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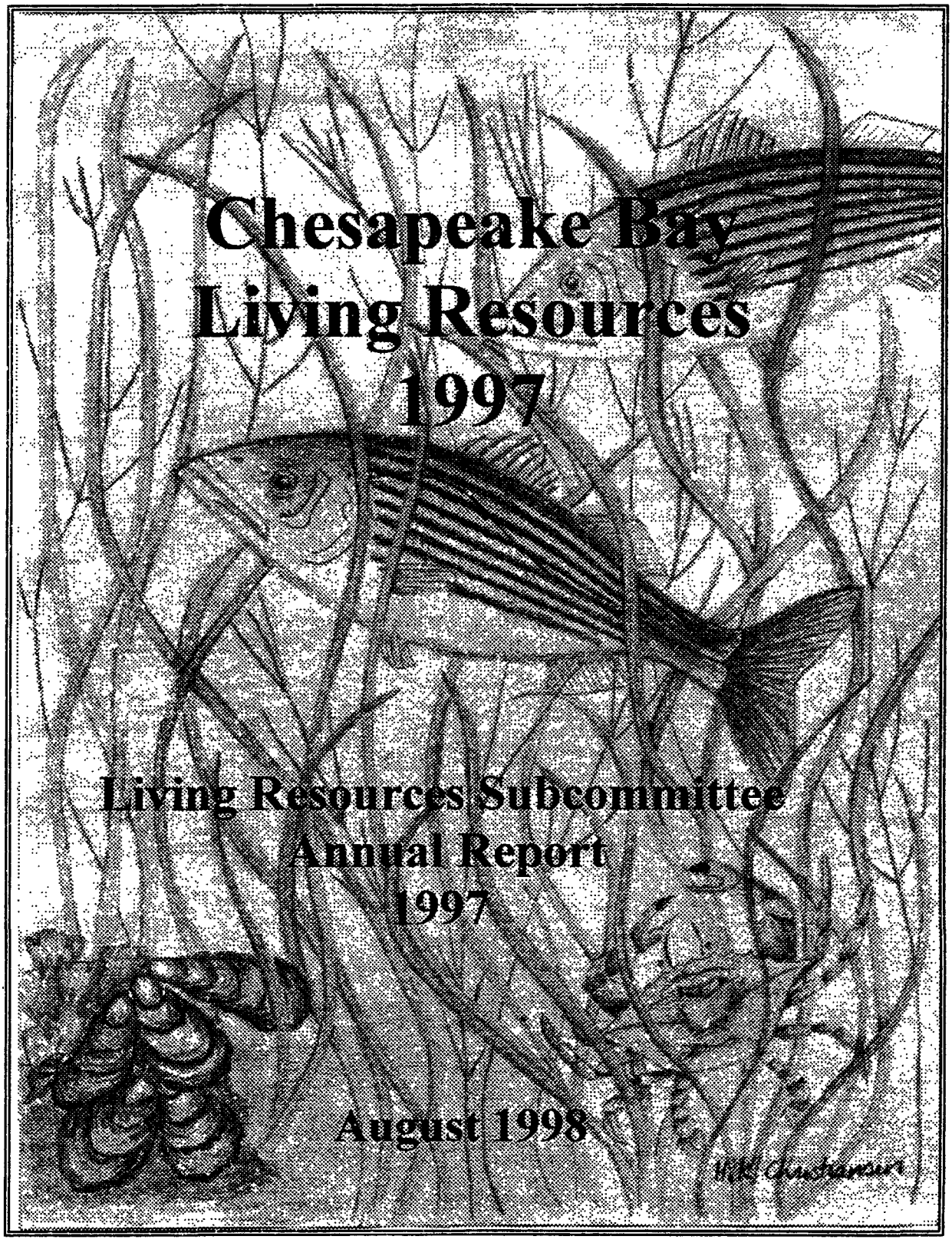

# Chesapeake Bay Living Resources 1997

## Living Resources Subcommittee Annual Report 1997

August 1998



Chesapeake Bay Program

# LIVING RESOURCES SUBCOMMITTEE

*"The productivity, diversity and abundance of living resources are the best ultimate measures of the Chesapeake Bay's condition. These living resources are the main focus of the restoration and protection effort."* ***1987 Chesapeake Bay Agreement.***

The Living Resources Subcommittee (LRSc) is committed to the restoration, enhancement, protection and management of the living resources of Chesapeake Bay. Living resources include fish, shellfish, birds and waterfowl, as well as the submerged aquatic vegetation (SAV), wetlands, and other shoreline and riverine systems important to water quality and fish and wildlife habitats. In cooperation with Bay Program partners, the LRSc supports the restoration of streams, wetlands, Bay grasses (submerged aquatic vegetation) and aquatic reefs, and the opening of stream blockages for migratory fish passage. The Subcommittee also guides the development of Chesapeake Bay-specific fish management plans. LRSc-directed policies and projects have enhanced fish and shellfish populations, helped improve water quality, and increased wildlife habitat in the Chesapeake Bay watershed. Ongoing biological monitoring and ecosystem modeling programs contribute significantly to the understanding of Chesapeake Bay's living resources and their relationships with each other, as well as the land and water.

Eleven workgroups and the Chesapeake Bay Stock Assessment Committee, a joint committee with the National Oceanic and Atmospheric Administration (NOAA), support the LRSc. Workgroups include: Aquatic Reef Habitat, Ecosystem Indicators, Ecosystem Modeling, Exotic Species, Fish Passage, Fisheries Management Plan (FMPs), Habitat Objectives/Restoration, Living Resources Monitoring (a joint workgroup with the Monitoring Subcommittee), Submerged Aquatic Vegetation (SAV; also a joint workgroup with the Monitoring Subcommittee),Waterfowl and Other Water Birds, and Wetlands.

# Chesapeake Bay Living Resources 1997

## Living Resources Subcommittee Annual Report



Chesapeake Bay Program

Prepared by the Living Resources Subcommittee
Chesapeake Bay Program

## August 1998

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# EXECUTIVE SUMMARY

The Living Resources Subcommittee (LRSc) is committed to the restoration, enhancement, protection and management of the living resources of Chesapeake Bay. LRSc workgroups include: Aquatic Reef Habitat, Ecosystem Indicators, Ecosystem Modeling, Exotic Species, Fish Passage, Fisheries Management Plan (FMPs), Habitat Objectives/Restoration, Living Resources Monitoring (a joint workgroup with the Monitoring Subcommittee), Submerged Aquatic Vegetation (SAV; also a joint workgroup with the Monitoring Subcommittee),Waterfowl and Other Water Birds, and Wetlands.

During 1997, the Wetlands Workgroup developed and tested a planning tool for local governments and watershed groups to help them combine wetlands protection with other land use management. The tools were applied to pilot watersheds at Lititz Run, Pennsylvania and Hunting Creek, Maryland. Directive 97-2, *Wetlands Protection and Restoration Goals*, signed by the Executive Council, recommits to a "no net loss" goal and to achieving a long-term net gain in wetland acreage and function. Two new public outreach wetlands documents were published.

Overall, the total acreage of Bay grasses (submerged aquatic vegetation) increased in 1997 for the second year in a row to 69,238 acres. This was a 9% increase (5,770 acres) from the 1996 area and represents 61% of the Bay's interim restoration goal. Workshops to teach interested citizens how to plant and identify Bay grass species were held in 1997 and planting projects continued in Virginia and Maryland.

Aquatic reef restoration progressed farther in 1997 than any previous year, both in terms of completed projects (four in Virginia, three in Maryland) and in our understanding of the ecological value of the reefs. In Virginia, reefs were constructed in the Coan, Yecomico, and Lynnhaven Rivers, and in Pungoteague Creek. Maryland constructed reefs on Southwest Middle ground (west of Smith Island), Cooks Point (mouth of the Choptank River), and in Strong Bay (mouth of the Chester River).

The Fisheries Management Plan Workgroup revised the *Chesapeake Bay Blue Crab Fishery Management Plan* and produced a technical report, *Catfish Populations in Chesapeake Bay. Guidelines for Developing and Revising Chesapeake Bay Fisheries Management Plans* were approved by the Bay Program's Implementation Committee in 1997. Record high juvenile striped bass indices for both Maryland and Virginia in 1996 were followed by more typical numbers in 1997. The first Baywide stock assessment for blue crabs was completed in 1997. The assessment concluded that the blue crab population is currently stable, at average levels of abundance. As a result of the stock assessment and other considerations, the *1997 Chesapeake Bay Blue Crab FMP* considers the blue crab stock to be fully exploited.

Bay jurisdictions completed 8 fish passage projects and opened 123.2 miles of blocked waterways in 1997, of which 104.0 are currently accessible to anadromous fish and 19.2 are not yet accessible. Another 49.8 miles of major tributaries have been opened to spawning herring in the lower Susquehanna. Shad lifted over Conowingo Dam on the Susquehanna River increased from a few hundred in the early 1980s to almost 104,000 in 1997. Also, 374,000 river herring used a fish passage to bypass the dam. Pennsylvania, Maryland, Virginia, and USFWS reared, marked and stocked 19.54 million American shad larvae, and Virginia stocked 3,000 adult blueback herring from the Chickahominy River to the James above Boshers Dam. In the Susquehanna River, about 11,000

adult shad from the Conowingo West lift were stocked above mainstem dams and 28,000 bluebacks were placed into several tributaries.

Ten other habitat restoration projects were approved for implementation in 1997, including four in Maryland, three in Virginia, two in Pennsylvania, and one in the District of Columbia. All together, these projects encompassed 35 acres of stream riparian buffers, 337 acres of wetlands, and 40 acres of forest habitat.

An ad hoc Exotic Species Panel was established to provide advice to the Chesapeake Bay Program, Living Resources Subcommittee and the Virginia Marine Resources Commission on a research proposal by the college of William & Mary, School of Marine Science, Virginia Institute of Marine Science (VIMS), to conduct in-water testing of triploid Pacific oysters *Crassostrea gigas* and *Crassostrea rivularis.* At the recommendation of the ad hoc committee, triploid and disease-resistant native oysters were included, monitoring for reversion of triploid *C. gigas* oysters was increased, and biweekly cleaning and verification of status was included as needed.

The Waterfowl Workgroup completed the reevaluation of the Waterfowl Plan and it was adopted by the Living Resources Subcommittee in October 1997. The reevaluation expands the workgroup's scope to include other species of waterbirds and marsh birds. The goal of the Chesapeake Bay Program is to restore waterfowl populations and habitats to levels seen in the 1970s by the year 2000. To date, 11 of the 20 species monitored have met that goal.

The Living Resources Monitoring Workgroup assisted several efforts to develop bioindicators of Bay health, as well as championed a Basinwide strategy to increase access to CBP data and information. In 1997, a relational database of Chesapeake Bay benthic monitoring data was completed and made available on the Chesapeake Information Management System (CIMS) Internet server. Collaboration with the Virginia Institute of Marine Sciences (VIMS) resulted in relational databases of fish monitoring data posted on a VIMS server and linked to CIMS. The Ecosystem Modeling Workgroup, in conjunction with the SAV Workgroup, revised Bay grass habitat requirements using a simple approach with light as the primary factor in growth and survival of Bay grasses.

# WETLANDS

Wetlands are a vital link between the land and water of Chesapeake Bay. Wetlands help maintain water quality, contribute to flood and erosion control, and provide wildlife habitat. Nearly 1.5 million acres of wetlands occupy the Bay's watershed. Population and development pressures, however, are threatening both tidal and nontidal wetlands in all the Bay states. The Bay Program established a "no net loss" goal in 1988. The *1989 Chesapeake Bay Wetlands Policy and Implementation Plan* fosters protection of wetlands through four strategies: inventory and mapping of wetlands; protection of existing wetlands; rehabilitation and restoration of degraded wetlands; and education and research. A new 1997 directive commits Bay Program partners to identify and track wetlands in the Bay watershed, develop strategies for achieving a net gain in wetlands acreage, and create a quantifiable goal by 1999.

The Wetlands Workgroup guides the development and implementation of a comprehensive strategy for protecting and managing all wetlands in the Chesapeake Bay watershed. Development and testing of the Wetlands Initiative protocol consumed the majority of the Workgroup's activities during 1997. In response to questions and direction from the Chesapeake Bay Program's Principle Staff Committee, a new Wetlands Directive was drafted and signed by the Executive Council (Directive 97-2). The Workgroup will lead the development of the plans, strategies and goals required by the Directive.

## 1997 Accomplishments

### Wetlands Initiative

The Initiative is a planning tool for local governments and watershed groups that is designed to help them combine wetlands protection with other land use management strategies. Technical specialists are developing mapping tools to help communities identify wetland types that exist in their watershed. Computer projections show how land use affects wetland function. Using these tools, communities can target wetlands for protection and restoration. A three-step protocol is based on identifying the location of local wetlands and evaluating wetland functions based on adjacent land use and surrounding features. During summer 1997, the tools were applied to pilot watersheds at Lititz Run, Pennsylvania and Hunting Creek, Maryland. It will be tested in Virginia in 1998.

