

Removing Impediments to Migratory Fishes in the Chesapeake Bay Watershed

**Annual Progress Report
1996**



October 1997

Chesapeake Bay Program

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.

In the *1987 Chesapeake Bay Agreement*, Chesapeake Bay Program partners 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, guided the restoration effort in 1993 with five directives addressing key areas of the restoration, including the tributaries, toxics, underwater bay grasses, fish passages, and agricultural nonpoint source pollution. In 1994, partners outlined initiatives for habitat restoration of aquatic, riparian, and upland environments; nutrient reduction in the Bay's tributaries; and toxics reductions, with an emphasis on pollution prevention.

The 1995 *Local Government Partnership Initiative* engages the watershed's 1,650 local governments in the Bay restoration effort. The Chesapeake Executive Council followed this in 1996 by adopting the *Local Government Participation Action Plan* and the *Priorities for Action for Land, Growth and Stewardship in the Chesapeake Bay Region*, which address land use management, growth and development, stream corridor protection, and infrastructure improvements. A 1996 riparian forest buffers initiative furthers the Bay Program's commitment to improving water quality and enhancing habitat with the goal of increasing riparian buffers on 2,010 miles of stream and shoreline in the watershed by the year 2010.

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. Improvements include fisheries and habitat restoration, recovery of bay grasses, nutrient reductions, and significant advances in estuarine science.

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to Migratory Fishes in the Chesapeake Bay
Watershed***

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1996**

Prepared by
the Fish Passage Workgroup of the Chesapeake Bay Program



October 1997

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TABLE OF CONTENTS

Executive Summary	4
Introduction	5
DISTRICT OF COLUMBIA	7
I. Fish Passage Initiatives	7
A. Completed Fish Passage Projects	7
B. Fishway Progress	7
C. Monitoring and Stream Surveys	7
D. Trap, Transport and Stocking	8
II. Fish Passage Support Activities	8
A. Public Relations and Education	8
B. Future Public Relations and Education	8
III. Other Future Activities	9
A. Plans for 1997	9
B. Meeting the Chesapeake Bay Program's Five-Year Goal (1993-1998)	9
C. Meeting the Chesapeake Bay Program's Ten-Year Goal (1993-2003)	9
Table 1: District of Columbia 1996 Fish Passage Projects	10
Figure 1: Fishway Progress in the District of Columbia	10
Map 1: Fishway Progress in the District of Columbia	11
MARYLAND	12
I. Fish Passage Initiatives	12
A. Completed Fishway Projects	12
B. Fishway Progress	12
C. Monitoring and Stream Surveys	14
D. Trap, Transport, and Stocking	15
II. Fish Passage Support Activity	15
A. Public Relations and Education	15
B. Future Public Relations and Education	16
III. Other Future Activities	16
A. Plans for 1997	16
B. Meeting the Chesapeake Bay Program's Five-Year Goal (1993-1998)	16
C. Meeting the Chesapeake Bay Program's Ten-Year Goal (1993-2003)	16
Table 2: Maryland 1996 Fish Passage Projects	17
Figure 2: Fishway Progress in Maryland	18
Map 2: Fishway Progress in Maryland	19
PENNSYLVANIA	20
I. Fish Passage Initiatives	20
A. Completed Fishway Projects	20
B. Fishway Progress	20
C. Monitoring and Stream Surveys	22

D. Trap, Transport and Stocking	22
II. Fish Passage Support Activities	23
A. Public Relations and Education	23
B. Future Public Relations and Education	23
III. Other Future Activities	23
A. Plans for 1997	23
B. Meeting the Chesapeake Bay Program's Five-Year Goal (1993 - 1998)	24
C. Meeting the Chesapeake Bay Program's Ten-Year Goal (1993 - 2003)	24
Table 3: Pennsylvania 1997 Fish Passage Projects	25
Figure 3: Fishway Progress in Pennsylvania	27
Map 3: Fishway Progress in Pennsylvania	28
 VIRGINIA	 29
I. Fish Passage Initiatives	29
A. Completed Fish Passage Projects	29
B. Fishway Progress	29
C. Monitoring and Stream Surveys	31
D. Trap, Transport and Stocking	32
II. Fish Passage Support Activities	32
A. Public Relations and Education	32
B. Future Public Relations and Education	33
III. Other Future Activities	33
A. Plans for 1997	33
B. Meeting the Chesapeake Bay Program Five Year Goal (1993 - 1998)	33
C. Meeting the Bay Program Ten -Year (1993 - 2003)	34
Table 4: Virginia 1996 Fish Passage Projects	35
Figure 4: Fishway Progress in Virginia	36
Map 4: Fishway Progress in Virginia	37
 FEDERAL AGENCIES	 38
U.S. Environmental Protection Agency (US EPA)	38
U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NOAA/NMFS)	38
U. S. Fish and Wildlife Service (USFWS)	39
A. Fish Passage and Stocking Activities	39
B. Outreach and Education	40
 BAYWIDE SUMMARY OF PROGRESS	 41
Table 5: Baywide Fish Passage Progress	41
Figure 5: Baywide Progress	42
Figure 6: Jurisdictional Progress	42
 Appendix A: Fish Passage Projects between September 1993 and December 1996	 43
 Appendix B: Fish Passage Workgroup Members	 45

Executive Summary

In 1996, the Chesapeake Bay Program signatories opened 55.8 miles to migratory fish within the Bay watershed. A total of 267.1 miles have been opened to date, including 148.7 miles opened prior to the Directive. Specific accomplishments during 1996 include:

- The District of Columbia completed no new projects but continued monitoring for alosids in Rock Creek and the Potomac River. American shad (*Alosa sapidissima*) eggs were collected from the Potomac River for culture at Harrison Lake National Fish Hatchery (NFH).
- Maryland completed one project, which opened 14.5 miles of habitat on a tributary to the Chester River. Maryland Department of Natural Resources (MD DNR) also reared, marked, and stocked 2.2 million American shad larvae and 871,000 hickory shad (*Alosa mediocris*) larvae into the Susquehanna, Patuxent and Choptank rivers. The US FWS reared and released 2 million shad in the Potomac River above Little Falls Dam.
- Pennsylvania completed two passage projects in the upper Juniata River, which will eventually provide 41.3 miles of new habitat to migratory fishes. Over 34,000 adult American shad were trapped at Conowingo Dam and transported to upstream spawning waters in PA. 7.5 million marked American shad larvae were stocked at several sites throughout the upper Susquehanna. Outmigrating juvenile American shad were monitored on the Susquehanna, and phase III of the Susquehanna River Tributary Blockage study was completed.
- Virginia opened no new miles of habitat in 1996 but approached conclusion of fish passage construction negotiations for Boshers Dam at Richmond. Virginia, in partnership with US FWS, also stocked over 5,000 adult herring in the upper James River. They also reared and released 7.7 million American shad larvae for the James and Pamunkey Rivers. Juvenile alosid populations were monitored in several rivers, and Phase I of the Rappahannock River Basin Impediment Survey was completed.
- Throughout 1996, all Bay jurisdictions and federal partners were active in education and outreach efforts providing numerous presentations, fish passage tours, and displays at river festivals and other forums.

In addition to 1996 and prior year results, this report also discusses fish passage projects currently in the planning, design, or construction phases for 1997 and future years. These projects will contribute to reaching Bay Program goals.

Introduction

The Fish Passage Workgroup of the Chesapeake Bay Program's Living Resources Subcommittee (LRSc) is charged with reopening blocked tributary waters of the Bay to provide access to spawning habitat for anadromous fish. This is accomplished through the construction of fish passage facilities, dam removal, reconstruction of highway culverts, or by creating breaches or notches in dams. The Workgroup includes representatives from the District of Columbia, Maryland, Pennsylvania, Virginia, the Chesapeake Bay Foundation, the U. S. Environmental Protection Agency (US EPA), the U.S. Fish and Wildlife Service (US FWS), and the National Oceanic and Atmospheric Administration's (NOAA's) National Marine Fisheries Service (NMFS). An interagency agreement between the US EPA and NOAA/NMFS facilitates the processing and distribution of federal funds to the jurisdictions for many of the fish passage, stocking, and survey projects. The high degree of cooperation amongst these jurisdictions and agencies has resulted in opening up many miles of stream habitat where migratory fish could potentially spawn.

Fish passage development in Bay tributaries has been underway since the late 1980s. In December, 1993 the Chesapeake Executive Council formalized short- and long-term goals for this initiative with Directive 93-4, which instructs the Chesapeake Bay Program partners to open 582.05 and 1356.75 miles of spawning habitat for shad and herring (*Alosa* spp.) by 1998 and 2003, respectively. The Chesapeake Bay Program, in turn, designated the LRSc through the Fish Passage Workgroup to accomplish these goals. Ultimately, this initiative is aimed at restoring populations of anadromous species, particularly American shad and river herring (*Alosa* spp.). Directive 93-4 sets up two goals. The five-year goal, which covers the period 1994-1998, is to open 582.05 miles of blocked habitat. The ten-year goal, to be completed by 2003, is to open a total of 1,356.75 miles, which includes 148.7 miles opened prior to the Directive.

Prior to Directive 93-4, all three Bay states and the District had begun their own fish passage programs. The District had opened 0.6 miles; Maryland had opened 106.1 miles; Pennsylvania, 9 miles; and Virginia, 33 miles of fish spawning habitat. The jurisdictions and federal partners also have been participating in other efforts, such as commenting on and processing hydroelectric project licenses through the Federal Energy Regulatory Commission (FERC), stocking of cultured American shad, trap and transport of adult shad and herring, surveying of stream habitats, and providing public education.

All jurisdictions and other agency representatives on the Fish Passage Workgroup are expanding efforts throughout the watershed. Design, construction, and associated projects for the restoration of anadromous fish are accelerating. Accomplishments planned for the next few years will greatly boost the number of habitat miles opened to migratory fish, hopefully increasing their abundance.

The greatest problem with achieving fish passage goals is that all jurisdictions, as well as other state and federal agencies involved, are faced with decreasing budgets. As a result, fish passage

programs have been scaled back. Two other common and persistent problems that slow progress include legal difficulties and the negotiation of fish passage agreements with public and private property owners.

This report provides a description of all fish passage development, reintroduction efforts, and habitat assessment activities by the signatory jurisdictions. A summary of federal agency activities in 1996, as well as those activities and actions planned for 1997, are presented. In addition, a "Baywide Summary" (page 41) relates 1996 and prior year actions with the stated five and ten-year goals of Directive 93-4.

DISTRICT OF COLUMBIA

I. Fish Passage Initiatives

Table 1, Figure 1, and Map 1 at the end of this chapter provide details of 1996 fish passage progress in the District of Columbia.

A. Completed Fish Passage Projects

In 1996, no fish passage projects were completed in the District of Columbia.

B. Fishway Progress

During 1996, the District of Columbia's Fisheries Management Branch (DC FMB) program staff conducted weekly monitoring of river herring activity around the lower fish passage blockage in Rock Creek (Ford #1). This sampling documented prevention of upstream movement of the alewife (*Alosa pseudoharengus*) and blueback herring (*Alosa aestivalis*) during the breeding season. We plan to use this information to help justify the expenditure of funds to have the barrier (Ford #1) removed in 1997.

C. Monitoring and Stream Surveys

During 1996, the DC FMB continued monitoring the lower reach of Rock Creek. Since 1993, this monitoring has helped determine species composition and abundance in Rock Creek. In addition to the regular monitoring work, ichthyoplankton collections were made weekly from the last week in March until the first week in June at a site just upstream from the mouth of Rock Creek and just downstream of the first instream migration barrier (Ford #1).

Ichthyoplankton data suggests that most spawning occurs in late March upstream of the first instream barrier and continues in Rock Creek until the middle of May. Data collected during our 1996 electrofishing surveys indicated that adult alewife entered Rock Creek by the last week in March and adult blueback herring were in the creek by the last week in April. During both March and April, alewife and blueback were observed moving upstream past the first instream blockage on Rock Creek. This barrier is an abandoned ford located at stream mile 2.6. Hundreds of fish were still blocked from upstream migration however and were congregated just downstream of this blockage. The limited movement of fish over this barrier was flow-related, with only moderate to high flows allowing fish to surmount this obstacle. A similar ford at stream mile 3.8 (Ford #2) was not surveyed regularly due to its inaccessibility. However, the first blockage has a much lower vertical profile. So if fish were able to pass the Ford #1, Ford #2 would provide little or no obstacle to upstream migration. These two barriers are the last obstructions to fish passage in the first 4.4 stream miles of Rock Creek. Once they are removed, they will allow a record numbers of fish to migrate as far upstream as Pierce Mill Dam.

