continued to grow in 1989 with tens of thousands of residents now pledged 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 that originated in Anne Arundel County was extended statewide in 1989 under the sponsorship of the One Million Marylanders program and the Chesapeake Bay Foundation. Community groups use 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

Public Information, Education and Participation

the Chesapeake Bay Trust, which uses the checkoff funds as well as other contributions to expand citizen involvement projects in the Bay watershed. The Trust has received about \$1 million in contributions from Maryland citizens and businesses.

The Bay Trust also joined with the Governor's Office and the Department of Natural Resources in sponsoring the third annual Bay Day promoting the Chesapeake restoration on May 7, 1989. About 45,000 citizens attended the festival.

More than 24,000 Maryland students participated in the State's Estuarine Field Studies Program in 1989, taking part in a variety of hands-on environmental experiences. Maryland also provided \$113,000 to fund 16 environmental education projects across the State. The State Board of Education adopted a bylaw in April 1989 requiring comprehensive environmental education for all school-age children in Maryland. Curriculum development, teacher training and certification, and stronger coordination of environmental education efforts are getting primary attention in implementation of the new requirement.

Over 600 youngsters participated in the Maryland Conservation Corps program in 1989, completing 62 Bay cleanup projects such as repairing streambanks, clearing shoreline trails, removing debris, and planting trees.

More than 400 cleanup projects have been undertaken as part of Maryland's Chesapeake Cleanup Campaign (CCC). The program provides a network for citizen action statewide, with county coordinators organizing local restoration efforts.

District of Columbia. The District's Thomas L. Ayers Outdoor Classroom Program was part of the curricula in 25 public schools in 1989. Teachers utilize science, geography, language, arts, mathematics and reading in outdoor settings to give students a greater appreciation for conservation and the resources available to them in an urban setting.

Workshops are held in the spring and fall of every year to give teachers additional information and resources as a basis for expanding their respective programs. Participating schools are recognized at annual awards programs.

In the summer months, the District's Aquatic Resources Education Program offers outdoor classes in conservation ethics, aquatic biology, water safety and basic fishing techniques. An average of 500 young people ranging from 4 to 18 years of age have participated in the program in each of the last four years.

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. In addition to offering trips, streamwalks and other activities, the program encourages citizens to participate in the restoration by "adopting" a stream near their homes or joining a monitoring program. The District's Fisheries Management Program has initiated a similar Adopt-a-Mile of the Anacostia Program within the public school system.

Public Information, Education and Participation

Pennsylvania. The Pennsylvania Bay Education Office continued to promote the Bay Program through public information, education, and outreach projects, starting with participation in the Pennsylvania Farm Show in January 1989. The Education Office also exhibited during AgProgress Days at Penn State University in August. Some 8000 Bay buttons and 5000 literature bags imprinted with the message "The Bay Starts Here" were distributed to the public in 1989.

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. Four issues of the newsletter, "Keystone in the Clean-up," were distributed to more than 1500 individuals and organizations.

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.

The third annual Pennsylvania Chesapeake Bay Clean Water Farm Awards were presented to three winners in January 1989. The Education Office also coordinated the Bay "mini-grant" program, which provided up to \$500 in funding to each of 14 groups sponsoring public outreach and education projects. As part of a River Month celebration in June, the Education Office organized a River Trivia Contest in which 15 Susquehanna River Valley radio stations participated.

Federal Agency Programs

The Fish and Wildlife Service joined with the National Aquarium and the Chesapeake Bay Trust in developing a new curriculum entitled "Bay B C's: A multidisciplinary approach to teaching about the Chesapeake Bay." "Bay B C's" includes background material and lesson plans for teachers of early elementary grades and reading materials and worksheets for their students. The curriculum is being implemented by science coordinators and teachers in public and private schools throughout Maryland, Virginia and Pennsylvania. A series of workshops to introduce teachers to the use of the program is being conducted through the spring of 1990.