### Wetlands Directive

Directive 97-2, *Wetlands Protection and Restoration Goals*, recommits to a "no net loss" goal and to achieving a long-term net gain in wetland acreage and function. The Directive encourages the identification and development of a strategy for assessing wetlands status and trends every five years. A numeric wetland protection and restoration goal will be established by 1999. The Chesapeake Bay Program will continue assisting local governments and community-based watershed efforts through the development of tools and technical assistance resources.

**Protecting Wetlands -- New Publications**

***Chesapeake Bay Wetlands: the Vital Link between the Watershed and the Bay***

More than 1.5 million acres of wetlands exist in the Chesapeake Bay watershed. This is about 4 percent of the 64,000-square mile basin. Most of the wetlands are freshwater (1.3 million acres), with only 200,000 acres of tidal wetlands. Between 1982 and 1989, over 37,000 acres of wetlands were lost. This document details the causes, status and trends of wetland loss in the Bay watershed between 1982 and 1989. Published March 1997.

***Protecting Wetlands: Tools for Local Governments in the Chesapeake Bay Region***

Tools are available for local governments who want to protect, conserve, and restore wetlands. This handbook is designed to assist local government officials, landowners, community activists, and others with identifying and using these tools. It details how local governments in the Chesapeake Bay watershed can acquire wetlands, implement land-use planning, create financial incentives, provide technical assistance, and conduct education and outreach. Case studies give snapshots of how the tools work. *Protecting Wetlands: Tools for Local Governments in the Chesapeake Bay Region* is available as hard copy and online on the Chesapeake Bay Program homepage at www.chesapeakebay.net/bayprogram. Published April 1997.

***Protecting Wetlands II: Technical and Financial Assistance Programs for Local Governments in the Chesapeake Bay Region***

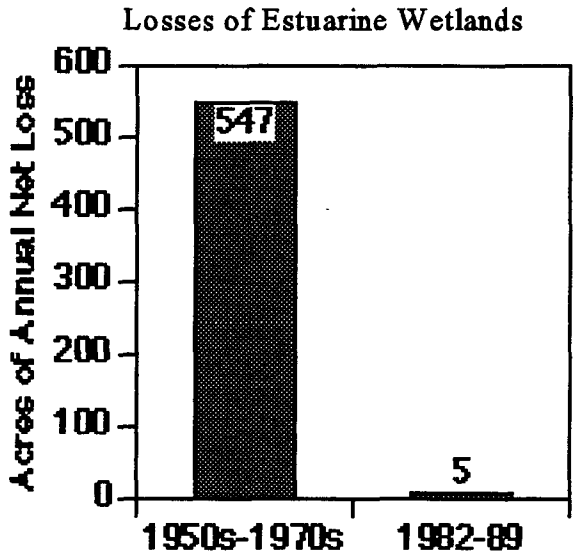
Opportunities exist for local governments to participate in federal and state decision-making processes. A variety of federal and state programs provide technical and financial assistance to local governments, watershed groups, and private landowners for protecting wetlands. This handbook supports the strategies and tools described in *Protecting Wetlands: Tools for Local Governments in the Chesapeake Bay Region* with leads on financial and technical assistance opportunities. Both regulatory and non-regulatory programs are described. Assistance is available through farm, forestry, wetland, transportation, and wildlife enhancement programs. Information and educational resources abound. Published March 1998.

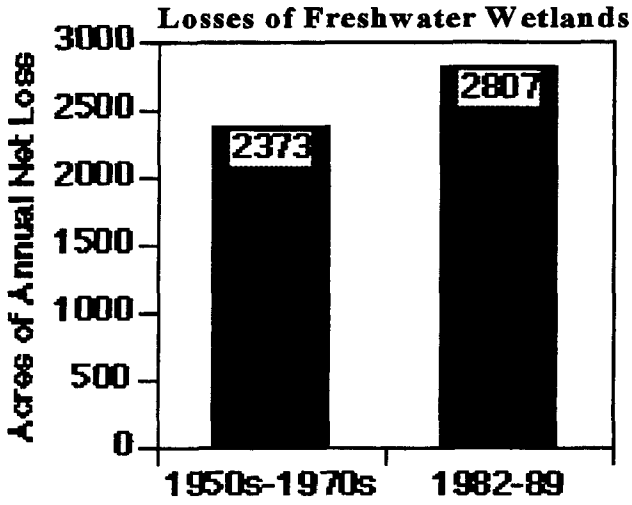
## 1998 Wetland Workgroup Priorities

1. Identify a strategy for evaluating wetland status and trends in the watershed that can feasibly be conducted every five years.
2. Complete the Virginia pilot for the Wetlands Initiative.
3. Develop jurisdiction-specific strategies for achieving a net gain in wetland acreage.
4. Complete the National Wetlands Inventory (NWI) mapping.
5. Publish the Wetlands Initiative protocol.

**Status of Wetlands on Chesapeake Bay**

The Chesapeake Bay watershed continues to lose estuarine wetlands, such as tidal marshes, but loss rates have been significantly reduced. Losses are down from 547 acres/year during the 1950s--1970s, to 5 acres/year during the 1980s. However, freshwater wetlands, such as forested swamps, are being lost at an increasing rate. Losses are up from 2,373 acres/year during the 1950s--1970s, to 2,807 acres/year during the 1980s.



# BAY GRASSES (SUBMERGED AQUATIC VEGETATION)

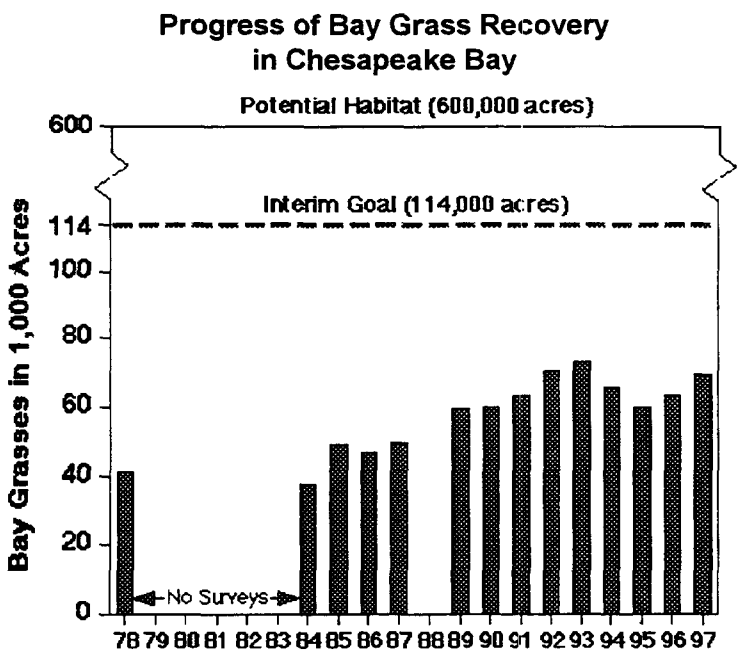
Bay grasses grow in shallow water regions of the estuary and are ecologically important to the Bay's living resources. These underwater grasses provide food for waterfowl and habitat for fish, crabs, and invertebrates; remove suspended sediments from the water; and add oxygen to water and sediments. Growth is dependent on sufficient levels of light reaching the underwater leaves. Algae that grow on Bay grass leaves and thrive in high-nutrient situations, and sedimentation reduce the amount of light reaching plants. Thirteen species of Bay grasses once covered over 400,000 acres of the Bay. The Chesapeake Bay Program is working to restore Bay grasses to historical levels of acreage, abundance and species diversity In 1993, the Chesapeake Executive Council agreed to an interim goal of restoring 114,000 acres of Bay grasses Baywide by 2005.

The Submerged Aquatic Vegetation (SAV) Workgroup implements the Bay Program's SAV policy by directing the protection and restoration of the Bay's underwater grasses. The Workgroup continued funding for aerial surveys of Bay grass coverage during 1997, conducted the surveys, and revised 1984 and 1986 coverage area using estimates for segments that were not flown those years. Workgroup members implemented recommendations from the 1995 *Guidance for Protecting Submerged Aquatic Vegetation from Physical Disruption* by advising regulators and contractors on mapping and avoiding SAV when navigation projects are undertaken.

## 1997 Accomplishments

### Restoration Progress Report

The Bay Program is more than half-way to its interim goal. Overall, the total acreage of Bay grasses increased in 1997 for the second year in a row to 69,238 acres. This was a 9% increase (5,770 acres) from the 1996 area and represents 61% of the Bay's interim restoration goal. The 1997 survey revealed that increases in Bay grass coverage of more than 20% (or areas with grass in 1997 and not in 1996) occurred in 21 of the 73 survey segments of the Bay and its tidal tributaries. In the upper Bay these areas included waters just south of the Susquehanna Flats and the Gunpowder, Middle, Magothy, Chester, Elk, and Bohemia rivers. In the mid-Bay they included the South River, the upper Patuxent River near Lower Marlboro, the lower Potomac River and Piscataway Creek on that river, Eastern Bay, the middle Choptank River near Cambridge, four small rivers on Maryland's lower Eastern shore (the Little Choptank, Honga, Manokin, and Big Annemessex rivers), and new grass beds near North



Beach. In the lower Bay increases were seen in the Piankatank River, the middle James River near Jamestown, and the lower James River.

Grasses decreased by more than 20% in 1997 in 3 of the 73 survey segments, including the lower Rappahannock River, the Corrotoman River, and Lynnhaven Bay. In addition, Bay grass area in Tangier Sound and around the nearby islands declined for the fifth year in a row, by 14% compared to 1996. These declines in Tangier Sound are a cause for concern because they have continued for so long and so many acres are involved. Tangier Sound had 18,106 acres of grass at the peak in 1992 and 9,449 acres in 1997, a loss of 8,657 acres or almost half (48%) of the 1992 area. Causes for this decline are unclear, although the area has had worsening water quality trends. Results of the Bay grass surveys are posted as they are analyzed on the Virginia Institute of Marine Science (VIMS) web site at http://www.vims.edu/bio/sav/.

**Bay Grass Surveys**

Refining the methods used to survey Bay grasses and how to report the results is an ongoing activity. During 1996, Bay grass coverage for 1984 and 1986 was revised using estimates for quads that were not flown during those years. Historical aerial photos from the lower Patuxent River from 1952 were digitized, revealing extensive grass beds. Current VIMS survey data, which goes back to 1978, indicates few or no Bay grass beds in the lower Patuxent in the past two decades. Areas damaged by clam dredging in Maryland and Virginia coastal bays were identified and digitized from aerial photos.

**Citizen Monitoring and Bay Grass Planting**

Three SAV Hunt training workshops, which teach interested citizens how to identify Bay grass species, were held in 1997. Citizen volunteers conduct ground truthing and shoreline surveys to support aerial survey results, plus monitor established sites. During 1997, areas that haven't been ground-truthed recently were surveyed by volunteers. A SAV Planting Techniques workshop was conducted March 1997. Planting projects continued in Virginia and Maryland with several new projects started and protocols for follow-up monitoring by citizens established. Methods for planting were refined for all salinity zones. See http://www.gacc.com/dnr/Bay/sav/ for Maryland planting sites and information and look soon on the VIMS web site at http://www.vims.edu/bio/sav/restoration/ for Virginia planting maps and reports.

Support continued for a monitoring program using volunteers to monitor water quality habitat requirements for Bay grass growth. Sixteen volunteer monitors were trained and eight nearshore monitoring stations were added to the current stations. Data are being used to help target Bay grass restoration efforts in a new geographic information system (GIS)-based targeting tools being developed by Maryland Department of Natural Resources (DNR) staff.

**Protecting Bay Grasses from Fisheries Impacts**

The workgroup continued its evaluation of fisheries impacts on SAV. A study of haul seining impacts on SAV in Susquehanna Flats was completed by Maryland DNR at the request of the Maryland Legislature. Little damage was found, and since then the fishery has been largely abandoned. The proximity of clam aquaculture nets to Bay grass beds and how this changed over time was identified and measured using aerial photos. Workgroup members visited a clam

aquaculture facility near Cape Charles in June 1997 and discussed possible impacts of clam aquaculture of Bay grasses with the owner of the aquaculture facility. A workgroup member also served on a Virginia advisory board on aquaculture organized by VMRC.

**Bay Grass Restoration Goal: Tier II**

Digitizing of the Tier II (to 1 meter) contour for use in a Tier II restoration goal was finalized in 1997. "Unlikely growth" zones (exclusion areas) are being identified. Contouring and exclusion areas will be used to develop the restoration goal for Bay grass acreage located in areas of up to 1 meter water depth at mean low water.

**Habitat Requirements**

To better direct Bay grass restoration and monitoring efforts, new Bay grass habitat requirements for percent light that incorporate leaf surface light attenuation due to epiphytes were developed, tested and validated. The habitat requirements define conditions needed to support survival, propagation and restoration of Bay grasses to one meter depth. They can be used by managers and citizens to guide activities that will improve water quality for Bay grasses. Such activities include stream restoration and creation of forested stream buffers to reduce erosion and capture excess nutrients.

