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Removing Impediments to Migratory Fishes in the Chesapeake Bay Watershed

Annual Progress Report 1997-1998

Prepared by the Fish Passage Workgroup of the Chesapeake Bay Program

Chesapeake Bay Program

July 1999

Printed on Recycled Paper by the U.S. Environmental Protection Agency for the Chesapeake Bay Program

THE CHESAPEAKE BAY PROGRAM

The Chesapeake Bay Program is a unique regional partnership that has led and directed the restoration of the 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 to restore 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 percent by the year 2000. In the 1992 Amendments to the *Chesapeake Bay Agreement*, partners agreed to maintain the 40 percent goal beyond the year 2000 and to attack nutrients at their source–upstream in the tributaries. The Chesapeake Executive Council, comprised 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 reestablishing Bay grasses, protecting and planting riparian forest buffers, opening fish passages, creating and restoring aquatic reefs and Baywide management of fish stocks. Toxic contaminants are declining in many parts of the Bay since regional action plans have been established and a voluntary industrial pollution prevention program was implemented. Other improvements include fisheries and habitat restoration, recovery of Bay grasses, nutrient and toxics reductions and significant advances in estuarine science.

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EXECUTIVE SUMMARY

In 1997 and 1998 the Chesapeake Bay Program signatories opened 294.3 miles of blocked tributary habitat to migratory fish and 67 miles to resident fish (a total of 361.3 miles) within the Bay watershed. Since the program's inception, almost 80 projects have been completed, which opened 523.5 stream miles to migratory fish. An additional 121.5 stream miles are open but not yet accessible due to downstream blockages. These totals include 143.1 miles that were opened before Directive 93-4 was signed. The following lists the workgroup's accomplishments for 1997-98:

- Although the District of Columbia completed no passage projects in 1997-98, DC staff continued to monitor for the occurrence and movements of tagged herring in Rock Creek and the Potomac River. The Interstate Commission for the Potomac River Basin, the Little Falls Task Force and the U.S. Fish and Wildlife Service (USFWS) collected American shad eggs from the Potomac River for culture at Harrison Lake NFH.

- Maryland completed 13 fish passage projects in 1997-98, including eight collapsed dams and weirs with debris removal. These opened 117 stream miles to migratory fish and 3.5 miles that are not yet accessible. Maryland DNR also reared and stocked more than 3 million American shad larvae and 21.8 million hickory shad larvae in the Patuxent, Patapsco, Choptank, Nanticoke and Tuckahoe rivers. USFWS stocked 3.1 million American shad larvae in the upper Potomac River above Little Falls.

- Pennsylvania completed 13 projects in 1997-98, which opened 32 miles to migratory fish and 63.5 miles that are not yet accessible due to downstream dams. The Susquehanna mainstem miles resulted from the construction of multimillion-dollar fish elevators at two FERC-licensed hydroelectric dams. The remaining tributary projects involved demolition and removals. As part of the Susquehanna restoration program, more than 15,000 adult shad and 33,000 adult blueback herring were stocked above dams in 1997-98, as were 20 million cultured shad larvae. Shad and herring returns to Conowingo Dam in 1997 were the highest on record, but numbers fell off in 1998 due to unusually high river flows.

- Virginia completed two projects in 1997-98: fishways at Harvell Dam on the Appomattox River and Bosher Dam on the James River. These opened 143.3 stream miles to anadromous fishes and more than 200 miles of James River tributaries above Richmond. The Virginia Department of Game and Inland Fisheries (VDGIF) continued to monitor shad and herring in the James and Pamunkey rivers and also stocked several thousand adult herring in the upper James River. With assistance from USFWS, VDGIF reared and released more than 21 million shad larvae in the James and Pamunkey rivers.

- All Bay jurisdictions and federal partners were active in education and outreach efforts, providing presentations, fish passage tours and displays at river festivals and other forums.

In addition to presenting 1997-98 and prior year results, this report also discusses fish passage projects currently in the planning, design or construction phases for 1999 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 the Bay's blocked tributary waters to provide access to spawning habitat for anadromous fish. This is accomplished by constructing fish passage facilities; breaching, notching or removing dams; and reconstructing highway culverts. The workgroup includes representatives from the District of Columbia, Maryland, Pennsylvania, Virginia, the U. S. Environmental Protection Agency (US EPA), the USFWS, the National Marine Fisheries Service (NMFS) and the Chesapeake Bay Foundation. An interagency agreement between the US EPA and 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 among these jurisdictions and agencies has opened up many miles of stream habitat to migratory fish.

Fish passage development in Bay tributaries has been under way since the late 1980s. In December 1993 the Chesapeake Bay Executive Council formalized short- and long-term goals for this initiative in Directive 93-4, which instructs CBP partners to open 582.05 and 1,356.75 miles of spawning habitat for shad, alewives and blueback herring by 1998 and 2003, respectively. Of this latter amount, about 143.1 miles were reopened prior to the directive, including 97.1 miles in Maryland, nine miles in Pennsylvania and 37 miles in Virginia. The CBP 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.).

The Bay 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 cultured American shad; trapping and transporting adult shad and herring; surveying stream habitats; and developing public education programs. Jurisdictions and agency representatives of the workgroup are accelerating efforts throughout the watershed to design and construct fish passage and associated projects for the restoration of anadromous fish.

Goals planned for the next few years will greatly boost the number of habitat miles opened to migratory fish, hopefully increasing their abundance. However, as a result of decreasing budgets, all jurisdictions, as well as other state and federal agencies involved, have faced cuts in their fish passage and hatchery support programs. Other common and persistent problems that slow progress include legal difficulties and obstacles raised in negotiating fish passage agreements with public and private property owners.

Throughout this report, mileage accumulation toward Bay Program goals are presented in two categories: stream miles opened and fully accessible to migratory fishes, and miles opened but not yet accessible because of remaining downstream blockages. These latter projects are supported with Bay Program funding, and the miles attained will eventually convert to countable statistics.

This report provides a description of all fish passage development, reintroduction efforts and habitat assessment activities by the signatory jurisdictions. It presents a summary of federal agency activities in 1997-98 and activities and actions planned for 1999. In addition, a "Baywide Summary" relates 1997-98 and prior year actions with the stated five- and 10-year goals of Directive 93-4.

THE DISTRICT OF COLUMBIA

I. Fish Passage Initiatives

Table 1, Figure 1, and Map 1 at the end of this chapter provide details of the 1997-98 fish passage progress in the District of Columbia.

A. Completed Fish Passage Projects

No new fish passage projects were completed in District of Columbia waters in 1997 or 1998.

B. Fish Passage Progress

During the spring seasons of 1997 and 1998, the District of Columbia Fisheries Management Branch (DCFMB) staff, in concert with a telemetry study, conducted weekly monitoring of river herring activity around the lower fish blockage at Pierce Mill Dam in Rock Creek. The objective of this sampling was to document the actual blockage of upstream movement of alewife and blueback herring during the spawning season. This information will be used to document fish usage and available spawning habitat upstream of the blockage. It will also help justify expending funds to have the barrier removed.

C. Monitoring and Stream Surveys

DCFMB continued to monitor the site regularly. It was set up on the lower reach of Rock Creek in 1993 to help determine species composition and abundance in that part of the stream. Electrofishing surveys confirmed the presence of alewives on March 12, 1997 and March 16, 1998. Blueback herring were first detected in Rock Creek on April 30 in both years. In both March and April, after alewife and blueback herring had returned to Rock Creek, some fish were observed moving upstream past the first instream blockage. 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 over this barrier was flow-related. Fish were only able to surmount this obstacle during moderate to high flows. A similar ford at stream mile 3.8 was not surveyed regularly due to its inaccessibility. However, due to its much lower vertical profile, if fish were able to pass the lower ford, this barrier would provide little or no obstacle to upstream migration. Since these two barriers are the last obstructions to fish passage in the first 4.4 stream miles of Rock Creek, once removed, there will be record numbers of fish returning as far upstream as Pierce Mill Dam. In addition to these two blockages, the stream was narrowed by about one-half at about stream mile 0.5. This possible partial blockage, which caused greatly increased velocities for a couple of hundred feet, was due to a roadway construction project over Rock Creek in early 1998. This section of stream was restored to its original condition by late summer.

A radio telemetry study, which had been in the planning stage for several years, was finally completed in the spring of 1997. In this study, five releases, with 10 radio-tagged herring each, were made upstream of Pierce Mill Dam to determine if alewife and blueback herring could pass upstream through the fall-line region of this stream. While anecdotal evidence indicates that historically these species moved upstream well beyond the fall line, this study did not document any movement upstream from the point where the fish were placed in the stream. It is believed that these fish did not continue their migration, since they were not imprinted to these upstream areas, and because spawning population pressure was not great enough to force them upstream. However, many of these fish did stay upstream long enough to complete their spawning cycle before moving back downstream.