The curriculum includes "Chessie Returns," a sequel to the popular FWS coloring book, "Chessie: A Chesapeake Bay Story." Some 50,000 copies of the original "Chessie" have been distributed since the first printing in 1986.

The FWS Chesapeake Bay Estuary Program also introduced a fish passage exhibit which describes the life cycle of the Bay's shad, river herring and other anadromous fish and shows how passages at dams allow these species to return to their spawning habitat. Another exhibit, "Chesapeake Bay: Profile of an Estuary," was created by FWS for use at the Boy Scout Jamboree at Fort A.P. Hill in Virginia in July 1989. Viewed by 20,000 Scouts at the Jamboree, the hands-on display is now being loaned to school systems to enhance their environmental education programs.

The Service expanded distribution of its weekly column, Chesapeake Corner, to 25 newspapers throughout the Bay watershed in 1989.



The Navy launched a number of projects in 1989 to increase awareness of Bay restoration activities among its on-base personnel and the general public. Rear Admiral Jimmy Pappas, commander of the Norfolk Naval Base and the Navy's Chesapeake Bay coordinator, attended an Annapolis ceremony in April 1989 climaxing a campaign encouraging Naval personnel to join the One Million Marylanders for the Bay. Maryland Governor Schaefer participated in the ceremony, presenting Salute to Excellence Awards to the Naval Radio Transmitting Facility, the David Taylor Research Center and the Annapolis Naval Station in recognition of their contributions to improving Bay water quality.

The Navy also sponsored a Chesapeake Bay Program logo contest to promote awareness of the restoration effort at Navy facilities in the Bay basin. The winning design will be used on Navy publications as a symbol of support for the Bay cleanup.

EPA's Chesapeake Bay Program produced a 10-minute slide/tape presentation, "The Chesapeake Bay: A Time of Challenge," to introduce audiences to the causes of the Bay's decline and the activities initiated under the 1987 Agreement to restore the estuary and its living resources. The show is available on loan from the Alliance for the Chesapeake Bay, the Chesapeake Bay Liaison Office, and a number of State agencies.

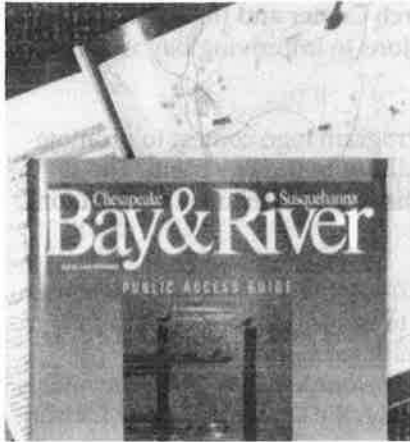
The Bay Program Monitoring Subcommittee and EPA continued distribution of "Bay Barometer," a monthly feature highlighting environmental topics and reporting on water clarity and dissolved oxygen levels in the Bay. The feature is distributed to newspapers, newsletters, and some 200 organizations, schools and colleges, businesses and government agencies.

EPA also published a brochure on the Federal role in the Bay cleanup and a fact sheet on pollution prevention.

Soil Conservation Service personnel made 375 appearances during the past year, presenting talks, slide shows, exhibits or other programs to give both urban and agricultural audiences information on practices that affect the water quality of the Bay.

Public Access

"Bay and River"



"Bay and River—A Public Access Guide to the Chesapeake Bay, its tidal tributaries and the Susquehanna River" went on sale throughout the watershed in April 1989, completing the major initial effort in support of the Agreement goal to "promote increased opportunities for public appreciation and enjoyment of the Bay."

The guide describes and maps more than 750 parks, recreational areas, refuges, landings and other facilities that offer access to the Bay, the Susquehanna River, and other tidal waters. It was produced by the Bay Program's Public Access Task Force (now the Public Access Subcommittee).

With a first printing of 91,000 copies, "Bay and River" is available from State agencies and a number of other outlets throughout the Chesapeake region. The guide is being sold at a price of \$4.95 a copy to defray the cost of compiling and producing the publication.