**Chesapeake Bay Water Quality Requirements for Bay Grass Restoration to 1M Depth[1]**

| Salinity Regime[2] | Light Attenuation Coefficient (Kd; m-1) | Secchi Depth (m)[3] | Total Suspended Solids (mg/l) | Chlorophyll a ($\mu$g/l) | Dissolved Inorganic Nitrogen (mg/l) | Dissolved Inorganic Phosphorus (mg/l) | Critical Life Period |
|---|---|---|---|---|---|---|---|
| **Tidal Fresh** | <2 | >0.7 | <15 | <15 | --- | <0.02 | April-Oct. |
| **Oligohaline** | <2 | >0.7 | <15 | <15 | --- | <0.02 | April-Oct. |
| **Mesohaline** | <1.5 | >1.0 | <15 | <15 | <0.15 | <0.01 | April-Oct. |
| **Polyhaline** | <1.5 | >1.0 | <15 | <15 | <0.15 | <0.02 | Mar.-May, Sept.-Nov. |

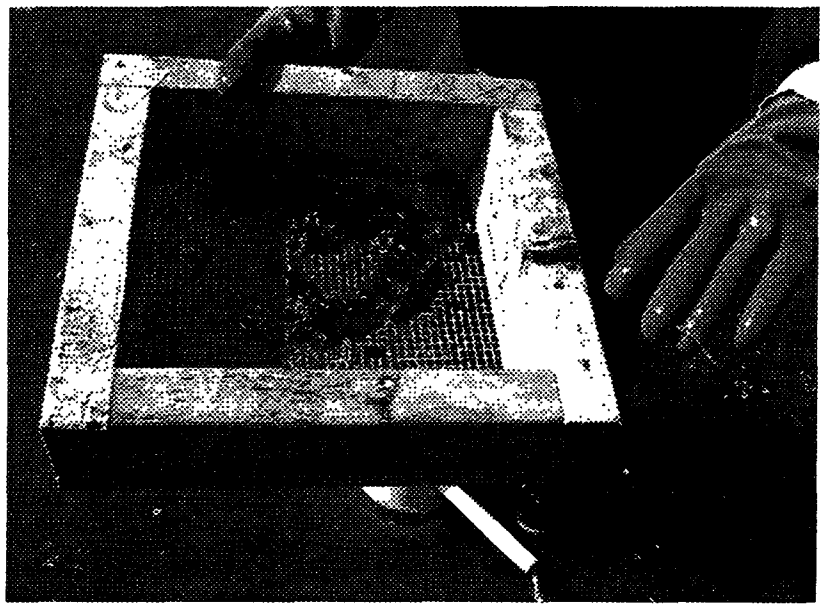
[1]Sources: m = meters, mg/l = milligrams per liter, $\mu$g/l = micrograms per liter. The SAV habitat requirements are applied as median values over the April-October critical life period for the tidal fresh, oligohaline and mesohaline salinity regimes. For the polyhaline salinity regimes, the SAV habitat requirements are applied as median values from combined March-May and September-November data. Light attenuation coefficient (or Secchi depth) should be applied as the primary habitat requirement; the remaining habitat requirements should be applied to help explain regional or site-specific causes of water column and leaf surface light attenuation, which should be directly managed.

[2]Tidal fresh = salinity <0.5 parts per thousand (ppt); oligohaline = 0.5-5 ppt; mesohaline = >5-18 ppt; and, polyhaline = >18 ppt.

[3]The Secchi depth habitat requirement is calculated: Secchi depth = 1.45/light attenuation coefficient (Kd). This represents the minimum median Secchi depth that will permit SAV growth.

## 1998 Submerged Aquatic Vegetation (SAV) Workgroup Priorities

1. Continue ongoing annual surveys of SAV distribution and abundance.
2. Continue SAV restoration and related targeting projects, and SAV protection efforts.
3. Continue research on SAV/water quality/living resource linkages and SAV protection. issues.
4. Finish and distribute products of several other ongoing workgroup projects, including outreach efforts.
5. Continue outreach and education efforts about SAV.



**Citizen Monitoring of SAV on Mill Creek. Magothy River, Arnold, MD. Winter.**

# OYSTER REEF RESTORATION

Oyster reefs have an important ecological role in Chesapeake Bay by providing essential habitat for the Bay's oysters, as well as finfish and crabs. Historically, reefs of densely packed individual oysters grew upward and outward, creating hard surface over many acres of Bay bottom and three-dimensional habitat for Bay creatures. Reef acreage has been lost to harvest pressure, oyster diseases, and pollution. Harvesting techniques have reduced many three-dimensional reefs to flat surfaces.

The *Aquatic Reef Habitat Plan* establishes specific goals to rebuild and restore reefs as habitat for the oyster and other reef community species. The Plan commits Bay Program signatories "to enhancing, protecting, and restoring benthic reefs as ecological systems to benefit the oyster resource and the diverse ecological community associated with Chesapeake Bay structured reefs." Approximately 5,000 acres each in Maryland and Virginia, and 1,000 acres in Potomac River, must be designated as oyster reef habitat by the year 2000. Oyster reef habitat will be created within these designated areas.

The Aquatic Reef Habitat Workgroup directs the enhancement, protection and restoration of oyster reefs. The workgroup continues to grapple with designation of oyster reef habitat in Chesapeake Bay and the Potomac River and is making significant progress toward the year 2000 goal. Funded projects focus on reef restoration and creation, as well as ecological evaluation of created reefs.

## 1997 Accomplishments

### Reef Restoration Progress

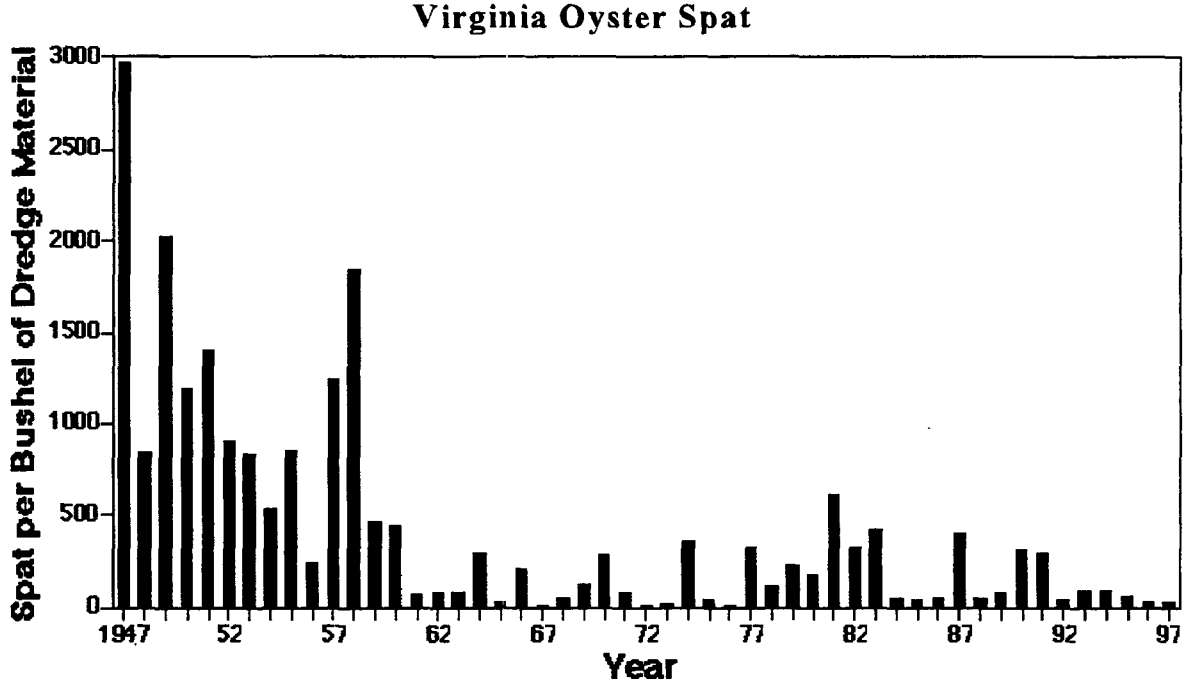
Reef restoration progressed farther in 1997 than any previous year, both in terms of completed projects (four in Virginia, three in Maryland ) and in our understanding of the ecological value of the reefs. In Virginia, reefs were constructed in the Coan, Yecomico, and Lynnhaven Rivers, and in Pungoteague Creek. Significant improvements in the status of the oyster resource, especially spatset, were observed in association with reefs in the Coan, Yecomico, and Great Wicomico Rivers. More large, presumably disease-tolerant oysters were transplanted from Tangier Sound to reefs in Pungoteague Creek, and the Piankatank and Great Wicomico Rivers. A significant effort was initiated by citizen volunteers in the lower Chesapeake Bay area to grow hatchery produced, disease-tolerant oysters for placement on the reef in the Lynnhaven River. Maryland constructed reefs in 1997 on Southwest Middle ground (west of Smith Island ), Cooks Point (mouth of the Choptank River), and in Strong Bay (mouth of the Chester River ). Hatchery seed was added to the reef site at Cooks Point.

### Reef Ecology Studies

Ecological studies of Virginia's constructed reefs show that other animals including crabs, recreational finfish and clams are also benefitting from three-dimensional oyster reef creation. Three-dimensional reefs provide substantial benefits for oysters compared with just hard substrate on the bottom. Monitoring efforts in association with the Virginia reef projects have suggested three important ecological functions of the three-dimensional reef structure for the oyster. First, three dimensional reefs provide the best configuration for positioning oysters to maximize fertilization success in the tidal Bay system. Second, the three-dimensional structure provides juvenile protection from predation, which results in higher survival than occurs when oyster live on the bottom. Thirdly, oysters appear to grow faster on the reef structure than on the bottom.

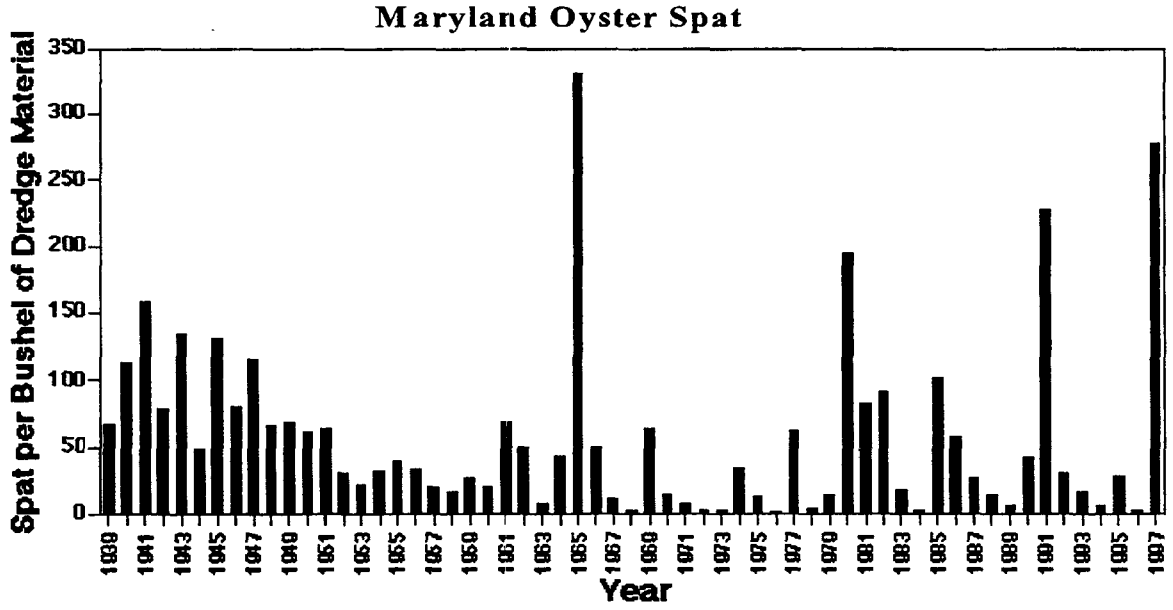
# Chesapeake Bay Program Reef Restoration Sites