An ichthyoplankton juvenile and adult sampling program was continued in 1997-98 to help inventory migratory fish that are reaching the District. Two of the sampling sites are especially important 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, and the other stands near the upstream limit of the District's jurisdiction on the Potomac, about a mile downstream of Little Falls Dam. This dam is a water supply facility for the Washington, D.C. metro area that blocks migratory fish passage to about 10 miles of potential Potomac River spawning and nursery habitat. Migratory fish captured during sampling at these sites help determine the potential population available to recolonize the spawning habitat above the barriers, while ichthyoplankton surveys will help document any improvement in the spawning success of the anadromous species, once the barriers are removed.

In 1997-98 DC Fisheries Research Branch personnel tagged 597 striped bass captured during their monthly river surveys, which are conducted within the District using USFWS tags. Radio tags also were implanted in six striped bass during the 1998 spawning season to determine the amount of time these spawners spend in the District and where they stay while visiting. Recapture of any of these tagged fish will compliment tagging activities carried on in the surrounding jurisdictions.

D. Trap, Transport and Stocking

In 1997-98, in concert with the telemetry study, the DCFMB trapped and transported several hundred adult prespawned alewife and about 100 adult prespawned blueback herring. These fish were released above Pierce Mill Dam. DCFMB intends to continue this activity at least until fish passage is provided at Pierce Mill Dam.

II. Fish Passage Support Activities

A. Public Relations and Education

In 1997-98 the DCFMB made extensive use of its Aquatic Resource Education Center (AREC), which is located on the Anacostia River. More than 6,000 local students and adults received

instruction on the diversity of anadromous and resident fish species found within the District and on the interrelationship of the District's aquatic resources with those of the Bay. In addition, the District, in partnership with the Potomac Electric Power Company (PEPCO) and the National Park Service, began designing an addition to the AREC that will provide for additional classroom space as well as a demonstration hatchery facility. This program has begun and continues to educate the community about the effects that activities in their own backyards can have on the Bay region as a whole. In addition, the DCFMB offers an in-school program that sends staff to area schools to give presentations on the District's aquatic resources. In 1997-98 this program was presented to more than 3,500 students and their teachers. The teachers receive information that can be incorporated into their regular instruction to help reinforce the DCFMB presentations.

B. Future Public Relations and Education

The District of Columbia has committed to educating its residents about the interrelationships among the Potomac and Anacostia rivers and the Chesapeake Bay. To this end, the DCFMB will continue to use its staff and the Aquatic Resources Education Center to communicate its message. In addition, once the addition to AREC is completed, and once there is a fishway at Pierce Mill Dam, the District hopes to work cooperatively with PEPCO and the National Park Service to make these facilities outstanding educational tools. It is believed that an expanded Aquatic Education Resources Center 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. Future Activities

A. Plans for 1999

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

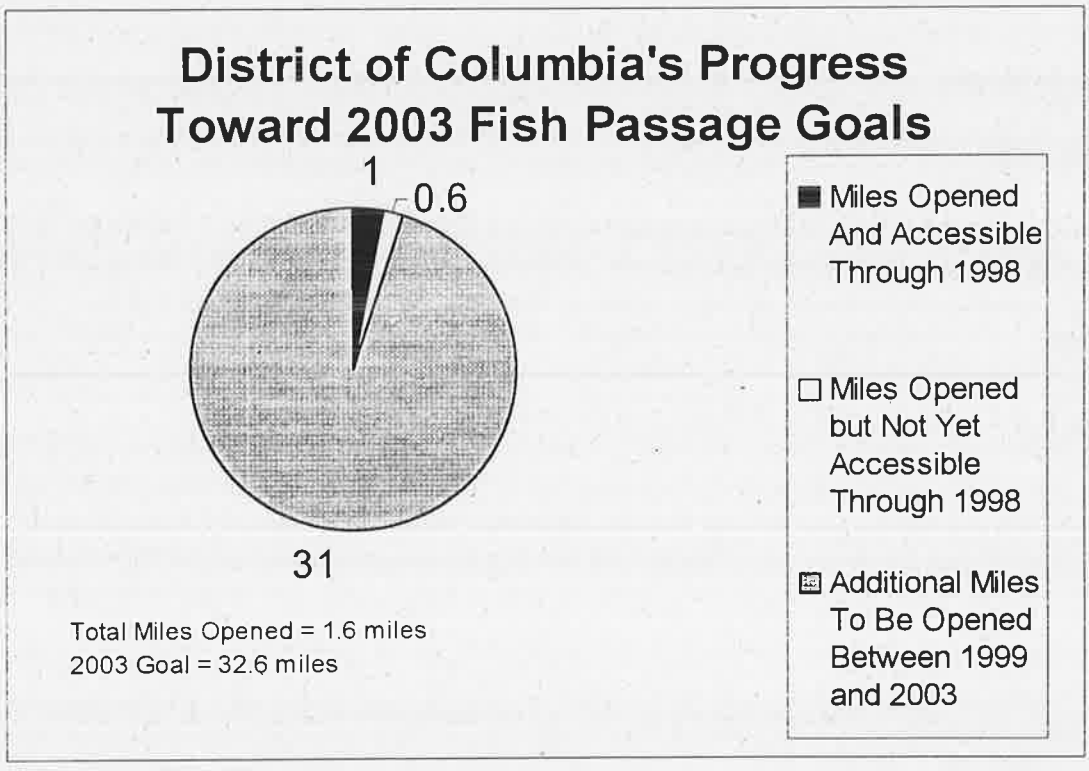
B. Meeting the Chesapeake Bay Program's 10-Year Goal (2003)

A Denil fishway needs to be designed and constructed at Pierce Mill Dam, which is the largest upstream fish passage blockage on Rock Creek within the District of Columbia. In addition to directly benefitting fish passage, this fishway will be used as an educational tool. There are also six low-head barriers that, depending on flow, block fish passage upstream to the Maryland state line. These include five sewer crossings and one ford. In addition to constructing the fishway at Pierce Mill Dam, the DCFMB's 10-year goal is to provide fish passage at the remaining barriers on Rock Creek, up to the Maryland state line. DC's 10-year fish passage goal is 32.6 miles reopened to migratory fish.

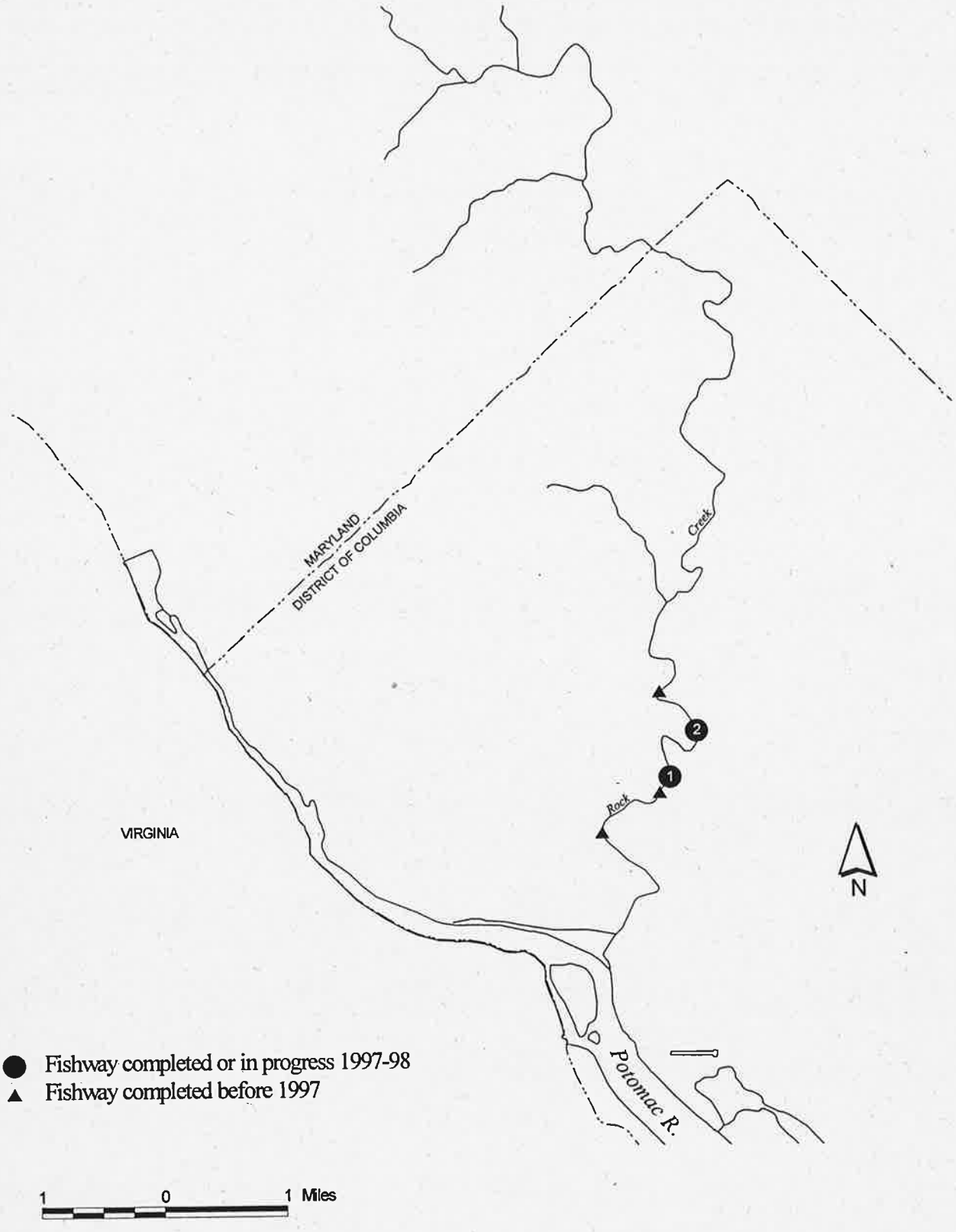
Table 1 - Fish Passage Projects Within the District of Columbia