Virginia started distribution of its 43,000 copies with mail-order and walk-in sales by the Departments of Game and Inland Fisheries and Conservation and Recreation. Contracts were negotiated subsequently to make the guide available through wholesale news and magazine distributors in Hampton Roads and Richmond.

Distribution in Maryland, which received 24,000 copies, has been primarily by mail-order from the Department of Natural Resources. The Pennsylvania Fish Commission is the focal point for distribution of that State's 18,000 copies. The District of Columbia's Department of Recreation and Parks, which is distributing 5,000 copies, has made "Bay and River" available at book stores and other retail outlets in Washington.

Commitment for 1990

A second major commitment under the Public Access section of the 1987 Agreement calls for development of a strategy by December 1990 "which targets State and Federal actions to secure additional tidal shorefront acres... along the Bay and its tributaries."

The States and the District of Columbia are currently developing base maps and other information that will be incorporated ultimately into a single Bay Plan listing areas recommended for access development and identifying natural areas which may be acquired as a preservation measure.

The Virginia Department of Conservation and Recreation has been awarded a \$35,000 Coastal Zone Management grant to fund development of a technical assistance guide for locating and developing access sites and a basinwide public access signage plan and logo. The projects are to be completed by September 1990.

The National Oceanic and Atmospheric Administration also has allocated \$50,000 through Maryland's Coastal Zone Management Program to produce a series of overlay maps showing all public access locations, "sensitive areas," and sectors where additional public access is needed.

Public Access



As part of this project, Maryland's Department of Natural Resources is reviewing the State Comprehensive Outdoor Recreation Plan, County Open Space and Recreation Plans, and Chesapeake Bay Critical Area Protection Plans to pinpoint needs for future public access opportunities along Maryland Bay and tidal tributary shorelines.

Maryland will utilize an electronic Geographic Information System (GIS) for the identification and protection of "sensitive areas" adjacent to the Bay and its tidal tributaries. The GIS will be used to analyze the need for acquisition or other protection efforts for "sensitive areas" as well as identifying tributary access sites.

The Pennsylvania Fish Commission has completed an inventory and ground-checked potential access sites on the Susquehanna River. Base maps are now being prepared to show severe slopes, wetlands, archeological and historic landmarks, and other features to be considered in preparing development recommendations. Construction plans already have been completed to provide public access at one of the sites inventoried.

In Virginia, the public access project is a collaborative effort involving several State agencies, coordinated by the Department of Conservation and Recreation. The Department's Natural Heritage Program is providing information about sensitive plant and animal communities. Its Division of Soil and Water Conservation is collecting data on soils, severe slopes, eroding shorelines and existing beaches, and the Chesapeake Local Assistance Department will be providing information related to local development plans and identified critical areas.

Virginia has had a field researcher working with localities in the Northern Neck and Middle Peninsula for more than a year to determine where additional access is needed or existing facilities should be improved. He also has been negotiating with landowners regarding protection of "sensitive areas" identified by the Department of Conservation and Recreation, U.S. Fish and Wildlife Service, the Chesapeake Bay Foundation, and other organizations.

The Department of Conservation and Recreation is purchasing a map and imaging processing system to use in conjunction with existing computer systems. The State expects to utilize this technology to compile data for inclusion in the 1990 plan for future access to the Bay and for protecting sensitive areas.

Governance

Bay Program

The Chesapeake Bay Program realigned its committee structure in 1989 to more closely match the priorities set out in the 1987 Agreement and help to ensure continuing attention to implementation of all Agreement commitments.

The Program's Implementation Committee, the 30-member group that meets regularly through the year as the operational/policy arm of the Executive Council, established new Subcommittees for Toxics, Population Growth and Development, Public Access, and Public Information and Education.

The Committee retained four other Subcommittees—Living Resources, Monitoring, Modeling, and Nonpoint Source—and the Federal Agencies Committee, but eliminated a Data Management Subcommittee and divided its responsibilities between the Monitoring and Living Resources panels.