Data updated March 1998

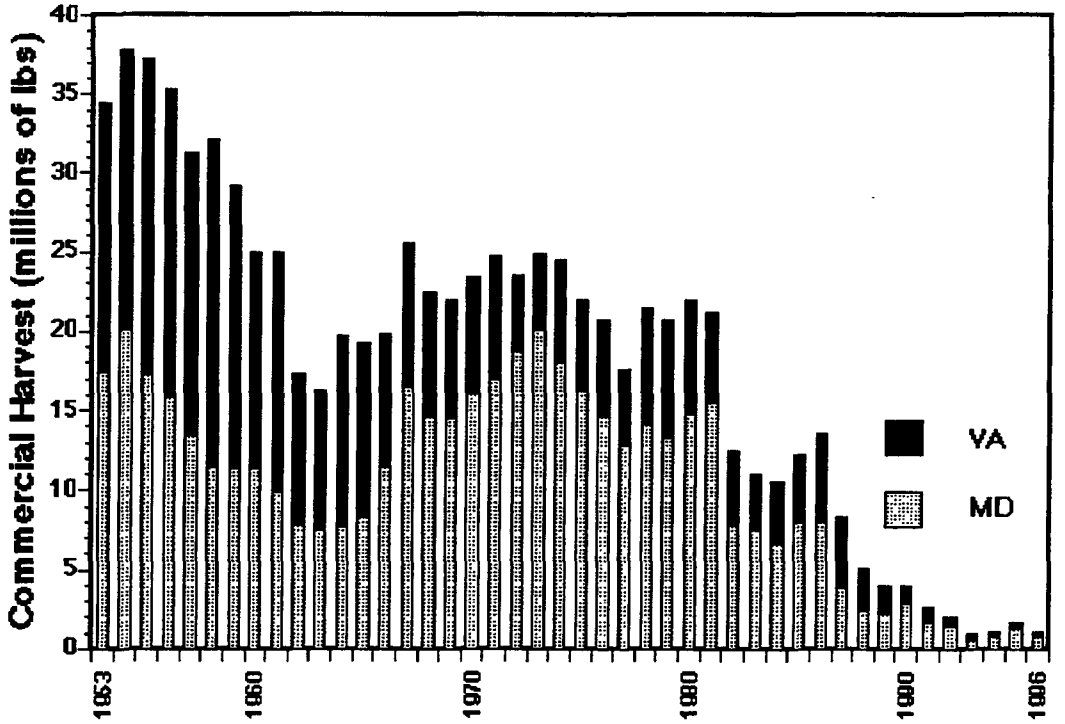



**Oyster Spat Set and Harvest Update**

Oyster spat production shows strong annual peaks and Maryland's 1997 spat set was the second highest since monitoring began in 1939. However, survival to harvestable size is severely compromised by MSX and Dermo. Freshwater flows during the spring and early summer resulted in some oyster mortality in Virginia and kept the incidence of disease low. However, near drought conditions since July caused salinities to rise, which increased the likelihood of diseases impacting oysters and caused additional oyster deaths in the fall of 1997. Oyster harvests on Chesapeake Bay remained low during the 1996-1997 season, with Virginia harvesting just 20,000 bushels, up slightly from last year, and Maryland harvesting 140,000 bushels, substantially down from last year's 200,000 bushels.



## Virginia and Maryland Commercial Oyster Harvest




## 1998 Aquatic Reef Habitat Workgroup Priorities

1. Construct two more reefs in the Great Wicomico River and one reef in the Western Branch of the Elizabeth River in Virginia and continue reef restoration efforts in Maryland.

2. Continue monitoring efforts to further document the value of the reef structure for the oyster as well as other reef-associated species.

# FISHERIES MANAGEMENT

Bay fisheries have traditionally been managed separately by Pennsylvania, Maryland, Virginia, and the District of Columbia, with guidance from several fisheries management councils. Chesapeake Bay Fish Management Plans (FMPs) are developed to provide compatible, coordinated management for the conservation and wise use of the Bay's fishery resources. To be effective, Chesapeake Bay FMPs must consider biological, economic and sociological factors of each resource.

The *1987 Chesapeake Bay Agreement* mandated the development of FMPs for commercially, recreational and ecologically valuable aquatic species. The *Strategy for the Restoration and Protection of Ecologically Valuable Species* goes a step further, requiring the incorporation of habitat requirements for species as part of FMPs. To date, 14 FMPs have been adopted by the Chesapeake Executive Council, encompassing 20 species and over 250 commitments.

**Approved Chesapeake Bay Program Fishery Management Plans**

Alosids (Shad and Herring)
American Eel
Atlantic Croaker and Spot
Black Drum
Black Sea Bass
Blue Crab
Bluefish
Horseshoe Crab
Oysters
Red Drum
Spanish and King Mackerel
Striped Bass
Summer Flounder
Weakfish and Spotted Seatrout

The Fisheries Management Plan Workgroup develops, implements, reviews and revises Baywide fishery management plans. During 1997, the FMP workgroup continued to monitor the status and trends of each stock, update fishery statistics, coordinate management actions among the Bay jurisdictions and with coastal commission recommendations, integrate habitat considerations, and track the progress of each plan. New FMPs for tautog and sturgeon restoration are currently under development and revision of the *Chesapeake Bay Blue Crab FMP* was completed in 1997.

## 1997 Accomplishments

**New FMP: *1997 Chesapeake Bay Blue Crab Fishery Management Plan***

On June 4, 1997, the Chesapeake Executive Council adopted the *1997 Chesapeake Bay Blue Crab FMP*. The goal of this Plan is to manage Chesapeake Bay blue crabs to conserve the Baywide stock, protect its ecological value, and optimize long-term use of the resource. The *1997 Blue Crab FMP* incorporates an enhanced habitat section encouraging protection and restoration of Bay grasses and water quality. The Plan also recommends maintaining regulations enacted by the states, limiting access to the fishery, preventing exploitation, and improving research and monitoring. It showcases the latest 1997 stock assessment results. Cooperation among Maryland and Virginia scientists, stakeholders and legislators resulted in the formation of the Chesapeake Bay Commission Bi-State Blue Crab Advisory Committee, which provided technical review and evaluation of the 1997 Plan.

**Technical Report: *Catfish Populations in Chesapeake Bay***

Catfish are an important commercial, recreational and aquaculture species in the Chesapeake Bay region. Six species live in the freshwater reaches of the Bay's tributaries. Catfish are a resilient species and populations are not currently considered in danger. *Catfish Populations in Chesapeake Bay* brings together all the available information on the biology, ecology and stock dynamics of native and introduced catfish species. It also identifies research and data needs and establishes a reference from which to gauge and direct future management.

**Fishery Management Plan Guidelines**

The ultimate, long-term goal of the Chesapeake Bay Program is the protection, restoration and maintenance of the health of the living resources of the Bay. Many commercially valuable aquatic species once inhabited the Bay in great numbers and, although it may not be practical in all cases to reach these historic levels of abundance, the success of the program must ultimately be measured by the health and abundance of the Bay's living resources. *Guidelines for Developing and Revising Chesapeake Bay Program Fishery Management Plans* advocates the elimination of overharvest of all finfish and shellfish which spend any or all of their life cycle in the Bay in order to assure the long-term sustainability of both the commercial and recreational fisheries for future generations. To achieve this objective, *Guidelines for Developing and Revising Chesapeake Bay Fisheries Management Plans* were approved by the Bay Program's Implementation Committee in 1997.

Chesapeake Bay Program FMPs should prevent crises in fisheries by utilizing the best scientific information. To assure renewability of the stock, sustainable population targets should be established for individual species and harvest levels developed that will attain and maintain that target. FMPs must identify, protect and restore critical fish and shellfish habitat for all life stages of the species and individual stocks of the species. Management actions must be coordinated among jurisdictions, including regulations and legislative actions. An ecosystem approach that strives to manage a fishery and/or species by maintaining essential food web relationships is essential. The Chesapeake Bay FMPs for coastal migratory species follow guidelines established by the Atlantic States Marine Fisheries Council (ASMFC) and the Mid-Atlantic Fisheries Management Council (MAFMC) and outline how the Bay jurisdictions will comply with coastal management recommendations.

**Hot Topic: Fish Lesions and Pfiesteria**

Unusually high numbers of fish with open sores were reported in several Maryland and Virginia rivers during fall 1996 and spring 1997. In late summer and early fall 1997, fish kills spurred concern that the dinoflagellate, *Pfiesteria piscicida*, or related organisms were the culprit. Federal and state agencies have responded with funds for research; increased water, sediment and fish sampling; and agricultural management practices. Health officials are tracking potential human health problems. It is believed that a combination of moderate salinity, poor flushing, warm water, high nutrient concentrations, and high densities of fish may have created conditions conducive to toxic dinoflagellate activation.

## Summary of Fishery Management Plan Workgroup Activities for 1997

***Alosid FMP***

The goals and objectives of the *1989 Alosid FMP* were revised and the management strategies reviewed. The upper Bay population estimate will undergo a peer review process before a decision is made on how the estimate will be used in the revised plan. American shad restoration targets are being evaluated and will be incorporated into the revised Alosid plan. The targets will probably be used in conjunction with stocking and fish passage efforts to track restoration progress. The Alosid revision is scheduled for completion by the end of 1998.

***Atlantic Sturgeon***

A special workgroup was organized to draft an *Atlantic Sturgeon Restoration Plan*. An outline and questionnaire was prepared to help determine a restoration approach in the Bay. A draft biological background section has been completed and will be sent out for review. The plan is scheduled for completion by October 1998.

***Black Drum***

The *1993 Black Drum FMP* was thoroughly reviewed to assess the need for any changes in management strategies. The FMP Workgroup concluded that the 1993 plan has been fully implemented. A one-page update will be inserted at the beginning of the plan which updates the fishery statistics and recent tagging results.

***Horseshoe Crabs***

There has been an increased concern about the harvest of horseshoe crabs along the Atlantic Coast and its potential impact to horseshoe crab and migratory shorebird populations. As a result, representatives from New Jersey, Delaware, Virginia, Maryland, National Oceanic and Atmospheric Administration (NOAA), ASMFC, and U.S. Fish and Wildlife Service (FWS) met to initiate the development of a regional horseshoe crab management plan. A stock assessment workshop will be held next year (1998) to review the existing data, develop a regional consensus on the status of the stock, and identify data needs. New Jersey, Delaware and Maryland have proposed new regulations to reduce the harvest of horseshoe crabs until regional management measures are adopted. A *Chesapeake Bay and Atlantic Coast Horseshoe Crab FMP* was adopted in 1994. Since then, Maryland has been conducting a spawning beach survey to document important habitat for horseshoe crabs and has cooperated in a multi-state tagging effort. Additional funding has been requested to conduct a regional research and monitoring program. *The Horseshoe Crab FMP* is frequently requested through the Chesapeake Bay Program homepage at: http://www.chesapeakebay.net/bayprogram/pubs/pubs4.htm.

***Red Drum***

The *1993 Chesapeake Bay Red Drum Fishery Management Plan* was reviewed by the FMP Workgroup. The Atlantic coast stock is currently overfished but management measures appear to be having a positive impact on the stock. The interim target for the escapement of small red drum as recommended by the ASMFC has been met. The FMP Workgroup suggested that Bay jurisdictions continue implementing management measures until further recommendations are made by the ASMFC/South Atlantic Fisheries Management Council (SAFMC). Research and monitoring efforts

are priority issues. It was determined that the *Chesapeake Bay Red Drum FMP* does not need to be revised, but a one page summary updating research efforts (particularly VA's tagging program) will be prepared.

***Striped Bass***

The Workgroup developed a draft Amendment #1 to the *1989 Striped Bass FMP*. The amendment includes an update on the status of the stock, current coastal management recommendations, and a Chesapeake Bay-specific habitat section. The habitat section includes a narrative on the habitat requirements by life stage for striped bass. The Workgroup is currently preparing habitat maps delineating striped bass habitat requirements. This information will be used by the habitat workgroups of the Chesapeake Bay Program's Living Resources Subcommittee to develop habitat recommendations.

***Summer Flounder***

An amendment to the *1991 Summer Flounder FMP* was developed and adopted by the Chesapeake Executive Council in October 1997. It updates the status of the summer flounder stock and the current problems associated with managing the coastwide quota system. The Bay jurisdictions will follow the guidelines recommended by the MAFMC/ASMFC that balance reductions in fishing mortality (F) with short-term economic burdens placed on the participants in the fishery. The Bay jurisdictions will equitably allocate the coastwide harvest of summer flounder to maintain the traditional recreational and commercial fisheries in the Chesapeake region. It allows for management measures that equitably allocate the harvest.

***Tautog***

A draft *1998 Chesapeake Bay Tautog FMP* was reviewed by the FMP Workgroup. The goal of the plan is to "enhance and perpetuate" tautog stocks and their habitat in the Chesapeake Bay and throughout its Atlantic coastal range, and to provide optimum utilization of the resource over time. The Bay jurisdictions have proposed to reduce exploitation and improve protection of the spawning stock by implementing a 14" minimum size limit; implementing a combination of seasons, creel limits and/or gear restrictions; and requiring escape vents and biodegradable hinges in tautog pots. The draft plan is scheduled for completion by October 1998.

## 1998 FMP Workgroup Priorities

1. Continue the FMP process to monitor the status and trends of managed species, update fishery statistics, coordinate management actions among the Bay jurisdictions and with coastal commission recommendations, integrate habitat considerations, and track the progress towards meeting the goals and objectives of each of the plans.

2. Revise the 1990 Weakfish/Spotted Seatrout FMP.

3. Complete the 1989 Alosid revision.

4. Review the 1991 Spot/Atlantic Croaker FMP and the 1994 Spanish/King Mackerel FMP.

**1998 Workgroup Priorities continued**

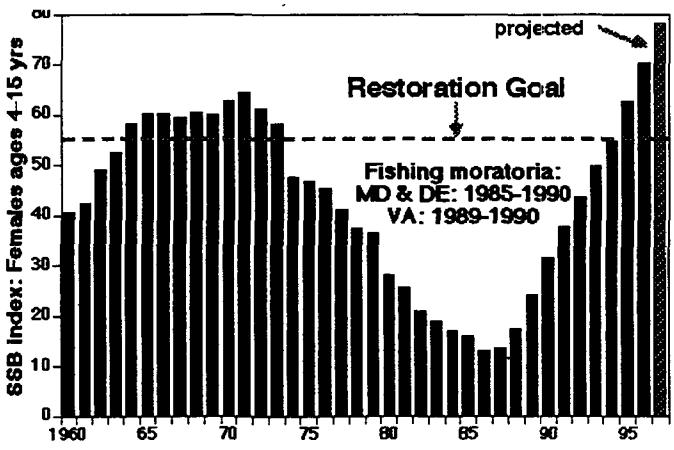
5. Complete the 1989 Striped Bass Amendment #1.