Map ID #	Project (Stream & River Drainage)	Passage Type	Habitat Opened (Miles)	Funding Source	Status
1	Ford #1, Rock Creek, Potomac River	Removal	0.70	DCFMB	Planned 1999
2	Ford #2, Rock Creek, Potomac River	Removal	1.10	DCFMB	Planned 1999
	Pierce Mill, Rock Creek, Potomac River	Denil	29.2	DCFMB/EPA	Planned

Figure 1. Fish Passage Progress in the District of Columbia



Map 1: Fishway Progress in the District of Columbia



MARYLAND

1. Fish Passage Initiatives

Table 2, Figure 2 and Map 2 at the end of this chapter provide details of 1997-98 fish passage progress in Maryland.

A. Completed Fish Passage Projects (including natural collapse of structures)

Unicorn Dam Fish Passage, Unicorn Branch, Chester River, Queen Anne County: Construction on the Alaskan steeppass fishway was essentially completed in 1996, and the 14.5 stream miles opened to migratory fish were accounted for that year. In 1997 contractors completed repairs of defects and installed handrails and gratings. DNR Fisheries Service biologists, onsite at the Unicorn Hatchery, monitored and kept the Alaskan Steeppass fishway clear of debris during the spring fish migrations in 1997-98. Funding for the design and construction of the fishway was provided through the CBP. CBP also provided approximately 40 percent of the funding toward the dam repairs from the postponed Andover Branch fishway project, while the DNR Fisheries Service provided the remaining 60 percent.

Simkins Dam Fishway, Patapsco River, Baltimore and Howard Counties: Construction of a concrete Denil fishway with wooden baffles on the Simkins Dam was completed by the end of 1997, reopening 3.8 miles of upstream habitat. Fortunately, no major dam repairs were required and the project was completed at a cost below the budgeted amount. The funding required to design and construct this project was provided by a combination of sources, including private mitigation settlements and CBP funding. Simkins Industries, the owners of the dam, donated additional funding and a 38.4-acre parcel of forested land adjacent to the property, which will become part of the Patapsco Valley State Park. The privately-owned dam is located on the Patapsco River about one mile downstream of Ellicott City, Maryland. The Simkins project provides passage at the second of four barriers on the mainstem of the Patapsco, reopening it from Baltimore Harbor to Liberty Reservoir in Carroll County, a distance of 44 miles. Migratory species have not had access to these upper reaches since the first dams were constructed on the Patapsco nearly 155 years ago.

State Highway Administration Road Crossings: Engineering design and construction was completed during 1997 for the following sites:

- Nassawango Creek, Route 12 (Pocomoke River): A notch was completed in the existing weir on the Route 12 culvert. Reopening this blockage provides an additional 49 miles of upstream habitat for anadromous species.

- Gilbert Run, Route 6 (Wicomico River, Western Shore): The removal of the concrete floor at the Route 6 culvert now allows for fish passage. Since the project was completed in September 1997, an additional two miles of upstream habitat is now available to

resident fish.

- Turville Creek, Route 589: A pool and weir fishway have been constructed at this existing weir and culvert on Route 589. The completion of this project in September 1997 provided four additional miles of upstream habitat for anadromous species. Since this project does not drain into the Chesapeake Bay, these miles are not accumulated toward Bay Program goals.

Cypress Branch Dam, Cypress Branch, Chester River, Kent County: The original intent at this site, located at the town of Millington, was to provide an Alaskan Steeppass fishway at the dam's main spillway. However, state regulators would have required the installation of an emergency spillway capable of conveying the 100-year-storm as a permit condition to construct the fishway. This requirement would have been cost-prohibitive; therefore, a more cost-effective means of providing fish passage by removing the existing overflow spillway was chosen. In the interim, the overflow spillway, which was in poor condition, has deteriorated to the extent that migratory fishes can now pass above it, at least to some extent. The blockage removal opens a 28-square-mile drainage basin containing about 28 linear miles of stream, of which 12 miles are available as migratory fish spawning habitat.

Waugh Chapel Road Culvert, Towsers Branch, Little Patuxent River, Anne Arundel County: Fish passage at this site included replacing the road culvert and providing a small weir-type fishway below it. The work was done by the Anne Arundel County Department of Public Works, which owns the culvert. Towsers Branch is blocked by two other downstream structures; therefore, this project reopened 1.2 miles of habitat to resident species only.

USGS Gage, Saint Leonard Creek, Patuxent River, Calvert County: An abandoned USGS gaging weir collapsed, and DNR fish passage staff removed the debris, which reopened 9.5 miles of habitat to migratory fishes.

Pipeline Crossing, Hunting Creek, Patuxent River, Calvert County: The structure collapsed and was removed, reopening 7.4 miles of stream to migratory fishes.

Small unnamed dam, Cocktown Creek, Patuxent River, Calvert County: The structure collapsed and debris was removed, reopening five miles of stream to migratory fishes.

USGS Gage, Western Branch, Patuxent River, Prince Georges County: An abandoned USGS gage collapsed, reopening 2.5 miles to migratory fishes.

USGS Gage, Mattawoman Creek, Potomac River, Charles County: An abandoned USGS gaging weir collapsed and DNR fish passage staff removed the debris. Removal of this blockage has reopened 18 miles of habitat to migratory fishes.

Hancock Run culvert, Potomac River, Charles County: The culvert was replaced by the Charles

County Department of Public Works, reopening 1.3 miles of stream to migratory species.

Boy Scout Dam, Octoraro Creek, Susquehanna River, Cecil County: This small stone dam collapsed and the debris was removed by DNR fish passage staff, reopening 2.3 miles of habitat to resident fishes.

Route 232 culvert, Gilbert Run, Wicomico River: The culvert collapsed and DNR staff assisted in debris removal, opening 2.5 miles of stream habitat.

B. Fishway Progress

Little Falls Dam, Potomac River: The final engineering design plan was completed and approved by the Fish Passage program; the Project Cooperative Agreement (PCA) was approved and signed by both DNR and the Army Corps of Engineers; and Maryland's 25 percent share of the funding will be provided through mitigation settlements. Construction could not be accomplished during 1998 due to delays in resolving permitting issues. Construction is now scheduled to begin in the summer of 1999 and completed by the end of the year. Completion of this fishway will reopen 10 miles of high quality mainstem migratory fish spawning habitat on the Potomac River.

Wilson Mill Dam, Deer Creek, Susquehanna River, Harford County: The final engineering design of a Denil fishway was approved during 1998. Construction is scheduled to begin in 1999 and to be completed before the end of the year. Although available for American shad and river herring, this project is the first Maryland fishway designed specifically for hickory shad. Completion of this project will reopen 24 miles of upstream migratory fish spawning habitat.

Urieville Fishway, Morgan Branch, Chester River, Kent County: A stream survey was conducted in 1997 to evaluate the habitat upstream of the Urieville dam and culvert. The design and construction of a fishway at this site has been canceled due to the low quality and quantity of upstream habitat for anadromous fish and the possible necessity of dredging the 35-acre lake above the dam. The CBP funding for the design and construction of the Urieville fishway will be reallocated to other projects.

Johnsons Pond Fishway, Wicomico River, Wicomico County: The final engineering design was completed during 1998. Although there is sufficient upstream spawning habitat to warrant constructing a fishway at this dam, the project has been canceled due to concerns from the DNR Fisheries Service's freshwater fisheries biologists that the proposed fishway will adversely impact largemouth bass and bluegill fisheries in the headpond.