The 1987 Agreement designated the Executive Council as the chief coordinating body to lead the Bay restoration effort and specified that its membership consists of the Governors of Maryland, Pennsylvania and Virginia, the Mayor of the District of Columbia, the Administrator of EPA representing the Federal Government, and the Chairman of the Chesapeake Bay Commission.

The Council is required under the Agreement to meet at least once a year. The Principals' Staff Committee, made up of representatives designated by the Council members, meets more often to consider issues that will come before the Council.

Other elements of the Bay Program organization include a Budget and Workplan Steering Committee and a 1991 Nutrient Reevaluation Workgroup, which will carry out the reassessment of the 40-percent nutrient reduction goal called for by the Bay Agreement. In addition, the Citizens Advisory Committee, the Local Government Advisory Committee, and the Scientific and Technical Advisory Committee bring the perspectives of their constituencies to the committees and workgroups of the Bay Program.

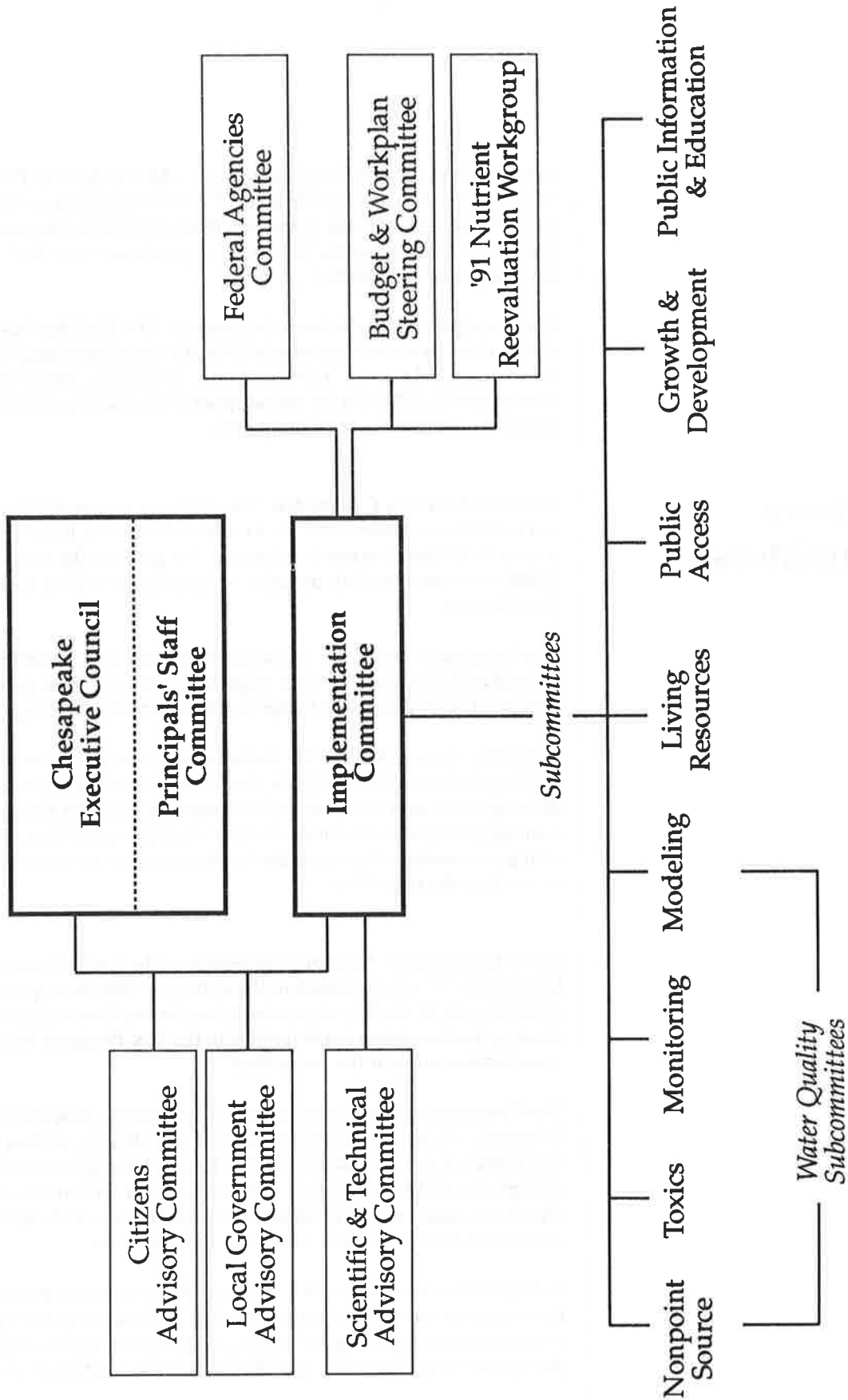
Funding the Bay Program

Spending on State and Federal programs that contribute to the restoration and protection of the Bay system is not allocated from a neatly wrapped budget package. Seven Federal agencies administer a wide range of activities directly related to Bay water quality. Dozens of other governmental offices in the States and the District of Columbia have programs and projects that contribute to the restoration effort—some in conjunction with Federal programs, others that stand on their own.

Overall, State and Federal funding for Bay-related programs added up to nearly \$500 million for fiscal years ending in 1989. The most sizeable single category of spending—more than 40 percent of the total—was for the construction or improvement of wastewater treatment plants in the watershed.

Annual spending totals include money Congress specifically allocates for the Chesapeake Bay from the EPA budget, an amount approaching \$13 million for FY1990, starting October 1, 1989. These funds for the most part are disbursed in keeping with an expenditure plan approved by the Implementation Committee.

MAJOR COMMITTEES IN THE CHESAPEAKE BAY PROGRAM



Advisory Committees