6. Review and possibly amend the 1990 Bluefish FMP.

7. Complete the 1998 Tautog FMP and Atlantic Sturgeon restoration plan.

8. Focus on strategies that will enhance multispecies management in Chesapeake Bay.

## Striped Bass Restoration Index of Spawning Stock Biomass

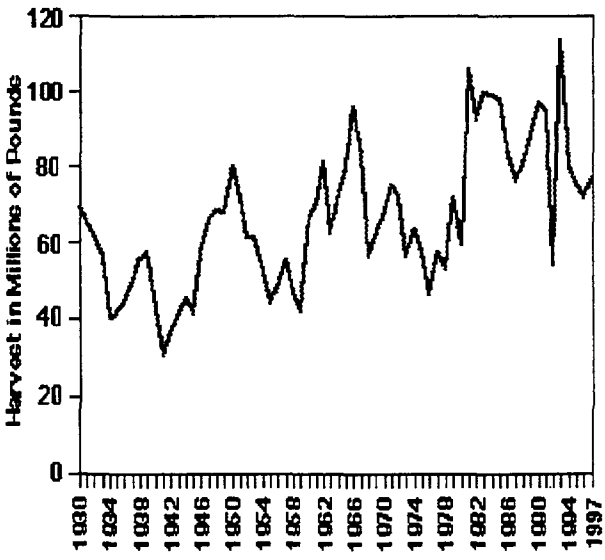



**Status: Striped Bass and Crabs**

Striped bass are a fisheries management success story on Chesapeake Bay. Conservative management measures first removed, then limited fishing pressure. The goal for considering striped bass restored was a spawning stock biomass (SSB) equal to SSBs recorded during 1960 through 1972. The Atlantic States Marines Fisheries Commission declared the stock restored as of January 1, 1995. Spawning stock biomass has continued to rise since then. Juvenile indices of striped bass widely fluctuate. Record high juvenile indices for both Maryland and Virginia in 1996 were followed by more typical numbers in 1997.

The first Baywide stock assessment for blue crabs was completed in 1997. The assessment compiled 50 years of landings and survey data to evaluate long-term trends in the Baywide blue crab population. The assessment concluded that the blue crab population is currently stable, at average levels of abundance. Despite a five-fold increase in fishing effort, the portion of blue crabs harvested from the population has not changed over time. As a result of the stock assessment and other considerations, the *1997 Chesapeake Bay Blue Crab FMP* considers the blue crab stock to be fully exploited. A fully exploited stock is one that can reproduce and replace itself with its fisheries operating at maximum capacity. Fully exploited fisheries require conservative management to prevent the fishery from becoming overexploited.

## Chesapeake Bay Blue Crab Harvest



# FISH PASSAGE

Anadromous fish, including several species of shad and herring, must migrate from saltwater environments to spawn in freshwater tributaries. Many streams and rivers in the Chesapeake Bay watershed are blocked by dams, culverts, and other structures. Over 2,500 blockages in the watershed keep anadromous and other migratory fish from reaching historic spawning grounds. As a result, natural reproduction of American shad, in particular, remains low. Currently, stocking programs conducted by the states help resupply the shad population in Chesapeake Bay. The Bay Program is committed to opening blockages in the tributaries so anadromous fish can reach freshwater spawning grounds. Fish passage goals established in 1993 direct Bay Program signatories to open 582 stream miles by 1998 and over 1,356 miles by 2003.

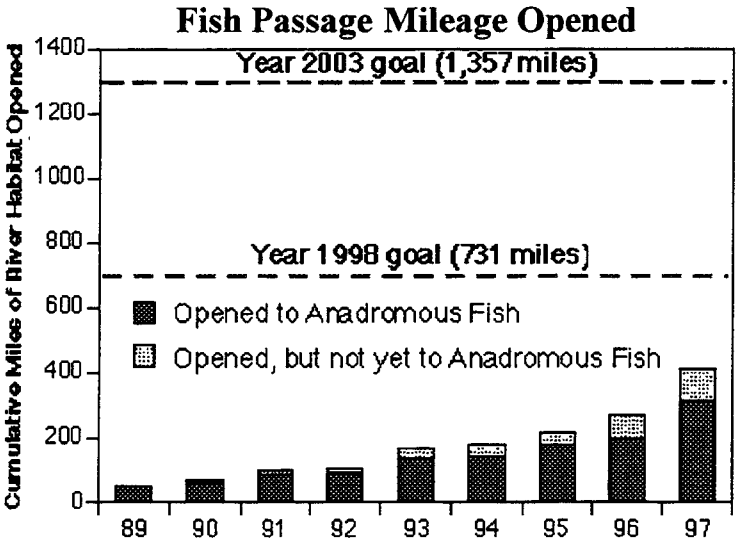
The Fish Passage Workgroup strives for fish passages at dams and other stream blockages, wherever necessary, to help restore migratory fish access to historic spawning habitat upstream. Progress opening stream miles was significant in 1997, but the workgroup speculates that miles opened will fall short of the five-year 1998 goal by about 106 miles. However, projects planned for the next few years ensure that the 10-year goal will be achieved and possibly surpassed.

> Check out our new animated fish passage map on the Chesapeake Bay Program web site at www.chesapeakebay.net/bayprogram/bay_eco/fishpass.htm. Watch stream miles open as fish passages are created at blockages.

## 1997 Accomplishments

### Fish Passage Update

Through 1997, 57 projects opened a total of 410.2 miles of Bay tributaries to migratory and resident fish. Accessibility to a few dozen miles of this habitat is awaiting fish passage project completion at lower stream blockages. Altogether, Bay jurisdictions completed 8 projects and opened 120.9 miles of blocked waterways in 1997, 17.8 miles of which had previously only been available to resident fish. Opening a blockage at the Simkins Dam, on the Patapsco now allows anadromous fish access to the fishways at the Union and Daniels Dams upstream. Another 19.2 miles were opened in 1997 for resident fish, but are not yet accessible to anadromous fish. Although not counted under the Bay Program goal, another 49.8 miles of major tributaries have been opened to spawning herring in the lower Susquehanna.



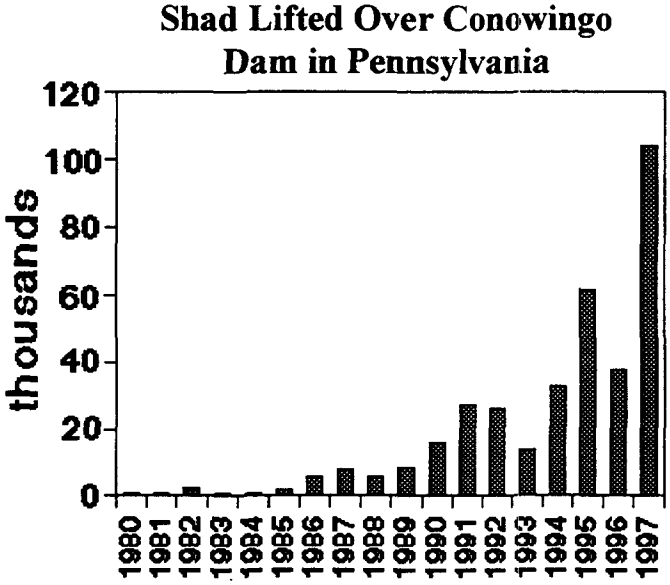

In Pennsylvania, utilities operating the Holtwood and Safe Harbor hydroelectric projects on the Susquehanna River completed multi-

million dollar fish elevator systems (lifts) which opened 32 miles of mainstem and 49.8 miles of major tributaries suitable for herring reproduction. These and the Conowingo Dam East lift (completed in 1991) operated to pass all fish upstream during spring months with modern records being achieved for American shad and blueback herring abundance.

The PA Fish and Boat Commission worked with several dam owners and, using Bay Program funding support, removed four tributary blockages during 1997. Removal of Maple Grove Dam on Little Conestoga Creek and an unnamed dam on Fishing Creek, in Clinton County, opened 10.2 miles for future use by migratory fish once lower tributary obstructions are eliminated. The fish passage at Rock Hill opened 18.5 miles to anadromous fish. The fourth (Castle Fin on Muddy Creek) opened an additional 4.3 miles to resident fish only and these are not counted toward Bay Program goals.

Maryland Department of Natural Resources (DNR) completed three projects in 1997 including a denil fishway at Simkins Dam on the Patapsco River, a notch in a weir on Nassawango Creek, and a culvert reconstruction on the Wicomico in Charles County. Together these opened 52.8 miles of tributary waters to anadromous fish and 9 miles to resident migratory fish.

Virginia developed no new fish passages in 1997 but worked with numerous partners to complete the budget package for development of a long awaited fishway at Boshers Dam on the James River at Richmond. A ground breaking ceremony occurred in July and construction is expected to be completed in 1998.




**Alosid Restocking**

Stocking efforts and a moratorium on shad fishing in the Bay have helped increase the number of American shad, a historically important fish for the Bay. Shad lifted over Conowingo Dam on the Susquehanna River increased from a few hundred in the early 1980s to almost 104,000 in 1997. Also, 374,000 river herring used a fish passage to bypass the dam in spring 1997. The percentage of wild shad seen at Conowingo increased from 11% in 1995 to 60% this year. That means shad transported upstream by truck in previous years successfully reproduced and their offspring returned to spawn.

Pennsylvania, Maryland, Virginia, and U.S. Fish and Wildlife Service reared, marked and stocked 19.54 million American shad larvae in 1997. Stockings were in the Susquehanna (8.02 M), James (5.87 M), Pamunkey (1.28 M), Potomac (1.53 M), and various Maryland tributaries (2.83 M). Maryland DNR also cultured and stocked over 12 million hickory shad larvae in the Patuxent, Choptank, and Patapsco rivers.

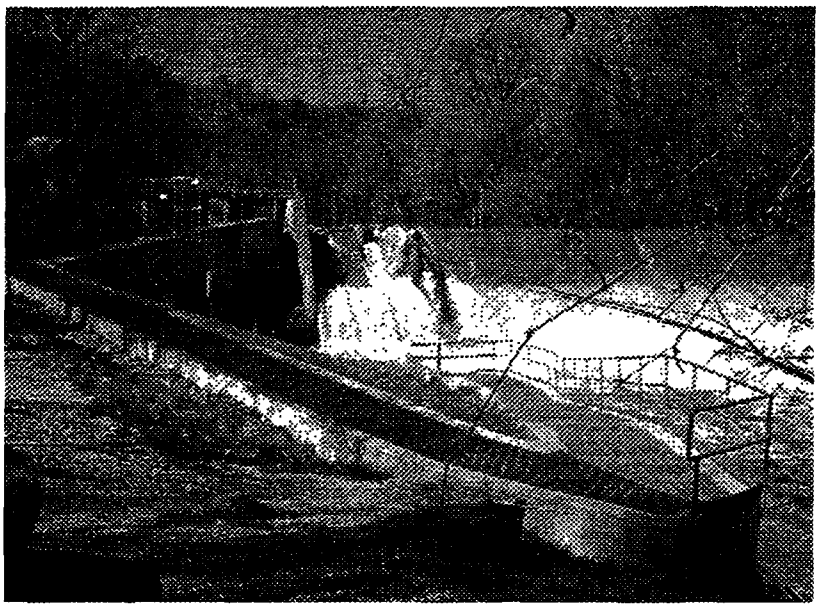
Virginia stocked 3,000 adult blueback herring from the Chickahominy River to the James above Boshers Dam. In the Susquehanna River, about 11,000 adult shad from the Conowingo West lift were stocked above mainstem dams and 28,000 bluebacks were placed into several tributaries.