An ongoing ichthyoplankton, juvenile and adult sampling program was continued in 1996 to inventory migratory fish reaching the District of Columbia. Two of the sampling sites are of special importance to fish passage work. One of the stations is located at Roosevelt Island, on the mainstem of the Potomac near the mouth of Rock Creek. The other station is located near the upstream limit of the District of Columbia's jurisdiction on the Potomac, a short distance downstream of Little Falls Dam. Little Falls Dam, a water supply facility for the Washington, D.C. metro area, blocks about 10 miles of Potomac River migratory fish spawning and nursery habitat. Migratory fish sampled at these sites help determine the potential population available to recolonize the spawning habitat above the barriers. Ichthyoplankton surveys will help document any improvement in the spawning success of anadromous species after the barriers are removed.

DC FMB personnel continued to tag striped bass captured during their monthly river surveys. Recapture of these tagged fish will compliment tagging activities carried out in the surrounding jurisdictions.

D. Trap, Transport and Stocking

In 1996 there was no trap and transport activity within the District of Columbia.

II. Fish Passage Support Activities

A. Public Relations and Education

In 1996, the DC FMB made extensive use of its Aquatic Resource Education Center (AREC) located on the Anacostia River. More than 4,000 area students and adults received instruction about the diversity of anadromous and resident fish species found within the District of Columbia and about the interrelationship between the District's and the Bay's aquatic resources. In addition, the District of Columbia, in partnership with the Potomac Electric Power Company (PEPCO) and the National Park Service (NPS), began the design of an expansion of the AREC. This will provide for additional classroom space as well as a demonstration hatchery facility.

In addition, the DC FMB has an in-school program which sends staff to area schools to give presentations about the area's aquatic resources. In 1996, this program was presented to over 2000 students and their teachers. These classes are also given information which the teachers use to supplement their regular instruction to help reinforce the presentations given by the DC FMB staff.

B. Future Public Relations and Education

The District of Columbia has committed itself to educating its residents about the interrelationship between the Potomac and Anacostia Rivers and Chesapeake Bay. To this end, the DC FMB will continue to use its staff and the AREC to disseminate information. Once the addition to AREC is completed and there is a fishway at Pierce Mill Dam, the District hopes to work cooperatively

with PEPCO and the NPS to make these facilities outstanding educational tools. It is believed that an expanded AREC and a working fishway in the Nation's Capitol would help illustrate that there are still opportunities to greatly improve the environment, especially in an urbanized area.

III. Other Future Activities

A. Plans for 1997

Within the next year, the DC FMB plans to remove the last two instream barriers to fish passage below Pierce Mill Dam. After these barriers are removed, a fishway will need to be built at Pierce Mill to provide alewife and blueback herring access to the rest of their historical spawning grounds in Rock Creek.

B. Meeting the Chesapeake Bay Program's Five-Year Goal (1993-1998)

The District of Columbia's Five-Year Goal is to open 32 miles. A Denil fishway needs to be designed and constructed at Pierce Mill Dam, the largest upstream fish passage blockage on Rock Creek within the District of Columbia. In addition to its direct fish passage benefit, this fishway will be used as an educational tool.

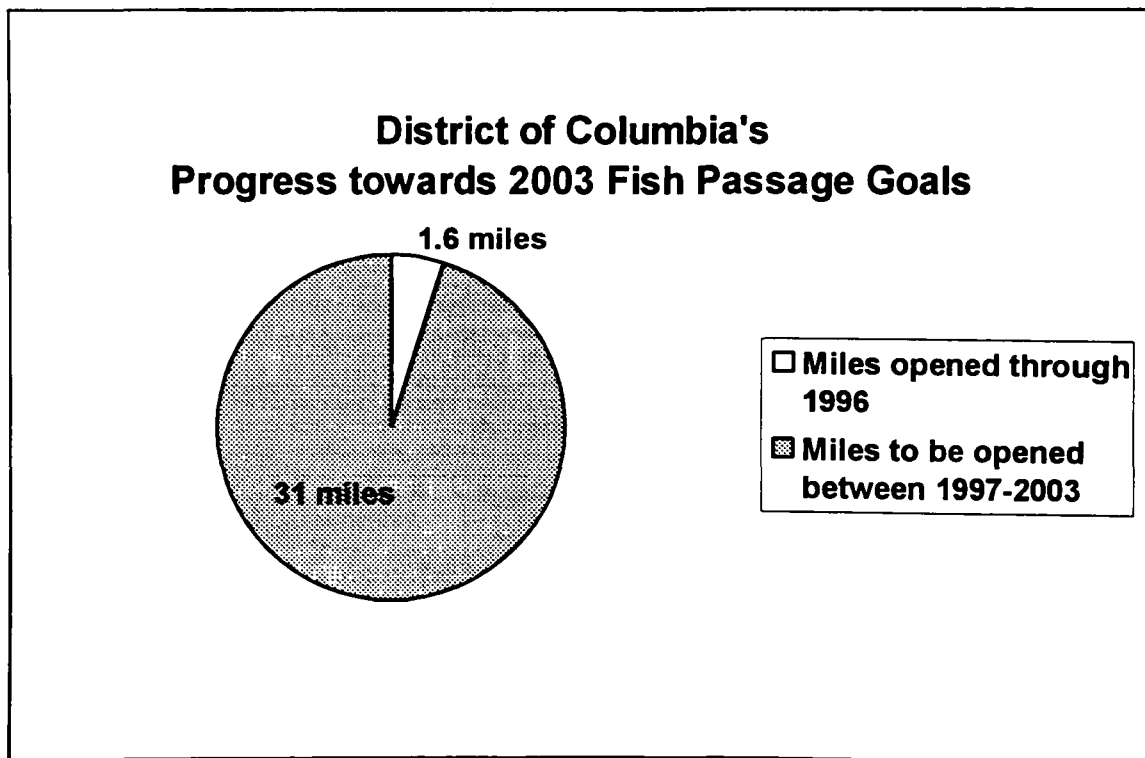
C. Meeting the Chesapeake Bay Program's Ten-Year Goal (1993-2003)

The District of Columbia's Ten-Year Goal is to open 32.6 miles. When the possibility of fish passage through the boulder field is demonstrated, and after a fishway is built at Pierce Mill Dam, six low head barriers remain. Depending on flow, these barriers may block fish passage upstream to the Maryland state line. These barriers include five sewer crossings and one ford. After fish passage is provided at Pierce Mill Dam, the DC FMB's Ten-year goal is to provide fish passage at the remaining barriers on Rock Creek, up to the Maryland state line.

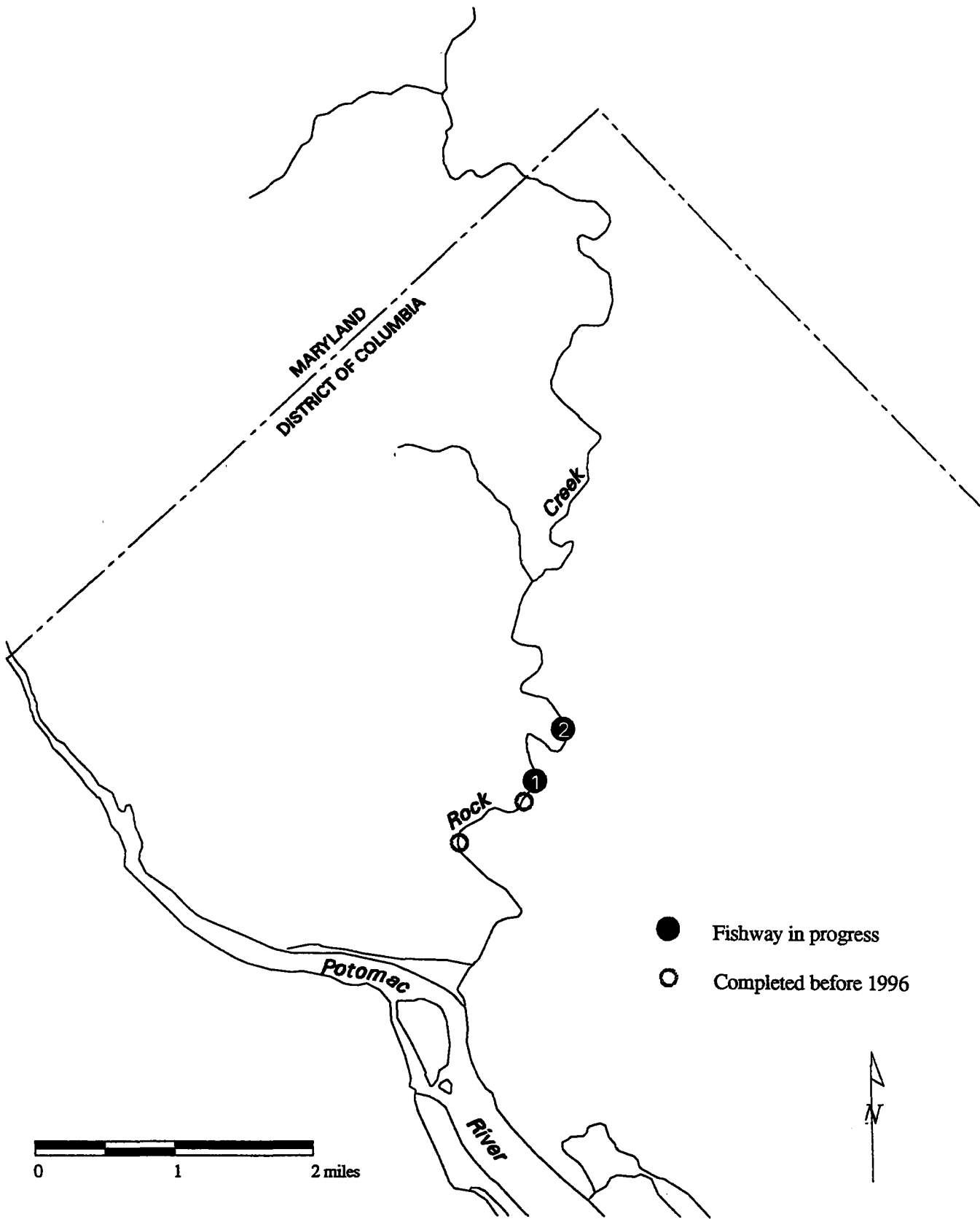
Table 1
District of Columbia 1996 Fish Passage Projects
Completed, In Progress, Planned

Map ID #	Project (Stream & River Drainage)	Passage Type	Habitat Opened (Miles)	Funding Source	Status
1	Ford #1, Rock Creek; Potomac	Removal	0.70	DC FMB	Planned Fall 1997
2	Ford #2, Rock Creek; Potomac	Removal	1.10	DC FMB	Planned Fall 1997
3	Pierce Mill, Rock Creek; Potomac	Denil	29.2	DC FMB/EPA	Planned

Figure 1
Fishway Progress in the District of Columbia



Map 1: Fishway Progress in the District of Columbia



MARYLAND

I. Fish Passage Initiatives

Table 2, Figure 2, and Map 2 at the end of this chapter provide details of 1996 fish passage progress in Maryland.

A. Completed Fishway Projects

Unicorn Dam Fishway: Construction of the Alaskan steeppass fishway began in September, 1996 and was completed by the end of the year. However, midway during construction, serious defects affecting the integrity of the dam required extensive repairs. The Maryland Department of the Environment's Dam Safety Division issued an emergency directive requiring completion of the repairs as soon as possible. Repairs will be completed during the first quarter of 1997. Funding for fishway design, construction and about 40% of the dam repairs were provided by the Chesapeake Bay Program. The remaining 60% of the dam repairs were funded by the Maryland Department of Natural Resources (MD DNR) Fisheries Service.

The Unicorn Dam fishway, located just south of Millington, MD on Unicorn Branch, is the first of three fishways scheduled for the upper Chester River basin. It reopened a 22.5 square mile watershed with 14.5 stream miles of migratory fish spawning habitat. Due to the quality and importance of the freshwater ecosystem in the upstream of the dam, the fishway was designed to exclude white perch and common carp, which are potential nuisance species in a freshwater lake.