About half of the Bay Program budget—\$6.5 million in FY1990—goes to the States and the District in the form of implementation grants used primarily to fund “best management practices” that will reduce the amounts of nitrogen and phosphorus reaching the Bay. Federal grants are matched dollar for dollar by the States and the District.

Other major allocations from the proposed FY1990 Bay budget include \$1.1 million for toxics studies; nearly \$978,000 for monitoring; \$803,000 for modeling; \$434,000 for living resources programs; \$961,800 for data management; \$353,000 for the support of advisory committees, and \$241,000 for public information and participation.

Citizens Advisory Committee. The primary responsibility of the Citizen Advisory Committee (CAC) is to review State and Federal Bay programs and assess their contribution to achieving the goals of the restoration effort. The Committee membership includes representatives from each of the watershed jurisdictions.

The Committee helped to shape many of the commitment strategies developed in 1988 and continues to track implementation of these plans through the review of workplans and budgets at its quarterly meetings .

Activities of the CAC in 1989 included representation on the “blue ribbon” toxics panel, co-sponsorship of the Alliance conference on growth and development, and analysis and comment on the first three fisheries management plans developed under the Bay Agreement. The citizens’ panel also gave considerable attention in the past year to the role of Federal agencies in the Bay cleanup effort.

Local Government Advisory Committee. The Local Government Advisory Committee (LGAC), created in the spring of 1988 in response to a specific commitment in the Bay Agreement, began implementation this past year of its strategy to encourage participation in the Bay Program by the nearly 2000 local government units in the watershed.

The Committee started publication of a quarterly newsletter, “Chesapeake Bay Currents,” which is distributed to local jurisdictions across the Bay basin. It established a toll-free phone service to give local governments ready access to Committee and Bay Program information. The Committee also continued efforts to assist local governments in finding technical and financial support to meet their responsibilities under the Bay Program.

In September, the Committee sponsored a conference focusing on growth management issues confronting local governments in the Bay basin. The Committee reviewed issues relating to nonpoint source control, Baywide development policies and guidelines, and the discharge of sewage from boats.