## 1998 Fish Passage Workgroup Priorities

As many as 13 projects are planned for completion. These include the following:

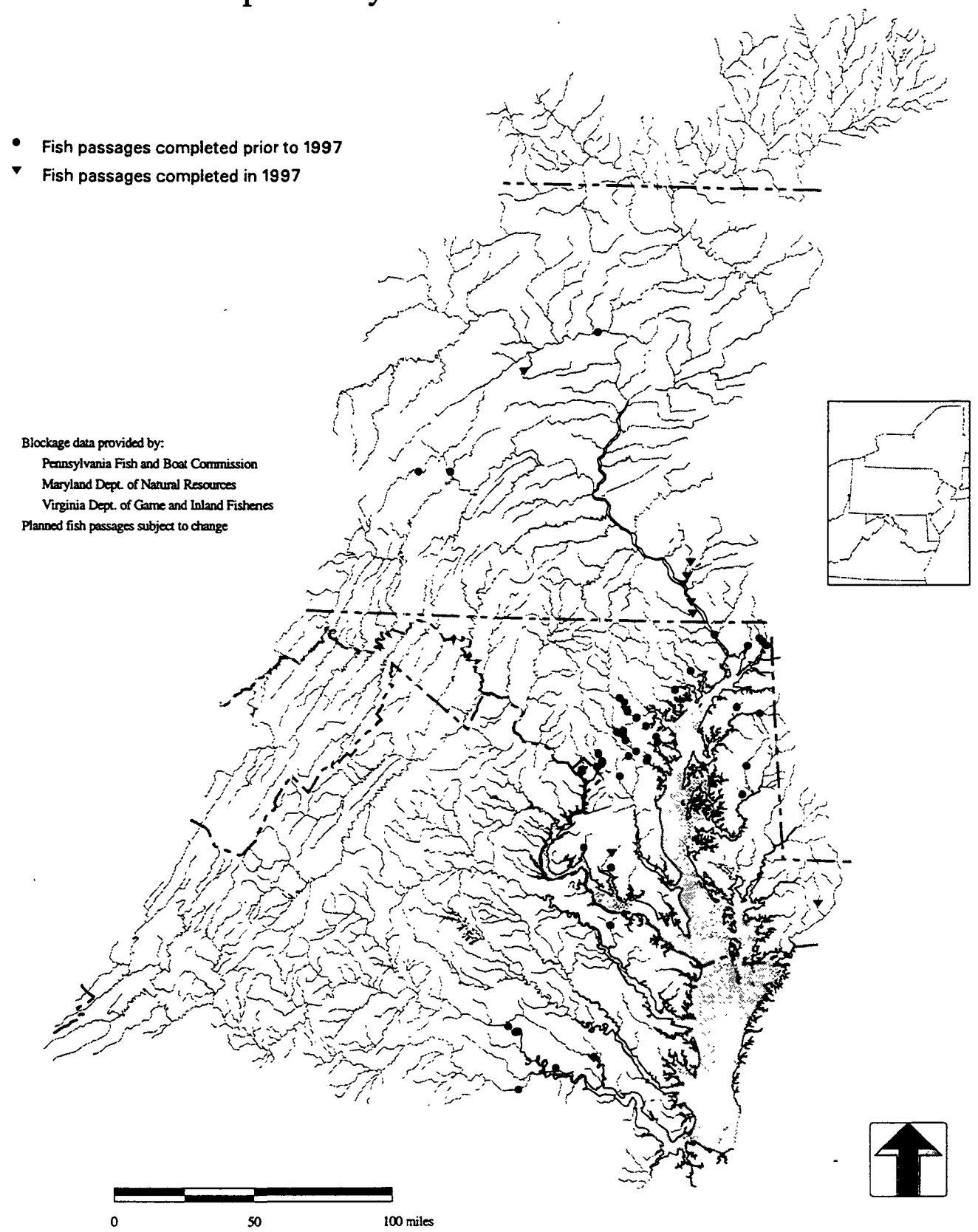
1. A fishway at Boshers Dam on the James River, which will open 137.6 mainstem and 168 major tributary miles.
2. A weir fishway at Little Falls Dam on the Potomac River (10 miles) and four other projects in Maryland, including denil fishways and breaches (44.0 miles).
3. As many as six projects in Pennsylvania, all dam removals (26.0 miles).

If all of these are completed in 1998, they will add 223.2 miles with a cumulative pre-1993 to 1998 total of 625 miles reopened toward the goal. Although still short of the 5-year goal by 106 miles, this is offset by the additional 218 miles of major tributary habitats made accessible to river herring in the Susquehanna and James rivers. Some of these uncounted tributaries are substantially larger and potentially more productive alosid habitat than many targeted streams included in the goal. A worst case scenario for 1998 will include Boshers, two MD projects and 3-4 PA projects totaling about 190 miles and missing the 1998 goal by about 150 miles.



**Denil Fishway at Bloede Dam, First Dam on the Patpasco River**

# Completed Fish Passages Within the Chesapeake Bay Watershed



# HABITAT RESTORATION

Five major rivers run through the Chesapeake Bay watershed. The Susquehanna, Potomac, Rappahannock, York, and James rivers supply nearly 90% of the freshwater flowing into the Bay. These are large river systems, comprised of many smaller rivers and streams. A huge portion of the Bay's nutrients and sediments come from the tributaries. Stream preservation and restoration is crucial to controlling nitrogen and sediment inputs into Chesapeake Bay. Healthy streams provide essential habitat for fish and other wildlife.

*Chesapeake Bay Habitat Restoration: A Framework for Action* lists freshwater tributaries as one of four habitat areas targeted for restoration efforts. In addition to opening migratory fish blockages and restoring nontidal wetlands, preservation and restoration of upstream habitat is a Bay Program priority. The 1996 Chesapeake Executive Council *Adoption Statement on Riparian Forest Buffers* reinforces the Bay Program's commitment to stream restoration. The goal of this statement is to restore forest buffers on 2,010 miles of stream and shoreline in the watershed by the year 2010. Restoration projects are a good example of local, state, and federal government agencies partnering with local, nonprofit organizations.

The Habitat Objectives & Restoration Workgroup develops and maintains guidelines for the protection of water quality and habitat conditions necessary to support living resources found in the Chesapeake Bay watershed. The workgroup accomplished several important tasks in 1997 that contributed to the fulfillment of the CBP's *Chesapeake Bay Habitat Restoration -- A Framework For Action.* Probably the most important was completion of another year of implementing projects within each of the CBP's jurisdictions specifically designed to restore habitat within the Chesapeake Bay watershed.

## 1997 Accomplishments

### Habitat Restoration Progress

Ten projects were approved for implementation in 1997, including four in Maryland, three in Virginia, two in Pennsylvania, and one in the District of Columbia. All together, these projects encompassed 35 acres of stream riparian buffers, 337 acres of wetlands, and 40 acres of forest habitat. Preparations were made for the approval of projects for FY 1998. A total of 32 project proposals were evaluated by the workgroup, after having been solicited using an Request-For-Proposals (RFP) approach, and 13 projects have received tentative approval.

### Habitat Restoration Targeting

The workgroup initiated development of a targeting scheme for selecting habitat restoration projects using an approach that is expected to yield higher ecological benefits. This is expected to satisfy Phase II of the *Framework*. Efforts are directed at developing models to target habitat restoration based on species' habitat requirements and identify data needs.

### Beneficial Use of Dredged Material

The workgroup successfully advanced a policy to the Implementation Committee on promoting beneficial use of clean dredge material for habitat restoration purposes and contributed to the development of guidelines for writing Fishery Management Plans. Additionally, the workgroup initiated development of a *Citizen's Resource Guide to Habitat Restoration*, which is expected to be completed in 1998.

## 1998 Habitat Objectives and Restoration Workgroup Priorities

1. Release another RFP soliciting projects from all CBP jurisdictions for advancing the *Framework*, and conduct meetings in each jurisdiction to discuss the RFP with prospective applicants.

2. Develop the targeting scheme further, with the assistance of specialists who can give the approach a "reality" test.

3. Form a special ad hoc team to begin writing an implementation plan for the dredge material beneficial use policy.

4. Launch a new effort to summarize a host of diverse information on Bay tributaries to enable a comprehensive characterization of major sub-watersheds. The proposed characterization may include land use/land cover, habitat types, SAV beds, waterfowl concentration areas, and the like, and will be established on the web. Much work will be necessary, but the characterizations are expected to be very useful.

# EXOTIC SPECIES

Exotic aquatic species, also called nonindigenous species, are not native to the Chesapeake Bay watershed. Exotic species may have entered the watershed through intentional introduction, such as certain sportfish, or via unintentional introduction mechanisms, such as the discharge of ballast water or escape from aquaculture facilities. Exotics may threaten the ecosystem of Chesapeake Bay via disease transmission, competition with native species, or through other ecological pathways. The *Chesapeake Bay Policy for the Introduction of Non-Indigenous Aquatic Species*, adopted in 1993, aims to minimize the economic and/or ecological risks associated with first time introduction of exotic aquatic species to the Chesapeake Bay watershed. An *Implementation Plan* was finalized in 1996. It recommends identifying and monitoring exotic aquatic species in the watershed. Few regulatory controls currently exist to prevent the introduction of nonindigenous species, making education the best method for controlling introduction of new exotics.

The Exotic Species Workgroup implements the Chesapeake Bay Regional policy that guides the intentional introduction of exotic species. The Workgroup also addresses strategies for preventing and controlling accidental introductions.

## 1997 Accomplishments

**Exotic Oyster Species**

An ad hoc Exotic Species Panel was established to provide advice to the Chesapeake Bay Program, Living Resources Subcommittee and the Virginia Marine Resources Commission (VMRC) on a research proposal by the college of William & Mary, School of Marine Science, Virginia Institute of Marine Science (VIMS). The proposal to conduct in-water testing of triploid Pacific oysters *Crassostrea gigas* and *Crassostrea rivularis* consisted of field testing 7500 "naturally induced" triploid *C. gigas* at nine locations in the Virginia portion of Chesapeake Bay and a smaller number of chemically induced triploid *C. rivularis* at the dock at VIMS. Critical issues identified by the ad hoc committee included: possible reversion of "natural" triploid oysters to diploid/mosaic status, lack of monitoring for reversion to diploid status in the proposed *C. gigas* research, and the failure to include disease-resistant strains of indigenous *C. virginica* in the research strategy. At the recommendation of the ad hoc committee, triploid and disease-resistant native oysters were included, monitoring for reversion of triploid *C. gigas* oysters was increased, and biweekly cleaning and verification of status was included as needed.

**Atlantic Sturgeon**

The risks of stocking Hudson River Atlantic sturgeon into Chesapeake Bay were considered by the workgroup. It was determined that Hudson and Chesapeake sturgeon populations are probably discrete, but small-scale stocking of Hudson River Atlantic sturgeon is unlikely to have negative impacts on the ecosystem of Chesapeake Bay. Spawning populations of Atlantic sturgeon probably are extirpated in the Chesapeake Bay and studies should be designed to evaluate the efficacy of stocking for re-establishing the Atlantic sturgeon population and to examine habitat use by stocked juveniles and their interactions with other biota.

## 1998 Exotic Species Workgroup Priorities

1. Develop guidelines for deciding what constitutes an acceptable level of risk from field experiments with exotic species of oysters (triploid *Crassostrea gigas* and *C. ariakensis*).

2. Develop a position paper on when subspecies should be considered exotic species for the purposes of introductions.

3. Begin to consider control of exotic species which are already established (e.g. mute swans, nutria, grass carp, Phragmites) in addition to issues relating to first time introductions.

4. Complete template for an Aquatic Nuisance Species Management Plan for the Basin.

# WATERFOWL AND OTHER WATER BIRDS

Historically, Chesapeake Bay was rich with waterfowl. Twenty-nine species of waterfowl, including ducks, geese and swans, use Chesapeake Bay for wintering, breeding, or as a migratory stopover. During the late 19th century and early 20th century, the numbers of waterfowl overwintering on the Bay were substantially reduced by uncontrolled market hunting. Although uncontrolled waterfowl hunting was outlawed in 1918 and many waterfowl slowly recovered through the 1950s, species that rely on aquatic habitat have declined in recent decades. Today, waterfowl in Chesapeake Bay are challenged by development and water pollution, as their habitats are destroyed or altered. The *1990 Chesapeake Bay Waterfowl Policy and Management Plan* advocates the restoration, enhancement, and protection of waterfowl and their habitats. The Plan directs Bay Program partners to prevent loss or degradation of habitats; restore or enhance currently degraded habitats; support responsible waterfowl management programs; and improve public understanding of the waterfowl resource and its habitats. Reevaluation of this policy in 1997 resulted in the expansion of focus to include other waterbirds, including shorebirds and colonial waterbirds.

The Waterfowl Workgroup is a loose confederation of waterfowl biologists working towards implementation of the *Chesapeake Bay Waterfowl Management Plan.* Members coordinate research needs within the Mid-Atlantic region. The workgroup expanded its scope in 1997 and was renamed the Waterfowl and Other Waterbirds Workgroup.

## 1997 Accomplishments

### Waterfowl Plan Reevaluation

The reevaluation of the Waterfowl Plan and Workgroup was completed and adopted by the Living Resources Subcommittee in October 1997. The workgroup was renamed the "Waterfowl and Other Waterbirds Workgroup" to reflect a broadening of the activities of the group. The reevaluation expands the workgroup's scope to include other species of waterbirds and marsh birds.

### Waterfowl Concentration Database and Atlas

Biologists from all three states continue to collect data on the location and numbers of waterfowl concentrations during the Mid-winter Waterfowl Survey. In 1998, the Bay Program will provide funding for late winter concentration surveys an area of information that has been lacking. This data will help protect habitats used by waterbirds in late winter, which may differ from early winter distributions.

### The Waterfowl Status and Trends Report

The status and trends report of Chesapeake Bay waterfowl includes distribution maps, migration maps, population trends graphics, and color photographs. The final document is expected to be published on the Internet in 1998.