B. Fishway Progress

Simkins Dam Fishway, Patapsco River, Baltimore and Howard Counties: Construction of a Denil fishway at this site, located on the Patapsco River about one mile downstream of Ellicott City, Maryland, was about 30% complete at the end of 1996. Major repairs to this dam are not necessary. Construction should be completed by the end of June, 1997. This project was funded through a public/private agreement between the state of MD and Simkins Industries, the dam's owner. The majority of the design and construction costs were covered by state and Chesapeake Bay Program grant funds. In addition, Simkins Industries has donated some funding and 38.4 acres of forested land that will become part of the Patapsco Valley State Park. The Simkins fishway is the fourth and last fishway on the Patapsco River's mainstem and will allow fish to ascend forty-four miles of the Patapsco for the first time in 155 years.

Broadway Branch Dam, Lake Bonnie, Chester River, Caroline County: The final engineering design of an Alaskan Steeppass fishway began in late 1996. Completion of the design is scheduled for spring 1997 and construction should begin in late summer.

Johnsons Pond Fishway, Wicomico River, Wicomico County: The project is located in the City of Salisbury on Maryland's lower Eastern Shore. The final engineering design of a Denil

fishway at this site began in late 1996. The design should be completed in the second quarter of 1997 and construction should begin in the fall.

Midway Branch Culvert at Range Road, Little Patuxent River, Anne Arundel County:

The culvert, located on former property of Fort George G. Meads, is now the property of the U.S. Fish and Wildlife Service's Patuxent National Wildlife Refuge. A contract to provide final engineering design services for an Alaskan Steeppass fishway at the culvert was awarded in November, 1996. The design should be completed in the first half of 1997 and construction will likely begin in late summer 1997.

Wilson Mill Dam, Deer Creek, Susquehanna River, Harford County: The final engineering design of a Denil fishway began in later summer of 1996 and construction is anticipated to begin in late summer of 1997. Although designed for shad and herring, this project is the first Maryland fishway designed specifically for hickory shad.

Andover Branch Fishway, Chester River, Kent County: Although this project is the most important of the three fishways planned for the Upper Chester River basin, it has been postponed indefinitely, because an acceptable agreement with the dam's private owner could not be reached. Next steps are under consideration. The Chesapeake Bay Program funding for this fishway was transferred to the Unicorn fishway (above) to help fund the dam repairs and to the Simkins Dam fishway (above) to assist with construction costs.

Cypress Branch Fishway, Cypress Branch, Chester River, Kent County: Plans to construct an Alaskan Steeppass fishway at this dam has been canceled because of the required dam repairs and the necessary construction of a spillway to accommodate a 100-year storm event. Instead, the dam will be breached by removing the existing overflow spillway, which is crumbling. Preliminary evaluations of the wetlands and pond upstream from the dam and of the pond and stream below the spillway were conducted. The breach should be completed in late 1997. At this time it is believed that breaching the dam will not adversely affect the upstream wetlands.

Dorsey Run Dam, Little Patuxent River, Anne Arundel County: The dam removal was postponed pending resolution of wetland and stream stabilization issues. Wetland restoration in the floodplain above and adjacent to the dam, stream bank stabilization and upstream bottom dredging of sediments will likely be required in addition to the proposed dam removal. During 1996, the MD DNR Fisheries Service completed an analysis of upstream sediment to determine the potential for various strata to move downstream after the dam is removed. Results of this analysis showed that large-scale movement of upstream sediment would be unlikely with the removal of this dam.

State Highway Administration Road Crossings: Engineering designs were prepared and permit applications submitted for fishways at the following road culverts: Gilbert Run, Rt 6; Gilbert Swamp Run, Rt 232; and Nassawango Creek, Rt 12.

Urieville Fishway, Morgan Branch, Chester River, Kent County: The design of a fishway at this site has been delayed because it may be necessary to dredge the 35 acre lake above the dam. If a decision is made to dredge, the fishway will be postponed for at least two years.

Little Falls Dam, Potomac River: Located about one mile upstream from the District of Columbia city line, Little Falls Dam is one of Maryland's highest priority fish passage projects. The overall project is coordinated through the Little Falls Taskgroup of the Fish Passage Workgroup and is state, federally and privately funded. During 1994, topographical studies of the river bottom near the proposed fishway were completed, and a three dimensional model of the area was constructed. In 1995, various fish passage options were studied by the S.O. Contee Anadromous Fish Research Laboratory. In 1996, a conceptual design of a 24 foot wide notch with three labyrinth weirs, one in the notch and two immediately below it, were provided by the Contee Laboratory and approved by the Maryland Fish Passage Program. In addition, a feasibility study was completed. During 1997, the final engineering design will be completed, wetlands evaluations performed and all required permits obtained. Construction will begin as soon as possible after completion of these tasks.

C. Monitoring and Stream Surveys

Adult Alosid Monitoring

During the Spring of 1996, the MD DNR Fisheries Service conducted electrofishing in the lower Susquehanna River basin in Deer Creek below Wilson's Mill Dam. Hickory shad and alewife were found in large numbers below the dam. American shad were collected from the Conowingo Dam fish lift for otolith analysis and to provide hatchery stocks. To reduce handling stress, fish were also collected from recreational sport fishermen below the Conowingo dam. Hickory shad were collected by hook and line from recreational fishermen on the banks of the Susquehanna River for hatchery culture and Deer Creek for an angling mortality study.

Juvenile Alosid Monitoring

The MD DNR Fisheries Service conducted monitoring in 1996 in the Patuxent and Choptank River systems. A seine survey collected 221 juvenile American shad (32% hatchery tagged) and 44 hickory shad (1% hatchery tagged). Choptank River surveys captured 107 juvenile American shad (55% hatchery) and 14 hickory shad (0% hatchery). There were no American shad or hickory shad captured in these tributaries prior to these studies for 35 years.

Wicomico River Assessment

Through an Interagency Agreement, the MD DNR Fisheries Service, the Maryland Cooperative Fish and Wildlife Research Unit, the Coastal Ecology Research Laboratory, and University of Maryland, Eastern Shore jointly performed an assessment of anadromous fishes in the Wicomico River. This study focused on demonstrating that anadromous species congregate and spawn

below the proposed fishway at the Johnson Pond Dam. American shad, alewife, and blueback herring were found below the dam. Clupeids, especially alewife and blueback herring, were found spawning in high numbers below the dam. (This report is available from Larry Leasner, Chief of Special Projects, MD DNR Fisheries Service, 410 260-8341).

Habitat Survey in the Wicomico and Lower Susquehanna River Basins

This survey was conducted through a Memorandum of Agreement between the MD DNR Fisheries Service and the Monitoring and Non-Tidal Assessment Division. This study characterized and estimated potential spawning and juvenile habitat suitable for anadromous and semi-anadromous fish (This report is available from Larry Leasner, Chief of Special Projects, MD DNR Fisheries Service, 410 260-8341). Streams above Johnsons Pond Dam on the Wicomico River and those above Wilsons Mill Dam on Deer Creek in Harford County were studied.

Stream Assessments and Database Management

- Streams within the Patuxent River basin and streams above State Highway Administration road crossings were assessed for their fish passage potential.
- Version 2 of the Maryland Fish Passage database was published and provided to various agencies and public groups. Additions and refinements to the database will continue as needed.

D. Trap, Transport, and Stocking

During 1996, American and hickory shad larvae and juveniles were stocked in the lower Susquehanna, the Patuxent and Choptank Rivers. MD DNR Fisheries Service biologists collected American shad from the Conowingo Dam fish lift and from recreational sports fishermen. These fish provided the eggs from which stocked larvae were produced at the Manning Hatchery. Because hickory shad were not regularly captured by the fish lift, all hickory shad were collected by hook and line from recreational fishermen on the banks of the Susquehanna River and Deer Creek. A total of 920,000 American shad larvae were stocked at 3-6 days post hatch in the Susquehanna River. In the Patuxent River, 654,552 American shad larvae were stocked at 9-12 days post-hatch and 745,870 hickory shad larvae were stocked at 3 days post-hatch. In the Choptank River, 626,127 American shad larvae were stocked at 6-12 days post-hatch and 125,000 hickory shad larvae were stocked at 3 days post hatch.

II. Fish Passage Support Activity

A. Public Relations and Education

- Fish passage displays were set up at the Herring Run festival at Herring Run Park in Baltimore, the Shad Festival in Vienna and the Patapsco River Appreciation Festival at the Patapsco River State Park.

- Tours of fishways were provided to a delegation from the state legislature, a group of Assistant Attorneys General and students.
- MD DNR Fisheries Service worked with an engineering professor at the University of Maryland, Baltimore County campus. Students were assigned the task of drawing conceptual fishway designs for the Unicorn and Simkins Dams. The students were provided with fish passage program overview lectures and technical specifications and guidance. At the end of the semester, the students' designs were compared to the professional fishway designs. Some of the designs were "unique" and some were not too different from the professional designs.
- Presentations were given to students at two elementary schools.
- Fish passage interviews were given to the *Baltimore Sun* newspaper and Channel 17 in Salisbury, Maryland.

B. Future Public Relations and Education

The Fish Passage Program will continue providing educational outreach to schools and interested groups upon request.

III. Other Future Activities

A. Plans for 1997

- **Construction:** In 1997, construction of the following fishways should be completed: Simkins Dam; Wilson Mill Dam; Broadway Branch Dam; Johnsons Pond Dam; Cypress Branch Dam; Dorsey Run Dam; the Range Road culvert at Midway Branch; Rt 6, Gilbert Run; Rt 232, Gilbert Swamp run; Rt 12, Nassawango Creek; and Rt 589, Turville Creek.
- **Stream assessments:** This work will continue on streams at State Highway Administration culverts and in the Patuxent River basin.
- **Public outreach:** Outreach and education will continue upon request.

B. Meeting the Chesapeake Bay Program's Five-Year Goal (1993-1998)

The Maryland Fish Passage Program has completed 38 projects to date, reopening 173 miles of migratory fish spawning habitat. Achieving Maryland's Five-year goal of 316.6 miles will depend on available funding and the resolution of technical or legal issues that may arise.

C. Meeting the Chesapeake Bay Program's Ten-Year Goal (1993-2003)

Maryland's portion of the ten year goal is to reopen a total 388.65 miles of stream habitat. The additional 72.5 miles beyond the 1998 goal is achievable and could be exceeded.

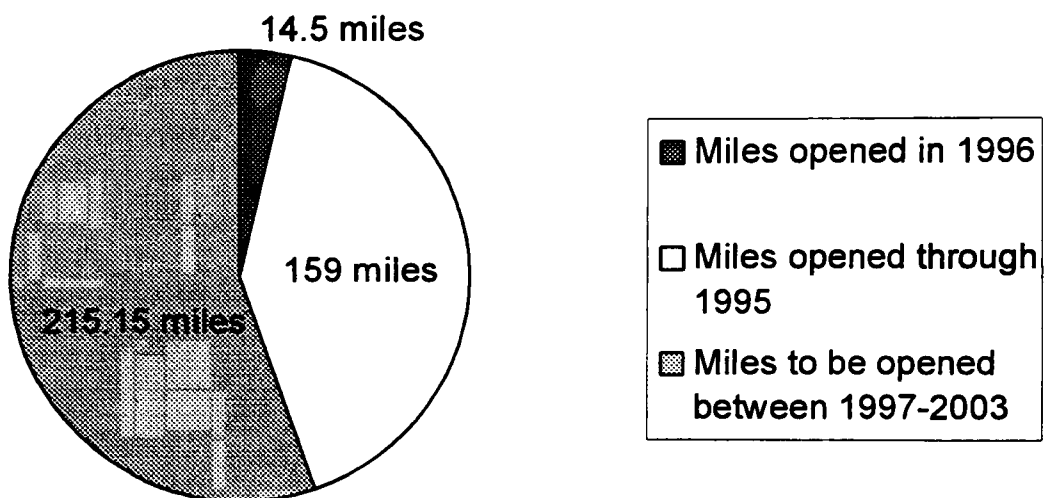
Table 2
Maryland 1996 Fish Passage Projects
Completed, In Progress, Planned

Map ID #	Project (Stream & River drainage)	Passage Type	Habitat Opened (miles)	Funding Source	Status
1	Unicorn Dam, Unicorn Branch, Chester River	Alaskan Steeppass	14.5	Federal/ State	Completed 1996
2	Simkins Dam, Patapsco River	Denil	3.8	State/ Federal	Construction ongoing
3	Broadway Branch Dam, Chester River	Alaskan Steeppass	12.5	Federal	Design ongoing
4	Johnsons Pond Dam, Wicomico River	Denil	25.0	Federal	Design ongoing
5	Range road Culvert, Midway Branch, Little Patuxent River	Alaskan Steeppass	1.2	State	Design ongoing
6	Wilsons Mill Dam, Deer Creek, Susquehanna River	Denil	24.0	Federal	Design ongoing
	Andover Branch Dam, Andover Branch, Chester River	Denil	25.0	Federal	Planned
	Cypress Branch Dam, CypressBanch, Chester River	Breach	12.0	Federal	Planned
	Dorsey Run Dam, Dorsey Run, Little Patuxent River	Removal	7.0	State	Planned
	Rt 6 Culvert Gilbert Creek Wicomico River (west)	Pool & Weir	9.0	State	Planned
	Rt 12 Culvert/USGS Weir, Nassawango Creek, Pocomoke River	Notch	49.0	State	Planned
	Rt 232 Culvert, Gilbert Swamp Run, Wicomico River (west)	Pool & Weir	6.6	State	Planned