Dorsey Run Dam, Little Patuxent River, Anne Arundel County: Due to the extensive stream and wetlands restoration, a decision was made to create a new stream channel bypassing the dam, rather than demolishing and removing it. A conceptual stream relocation and fish passage design has been prepared, including several weirs in the new stream channel that will bypass the dam. The overall project is scheduled to be completed in 1999. This project will reopen seven miles of

migratory fish spawning habitat. Fill from the excavation of the stream channel will be used to cover the dam and fill a nearby ditch as part of an overall project to restore 17 acres of riparian wetlands.

Eighth Avenue Dam, Weir and Tributary 9 on Sawmill Creek: The final engineering design plan for a pool and weir fishway and an additional weir at the upstream gage was completed during 1998. Construction is scheduled for early summer 1999. Completion of the Eighth Avenue fishway will reopen 0.9 miles of habitat, and the gage project will reopen an additional 2.3 miles of habitat, for a total of 3.2 miles.

Broadway Branch Dam, Lake Bonnie, Chester River, Caroline County: The final engineering design of an Alaskan steeppass fishway was approved in 1998. Construction of the project is scheduled to begin in July 1999 and be completed in October. Completion of this fishway will reopen 12.5 miles of upstream spawning habitat for migratory species.

Midway Branch Culvert at Range Road, Little Patuxent River, Anne Arundel County: The Midway Branch culvert, located on former property of Fort George G. Meade, is now the property of the USFWS's Patuxent National Wildlife Refuge. The final engineering design was completed in 1998. Construction is scheduled to begin in June 1999 and be completed in October. Completion of this fishway will reopen 1.3 miles of spawning habitat to migratory species.

C. Monitoring and Stream Surveys

In 1997 DNR conducted a catch-and-release angling mortality study at Conowingo Dam. More than 300 angler-caught adult shad were placed in holding tanks for up to 48 hours, and only one fish died. This was a similar result to that of a hooking mortality study conducted on hickory shad in Deer Creek in 1996.

DNR conducted tag-and-recapture population assessments for adult shad in the upper Chesapeake Bay and the Conowingo Dam tailrace. In 1997 a total of 978 fish were marked from pound nets and by angling, and 145 were recovered or seen in the two fish lifts. In 1998 DNR staff captured 337 American shad by hook and line at the tailrace below Conowingo Dam on the Susquehanna River, and 215 were captured in a pound net in the Bay's mainstem off the Army's Aberdeen Proving Ground, for a total of 552 captures. Of this number, 373 were healthy enough for tagging. Thirty-four of the tagged American shad were recaptured or counted at the Conowingo Dam fish lifts, including 31 that were hook-and-line tagged and three that were taken from the pound net. During the low-flow spring season in 1997, 103,945 American shad used the fish lifts at Conowingo Dam, and 46,481 used the lifts during the high-flow season in 1998.

The Maryland DNR Fisheries Service continued to monitor juvenile alosid species in 1997-98. In 1997 seine surveys were done in the Patuxent River on seven separate occasions and resulted in 210 American shad and five hickory shad juveniles. In the Choptank River, 151 American shad were collected during four seine surveys. In 1997 only 29 shad were taken in juvenile finfish seine

surveys in the Upper Bay, of which 21 were stocked in the Susquehanna. In 1998, 144 young shad were taken in 58 seine hauls–the highest observed catch per effort for this species in 35 years. Most fish were wild.

DNR staff monitored the fishways at Van Bibber Dam on Winters Run, a tributary to the Bush River; the dam on Unicorn Branch, a tributary to the Chester River; and at Bloede Dam on the Patapsco River. In 1998 more than 18,500 herring and one hickory shad ascended the Van Bibber fishway; 3,000 herring ascended the Unicorn fishway; and although no target species ascended the Bloede Dam fishway, 11 species of fish passed through the fish ladder. Migratory species found below Bloede Dam included hickory shad, white perch, striped bass and about 1,000 blueback herring that spawned near the dam. This is a very encouraging sign for a river that was closed to migratory fishes for 150 years.

D. Trap, Transport and Stocking

In both 1997 and 1998 Maryland DNR used adult American shad taken by angling and the fish lifts at Conowingo Dam to produce eggs for culture at their Manning Hatchery. Fish spawned naturally in tanks after they were induced with timed-release hormones. Also, mature hickory shad were angled from Deer Creek and used in Manning's tank spawning system.

In 1997 American shad production amounted to 2.834 million fry from Manning and 96,400 fingerlings from PEPCO's Chalk Point ponds. These were all marked and stocked in the Patuxent, Choptank, Patapsco and Nanticoke rivers. Manning also produced 12.384 million hickory shad larvae and 36,000 fingerlings for stocking into the Patuxent, Choptank and Patapsco rivers. In 1998 DNR and PEPCO reared and stocked 197,000 American shad larvae and 33,600 fingerlings into the Choptank and Patuxent rivers, and 11.75 million hickory shad into the Patapsco, Patuxent and Choptank rivers.

II. Fish Passage Support Activities

A. Public Relations and Education

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

B. Stream Assessments and Database Management

Numerous streams were assessed throughout the state's tidal counties for their fish passage potential. Extensive modifications were made to the Maryland Fish Passage database during 1998. Version 3 will be distributed to interested parties during the first quarter of 1999. The database is available to all interested agencies and public groups or individuals.

III Future Activities

A. Planned Activities for 1999

- **Construction:** The following fishways are scheduled for completion: Little Falls Dam; Wilson Mill Dam; Broadway Branch Dam; Dorsey Run Dam; the Range Road culvert at Midway Branch; Eighth Avenue Dam and upstream USGS gage on Sawmill Creek; Dorsey Run stream relocation; and Midway Branch.

- **Design:** Fishway engineering design development is scheduled for: a Denil fishway at Andover Branch Dam, Andover Branch, Chester River, Kent-Queen Anne's counties; a breach or fishway at Octoraro Creek Dam, Octoraro Creek, Susquehanna River, Cecil County; and a widening of the existing breach at Union Dam, Patapsco River, Baltimore-Howard counties.

- **Stream assessments:** Sawmill Creek, Patapsco River; Whitemarsh Run, Bird River; and Mason Branch, Choptank River will be monitored for the presence of target species above fishways. In addition, the fishways at Route 40, Whitemarsh Run; Tuckahoe Dam (below German Branch); and Bloede Dam, Patapsco River will be monitored to determine the target species that ascend them. Streams throughout the tidal counties will be assessed, at least preliminarily, to develop information to make future fish passage decisions.

- **Public outreach:** Outreach and education will continue upon request.

B. Meeting the Chesapeake Bay Program's Five- and 10-Year Goals (1998 and 2003)

Maryland's 10-year goal for fish passage is to open 388.65 miles of streams to migratory fish. Through 1998 the Maryland Fish Passage Program completed 53 projects that opened 288.1 miles of fish spawning habitat, including 281.4 miles that were made available to anadromous fish and 6.7 miles that are currently available only to resident species. Of the 281.4 miles of habitat reopened to migratory species, 110.5 miles were reopened prior to establishing Maryland's five-year goal (210 miles). Therefore, since the 1993 Directive, Maryland has reopened 170.9 miles of stream spawning habitat, achieving 81 percent of its five-year goal.

An additional 59 miles of migratory fish spawning habitat is scheduled to be reopened in 1999, leaving Maryland only about 42 miles short of its year 2003 goal, which it is expected to exceed.