### Status of Chesapeake Bay Waterfowl

The goal of the Chesapeake Bay Program is to restore waterfowl populations and habitats to levels seen in the 1970s by the year 2000. To date, 11 of the 20 species monitored have met that

goal. A similar number of waterfowl are showing population increases. Increasing populations are not always good for Chesapeake Bay. Mallards, Canada geese and mute swans have growing resident populations that may harm the Bay ecosystem by competing with native species for food and breeding areas. More waterfowl may also conflict with humans by increasing bacterial levels in swimming areas.

## 1998 Waterfowl and Other Water Birds Workgroup Priorities

1. Expand the Workgroup and implement recommendations of the Revaluation Team.

2. Maintain data and continue collection of geo-referenced data on waterbird distributions.

3. Expand understanding of breeding waterfowl distribution and determine habitat use by mallards and black ducks.

4. Identify habitat restoration sites important for waterfowl.

5. Reduce degradation of coastal wetlands from exotic species such as Phragmites, nutria, and mute swans.

6. Determine impacts of fisheries bycatch on waterbird populations.

7. Seek to better integrate waterbird needs with fisheries management.

# BIOLOGICAL MONITORING AND GEOGRAPHIC INFORMATION SYSTEMS (GIS)

Over 2,700 species of plants and animals inhabit the Chesapeake Bay region. To better assess the status of Bay resources, the Chesapeake Bay Program has integrated and enhanced existing state biological monitoring programs since 1984. Aerial surveys track Bay grass coverage Baywide. Phytoplankton and zooplankton monitoring programs are piggy-backed onto the CBP water quality monitoring program. The states have monitored benthos, bacteria, shellfish and finfish commercial landings, and juvenile finfish for decades. Other state surveys also monitor habitat coverages, such as oyster bars and wetlands. Numerous waterfowl and songbird surveys are conducted throughout the United States; the Bay Program utilizes some of these data.

The *Living Resources Monitoring Plan* directs development of a Baywide monitoring program for commercially, recreationally and ecologically important species. The Monitoring Plan recommends the establishment of long-term, Baywide monitoring of the Bay's plant and animal resources. Analysis of these datasets is essential for a full understanding of how humans are impacting the Chesapeake Bay ecosystem, as well as the progress of Bay Program protection and restoration efforts. The Living Resources Monitoring Workgroup is a joint workgroup of the Living Resources and Monitoring Subcommittees, which focuses on creating, maintaining and updating biological and living resources monitoring databases, maintaining the CBP zooplankton monitoring program, and assisting in CBP efforts to implement a Basinwide Monitoring Strategy. It has also assisted several efforts to develop bioindicators of Bay health, as well as championing a Basinwide strategy to increase access to CBP data and information.

## 1997 Accomplishments

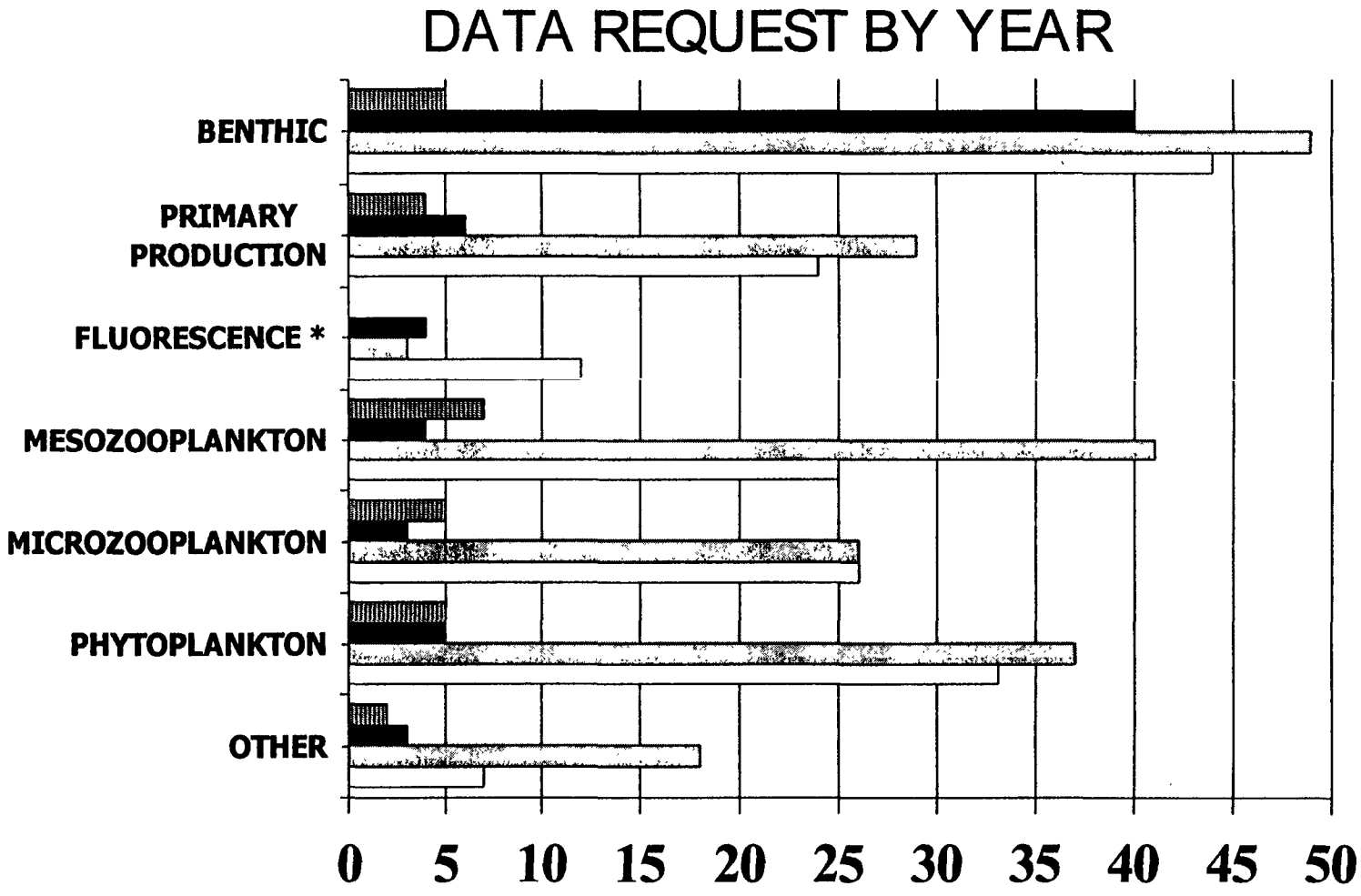
**Databases**

In 1997, a relational database of CBP benthic monitoring data was completed and made available on the Chesapeake Information Management System (CIMS) Internet server. This database can be queried on-line. Collaboration with the Virginia Institute of Marine Sciences (VIMS) resulted in relational databases of fish monitoring data posted on a VIMS server and linked to CIMS. Efforts are underway to similarly structure and upload the Maryland fish monitoring data on an Internet server linked to CIMS.

The following statistics and datasets are presently available on the CIMS Internet server in uniform databases, with documentation:

- ✦ Phytoplankton taxonomic counts
- ✦ Picoplankton taxonomic counts
- ✦ Primary productivity ($C^{14}$)
- ✦ Vertical and horizontal *in situ* fluorescence
- ✦ Microzooplankton taxonomic counts
- ✦ Mesozooplankton taxonomic counts
- ✦ Mesozooplankton measured and estimated biomass
- ✦ Gelatinous zooplankton measured biovolume
- ✦ Benthos taxonomic counts
- ✦ Benthos measured biomass

# Living Resources Data Request Summary




Request thru 5/31/98

*No Fluorescence Request in 1995

Other data are available through links to the CIMS server, including

- ✦ CBP submerged aquatic vegetation aerial surveys
- ✦ Virginia fish surveys
- ✦ Chesapeake Bay Ocean Data Acquisition System (ODAS) project
- ✦ National Marine Fisheries Statistics

**Index of Larval Striped Bass**

An index of larval striped bass habitat was developed to assess the relative importance of critical habitat parameters (food, salinity, temperature, and turbidity) to the survival of larval striped bass in addition to evaluating the overall status of the habitat. Significant correlations were found between this index and the striped bass juvenile index for the three spawning areas studied: Potomac, Patuxent and York rivers. This composite index is an example of the kinds of indices needed by the Chesapeake Bay Program to integrate and interpret diverse monitoring information for living resources management.

**Zooplankton Monitoring Programs**

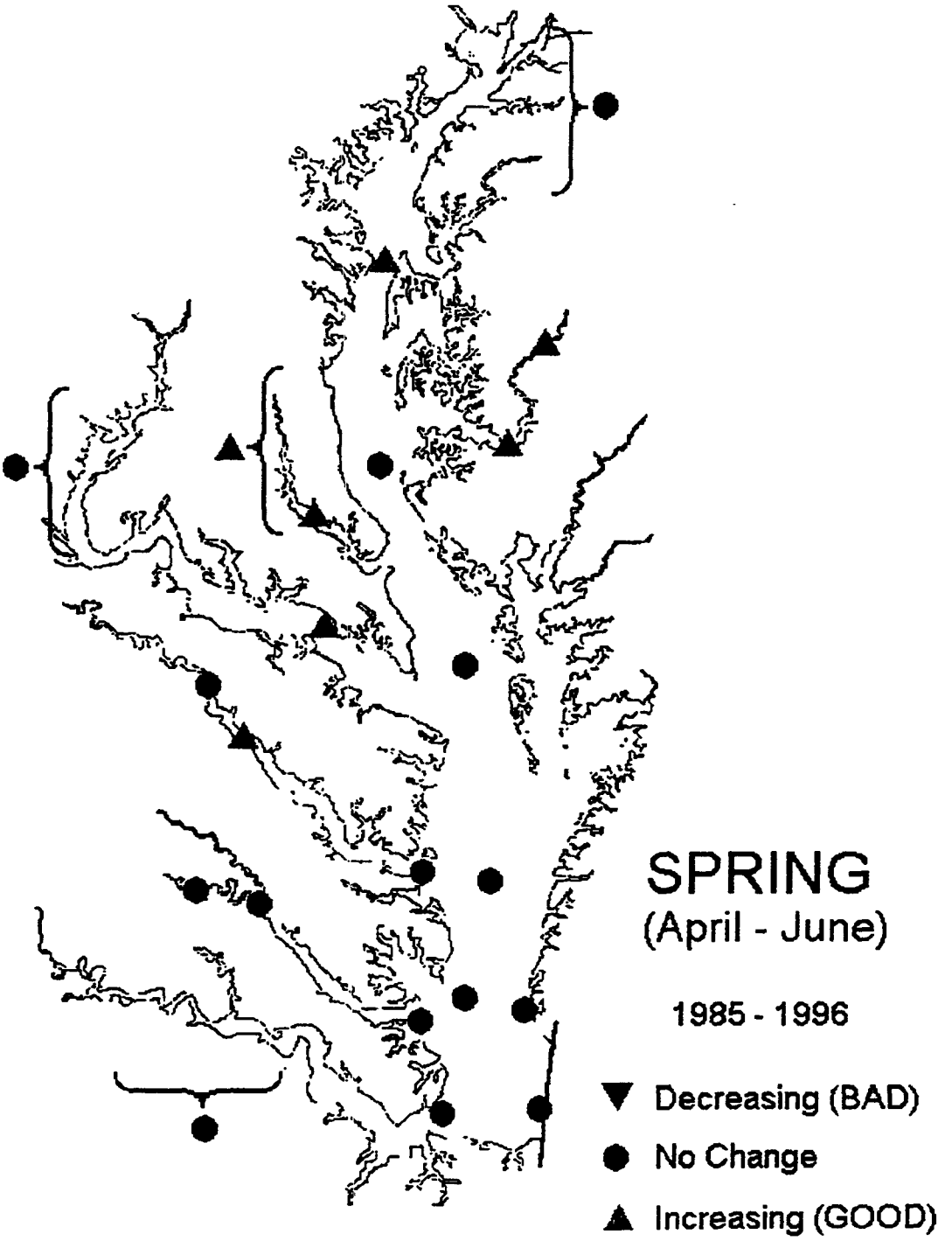
Coordination among components of the Maryland and Virginia zooplankton and phytoplankton monitoring programs was reviewed in 1997. Changes to both state programs will be implemented by the Principal Investigators and state Program Managers in 1998. These changes will improve the compatibility of data among states, as well as the overall utility of the monitoring data.

The plankton monitoring programs have revealed some disturbing Baywide trends. Since 1985, summer abundances of large zooplankton (mesozooplankton) have declined sharply in the mainstem, south of the Bay Bridge, and in lower regions of some tributaries. These declines may have started as early as the 1970s. Mesozooplankton species diversity has also declined in the lower Bay. Frequency of blue-green algal and dinoflagellate blooms are increasing. Although these bloom events may be related to recent surges in nutrients from floods, the longer term decreases in algal diversity indicate additional stress (see map p. 30).