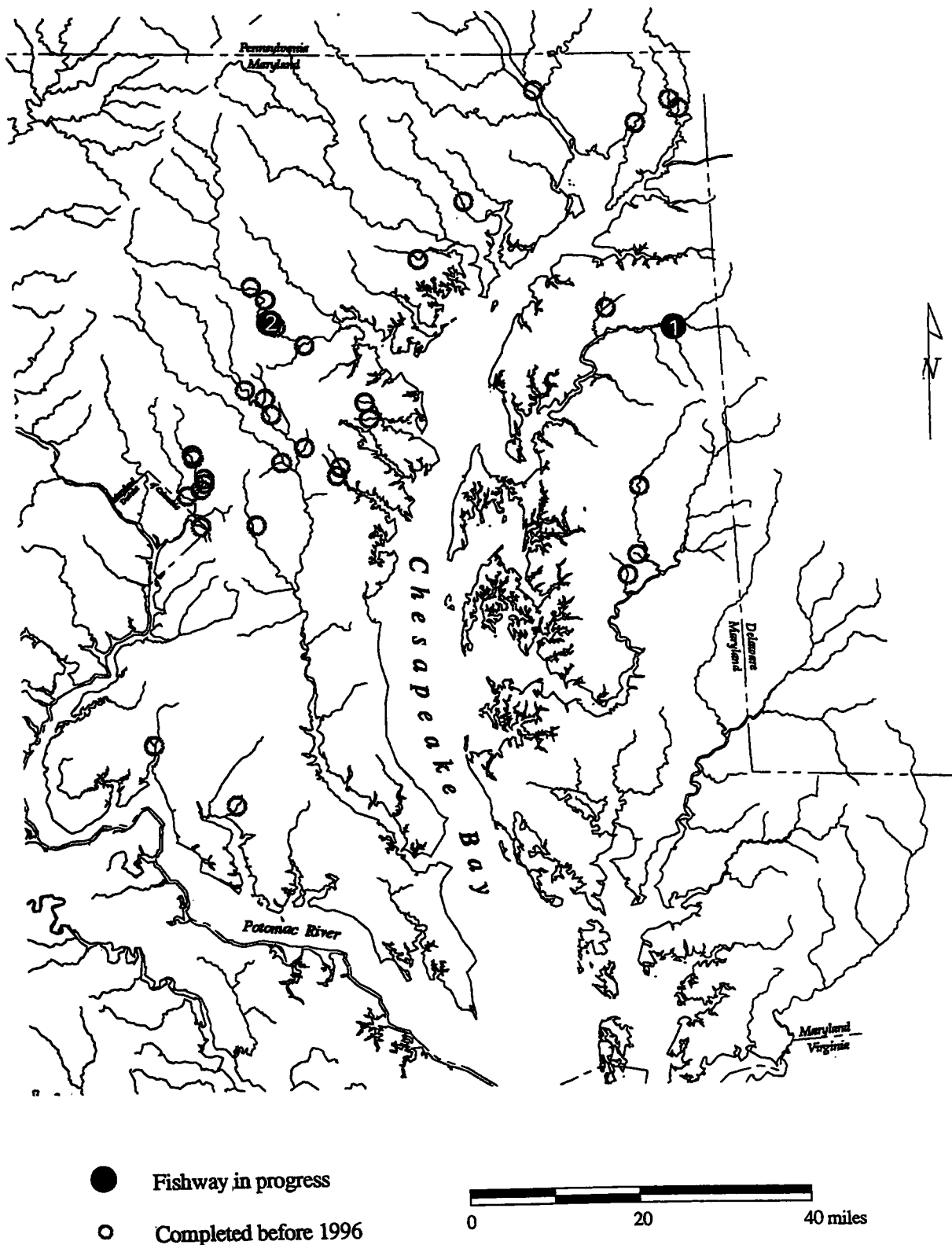
	Urieville Dam, Morgan Creek, Chester River	Alaskan Steeppass /pool & weir	5.0	Federal	Planned
	Little Falls Dam, Potomac River	Notch with three weirs	11.0	Federal/ State	Planned

Figure 2
Fishway Progress in Maryland

Maryland's Progress towards 2003 Fish Passage Goals



Map 2: Fishway Progress in Maryland



PENNSYLVANIA

I. Fish Passage Initiatives

Table 3, Figure 3, and Map 3 at the end of this chapter provides details of 1996 fish passage progress in Pennsylvania.

A. Completed Fishway Projects

Williamsburg Station Dam, Frankstown Branch of Juniata River, Blair County: Breaching, demolition and disposal of Williamsburg Station Dam has been completed. Williamsburg Station Dam was the first blockage on the Frankstown Branch of the Juniata River upstream from Warrior Ridge Dam on the Juniata River. The removal of this dam provides about 19.3 miles of potential alosid habitat. Additional blockages remain downstream.

Huntingdon Water Authority Dam, Standing Stone Creek, Huntingdon County: Construction of a Denil fishway at the Huntingdon Water Authority Dam was completed and will be operational for resident species in spring 1997. This project provides 22 miles of potential Alosid habitat.

B. Fishway Progress

Susquehanna River Main Stem Blockages

Holtwood, Safe Harbor and York Haven Facilities: Construction of fish lifts at Holtwood and Safe Harbor Dams was essentially completed in 1996. Fishways at both dams are scheduled to be tested in early 1997 and to be in service April 1, 1997. A dedication ceremony for these fishways is scheduled for May 1997.

At York Haven Dam, the Tri-County Boat Club was concerned about the conceptual design for the "open river" East Channel Dam approach to the fish passage. This design included three contiguous 67-foot openings with water control provided by gate works. The "open river" concept was replaced by a vertical slot fishway with auxiliary attraction flows. The design of the fishway is ongoing. The 1993 Fish Passage Agreement between the utilities and fisheries interests was amended to reflect the York Haven Dam design and forwarded to FERC for approval. The fish passage should be operating no later than April 1, 2000.

Fabri Dam at Sunbury, Northumberland/Snyder County: U. S. Fish and Wildlife Service (USFWS) personnel have provided a conceptual design for a vertical slot fishway at the inflatable dam located at Shikellamy State Park in Sunbury. The designs have been forwarded to the Pennsylvania Department of Conservation and Natural Resources (DCNR) and planning is underway. DCNR has included the cost for the fishway in their Five-year preliminary budget proposal. Construction date is pending funding approval.

Tributary Blockages

Rock Hill Dam, Conestoga River, Lancaster County: On-site activities to breach, demolish and dispose of Rock Hill Dam began in December 1996. The contractor is expected to complete the project by January, 1997.

U. S. Geological Service Weir (USGS), Conestoga River, Lancaster County: A proposal for Atlantic Coastal Fisheries Cooperative Management Act funding for Pennsylvania Fish and Boat Commission (PFBC) 1997/98 alosid biomonitoring has been submitted to National Marine Fisheries Service (NMFS) for approval. This proposal includes the use of electrofishing for adult alosids to determine if the weir constitutes a blockage to fish migration. Should the weir impede migration, the United States Geological Survey (USGS) will be requested to provide fish passage.

City of Lancaster Water Supply Dam, Conestoga River, Lancaster County: A proposal for Atlantic Coastal Fisheries Cooperative Management Act funding for PFBC alosid biomonitoring in 1997 and 1998 has been submitted to NMFS for approval. This proposal includes electrofishing for adult alosids at the base of the City of Lancaster Water Supply Dam. Upon documentation of alosids, provisions for fish passage will be mandated as provided by law.

American Paper Products Dam(s), Conestoga River, Lancaster County: Manheim Township has purchased two mill dams and 5.3 acres of adjacent property from the American Paper Products Co. of Philadelphia. An agreement between the PFBC and the Township will allow the PFBC to provide Bay Program funding for the breaching, demolition and disposal of the two dams. This funding will also support a riparian restoration project, which includes demolition of a large abandoned warehouse and service parking lot. Long-term plans are under development for a passive-use public park, which will provide access to the Conestoga River. Removal of the dams will open 4.3 miles of the Conestoga after passage is provided at the next downstream blockage, the City of Lancaster Water Supply Dam. Removal is targeted for completion by September 30, 1998.

Maple Grove Dam (Lancaster Township Dam), Little Conestoga River, Lancaster County: An agreement between the PFBC and the Township will allow the PFBC to provide Bay Program funding for the breaching, demolition and removal of Maple Grove Dam. The Township has hired a contractor for engineering design development, which is currently underway. Target date for project completion is September 30, 1998.

Castle Fin Dam, Muddy Creek, York County: Engineering design for the breaching, demolition and disposal of Castle Fin Dam is complete. Permit acquisition is delaying further progress prompting a request for an extension to the grant activation period. The new target date for project completion is September 30, 1997.

Marietta Gravity Water Co. Dam, Chickies Creek, Lancaster County: No agreement regarding fish passage has been reached between the PFBC and Marietta Gravity Water Company Dam located at Chickies Rock Park, Lancaster County. It is doubtful an agreement will be reached in the near future. Funding originally allocated for this project is being redirected to implement fish passage at other blockages.

Daily's Dam, Swatara Creek, Dauphin County: A public meeting regarding PFBC proposal for breaching, demolition and disposal of Daily's Dam, Swatara Creek, for the purpose of fish passage and habitat restoration, is planned for May 1997. The dam has been identified as the first blockage on Swatara Creek (river mile 2.0). Its removal will open approximately 11.0 miles of stream habitat to migratory fish.

C. Monitoring and Stream Surveys

Despite weather related delays and mechanical shut downs, the fish lifts at Conowingo Dam collected 37,500 returning adult American shad during Spring 1996. Otolith analysis determined that 55% of these were hatchery fish and a record 45% were wild fish. Biomonitoring of American shad in the autumn of 1996 indicated successful reproduction of trucked adults: approximately 42% of the fish migrating downstream and collected above Conowingo Dam were identified as wild fish.

The Pennsylvania State University Cooperative Fish and Wildlife Research Unit has completed the Susquehanna River Tributary Blockage study. The inventory identified and characterized over 200 impediments to migratory fish in 17 watersheds below the confluence of the Susquehanna and Juniata Rivers. Watersheds inventoried include: Conestoga River, Kreutz Creek, Chickies Creek, E. Conewago Creek, W. Conewago Creek, Codorus Creek, Fishing Creek (Lancaster Co.), Muddy Creek, Pequea Creek, Otter Creek, Fishing Creek (York Co.), Swatara Creek, Yellow Breeches Creek, Conodoguinet Creek, Fishing Creek (Dauphin Co.), Fishing Creek (Perry Co.), and Sherman's Creek.

D. Trap, Transport and Stocking

The trap and transport of alosids from Conowingo Dam, a Susquehanna River Anadromous Fish Restoration Cooperative funded activity, included approximately 34,000 pre-spawn American shad in 1996. The primary release site for these fish were the Tri-County Marina upstream of York Haven Dam and at Columbia, PA.

In 1996 a total of 14.4 million American shad eggs were received and incubated at PFBC Van Dyke Anadromous Fish Research Station. Of these, 62.7% were successfully hatched. Approximately 7.5 million American shad fry were marked and stocked into the Susquehanna drainage including: 4.8 million in the Juniata River; 1 million in the Susquehanna River; 561,000 in the West Branch of the Susquehanna River; 682,000 in the North Branch of Susquehanna River; and, 492,000 into three lower tributaries (Conodoguinet Creek, Conestoga River and

Standing Stone Creek). Biomonitoring determined that approximately 58% of the juveniles moving downstream and captured in fall 1996 were of hatchery origin.

II. Fish Passage Support Activities

A. Public Relations and Education

In 1996, PFBC staff displayed an exhibit on American shad restoration in the Susquehanna River at events in Pennsylvania and Maryland. Numerous slide presentations on migratory fish restoration were given by staff to various sportsmen, environmental and special interests groups. Also, the PFBC Anadromous Fish Restoration Unit gave numerous tours of the Van Dyke Research Station for Anadromous Fish to a number of organizations during 1996. Finally, shad stocking activities on the West and North Branches of the Susquehanna River and Standing Stone Creek were extensively covered by the local newspaper, radio and television media.