Table 2. Maryland 1997-98 Fish Passage Projects

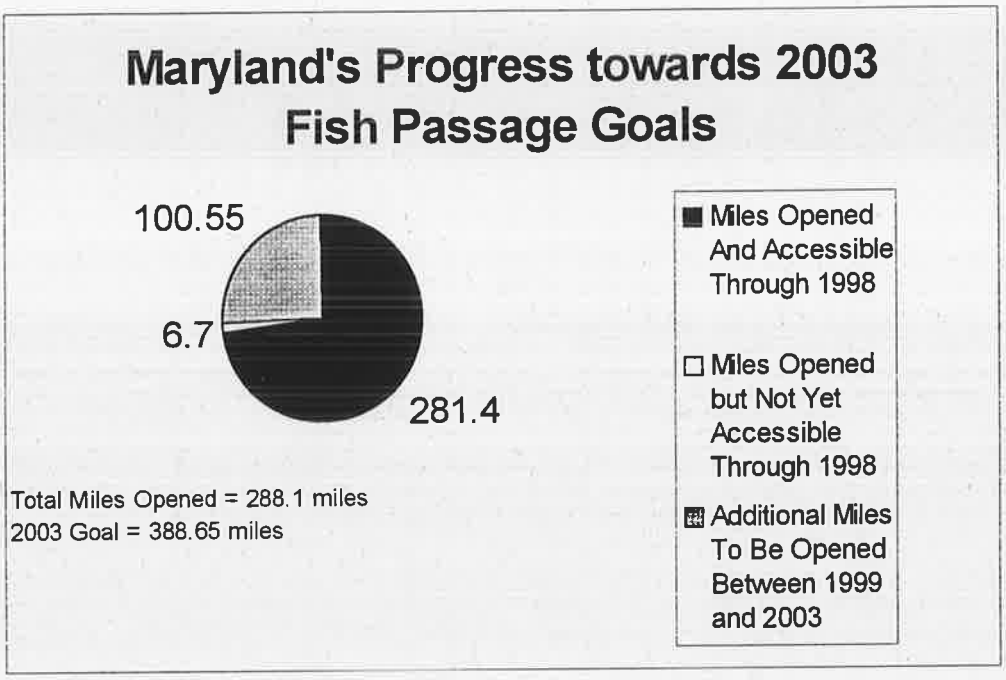
Map ID #	Project (Stream/River Drainage)	Passage Type	Habitat Mileage	Funding	Status
1	Simkins Dam, Patapsco River	Denil	3.8	State/ Federal	Completed 1997
2	Rt 6 Culvert, Gilbert Run Wicomico River (West)	Pool & Weir	2	State	Completed 1997
3	Rt 12 Culvert/USGS Weir, Nassawango Cr. Pocomoke River	Notch	49	State	Completed 1997
4	Cypress Branch Dam, Cypress Branch, Chester River	Breach	12	Federal	Overflow spillway crumbled, passage at some flows, 1998
5	Waugh Chapel Road, Towsers Branch, Little Patuxent River	Replacement & fishway	1.2	State/local	Completed 1998
6	USGS Gage, St. Leonard Creek, Patuxent River	Weir collapse & removal	9.5	State	Completed 1998
7	Pipeline crossing, Hunting Creek, Patuxent River	Weir collapse & removal	7.4	State	Completed 1998
8	Small dam, Cocktown Creek, Patuxent River	Structure collapse	5	State	Completed 1998
9	USGS Gage, Western Branch, Patuxent River	Weir collapse & removal	2.5	State	Completed 1998

Table 2. Maryland Fish Passage Projects (Cont'd.)

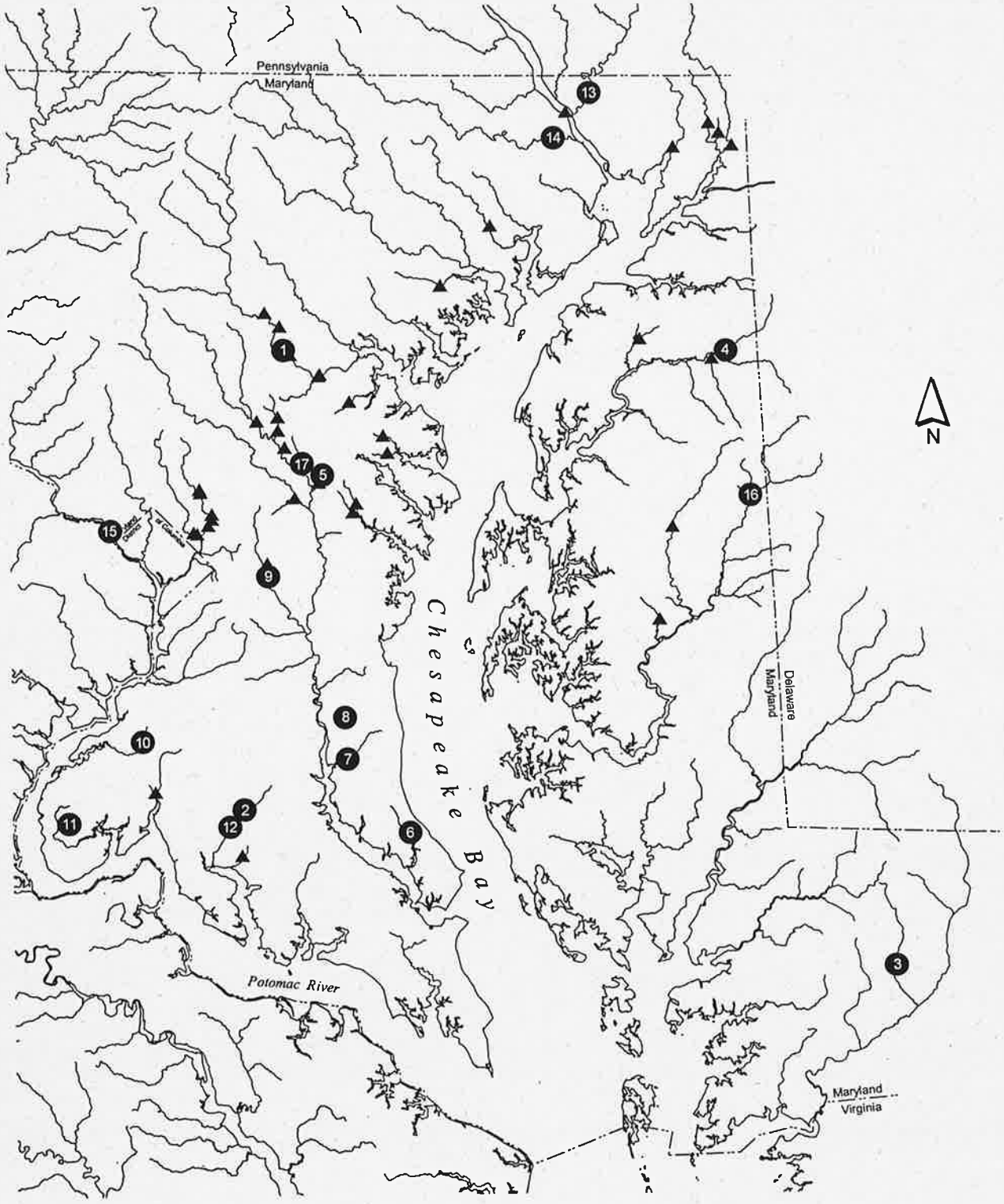
Map ID#	Project (stream & river drainage)	Passage Type	Habitat Opened (miles)	Funding Source	Status
10	USGS Gage, Mattawoman Creek, Potomac River	Weir collapse & removal	18	State	Completed 1998
11	Baptist Church Rd. Culvert, Hancock Run, Potomac River	Replacement	1.3	Local	Completed 1998
12	Route 232 culvert, Gilbert Run, Wicomico River	Collapse & debris removal	2.5	State	Completed 1998
13	Boy Scout dam, Octoraro Creek, Susquehanna River	Collapse & removal	2.3	State	Completed 1998
14	Wilsons Mill Dam, Deer Creek, Susquehanna River	Denil	24	Federal	Design completed 1998, construction 1999
15	Little Falls Dam, Potomac River	Notch and weir system	10	State/federal	Design completed 1998, construction 1999
16	Broadway Branch Dam, Broadway Branch Choptank River	Alaskan Steeppass	12.5	Federal	Design completed 1998, construction 1999
17	Range Road Culvert, Midway Branch, Little Patuxent River	Alaskan Steeppass	1.2	State	Design completed 1998, construction 1999

Map ID#	Project (stream & river drainage)	Passage Type	Habitat Opened (miles)	Funding Source	Status
	Dorsey Run Dam, Dorsey Run, Little Patuxent River	Relocate stream around dam	7	State	Construction 1999
	8th Avenue Dam, Sawmill Creek, Patapsco River	Pool & Weir	0.9	Federal	Conceptual design 1998, final design & construction 1999
	USGS Gage, Sawmill Creek, Patapsco River	Weir	1.3	Federal	Conceptual design completed 1998, final design & construction 1999
	Route 1 Dam, Octoraro Creek, Susquehanna River	Breach or fishway	17.7	Federal	Design 1999, Construction 2000
	Andover Branch Dam Andover Branch, Chester River	Denil	25	Federal	Design 1999, construction funds not available
	Johnson Pond dam, Wicomico River (east)	Denil	3.5		Design completed, construction canceled

Figure 2. Fish Passage Progress in Maryland



Map 2: Fishway Progress in Maryland



● Fishway completed or in progress 1997-98
▲ Fishway completed before 1997

20 0 20 Miles

PENNSYLVANIA

I. Fish Passage Initiatives

Table 3, Figure 3, and Map 3 at the end of this chapter provide details of 1997-98 fish passage progress in Pennsylvania.

A. Completed Fishway Projects

1. Susquehanna Mainstem Blockages

Holtwood and Safe Harbor Dams, Susquehanna River, Lancaster and York Counties: Fish lifts at Holtwood and Safe Harbor dams were completed and in service for the spring 1997 migratory fish season. Together they opened 32 miles of mainstem river to anadromous fish. Each lift experienced mechanical problems, resulting in some out-of-service days. However, both lifts functioned above expectations, considering it was their first season of operation. During its first two years of operation, Holtwood fish lifts passed only about 30 percent of those alosids passed at Conowingo Dam. The lift at Safe Harbor passed about 75 percent of alosids successfully lifted at Holtwood in 1997 and 1998. Poor efficiency in 1998 could be attributed to higher-than-normal river flows during the migratory season.