**Chesapeake Basinwide Monitoring Strategy**

A program-wide monitoring strategy is being developed to better support Living Resources subcommittee and workgroup activities. A list of its management information needs that rely on monitoring results was updated. LRSC workgroups and teams are currently working with the monitoring staff to implement the first stages of the Monitoring Strategy, namely: to identify data gaps and recommend changes to improve/optimize the current monitoring systems; to explore potential ways of linking or integrating different monitoring program results to enhance the data's usefulness; and to better answer management questions.

# Mesozooplankton Abundance



**New GIS**

***SAV Tier Goals/Bathymetry Processing***

Bathymetric soundings data acquisition was completed and processed. One- and two-meter contours were generated and used in SAV tier goal setting. These depth contours will also be used in habitat restoration targeting.

***Fish Passages***

Pennsylvania fish blockage data was acquired and evaluated. VA Dept. of Game and Inland Fisheries fish blockage data was also acquired and evaluated. A series of maps showing inventoried fish blockages by watershed was created for a Pennsylvania Fish and Boat Commission report to the Pennsylvania legislature.

***Habitat Restoration***

The Geographic Targeting Ad Hoc Group continued to develop GIS protocols for targeting habitat restoration.

***Reefs***

Locations of new reef sites in the Chesapeake Bay were added to the database, and maps showing these locations were updated.

***Wetlands***

National Wetland Inventory (NWI) data for 120 quads in Pennsylvania was acquired and evaluated. This layer was added to currently held data to map status of NWI in the watershed. The Phase 1 prototype for the Bay Program's Wetlands Initiative was developed to support pilot projects.

***Forest Buffers***

Riparian forest buffer data received from The Pennsylvania State University was evaluated for quality. Riparian forest buffers located on federal lands were mapped. These maps will aid restoration efforts.

***Website Additions***

In addition to the oyster reef maps, several other GIS-generated maps were placed on the Bay program website. These include: Chesapeake Bay Grasses (SAV) acreage changes 1985 - 1995; High Value Living Resource Areas in Northern Chesapeake Bay; and Black Sea Bass Nursery Areas in Chesapeake Bay. A new animated map shows the Progress Toward Opening Fish Passages.

## 1998 Data Management and GIS Priorities

1. Create, maintain and update biological databases
    - continue to assemble primary databases of biological and living resources monitoring data as needed; data sets prioritized by the Living Resources/Monitoring Workgroup
    - continue to make primary databases and data documentation accessible from the CBP homepage, either by placing them on the CIMS (Chesapeake Information Management System) server or by linking to other servers.
    - aid biological monitoring programs in the basin to implement a "distributed database" on the Internet
    - provide services and products to LRSC workgroups

2. Maintain and Enhance Zooplankton Monitoring Program
    - data collectors submit QA/QCed monitoring data in standardized database structure and format
    - data collectors and CBP regularly produce zooplankton indicators along with monitoring data
    - data collectors continue to enhance sampling methods and coordination
    - Zooplankton Indicator Team continues to develop additional zooplankton indicators of bay health

3. Update the 1988 *Living Resources Monitoring Plan*
    - work with the Basinwide Monitoring Strategy coordinator and LRSC workgroups to review existing biological and living resources monitoring programs
    - update the 1988 Plan to reflect changes in management needs and monitoring approaches

4. Accelerate efforts to assemble bioindicator databases
    - continue to make existing data sets of bioindicators, Indices of Biological Integrity (IBIs), summary statistics, etc. accessible from the CBP Home Page, either by placing them on the CIMS server or by linking to other servers (e.g. VIMS, MDDNR).

5. Develop and implement full habitat restoration targeting protocols.

6. Make more Living Resources data and maps available to the public on the CBP web site.

7. Acquire 33 more NWI quads in Virginia.

8. Provide LRSc and its Workgroups with data analysis and maps as needed.

# ECOSYSTEM MODELING

The Chesapeake Bay Ecosystem Modeling Program explores how water quality, the growth of plants and animals, and the physical and chemical forces of Chesapeake Bay affect each other. Model simulations help predict how things may change over time or under different conditions. The Bay Program's ecosystem models help clarify how the Bay's plant and animal life interact with the environment. Ecosystem models emphasize nutrient and organic matter sources and cycles, interactions among food web connections, and habitat structures. These state-of-the-art models help explain how and why the things we observe in Chesapeake Bay happen.

The *Strategy for the Restoration and Protection of Ecologically Valuable Species* directs Bay Program partners to pursue development of simulation models of the Chesapeake Bay ecosystem. Simulation models are part of a bigger package designed to restore and protect Bay species, at all trophic levels. Meeting the *1987 Chesapeake Bay Agreement* goal to "provide for the restoration and protection of the living resources, their habitats and ecological relationships" requires understanding the physical, chemical, and biological processes at work in the Bay. The Ecosystem Modeling effort is developing a series of interlinked models that address relationships in the Bay by simulating critical habitats of Chesapeake Bay. These simulations will be used for management decisions concerning land use, nutrient loadings, and fish production.

The Ecosystem Modeling Workgroup works jointly with the Modeling Subcommittee to provide oversight of ecological modeling activities. The workgroup ensures that models address management questions pertinent to the Chesapeake Bay Program. The ecosystem process modelers continued to develop simulation models to gain better understanding of the Bay as an ecosystem. Projects currently involve a coordinated effort that is beginning to link water quality conditions to living resource responses on an objective, quantitative basis.

## 1997 Accomplishments

**Bay Grass (Submerged Aquatic Vegetation) Models**

In conjunction with the SAV Workgroup, Bay grass habitat requirements (see Bay grass Chapter) were revised to use a simple approach with light as the primary factor in growth and survival of Bay grasses. The SAV Workgroup assisted the Modeling Workgroup by assembling data on changes in Bay grass biomass over time, as well as defining and mapping species assemblages in Chesapeake Bay. Relationships between Bay grasses and water quality in the Potomac River were examined over small spatial scales. Modelers are working closely with the Modeling Subcommittee to insure that Bay grass components are successfully integrated into the Chesapeake Bay Tributary Water Quality Model.

**Ecosystem Process Models**

Responses of various biological communities to direct and indirect effects of low dissolved oxygen conditions have been simulated. Box models continue to better explain the complex physical, chemical, and biological processes in the Patuxent River. This work lays the foundation to begin studies in other tributaries of the Bay. The ecosystem process models use nutrient loading and other information to predict the quality and quantity of food and habitat available to fish populations.

**Fish Bioenergetics Models**

The fish energetics models use the food and habitat information derived from the Ecosystem Process Models to predict the potential production of striped bass, bluefish, weakfish, Bay anchovy, menhaden, spot and white perch. The models are being combined to incorporate ecological feedbacks associated with top-down control by fish of their prey and ecosystem components, such as SAV and water quality. This effort should be completed in a year or two.

## 1998 Ecosystem Modeling Workgroup Priorities

1. Benthos/Pelagic Modeling
   - ♦ Run top-down restoration scenarios
   - ♦ Evaluate benthic and pelagic community responses to nutrient loadings
   - ♦ Couple model output with bioindicators
2. SAV Modeling
   - ♦ Use SAV models to verify outputs from Bay/Tributary water quality
   - ♦ Use SAV models to support revision of SAV habitat & evaluate tiered restoration goals
   - ♦ Continue to evaluate time to restoration
3. Regression/Box Modeling
   - ♦ Continue to investigate driving forces associated with water quality and living resources
   - ♦ Focus attention on the Bay's lower tributaries to aid in Tributary Strategy Development
4. Bioenergetics Modeling
   - ♦ Develop and test quantitative indices of fish habitat quality based on fish growth rate potential
   - ♦ Develop blue crab bioenergetics model
   - ♦ Complete multispecies food web model and run fisheries management and nutrient reduction simulations.

# NEW PUBLICATIONS

**New Documents**

Protecting Wetlands: Tools for Local Governments in the Chesapeake Bay Region
Protecting Wetlands II: Technical and Financial Assistance Programs for Local Governments in the Chesapeake Bay Region
Chesapeake Bay Wetlands: The Vital Link Between the Watershed and the Bay
Chesapeake Bay Blue Crab Fishery Management Plan (FMP) 1997
Catfish Populations in Chesapeake Bay
Removing Impediments to Migratory Fishes in the Chesapeake Bay Watershed: 1996 Annual Report
The 1997 Users Guide to Chesapeake Bay Program Biological and Living Resources Monitoring Data
The 1997 Atlas of Chesapeake Bay Program Biological and Living Resources Monitoring Data
Ecosystem Models of Chesapeake Bay 1994-1996
Chesapeake Bay Living Resources 1995-1996

**Brochures, Factsheets and Adoption Statements**

Chesapeake Bay Blue Crab Fishery Management Plan (FMP) Factsheet
Fish Lesions and Pfiesteria (factsheet)
Summer Flounder Fishery Management Plan Amendment (adoption statement)
Guidelines for Developing and Revising Fishery Management Plan
What's New with Living Resources 1997 (factsheet)

**Other Popular Documents**

Guidance for Protecting Submerged Aquatic Vegetation in Chesapeake Bay from Physical Disruption
Introduction of Non-Indigenous Aquatic Species Implementation Plan
Chesapeake Bay Habitat Restoration: A Framework for Action

**Hot Hits on the Chesapeake Bay Program Web Site**

Fish Passage animated map
Bay grasses (SAV) habitat requirements and VIMS link
Historical oyster reef maps
Fishery Management Plans (FMPs)
Bay grasses (SAV) coverage animated map
New benthic database

# LIVING RESOURCES SUBCOMMITTEE
# 1997

**Chair:** *Carolyn V. Watson* - MD Department of Natural Resources
**Acting Coordinators:** *Betsy Tam* - US Environmental Protection Agency, Chesapeake Bay Program Office
*Mike Fritz* - US Environmental Protection Agency, Chesapeake Bay Program Office

**Workgroup Chairs**
**Aquatic Reef:** *Jim Wesson*, VA Marine Resources Commission
**Ecosystem Modeling:** *Arthur Butt*, VA Department of Environmental Quality
**Ecosystem Indicators:** *Steve Jordan*, MD Department of Natural Resources
**Exotic Species:** *John Christmas*, Co-chair, MD Department of Natural Resources
*Eric May*, Co-chair, MD Department of Natural Resources
**Fisheries Management Plans:** *Dorothy Leonard*, Co -Chair, MD Department of Natural Resources
*Jack Travelstead*, Co- Chair, VA Marine Resources Commission
*Nancy Butowski*, Asst. Chair, MD Department of Natural Resources
**Fish Passage:** *Richard St. Pierre*, US Fish & Wildlife Service
**Habitat Objectives/Restoration:** *Steve Funderburk*, US Fish & Wildlife Service
**Living Resources Monitoring:** *Claire Buchanan*, Interstate Commission for the Potomac River Basin
**Submerged Aquatic Vegetation (SAV):** *Peter Bergstrom*, US Fish & Wildlife Service
**Waterfowl:** *Doug Forsell*, US Fish & Wildlife Service
**Wetlands:** *Carl Hershner*, VA Institute of Marine Science
**Chesapeake Bay Stock Assessment:** *M. Elizabeth Gillelan*, National Oceanic and Atmospheric Administration

# Chesapeake Bay Program

The Chesapeake Bay Program is a unique regional partnership leading and directing restoration of Chesapeake Bay since 1983. The Chesapeake Bay Program partners include the states of Maryland, Pennsylvania, and Virginia; the District of Columbia; the Chesapeake Bay Commission, a tri-state legislative body; the U.S. Environmental Protection Agency (EPA), which represents the federal government; and participating citizen advisory groups.

Since its inception, the Chesapeake Bay Program's highest priority has been the restoration of the Bay's living resources--its finfish, shellfish, Bay grasses, and other aquatic life and wildlife. Because water quality improvements are essential to living resource restoration, the *1987 Chesapeake Bay Agreement* set a goal to reduce the nutrients nitrogen and phosphorus entering the Bay by 40% by the year 2000. In the *1992 Amendments* to the *Chesapeake Bay Agreement*, partners agreed to maintain the 40% goal beyond the year 2000 and to attack nutrients at their source--upstream in the tributaries. The Chesapeake Executive Council, made up of the governors of Maryland, Pennsylvania, and Virginia; the mayor of Washington, D.C.; the EPA administrator; and the chair of the Chesapeake Bay Commission continues to guide the restoration with directives and policies that address habitat restoration, toxic pollution prevention, and point source and agricultural nonpoint source nutrient pollution reductions. Bay Program initiatives encourage the watershed's 1,650 local governments to address land use management, growth and development, stream corridor protection, and infrastructure improvements.

Nutrient pollution reductions are achieved through voluntary agricultural management practices, urban nutrient management strategies, and nitrogen-reducing technologies for wastewater treatment plants. Habitat restoration efforts focus on reestablishment of Bay grasses, protection and planting of riparian forest buffers, opening of fish passages, creation and restoration of aquatic reefs, and Baywide management of fish stocks. Toxic contaminants are declining in many parts of the Bay with establishment of Regional Action Plans and implementation of a voluntary industrial pollution prevention program. Improvements include fisheries and habitat restoration, recovery of bay grasses, nutrient and toxics reductions, and significant advances in estuarine science.

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**Chesapeake Bay Program Office**
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