B. Future Public Relations and Education

In 1997, initiatives to expand the PFBC public education and awareness efforts with regard to the Chesapeake Bay Program and migratory fish restoration in Pennsylvania will continue. The PFBC, in conjunction with the Chesapeake Bay Foundation, is planning a shad festival at the Borough of Huntingdon on the Juniata River in late May. In addition, the PFBC will conduct media events on migratory fish restoration in the Susquehanna Basin. Numerous slide presentations and exhibits on migratory fish restoration are also scheduled for 1997.

III. Other Future Activities

A. Plans for 1997

- Complete construction of fish lifts at Holtwood Dam and Safe Harbor Dam to open 32 miles of Susquehanna River and 28 miles of tributaries, third order or larger, from their mouths to the first upstream blockage.
- Breach and remove Castle Fin Dam, Rock Hill Dam, American Paper Product Co. Dam (Manheim Township), Maple Grove Dam (Lancaster Township) and a low-head dam on Fishing Creek, Clinton County to open a cumulative 38 miles of tributaries, third order or larger, not previously included in Pennsylvania's 10-year Bay Program goal.
- Complete fishway design for York Haven Dam, Cave Hill Dam and proposed dam on Mill Creek, a tributary to the Conestoga River.
- Negotiate agreements for fish passage at City of Lancaster Water Supply Dam (Conestoga River), Daily's Dam (Swatara Creek) and Carson Long Dam (Sherman's Creek).
- Continue to expand the PFBC public education and awareness initiatives, as well as develop programs to identify and acquire additional funding to supplement pre-existing monies for the removal of tributary blockages.

- Target additional tributary blockages for removal and submit funding proposals to the Bay Program for approval.
- Continue funding for the Fish Passage Coordination project.

B. Meeting the Chesapeake Bay Program's Five-Year Goal (1993 - 1998)

The five-year goal for Pennsylvania is 32 miles. The Directive specifically included opening the main stem of the Susquehanna River to migratory fishes by providing passage at Holtwood and Safe Harbor Dams. These projects will be operational in 1997 and will make accessible an additional 46 miles of tributaries, third order or larger, to migratory fish. This additional mileage was not previously included in Pennsylvania's Bay Program ten-year goal.

Forty-one miles of third order or larger tributaries not previously included in Pennsylvania's Bay Program goals were opened in 1996 with the completion of fish passage projects at Williamsburg Station Dam and Huntingdon Water Authority Dam. Also, PFBC expects to provide fish passage at City of Lancaster Water Supply Dam, Daily's Dam, and at tributary blockages yet to be determined.

C. Meeting the Chesapeake Bay Program's Ten-Year Goal (1993 - 2003)

The ten-year goal for Pennsylvania is 520 miles. This will be completed several years early by providing fish passage at York Haven Dam in 2000. Other potential projects beyond 1998 include the Fabri Dam, Warrior Ridge Dam, Oakland Dam, Brenneman's Dam, Cave Hill Dam, and Hykes Mill Dam, and Carson Long Dam. For planning purposes, fish passage is expected at ten additional high priority blockages on tributaries to the Susquehanna River by 2003.

Table 3
Pennsylvania 1997 Fish Passage Projects
Completed, in Progress, Planned

Map ID#	Project (Stream & River drainage)	Passage Type	Habitat Opened (Miles)	Funding Source	Status
1	Williamsburg Station Dam, Frankstown Br. Juniata R.	Breach & remove	19.3	Private	Complete
2	Huntingdon Water Authority Dam, Standing Stone Ck.; Juniata R.	Denil fishway	22.0	Local Government	Complete
3	Holtwood Dam, Susquehanna R.	Lift	9.0	Private	Construction ongoing
4	Safe Harbor Dam, Susquehanna R.	Lift	23.0	Private	Construction ongoing
5	York Haven Dam, Susquehanna R.	Vertical slot fishway	169.3	Private	Design ongoing
6	Rock Hill Dam, Conestoga R.	Breach & remove	18.5	Federal/ Private	Construction ongoing
4	*Fabri Dam, Susquehanna R.	Vertical slot fishway	310.0	State	Design ongoing
5	Castle Fin Dam, Muddy Ck.	Breach & remove	4.3	Federal/ Private	Design complete
	USGS Weir, Conestoga River	Undetermined	unknown	Federal/State	Status Pending
	Lancaster Water Authority Dam, Conestoga R.	Undetermined	11.0	Lancaster Water Authority	Negotiations
	American Paper Products Co. Dam, Conestoga R.	Breach & remove	2.5	Federal/ State/ Private	Planned
	Maple Grove Dam, Little Conestoga R.	Breach & remove	unknown	State/Local Government	Planned

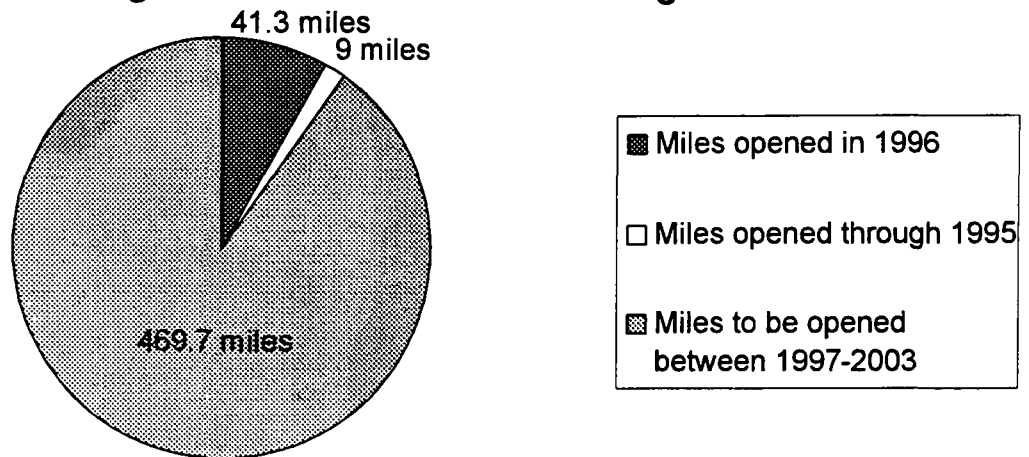
Pennsylvania Fish Passage Projects (Cont.)

	Marietta Gravity Water Co. Dam, Chickies Ck.	Undetermined	1.8	Undetermined	Negotiations
	Daily's Dam, Swatara Ck.	Undetermined	9.2	Federal/ State/ Private	Negotiations
	Oakland Dam, N. Br. Susquehanna R.	Undetermined	5.0	Private	FERC permit requirement
	Warrior Ridge Dam, Frankstown Br. Juniata R	Undetermined	81.3	Private	FERC permit requirement
	Lapp's Dam, Conestoga R.	Undetermined	4.3	Federal/ State/ Private	Negotiations
	Hykes Mill Dam, W. Conewago Ck.	Undetermined	22.0	Undetermined	Negotiations
	Dam near Union Deposit, Swatara Ck.	Undetermined	25.4	Federal/ State/ Private	Anticipated
	Brenneman's Dam, Conodoguinet Creek	Undetermined	9.2	Undetermined	Anticipated
	Cave Hill Dam, Conodoguinet Ck.	Denil	22.2	Local Government	State permit requirement
	Carson Long Dam, Shermans Creek	Undetermined	7.0	Undetermined	Negotiations

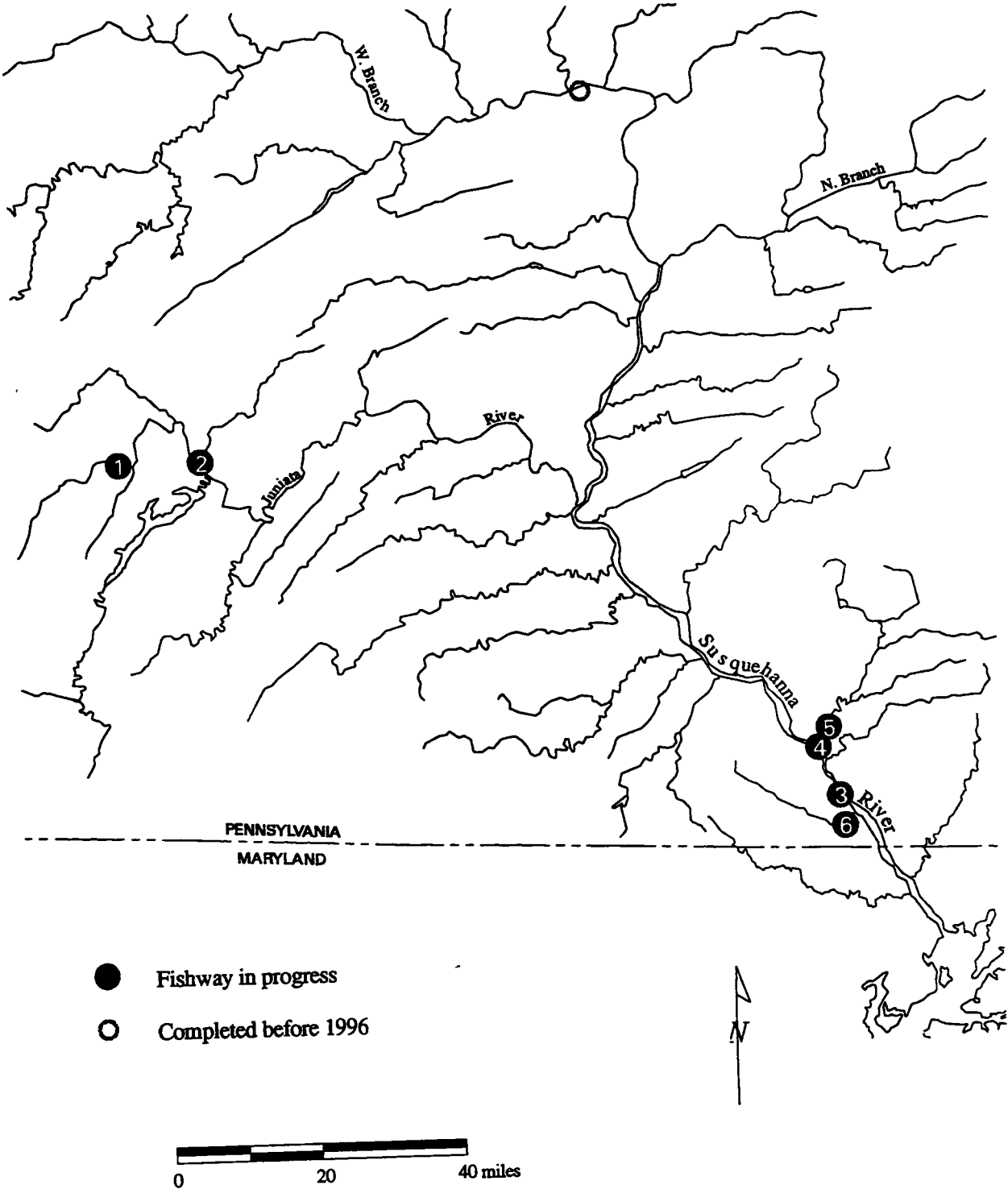
**Anadromous fish can freely pass this site until late May when the dam is inflated. Thus, it is an impediment for late arriving fish.*

Figure 3
Fishway Progress in Pennsylvania

**Pennsylvania's
Progress towards 2003 Fish Passage Goals**



Map 3: Fishway Progress in Pennsylvania



VIRGINIA

I. Fish Passage Initiatives

Table 4, Figure 4, and Map 4 at the end of this chapter provide details of 1996 fish passage progress in Virginia.

A. Completed Fish Passage Projects

Progress was made for several fish passage projects, however none were completed in 1996.

B. Fishway Progress

Harvell Dam, Appomattox River, City of Petersburg: The owner, Joshua Greenwood, of Greenwood Ironworks, completed the design of a Denil fishway for this 9 foot dam, and the plans were approved by the US FWS, National Marine Fisheries Service and the Virginia Department of Game and Inland Fisheries (VDGIF). The Federal Energy Regulatory Commission (FERC) issued orders to Greenwood Ironworks to proceed with the construction of the fishway. The Army Corps of Engineers (ACOE) and the Virginia Marine Resource Commission (VMRC) permits were obtained and a temporary dam to allow for fishway construction (a cofferdam) was in place before the end of the year. Several pieces of the attraction water system were under construction in the powerhouse and excavation for the fishway began in 1996. FERC also granted the owner's request to generate hydroelectric power up to March 1, 1997 even though the fishway was not yet completed. This project will open 5.6 miles and should be completed for the 1998 spring spawning run.