2. Tributary Blockages

Maple Grove Dam (Lancaster Township Dam), Little Conestoga River, Lancaster County: The breaching and removal of Maple Grove Dam was completed in October 1997, opening 3.2 miles of habitat. Riparian vegetation restoration and stream bank stabilization activities in formerly inundated areas upstream of the dam were completed in the spring of 1998.

Castle Fin Dam, Muddy Creek, York County: Breaching and removal of Castle Fin Dam was completed in September 1997 without complications. Because of a natural cataract below the dam site, this removal opened 4.3 miles of upstream habitat to resident fishes only.

Rock Hill Dam, Conestoga River, Lancaster, County: Rock Hill Dam was breached and removed in early 1997, reopening 18.5 miles of the Conestoga River to anadromous fish runs.

Unnamed Dam, Fishing Creek, Clinton County: A dam on Fishing Creek in Clinton County was breached and removed, opening seven miles stream habitat.

Milesburg Generating Station Water Supply Dam, Spring Creek, Centre County: The dam and impoundment provided a source of coolant water for the coal-powered electrical generating station owned by Allegheny Power. In 1998 Allegheny Power proposed to dismantle the station. The Pennsylvania Fish and Boat Commission (PFBC), which now owns the dam, requested that Allegheny Power remove the dam along with the station. The dam was breached and removed in August 1998. Removal of the dam opened two miles of stream habitat along a significant section of Spring Creek, a premier cold water fishery.

Unnamed Dam, Kishacoquillas Creek, Mifflin County: Removal of the former mill dam near

the intersection of the Kishacoquillas Creek and Route 322 was completed in December 1998. The project was mitigation by the Pennsylvania Department of Transportation (PADOT) for impacts associated with previous road construction projects in the drainage. Removal of the dam opened more than 20 miles of stream habitat, which will be made available to migratory fishes once passage is provided at blockages downstream.

American Paper Products Dams, Conestoga River, Lancaster County: Engineering design for removal of the two mill dams and a warehouse was completed in the spring of 1998. The dams were breached and removed in September 1998; destruction of the warehouse began shortly thereafter. Removal of the dams will open 2.5 miles of habitat, once passage is provided at the next downstream blockage, the City of Lancaster Water Supply Dam. Removal of the warehouse will clear space for the development of a public park.

Millport Conservancy Dam and Warwick Township Road Crossing, Lititz Run, Lancaster County: Breaching and removal of the dam owned by the Millport Conservancy and a concrete slab road crossing owned by Warwick Township was completed in December 1998. Stream bank and riparian restoration in the former inundated area will be under way in 1999. Removal of these blockages and associated habitat restoration activities are part of a much larger effort conducted under the auspices of the award-winning Lititz Run Watershed Alliance to restore stream habitat in the drainage. Removal of both impediments will open four miles of migratory fish habitat, once fish passage at downstream blockages is completed.

East Petersburg Water Authority Dam, Little Conestoga River, Lancaster is County: The former water supply dam was breached and removed in December 1998. Fish passage at numerous blockages downstream needs to be addressed before migratory fish will have access to this section of stream. Removal of the dam will open two miles of migratory fish habitat upon completion of fish passage at downstream blockages.

B. Fish Passage Progress

York Haven Dam, Susquehanna River, Dauphin County: The original open-gate design for the East Channel Dam was modified following concerns from boating interests on Lake Frederick. The new design incorporates an open channel with gate controls and a vertical slot fishway. The conceptual design for the modified fishway was completed in 1997, and the 1993 Agreement between the utilities and fisheries interests was amended to reflect design changes. The physical hydraulic model was tested, and construction and FERC permits were acquired in 1998. Construction began in late July 1998 and, because of favorable weather, the project is progressing ahead of schedule. The target in-service date for the fishway is April 1, 2000, but operational testing likely will occur in late 1999. This project will open 406 miles of the Juniata and North and West Branches of the Susquehanna River.

City of Lancaster Water Supply Dam, Conestoga River, Lancaster County: The City of Lancaster has acquired the assets of the Lancaster Water Authority. A contract for providing fish passage between the PFBC and the city has been drafted and approved by legal council and is in the process of being endorsed. The agreement calls for the engineering design of a Denil fishway to be completed by the spring of 1999 and construction completed by the spring of 2000. Settlement for construction of the fishway follows three years of negotiation

between the PFBC and the City of Lancaster/Lancaster Water Authority. Bay Program funding will finance 100 percent of the costs associated with the final engineering design and 50 percent of the construction costs. The city will provide the 50 percent non-federal match for costs associated with construction. The dam is now the first barrier to migratory fishes on the Conestoga River blocking 11 miles.

Iron Stone Mill Dam, Conestoga River, Lancaster County: Owners of the mill and corresponding water supply dam have been notified of their obligation to provide fish passage. USFWS and PFBC staff will be visiting the site in early 1999 to obtain the necessary information for the development of a conceptual design for permanent fish passage facilities at the dam.

Hellburg's Dam, Conestoga River, Lancaster County: The Hellburg's primary interests in removing their dam is to eliminate a public safety hazard and the associated liability. A contractual agreement between the PFBC and Hellburg's, providing reimbursement of 100 percent of the costs associated with removing the dam, has been fully executed. The engineering design has been completed and the necessary permits have been acquired. Removal of the dam is targeted for the fall of 1999. The dam is the third blockage on the Conestoga River, located approximately four miles upstream of Iron Stone Mill Dam. Its removal will open 17 miles of habitat on the Conestoga River and Cocalico Creek, a major tributary.

Route 322 Dam, Conestoga River, Lancaster County: PADOT will be removing a former mill dam at the intersection of the Conestoga River and U.S. Route 322 as part of a renovation project to upgrade the roadway. PFBC staff is assisting PADOT with in the project. The engineering design is complete and permits are being acquired. Removal is targeted for the summer of 1999.

Iron Mine Run Dam (Dailey's Dam), Swatara Creek, Dauphin County: USFWS engineers have determined that the dam in its present condition is not a complete blockage to migratory fishes. Fish should be able to bypass the dam along the east shoreline where the dam is approximately one foot in height. The PFBC will be monitoring to determine if the dam acts as a significant impediment.

Hershey Food Corporation Dam, Swatara Creek, Dauphin and Lebanon Counties: The USFWS engineering field office has completed conceptual designs for a Denil fishway to be placed on the west side of the dam. The design has been forwarded to Hershey Food Corporation's Environmental Division for comment. The PFBC is negotiating with Hershey Foods to provide the non-federal match for fish passage implementation. At present, Hershey Foods is deliberating the future needs of the dam. The possibility remains that the dam may be breached and removed to fulfill fish passage obligations, restore stream habitat and eliminate liability concerns. This dam is the first blockage on the Swatara. Implementation of fish passage or dam removal will open approximately 38 miles of stream to migratory fishes.

City of Lebanon Authority Water Dam, Swatara Creek, Dauphin and Lebanon Counties: PFBC, USFWS and Lebanon Water Authority held an onsite meeting to discuss provisions for passage at the dam. It was determined that passage could be provided by constructing a one-

to two-foot-deep notch in the dam. USFWS is developing a conceptual design. The PFBC has offered Bay Program funding to finance 50 percent of the final design and 50 percent of construction. The City of Lebanon Water Authority has agreed to construct fish passage facilities following an agreement with Hershey Foods to implement fish passage at their dam, located downstream. Implementation of fish passage at the dam will open approximately 25 miles of stream once fish passage is provided at the downstream blockage.

Carson Long Military Institute Dam, Sherman Creek, Perry County: PFBC and USFWS conducted a site visit to obtain information for the development of a conceptual design for fish passage at the dam. Initial expectations are for a single section of Alaskan steeppass to be installed along the dam's western abutment. Implementation of fish passage at the dam will open approximately 11 miles of stream to migratory fishes.

Hykes Mill Dam, West Conewago Creek, York County: Ice and high flows during 1996 and 1997 have continued to damage the dam, permitting passage of migratory fishes. The PFBC will be monitoring for migratory fishes at the base of the dam to determine if it still acts as a significant impediment.

Detter's Mill Dam, West Conewago Creek, York County: The Pennsylvania Department of Environmental Protection (PADEP), Division of Dam Safety has finished reviewing county tax maps and conducting a deed search to identify the owner of the dam. No owner was identified and the Commonwealth is in the process of assuming ownership of the dam. The dam is in an advanced state of disrepair. Breaching and removal has been identified as the preferred method of mitigating impacts associated with the dam. Engineering design and acquisition of necessary permits is under way, and removal is targeted for the fall of 1999. If necessary, a public meeting will be held to address public concerns of removing the dam.