Scientific and Technical Advisory Committee. The Scientific and Technical Advisory Committee (STAC), whose membership is drawn primarily from

leading universities and research institutions in the region, forged closer ties with other Bay Program committees in 1989 to reinforce its traditional role as a bridge between the scientific community and restoration activities.

STAC members and staff attended and contributed to discussions at CAC, LGAC, and other committee meetings and selected members also served on three standing subcommittees—Living Resources, Monitoring, and the new Toxics group.

An eight-member executive committee, established by the scientific panel in 1989 to guide its work, singled out four issues for special attention: atmospheric deposition, groundwater, economics, and public health. STAC members have started to identify economic problems and opportunities in the Bay Program and priority public health issues that the Committee may wish to pursue.

STAC's Economics Advisory Group began compiling a directory of Bay-area economists interested in assisting with Chesapeake Bay Program activities. STAC members assisted in selecting scientists to assist the Living Resources Subcommittee in revising its report on habitat requirements for Bay species. STAC staff carried out literature searches on key species targeted in the document.

STAC members also are assisting in development of the new Bay model, advising on the reevaluation of the nutrient reduction goal, and reviewing and exchanging ideas on stock assessment plans.

The Research Planning Committee created in December 1988 became part of STAC (the Research Planning Advisory Group) as part of the Bay Program committee realignment in 1989. As one of its first projects, the planning panel recommended priorities in toxics research early in 1989. The document produced from this effort will be integrated into a more comprehensive Chesapeake Basin Research Priorities Report in 1990.

The group initiated two other projects during the year, a synthesis of the scientific literature in four areas important to the Bay Program and compilation of a directory listing researchers throughout the Chesapeake Bay region and describing their projects and programs.

Bay Program Committees - 1989

Chesapeake Executive Council

Gerald L. Baliles, Chairman
Governor of Virginia

William Donald Schaefer
Governor of Maryland

Robert P. Casey
Governor of Pennsylvania

Marion Barry
Mayor of Washington, D.C.

William K. Reilly
Administrator of the U.S. EPA

James E. McClellan
Chesapeake Bay Commission

Principals Staff Committee

Virginia

John W. Daniel II, Chairman
Secretary of Natural Resources

Pennsylvania

Helen D. Wise
Secretary to the Cabinet

Maryland

Torrey C. Brown, M.D.
Secretary, Department of Natural
Resources

David Carroll
Chesapeake Bay Coordinator
Office of the Governor

Wayne A. Cawley, Jr.
Secretary, Department of Agriculture

District of Columbia

Donald Murray
Director, Department of Consumer &
Regulatory Affairs

U.S. Environmental Protection Agency

Edwin B. Erickson
Administrator, Region III

Implementation Committee

District of Columbia

James Collier
Department of Consumer & Regulatory
Affairs

Kenneth Laden
Department of Public Works

Anantha Padmanabha
Department of Consumer & Regulatory
Affairs

Maryland

Katherine Farrell
Department of the Environment

Verna E. Harrison
Department of Natural Resources

Robert Perciasepe
Department of the Environment

Rosemary Roswell
Department of Agriculture

Pennsylvania

Louis W. Bercheni
Department of Environmental Resources

Patricia A. Buckley
Governor's Office of Policy

Walter Peechatka
Department of Agriculture

Paul Swartz
Department of Environmental Resources

Virginia

Richard Burton
State Water Control Board

Keith J. Buttleman
Council on the Environment

Roland Geddes
Division of Soil & Water Conservation

William A. Pruitt
Virginia Marine Resources Commission

James Remington
Department of Game & Inland Fisheries

Bay Program Committees - 1989

Citizens Advisory Committee

Local Government Advisory Committee

Federal

Dr. Alvin R. Morris, Chairman
EPA Region III

William Ashe
U.S. Fish & Wildlife Service

Peter Boice
U.S. Department of Defense

John B. Currier
USDA Forest Service

Dr. Robert Lippson
National Oceanic & Atmospheric Adm.