Boshers Dam, James River, Henrico County: This 10 foot high dam is the last blockage to migratory fish on the James River in Richmond. A fishway here will open 137.6 mainstem miles and 168 tributary miles, third order or larger, of anadromous fish spawning habitat up to Lynchburg. A conceptual plan for a vertical slot fishway was provided by the US FWS in 1994 and the final design was completed by J.K. Timmons & Associates in August 1996. The final design was accepted for construction by the city of Richmond, the VDGIF, and the US FWS. VMRC issued their permit and the Virginia Department Environmental Quality (DEQ) plans to issue a permit waiver. Three construction bids were opened on September 13, 1996; however, the lowest bid, at \$1,292,000, was more than double the original budget allocated for this project. The construction grant was approved by Richmond City Council in late September, but due to this funding discrepancy, it remained unsigned by the City Manager.

The City of Richmond, J.K. Timmons & Associates, and the VDGIF met with US FWS engineers to discuss possible design changes that would reduce construction costs. The meeting was successful in identifying some minor changes but none that would greatly reduce costs. The City of Richmond and the VDGIF also met with two representatives from English Construction, Inc., the low bidding construction company, to discuss cost saving options. None, however, were

identified, and by the end of 1996 the bid had not been withdrawn by English nor rejected by the City of Richmond. More funding will therefore be needed in the near future for this project to be completed. Several options include funding from VMRC, private funds through the James River Association, and possibly State funds allocated by the General Assembly of Virginia.

Negotiations continue regarding the dam's transfer of ownership from CSX Railroad to the City of Richmond. After these negotiations are finalized, the City of Richmond will need to obtain an ACOE permit for construction of the fishway. The City of Richmond will maintain the fishway and the VDGIF will operate the facility. Due to additional water supply issues above Boshers Dam, the VDGIF will be required to operate the fishway according to operating regulations outlined in the pending ACOE permit. These permit conditions are not expected to alter normal spring fishway operations.

Ruffins Pond Dam, Massaponax Creek, Rappahannock River, Spottsylvania County:

Chesapeake Bay Program funds originally designated for fish passage at Ashland Mill Dam were extended and transferred to Ruffins Pond Dam. A Denil fishway for this 16-foot high dam is being designed by J.K. Timmons & Associates and is based on conceptual plans from the US FWS. Timmons submitted the first draft of the final design in October 1996 and by the end of December, Tarmac America, Inc. (a concrete company), the VDGIF and the US FWS accepted the plans. The project will be put out for bids in January of 1997. The fishway will not be completed in time for the 1997 spawning run. This project is being funded by the VDGIF, Tarmac, and federal dollars. Completion of this project will open 8 tributary miles to a good herring run.

Embrey Dam, Rappahannock River, Spottsylvania County: This 22-foot high dam in Fredericksburg is the only mainstem migration impediment on the Rappahannock River. In 1994, a sediment study was conducted to determine if toxic substances were present in the sediment behind the dam. Early in 1995, the Virginia DEQ reviewed the results and determined that the sediments retained by Embrey Dam are comparable to other sediments upstream and that these sediments would probably not be characterized as hazardous waste as defined in Virginia regulations. These results allow for the removal of all or part of the dam to be considered.

The City of Fredericksburg and Spottsylvania County decided to build a joint water plant at Mott's Run Reservoir, a tributary to the Rappahannock, a few miles upstream of Embrey Dam. This will make Embrey Dam obsolete as a water supply by early 1999. Removal of Embrey is therefore under strong consideration as the best option for fish passage and would open 70.6 miles of the mainstem alone. The City of Fredericksburg has stated that they will need to keep the historic canal watered even if Embrey Dam is removed. Satisfying all of these concerns will be one of the major challenges at Embrey Dam.

Ashland Mill Dam, South Anna River: Negotiations with the owner have temporarily been terminated due to problems over personal financing of the project. The VDGIF cannot guarantee that the owner will not spend personal funds or time on the fishway. The VDGIF plans to reopen

negotiations with the owner in the future. However, Chesapeake Bay Program funds originally granted for the Ashland project have been extended and transferred to the Ruffins Pond Dam fishway project.

C. Monitoring and Stream Surveys

Adult Alosid Monitoring: During the spring of 1996, shad and herring spawning runs were monitored throughout Virginia by the Fish Passage Coordinator and other Fish Division staff. Electrofishing for *Alosa* spp. was conducted at the following sites: below Boshers Dam down to the fall line/tidal interface on the James River; below Harvell Dam on the Appomattox River; below Walkers Dam on the Chickahominy River, below Embrey Dam down to the fall line/tidal interface on the Rappahannock River; and below Ashland Mill Dam on the South Anna River. American shad (*A. sapidissima*), blueback herring (*A. aestivalis*) and hickory shad (*A. mediocris*) were found in the James River. Blueback herring, alewives (*A. pseudoharengus*), and hickory shad were found in the Rappahannock, Chickahominy, and Appomattox rivers. American shad and blueback herring were found in the South Anna River. American shad were also monitored during collection by commercial gill netters for VDGF and USFWS fry culture procedures on the Pamunkey River. Age and growth rates were determined by Virginia Commonwealth University for broodstock shad.

Juvenile Alosid Monitoring: A minimal number of ichthyoplankton net samples were taken on the James River above and below Boshers Dam. The only fish collected were a few juvenile cyprinids above Boshers Dam. The net will be pushed, instead of towed, in next year's sampling.

Juvenile American shad were collected above and below Boshers Dam on the James River from July through October of 1996 using pushnet and electrofishing sampling techniques. This is a major milestone for the shad stocking program, because the habitat above Boshers Dam was shown to still be suitable for juvenile alosids. All of the shad otoliths examined from fish collected above Boshers displayed the oxytetracycline (OTC) mark received in the hatchery prior to stocking. Approximately 80% of the American shad juveniles collected below Boshers Dam were of hatchery origin. OTC marking will be a valuable tool for evaluating the overall contributions of wild and hatchery fish to the system, especially after the fishway is passing fish above Boshers Dam. Juvenile American shad were also collected on the Pamunkey River with both the pushnet and electrofishing boat. In contrast to the James, approximately 20% of the otoliths examined were OTC marked. The Pamunkey Tribal Government shad fry stocking program does not yet include OTC marking. Spawning shad are more abundant on the Pamunkey, although fewer marked fish were stocked in the Pamunkey than in the James.

Juvenile river herring (blueback and alewife) were collected below Boshers Dam by pushnetting and electrofishing in July and August and above the dam by electrofishing in October. The presence of herring juveniles above Boshers Dam is evidence that the stocked adults were able to successfully spawn, the eggs hatched and the fry survived to the juvenile phase. This increases the

significance of finding American shad juveniles above the dam: the habitat is conducive to natural alosid spawning and recruitment.

Rappahannock River Basin Impediment Survey: The first year of this four-year study was completed by Virginia Commonwealth University, and the contract with the VDGIF was continued for the second year of the study. Chesapeake Bay Program (CBP) funds are being used to conduct a comprehensive survey of impediments on Rappahannock River tributaries. The first year of the study focused on first through third order tributaries of the lower Rappahannock River. Impediments were characterized and biological sampling was conducted below impediments to determine migratory fish usage. The initial impediments database was completed which includes the standardized US EPA CBP fields. Migratory river herring (blueback and alewife) were documented at several impediments and reference sites. The long-term plans are to survey the entire basin over a four-year period and provide information necessary for setting fish passage priorities in the basin. In addition, an alosid habitat model may be developed which could be a useful tool for setting habitat restoration goals.

D. Trap, Transport and Stocking

The Fish Passage Coordinator and other VDGIF Fish Division staff, in cooperation with the US FWS, conducted a trap and transport project for blueback herring in April 1996. Blueback herring were collected by electrofishing below Walkers Dam on the Chickahominy River and transported in circular tanks to several stocking sites. Over 4,000 herring were stocked into the James River at Columbia Landing which is approximately 30 miles above Boshers Dam. Approximately 400 herring were stocked into Big Lickinghole Creek which is near Maidens Landing (James) and about 400 herring were stocked into Byrd Creek, also near Maidens Landing. Harrison Lake (on Herring Creek - tributary of lower James) received over 1,200 herring above the existing Denil fishway (US FWS). Resulting offspring should imprint on the "upstream habitat" and return in about five years through completed fishways to spawn themselves. This will aid in re-establishing the herring runs in these systems.

The American Shad Restoration Coordinator and other VDGIF Fish Division staff, in cooperation with the VMRC, the US FWS and the Commercial Watermen of Virginia, collected American shad broodstock on the Pamunkey River. The eggs were hatched at the State King and Queen fish hatchery and the fry otoliths were marked with OTC for identification purposes prior to stocking. American shad eggs were also hatched at the Harrison Lake National Fish Hatchery. The James River above Boshers Dam received 5.7 million fry and the Pamunkey River received 2 million fry.

II. Fish Passage Support Activities

A. Public Relations and Education

- The Fish Passage Coordinator presented the Fish Passage Program to a joint meeting of

the Virginia and Tidewater chapters of the American Fisheries Society (AFS) in February. The American Shad Restoration Project was also presented at the AFS meeting.

- A fish passage and anadromous fish restoration presentation was made to the citizens of Fredericksburg by the VDGIF in the spring. The Friends of the Rappahannock (FOR) sponsored the event. A "bucket brigade" was planned by the FOR and VDGIF to move herring over Embrey Dam during VDGIF sampling. The event was canceled due to prolonged high water during the spring.
- In November, the Fish Passage and Shad Restoration coordinators along with a representative from the US FWS made a presentation to the Skyline Chapter of Trout Unlimited in Lynchburg. The chapter was supportive and made a contribution to the James River Association for the Boshers fishway project.

B. Future Public Relations and Education

- The Fish Passage Coordinator plans to participate in the Shad Festival being held on the Rappahannock River in Fredericksburg in April 1997. This event is being planned by the Friends of the Rappahannock and the Chesapeake Bay Foundation.
- The Fish Passage Coordinator will be giving a fish passage presentation at the midyear meeting of the Southern Division of the AFS in San Antonio, Texas (February 1997).
- Upon request and as opportunities arise, the anadromous fish restoration efforts will be presented to the public to gain support.

III. Other Future Activities

A. Plans for 1997

- Complete fund raising for, and initiating construction of a vertical slot fishway on Boshers Dam on the James River which will open 137.6 miles.
- Complete the construction of a Denil fishway on Ruffins Pond Dam on Massaponax Creek, a tributary of the Rappahannock River which will open 8 miles.
- Work closely with Greenwood Ironworks on completion of a Denil fishway on Harvell Dam (FERC #8657) on the Appomattox River which will open 5.6 miles.
- Decide on a viable option for fish passage at Embrey Dam on the Rappahannock River.
- Set future goals for fish passage in Virginia.

B. Meeting the Chesapeake Bay Program Five-Year Goal (1993 - 1998)

Virginia's five-year goal is to open 308 miles. Williams Island Dam Notch was completed in November of 1993 and reopened 2.6 miles of the James River up to Boshers Dam. Also in 1993, a fish lift was installed on Brasfield Dam (Appomattox River), but the actual hopper is not yet in place. This lift will be completed when passage is provided at two downstream dams (Harvell and Abutment) and will open an additional 127.1 miles. In 1995, a Denil fishway on Chandlers Mill Dam (Rappahannock drainage) opened 8 miles of the two tributaries feeding Chandlers Pond.

The Chandlers fishway is an addition to the original five-year goal. The Boshers fishway should be completed in 1997 or 1998 and will open 137.6 miles. A fishway at Ruffins Pond Dam may be completed in 1997 and will open 8 miles. The Ashland Mill Dam (S. Anna River) project has been moved back to the ten-year goal (9 miles).

C. Meeting the Bay Program Ten -Year Goal (1993 - 2003)

Virginia's ten-year goal is to open 415.5 miles which includes 107.5 miles in addition to the 5-year Goal. Besides completing projects listed above, the ten-year goal will be achieved by providing fish passage at Embrey Dam on the Rappahannock (70.6 miles); and the Ashland Mill Dam and Ashland Water Supply Dam on the South Anna River (37 miles).