Good Hope Dam, Conodoguinet Creek, Cumberland County: Good Hope Dam is in advanced disrepair and has no identifiable owner. The PFBC has proposed removing the dam for the purpose of restoring fish passage and stream habitat as well as eliminating a recognized public safety hazard. A public meeting was held in spring 1998 to advance the proposal to breach and remove the dam. Significant opposition to removal was expressed by riparian property owners. PADEP, Division of Dam Safety and the PFBC have agreed to allow groups favoring the dam's refurbishment to generate funding for repairs and implementation of fish passage. A final decision regarding the dam will be made in 1999.

Cave Hill Dam, Conodoguinet Creek, Cumberland County: Cave Hill Dam is owned by the Borough of Carlisle and serves as a municipal water supply. Carlisle is in the process of upgrading the facility, which includes refurbishing the dam. As a permit requirement, the defunct fishway at the dam will be upgraded and made operational. The final engineering design for the fishway is being completed, with construction targeted for 1999.

Meiser's Mill Dam, Mahantango Creek, Perry County: A verbal agreement with the owner to remove the dam has been reached, and a formal contract between the owner and PFBC has been drafted and is under review. Engineering design and acquisition of necessary permits will be initiated in the spring of 1999. Removal is targeted for the fall of 1999.

Muren's Dam, South Branch Codorus Creek, York County: A verbal agreement with the owner to remove the dam has been reached, and a formal contract between the owner and PFBC has been drafted and is under review. Engineering design and the acquisition of necessary permits will be initiated in the spring of 1999. Removal is targeted for the fall of 1999.

Edelman's Dam, Middle Creek, Snyder County: A verbal agreement with the owner to remove the dam has been reached, and a formal contract between the owner and PFBC has been drafted and is under review. Engineering design and the acquisition of necessary permits will be initiated in the spring of 1999. Removal is targeted for the fall of 1999.

Barnitz Mill Dam, Yellow Breeches Creek, Cumberland County: A verbal agreement with the owner to remove the dam has been reached, and a formal contract between the owner and PFBC has been drafted and is under review. Engineering design and the acquisition of necessary permits will be initiated in the spring of 1999.

Brown's Dam, Mill Creek, Lancaster County: The owner of the dam has requested the assistance of PFBC to explore removal of the dam. PFBC has contacted riparian property owners to provide input on a proposal to remove the dam. Numerous responses have been received, most in opposition. It has not yet been determined if the owner will proceed with removal of the dam.

C. Monitoring and Stream Surveys

Conowingo Dam fish lifts collected a record 104,000 American shad and more than 370,000 blueback herring during the 1997 spring migration. New fish lifts at Holtwood and Safe Harbor passed 28,000 and 21,000 American shad, respectively. River herring passage at Holtwood and Safe Harbor was 1,000 and 500, respectively. Otolith analysis determined that 60 percent of the returning adults were wild fish, and the remaining 40 percent were hatchery. Monitoring of outmigrating juvenile American shad in the autumn of 1997 indicated only limited reproduction of past and trucked adults, with approximately 11 percent of the outmigrants collected above Conowingo Dam identified as wild fish.

In 1998 Conowingo Dam fish lifts collected approximately 46,000 American shad and 5,000 blueback herring. Holtwood and Safe Harbor facilities passed 8,200 and 6,000 American shad, respectively. Few river herring were caught at either facility. Otolith analysis determined that 71 percent of the returning adults were wild fish, and the remaining 29 percent were hatchery. Monitoring of outmigrating juvenile American shad in the autumn of 1998 indicated only limited reproduction of past and trucked adults, with approximately 7 percent of the outmigrants collected above Conowingo Dam identified as wild fish. Higher than normal river flows followed by elevated water temperatures affected lift efficiency and shortened the duration of the spawning run. Runs of river herring were virtually missed because the lifts at Conowingo were inoperable due to high flows.

D. Trap, Transport and Stocking

The trap and transport of alosids from Conowingo Dam West fish lift was funded by the

Susquehanna River Anadromous Fish Restoration Cooperative, with support from CBP. Approximately 10,500 prespawn American shad and 28,000 blueback herring were transported and stocked in 1997. The primary release site for shad was at the Tri-County Marina, upstream of York Haven Dam. Herring were released at Tri-County (17,000) and three tributaries: Conestoga River (3,100), Little Conestoga River (3,000) and Conodoguinet Creek (5,000). In 1998 only 4,500 American shad were stocked at Tri-County. Transported blueback herring numbered 4,700. Herring were stocked at Tri-County (1,000) and Little Conestoga River (3,700). High spring flows reduced the West Lift's efficiency and the ability to capture alosids early in the season.

A total of 22.8 million American shad eggs were received and incubated at PFBC Van Dyke Anadromous Fish Research Station in 1997. Of these, 10.6 million (46 percent) were successfully hatched. Approximately eight million American shad fry were marked and stocked in the Susquehanna drainage, including three million in the Juniata River; 2.8 million in the Susquehanna River; 620,000 in the West Branch of the Susquehanna River; 1.2 million in the North Branch of Susquehanna River; and 405,000 in two lower tributaries, Conodoguinet Creek and Conestoga River. Biomonitoring determined that approximately 89 percent of the outmigrating juveniles captured in fall 1997 were of hatchery origin.

A total of 27.8 million American shad eggs were received and incubated at Van Dyke in 1998. Of these, 15.9 million (57 percent) were successfully hatched. Approximately 11.8 million American shad fry were marked and stocked in the Susquehanna drainage, including 7.7 million in the Juniata River; 1.8 million in the Susquehanna River; 56,000 in the West Branch of the Susquehanna River; 1.1 million in the North Branch of the Susquehanna River; and 1.8 million into four lower tributaries, Swatara Creek, W. Conewago Creek, Conodoguinet Creek and the Conestoga River. Biomonitoring determined that approximately 93 percent of the outmigrating juveniles captured in fall 1998 were of hatchery origin. The USFWS Hatchery in Lamar, PA began tank spawning operations and produced 3.2 million shad eggs from Susquehanna River American shad.

II. Fish Passage Support Activities

A. Public Relations and Education

In 1997-98 PFBC staff displayed an exhibit on American shad restoration in the Susquehanna River at events throughout Pennsylvania. Numerous slide presentations on migratory fish restoration were given by staff to various sportsman, environmental and special interests groups.

A dedication ceremony for the fish lifts at Holtwood and Safe Harbor was conducted in the spring of 1997. The ceremony was by invitation only, and more than 200 dignitaries attended. Media coverage of the ceremony was extensive. Public tours of the fish passage facilities at Safe Harbor were booked throughout the lift operation season.

A shad festival and stocking event sponsored by PFBC and the Chesapeake Bay Foundation was held in Huntingdon on the Juniata River during the spring of 1997. The event was extensively covered by local newspaper, radio and television media.

A Conservation Award was presented to the Borough of Huntingdon for constructing fish passage facilities at their Water Supply Dam on Standing Stone Creek.

The PFBC Anadromous Fish Restoration Unit gave numerous tours of the Van Dyke Research Station for Anadromous Fish to organizations and groups in 1997 and 1998.

B. Future Public Relations and Education

The PFBC will conduct additional media events pertaining to migratory fish restoration in the Susquehanna Basin. Numerous slide presentations and exhibits on migratory fish restoration also are scheduled for 1999.

A video outlining PFBC efforts to restore American shad and other migratory fishes was completed by Commonwealth Media. It will be available for distribution to the public in 1999.

Planning for a shad educational event sponsored by the PFBC Bureau of Boating and Education is under way. The event will be held at Holtwood and Safe Harbor dams in the spring of 1999.

Initiatives to expand PFBC's public education and awareness efforts with regard to the CBP and migratory fish restoration in Pennsylvania continue. PFBC, in conjunction with the CBP, is planning a media event to cover the dedication of the new fishway at York Haven Dam in the spring of 2000.

Pennsylvania's American shad restoration brochure will be revised and updated in late 1999.

III. Future Activities

A. Plans for 1999

- Breach and remove Detter's Mill Dam, Hellburg's Dam, Meiser's Mill Dam, Muren's Dam, Edleman's Dam and Barnitz Mill Dam.
- Negotiate agreements for fish passage at Hershey Food Corporation Dam, Carson Long Military Academy Dam, and Good Hope Dam.
- Complete final engineering design for fish passage facilities at the Fabri Dam in Sunbury, City of Lancaster Water Supply Dam, Hershey Food Corporation Dam, City of Lebanon Water Authority Dam, Cave Hill Dam and Carson Long Military Academy Dam.
- Start construction of fishways at Cave Hill Dam and City of Lancaster Water Supply Dam.
- Continue to expand PFBC public education and awareness initiatives and to develop programs to identify and acquire additional funding to supplement existing monies for

the removal of tributary blockages.