Philip H. Christensen
USDA Soil Conservation Service

Stanley Sauer
U.S. Geological Survey

Bernard E. Stalmann
U.S. Army Corps of Engineers

District of Columbia

Robert Andretta
Marguerite Foster
Geneva T. Perry
Walter Wells

Maryland

Clifford A. Falkenau
Mary Roe Walkup (Chairman 1989)

Pennsylvania

David Brubaker
Edwin H. Coder (Chairman 1986-87)
William Eberhart
Walter L. Pomeroy

District of Columbia

Warren Graves
Alvin McNeal
Russ Thomas

Maryland

Robert Jarboe
Sidney Kramer
Anna M. Long
George P. Murphy
J. Anita Stup
Philip L. Tilghman

Regional

Robert Bielo
Susquehanna River Basin Commission

Ann Swanson
Chesapeake Bay Commission

Lee Zeni
Interstate Commission on the Potomac River Basin

Ex Officio

Gerald W. Hyland
Local Government Advisory Committee

Joseph A. Mihursky
Scientific and Technical Advisory Committee

Mary Roe Walkup
Citizens Advisory Committee

Virginia

Nancy Gillette
Joe Maroon
Gerald P. McCarthy (Chairman 1988)
Thomas C. Winstead

At Large

Ralph W. Abele
Dr. Elizabeth Bauereis (Chairman 1985)
N. Lee Brown
Cranston Morgan
Mitchell Nathanson
Ann Powers
Donald L. Spickler
Wayne L. Sullivan
William J. Whitney, Jr.

Pennsylvania

Ronald Fitzkee
John Garner
Robert C. Gerhard, Jr.
B. Kenneth Greider
Russell Pettyjohn

Virginia

R. Keith Bull
C. Flippo Hicks
Gerald W. Hyland (Chairman)
Nancy K. Parker
Stephen Whiteway
Clay Wirt

Bay Program Committees - 1989

Scientific and Technical Advisory Committee

Raymond Alden, Old Dominion
University

Wayne Bell, University of Maryland

William Dunstan (Carvel Blair -
alternate), Old Dominion University

James Ebert, Chesapeake Bay Institute

Thomas Grizzard, Virginia Polytechnic
Institute

James Hannaham, University of
the District of Columbia

Richard Jachowski, U.S. Fish and
Wildlife Service

A. Jose Jones (Elvira Paz - alternate),
University of the District of Columbia

E. B. Knipling (Alan Isensee and Jack R.
Plimmer - alternates), U.S. Department
of Agriculture

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

Robert Lippson, National Oceanic and
Atmospheric Administration

Archie McDonnell, Pennsylvania State
University

Joseph A. Mihursky, University of
Maryland, Chairman

Frank O. Perkins, Virginia Institute of
Marine Science

Clifford W. Randall, Virginia
Polytechnic Institute

William Rickards, University of Virginia

Louis Sage, Sciences of Philadelphia

Martha Sager, American University

Barry Smith, U.S. Geological Survey

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

Ivor Strand, University of Maryland

Charles P. Warr

Wilbert Wilson, Howard University

Subcommittee Chairmen

Living Resources

Verna E. Harrison
MD Department of Natural Resources

Modeling

James Collier
DC Department of Consumer &
Regulatory Affairs

Monitoring

Robert Perciasepe
MD Department of the Environment

Nonpoint Source

Roland Geddes
VA Division of Soil & Water
Conservation

Population Growth and Development

Keith J. Buttleman
VA Council on the Environment

Public Access

B. C. Leynes, Jr.
VA Department of Conservation and
Recreation

Public Information and Education

Kathi Bangert
U.S. Fish and Wildlife Service

Toxics

Katherine Farrell
MD Department of the Environment

*U.S. GOVERNMENT PRINTING OFFICE: 1990--720-080/06332