Table 4
Virginia 1996 Fish Passage Projects
Completed, In Progress, Planned

Map ID#	Project (stream & river drainage)	Passage Type	Habitat Opened (miles)	Funding Source	Status
1	Harvell Dam; Appomattox River; James	Denil	5.6	Private FERC #8657	Construction ongoing
2	Brasfield Dam; Appomattox River; James	Lift	*120.1	Appomattox Water Authority	Final construction pending
	Boshers Dam, James River; James	Vertical Slot	*137.6	Federal, State, Private, Corporate, Local (construction)	Design Completed
	Ruffins Pond Dam, Massaponax Creek; Rappahannock	Denil	8.0	Federal	Design Completed
	Embrey Dam; Rappahannock River; Rappahannock	Undetermined	*70.6	Undetermined	Planned
	Ashland Mill Dam; S. Anna River; York	Denil	9.0	Private	Planned
	Ashland Water Supply Dam; S. Anna River; York	Undetermined	28.0	Undetermined	Planned
	Abutment Dam; Appomattox River; James	Undetermined	1.4	Undetermined	Planned
	Unnamed Dam; Mill Creek; Rappahannock	Undetermined	2.5	Undetermined	Planned

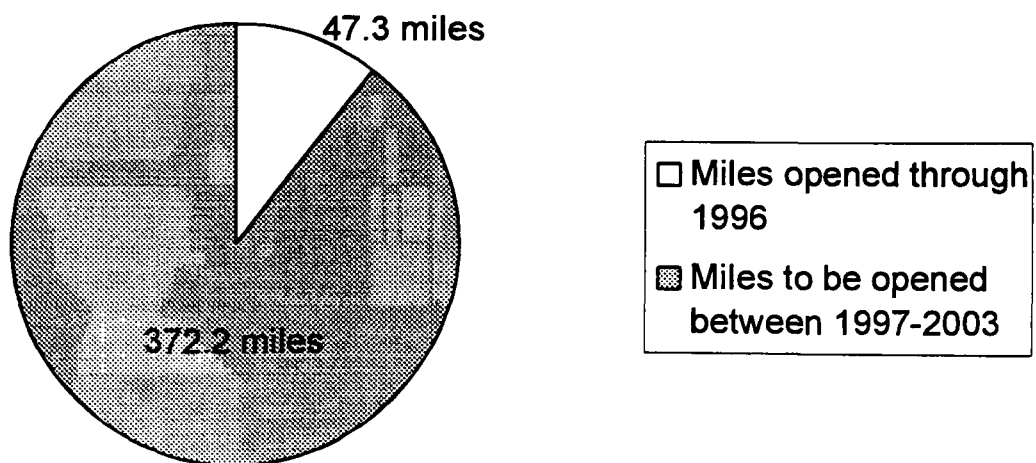
Virginia Fish Passage Projects (Cont.)

	Bridge on Walls Creek; James	Undetermined	1.2	Undetermined	Planned
	Gouldman Pond Dam; Rappahannock	Undetermined	2.0	Undetermined	Planned
	Unnamed Pond Dam; Haskins Creek; Rappahannock	Undetermined	2.0	Undetermined	Planned
	Pipe on Proctors Creek; James	Undetermined	unknown	Undetermined	Planned

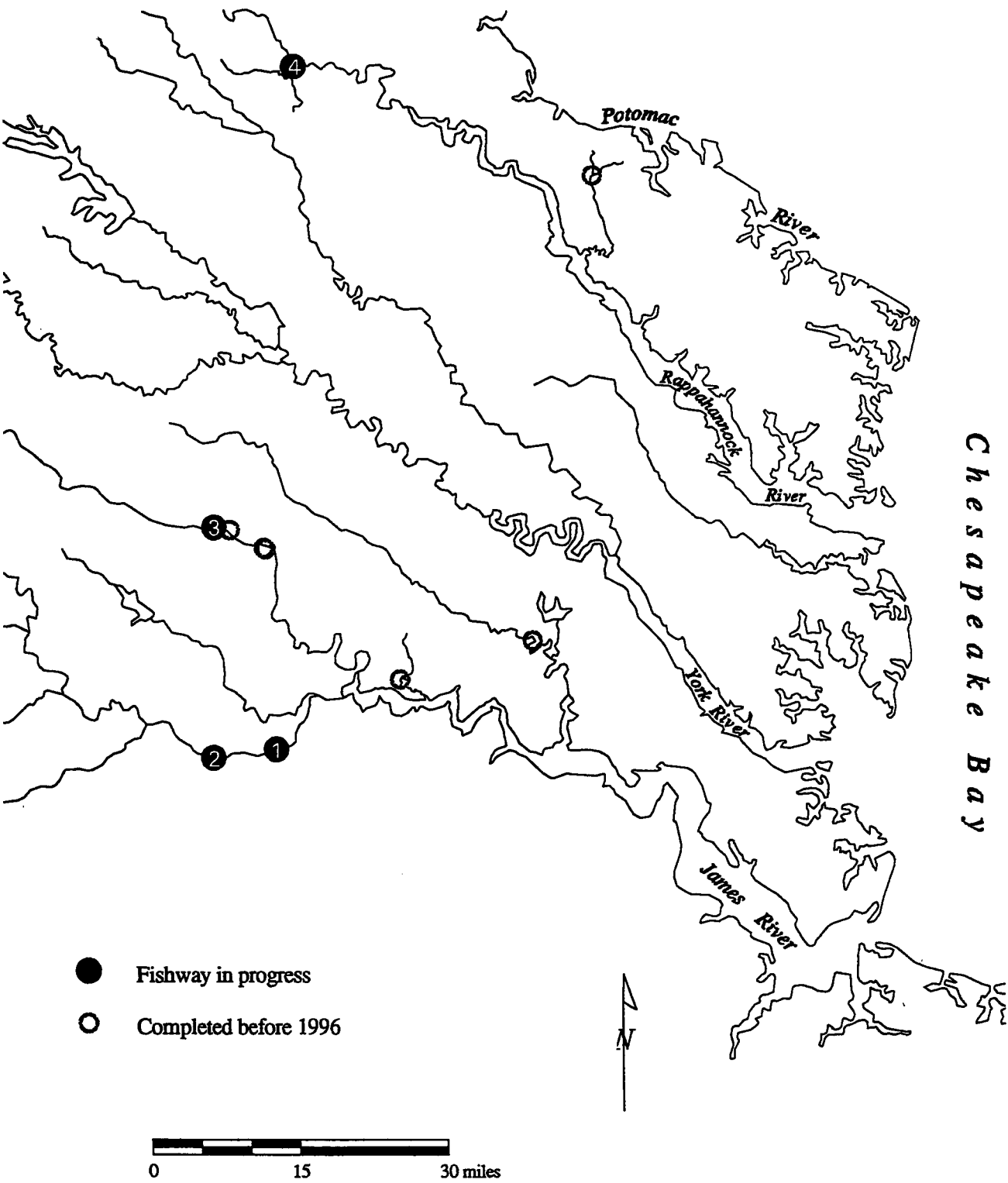
* *updated miles*

Figure 4
Fishway Progress in Virginia

Virginia's Progress towards 2003 Fish Passage Goals



Map 4: Fishway Progress in Virginia



FEDERAL AGENCIES

U.S. Environmental Protection Agency (US EPA)

In fiscal year 1996, the US EPA allocated a total of \$814,863 for fish passage activities in the Chesapeake Bay Watershed. The activities include the coordination of fish passage efforts, stream blockage surveys, and design and construction of fish passage facilities. The surveys assess anadromous fish species spawning habitat potential. The overall goal of these projects is to provide American shad, blueback herring, alewife, striped bass, as well as other anadromous species, with access to historical spawning areas.

In April 1995, the Northeast Region of the NMFS entered the fourth Interagency Agreement (IAG) with the US EPA for "Fisheries and Habitat Restoration in Chesapeake Bay". Under the provision of this IAG grant applications were received from Maryland Department of Natural Resources, the Pennsylvania Fish and Boat Commission, and Virginia Department of Game and Inland Fisheries. Project work focuses on the Susquehanna, Choptank, Patuxent, James, and Rappahannock River Watersheds. Two other IAGs were signed between the US EPA and the US FWS to fund (1) monitoring and the stocking of American shad at Little Falls Dam on the Potomac River, and (2) US FWS engineering expertise for fish passage design in Chesapeake Bay watershed. Upon completion, the fish passage construction activities are anticipated to open over 30 additional river miles to anadromous fish migrations.

U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NOAA/NMFS)

The National Marine Fisheries Service's Northeast Region administers the Chesapeake Bay Program Fish Passage grants, through an Interagency Agreement (IAG) with The Environmental Protection Agency's Chesapeake Bay Program Office (EPA CBPO), for the fourth consecutive year.

The NOAA Chesapeake Bay Office in coordination with EPA CBPO staff designed a Chesapeake Bay Fish Passage homepage on the World Wide Web. Located at http://chesapeakebay.net/bayprogram/cbp_home/bayprog/committ/lrsc/fpwg/passview.htm. This interactive internet site provides updated information on progress towards removing impediments to migratory fish and lists the names, locations, and types of the blockages and passageways in the Chesapeake Bay Watershed.

NMFS Habitat and Fisheries Engineering staff reviewed and provided comments on the final plans for the proposed Denil fishway for Harvell Dam, located on the Appomattox River in Petersburg, Virginia. Habitat staff also coordinated and completed an updated map of confirmed, as well as potential anadromous fish spawning/nursery habitat for the State of Virginia to assist the Norfolk District, Army Corps of Engineers in Section 10/404 permit review.

NMFS continues to contribute to American shad restoration efforts for the Susquehanna River as a technical and policy member of the Susquehanna Anadromous Fish Restoration Cooperative. NMFS reviews and provides input to the activities included in the annual Work Plan.

U. S. Fish and Wildlife Service (USFWS)

A. Fish Passage and Stocking Activities

The US FWS Susquehanna River Coordinator continued to coordinate the multi-agency shad restoration program on the Susquehanna River. In 1996, over 37,500 American shad were collected at Conowingo Dam and most were safely transported to spawning waters above all dams. Fifty-five percent of these returning adults were of hatchery origin. Shad hatcheries in Pennsylvania and Maryland cultured, marked and stocked 8.5 million larval shad in the Susquehanna. Juvenile surveys conducted during summer and fall months indicated that 58% of outmigrating shad were from the hatchery and 42% were naturally produced. New fish lifts were under near completion at Holtwood and Safe Harbor Dams. The Coordinator worked with state agencies and GPU-Genco to develop an agreement to build a 500,000 shad fish ladder in the East Channel of the York Haven project by April 2000.

The Harrison Lake National Fish Hatchery (NFH) and Virginia Fisheries Coordinator's Office, in cooperation with the Interstate Commission on the Potomac River Basin (ICPRB) and the Little Falls (Potomac River) Task Group produced 2 million American shad fry in support of the Little Falls Dam fish passage project. All fry were marked with oxytetracycline (OTC). Very limited assessment was conducted by US FWS utilizing a push-net. Several tetracycline marked shad were recaptured during the striped bass young-of-year survey by MD DNR.

Fish health screening for a sample of approximately 25 American shad were conducted by the US FWS's Lamar Fish Health Unit to ascertain the presence of pathogens in the wild stock. Screening was negative for *Vibrio* sp., *Oncorhynchus masou* virus, *Aeromonas salmonicida*, enteric redmouth bacterium, viral hemorrhagic septicemia virus, infectious hematopoietic necrosis virus, and infectious pancreatic necrosis virus.

The Harrison Lake National Fish Hatchery, and Virginia Fisheries Coordinator Office, in cooperation with the Virginia Department of Game and Inland Fisheries, and the Virginia Marine Resources Commission produced 1.2 million American shad fry in support of the Boshers Dam (James River) fish passage restoration project. All fry were OTC marked. Assessment of the fry stockings indicated that all fry above Boshers Dam were hatchery produced. Approximately 78% of all American shad fry examined from the James River downstream of Boshers Dam were hatchery cultured.

Service personnel from the Virginia Fisheries Coordinator/Harrison Lake NFH worked cooperatively with VDGIF to trap-and-transfer approximately 1,500 pre-spawned blueback

herring for re-introduction into the upper watershed of Herring Creek, above the U.S. Fish And Wildlife Service's Harrison Lake Dam in the James River watershed. A total of 5,000 pre-spawned blueback herring were moved above Boshers Dam.

Service engineers participated in at least 10 meetings and/or field investigations involving fish passage projects in the Chesapeake Bay drainage. In addition, the engineering staff provided technical assistance, conceptual designs, and/or review of designs for 18 fish passage projects in the Bay area.

The Chesapeake Bay Field Office continued to insure that projects constructed, licensed, or permitted by the Federal Government include provisions for fish passage where appropriate. The Denil fishway at the Harvell Hydro project is now under construction and should be ready for the 1998 migration.

B. Outreach and Education

Several US FWS fishery project leaders attended a "Shad Summit" sponsored by the Chesapeake Bay Foundation at Bishops Head, MD. The purpose for this meeting was to improve communications and education and to foster advocacy for shad restoration baywide. The Susquehanna River Coordinator hosted Secretary of the Interior Bruce Babbitt during his National Heritage Tour stop in Harrisburg in June where he specifically noted the value of maintaining strong clean water legislation to support migratory fish restoration in the river and the Bay.

Service personnel participated in several outreach events to inform the public about the importance of restoring suitable anadromous fish spawning and nursery habitat above existing blockages, and the importance of well run fish culture programs to reintroduce species into historic habitats.

BAYWIDE SUMMARY OF PROGRESS

The Chesapeake Bay Program's Executive Council signed Directive 93-4 on December 27, 1993. This directive charged the Bay's jurisdictions to open 1,356.75 miles of migratory fish spawning habitat along the major tributaries in the Chesapeake Bay by 2003. This ten-year goal includes 148.7 miles opened prior to signing the directive. An interim goal of 582.05 miles was set for the year 1998, which does not include the pre-directive miles. This directive has focused the goals and activities of the Fish Passage Workgroup for the past three years.

The Workgroup is moving steadily toward attaining these goals. By the end of 1996 a total of 267.1 miles of anadromous fish spawning and nursery habitat (55.8 in 1996) has been opened. Significant design work has been done in all the jurisdictions and over 100 additional miles should be opened in 1997 throughout the Bay watershed.

The following table and figure illustrates the "Baywide Success" in terms of miles opened. This includes all parameters of the agreement and the miles opened before the agreement.

Table 5
Baywide Fish Passage Progress

States/District	Miles Opened Before 9/93	Miles Opened 9/93 - 12/96	Five-Year Goal 1993 - 1998	Ten-Year Goal Pre 1993 - 2003
District	0.6	1.0	32.00	32.60
Maryland	106.1	65.8	210.05	388.65
Pennsylvania	9.0	41.3	32.00	520.00
Virginia	33.0	10.3	308.00	415.50
Totals →	148.7	118.4	582.05	1356.75

It is important to note that meeting the Directive's fish passage goals will not necessarily result in increased abundance of anadromous stocks. Other necessary efforts include control of harvest, habitat protection, trap and transport, stocking, proper design of facilities, and the proper management of fishways. These activities have been, and are, expanded throughout the watershed by the Fish Passage Workgroup.

Figure 5
Baywide Progress

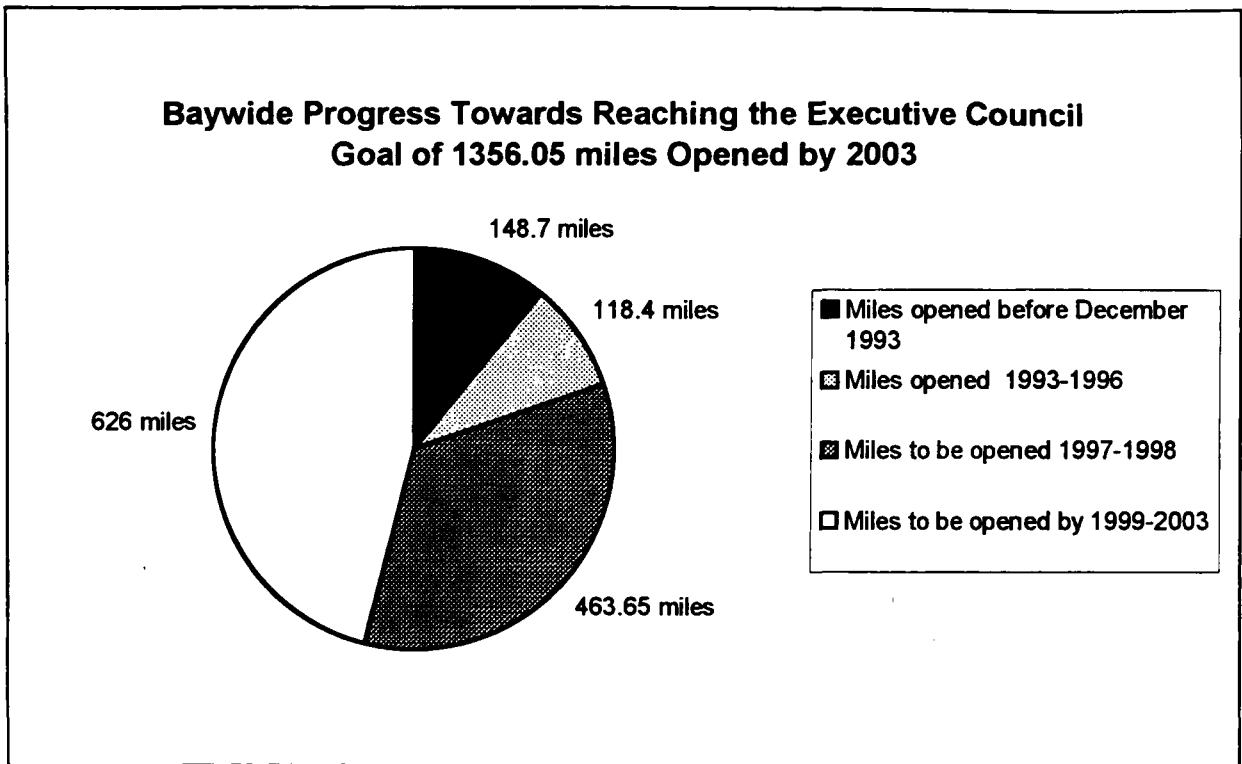
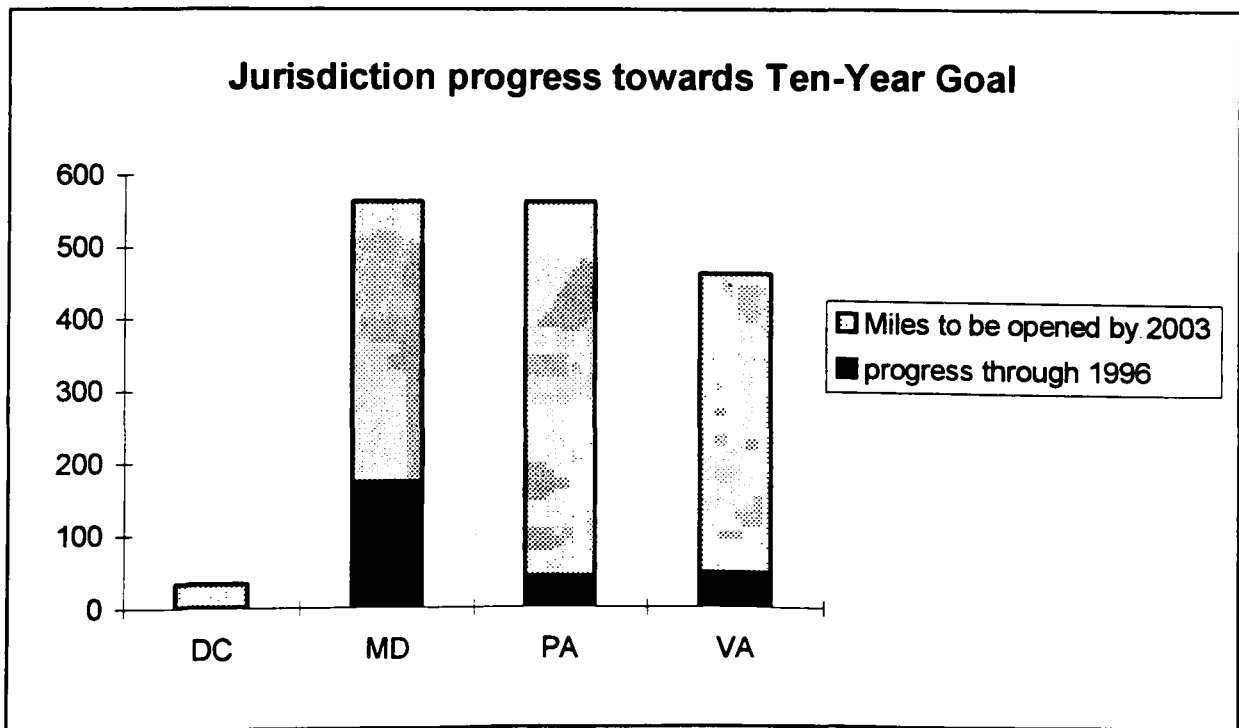


Figure 6
Jurisdictional Progress



Appendix A

Fish Passage Projects Completed after September 1993 through December 1996

State/District	Project	Fish Passage Type
District of Columbia		
	Ford # 3, Rock Creek, Potomac River	Removal
Maryland		
	Dam #1 on Northeast Branch, Anacostia River	Notch
	Culvert, Rt. 495 East Loop, Paint Branch, Anacostia River	Pool and Weir
	Culvert, Rt. 495 West Loop, Paint Branch, Anacostia River	Alaskan Steeppass
	Whitemarsh Run Rt. 40 Culvert, Bird River	Alaskan Steeppass
	Van Bibber Dam, Winter's Run, Bush River	Denil
	Weir on Morgan Creek, Chester River	Denil
	Beaverdam Creek Weir, Choptank River	Notch
	Tuckahoe Creek Dam, Choptank River	Denil Fishway
	Elkton Dam, Big Elk Creek, Elk River	Denil Fishway
	Railroad Bridge, Little Elk Creek, Elk River	Removal
	Fort Meade Dam, Little Patuxent River	Denil
	Railroad Tressel, Dorsey Run, Little Patuxent	Remove
	Culvert, Dorsey Run, Little Patuxent River	Replace Culvert
	Sewer Line, Little Patuxent River	Replacement
	Lake Waterford Dam, Lake Waterford, Magothy River	Pool and Weir
	North East Dam, North East River	Breach
	Bloede Dam, Patapsco River	Denil Fishway
	Daniels Dam, Patapsco River	Denil Fishway
	Deep Run Dam, Patapsco River	Removal
	Sawmill Creek Culvert, Patapsco River	Pool and Weir

	Stony Run Dam, Patapsco River	Removal
	Trail Culvert, Sawmill Creek Patapsco River	Pool and Weir
	Union Dam, Patapsco River	Breach
	Hoghole Run Rt. 6 Culvert, Port Tobacco River	Steeppass
	Railroad Trestle, Dorsey Run, Patuxent River	Removal
	Western Branch Rt. 214 Dam, Patuxent River	Removal
	Bacon Ridge Branch Weir, South River	Removal
	North River Culvert, South River	Replacement
	Connowingo Dam, Susquehanna River	Fishlift (2)
	Rt. 1 Culvert, Anacostia River	Baffle System
	Rt. 208, Anacostia River	Breach
	Paint Branch Dam #1, Anacostia River	Breach
	Md Rt. 648, Cattail Creek, Magothy River	Alaskan Steeppass
	Evergreen Road Culvert, Patuxent River	Culvert Replacement
	Horsepen Branch Dam, Patuxent River	Dam Removal
	MD Rt. 234, Budd's Creek (Western Shore)	Steeppass
Pennsylvania		
	Hepburn Stree Dam, West Branch Susquehanna River	Vertical slot
Virginia		
	Battersea Dam, Appomattox River, James River	Natural Breach
	Walkers Dam, Chickahominy River; James River	Denil (2)
	Harrison Lake Dam, Herring Creek; James River	Denil
	Manchester Dam, James River	Breach
	Browns Island Dam, James River	Breach
	Chandler's Mill Dam, Rappahannock River	Denil

Appendix B

Fish Passage Workgroup Members

Chair:

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Members:

Carin Bisland	U.S. Environmental Protection Agency/Chesapeake Bay Program
Scott Carney	Pennsylvania Fish and Boat Commission
William Goldsborough	Chesapeake Bay Foundation
Rick Hoopes	Pennsylvania Fish and Boat Commission
Robert Kelsey	U.S. Fish and Wildlife Service
Larry Leasner	Maryland Department of Natural Resources
John Nichols	National Marine Fisheries Service
Susan Olsen	National Oceanic and Atmospheric Administration
Richard Quinn	U.S. Fish and Wildlife Service
Jon Siemien	District of Columbia Fisheries Branch
Albert Spells	U.S. Fish and Wildlife Service
Alan Weaver	Virginia Department of Game and Inland Fisheries