B. Meeting the Chesapeake Bay Program's Five- and 10-Year Goals (1998 and 2003)

The five-year goal for Pennsylvania is 32 miles. This was achieved in 1997 with the completion of fish passage facilities at Holtwood and Safe Harbor dams. These projects also made accessible an additional 38 miles of tributaries, third order or larger (not counted toward goal), from their mouths to the first upstream blockage. Between 1996 and 1998, 105 miles of tributaries not previously included in Pennsylvania's Bay Program goals were opened, following the completion of fish passage and dam removal projects.

The 10-year goal for Pennsylvania is 520 miles. Pennsylvania will meet its 10-year goal once fish passage is provided at York Haven Dam (in April 2000). Bonus miles will be acquired by providing fish passage at high priority blockages.

Table 3. Pennsylvania 1997-98 Fish Passage Projects Completed, in Progress, or Planned for the Susquehanna River Basin

Map ID#	Project (stream & river drainage)	Passage Type	Habitat Opened (miles)	Funding Source	Status
1	Holtwood Dam, Susquehanna River	Lift	9	PP&L	Completed 1997
2	Safe Harbor Dam, Susquehanna River	Lift	23	Safe Harbor Water Power Corp.	Completed 1997
3	York Haven Dam, Susquehanna River	Vertical slot fishway	406	GPU-GENCO.	Completion target: 2000
4	Rock Hill Dam, Conestoga River	Breach & remove	18.5	EPA/NMFS/PFBC	Completed 1997
5	Maple Grove Dam, L. Conestoga River	Breach& remove	3.2	EPA/NMFS/PFBC/ Lancaster Twp.	Completed 1997
6	Castle Fin Dam, Muddy Creek	Breach & remove	4.3	EPA/NMFS/PECO	Completed 1997
7	Unnamed Dam, Fishing Creek, Clinton Co.	Breach & remove	7	EPA/NMFS/PFBC	Completed 1997
8	American Paper Products Co. Dam, Conestoga River	Breach & remove	2.5	EPA/NMFS/PFBC/ Mannheim Twp.	Completed 1998
9	East Petersburg Authority Dam, Little Conestoga River	Breach & remove	2	EPA/NMFS/PFBC	Completed 1998

Table 3. Pennsylvania Fish Passage Projects (Cont'd.)

Map ID#	Project (stream & river drainage)	Passage Type	Habitat Opened (miles)	Funding Source	Status
10	Millport Conservancy Dam, Lititz Run, Conastoga River	Breach & remove	2	EPA/NMFS/PFBC/ Warwick Twp.	Completed 1998
10	Unnamed dam (road crossing), Lititz Run, Conastoga River	Breach & remove	2	EPA/NMFS/PFBC Warwick Twp.	Completed 1998
11	Unnamed Dam, Kishacoquillas Creek, Juniata River	Breach & remove	20	PADOT	Completed 1998
12	Unnamed dam, Laurel Creek, Juniata River	Breach & remove	1	PA Dept. Cons. & Natural Res.	Completed 1998
13	Milesburg Power Generating Station, Spring Creek, Centre Co.	Breach & remove	2	PFBC/Allegheny Power	Completed 1998
14	Rose Hill Intake Dam, Kettle Creek, Little Juniata River	Breach & remove	1.5	Private	Completed 1998
15	Hellburg's Dam, Conestoga River	Breach & remove	14.7	EPA/NMFS/PFBC	Contract executed, completion fall 1999
16	Route 322 Dam, Conestoga River	Breach & remove	2	PADOT	Completion spring 1999
17	Detter's Mill Dam, W. Conewago Creek	Breach & remove	2.3	EPA/NMFS/PFBC	Completion fall 1999

Table 3. Pennsylvania Fish Passage Projects (Cont'd.)

Map ID#	Project (stream & river drainage)	Passage Type	Habitat Opened (miles)	Funding Source	Status
18	Muren's Dam, S. Branch Codorus Creek	Breach & remove	unknown	EPA/NMFS/ PFBC	Contract under review, completion fall 1999
19	Edelman's Dam, Middle Creek	Breach & remove	unknown	EPA/NMFS/ PFBC/ Private	Contract under review, completion fall 1999
	Yorkana Dam, tributary to Codorus Creek	Breach & remove	< 1 mile	Private	Completed 1997
	Yorktown Paper Co. Dam, tributary to Codorus Creek	Breach & remove	< 1 mile	Private	Completed 1997
	Fabri Dam, Susquehanna River	Vertical slot fishway	Not a complete blockage, passage permitted until late May	PA Dept. Cons. & Natural Res.	Conceptual design ongoing
	Warrior Ridge Dam, Frankstown Branch Juniata River	Undetermined	81.3	American Hydro Power Corp.	FERC permit requirement
	Brown's Dam, Mill Creek	Breach & remove	<1	EPA/NMFS/ PFBC/ Private	Negotiations

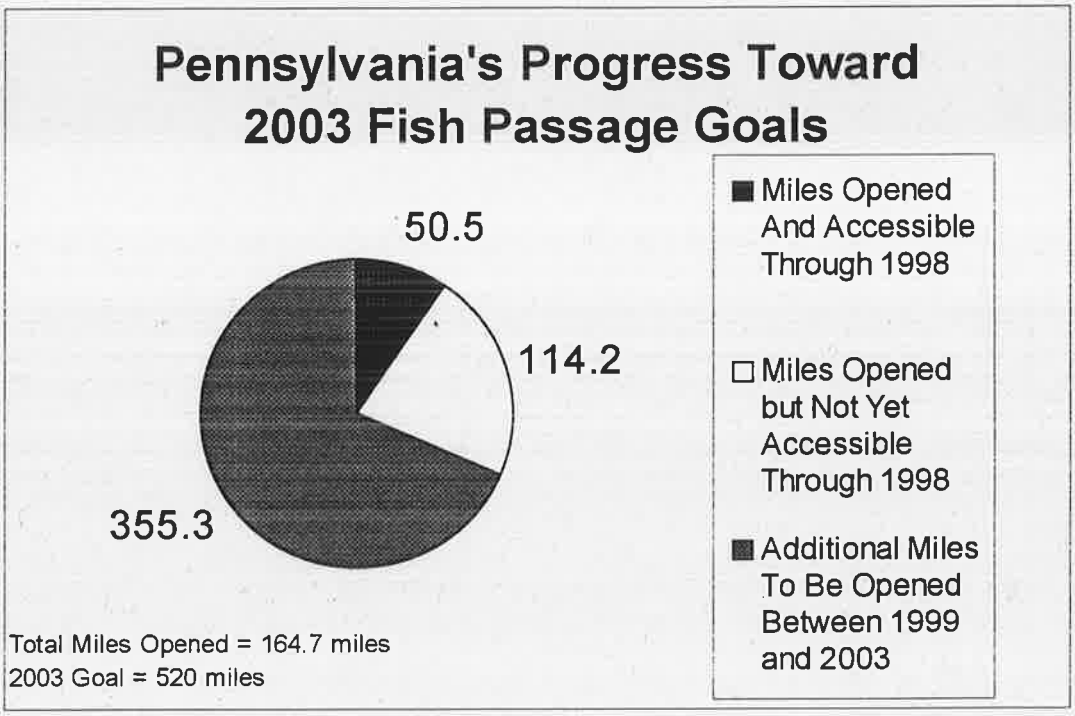
Table 3. Pennsylvania Fish Passage Projects (Cont'd.)

Map ID#	Project (stream & river drainage)	Passage Type	Habitat Opened (miles)	Funding Source	Status
	Lancaster Water Authority Dam, Conestoga River	Denil	11	EPA/NMFS/PFBC/ City of Lancaster	Contract under draft, completion spring 2000
	Iron Stone Mill Dam, Conestoga River	Denil	4.3	EPA/NMFS/PFBC	Negotiations
	City of Lebanon Water Supply Dam, Swatara Creek	Notch	24.2	EPA/NMFS/PFBC/ Lebanon	Verbal Agreement
	Issack's Dam, L. Conestoga River	Undetermined	4.8	EPA/NMFS/PFBC	Negotiations
	Daily's Dam, Swatara Creek	Breach permits passage	9.2		No action expected, natural breach
	Good Hope (Brenneman) Dam, Conodoguinet Creek	Undetermined	22.2	EPA/ NMFS/	Negotiations
	Cave Hill Dam, Conodoguinet Creek	Denil	9.2	Borough of Carlisle	State permit requirement
	Meiser's Mill Dam, Mahantango Creek	Breach & remove	unknown	EPA/NMFS/PFBC/ Private	Contract under review, completion fall 1999

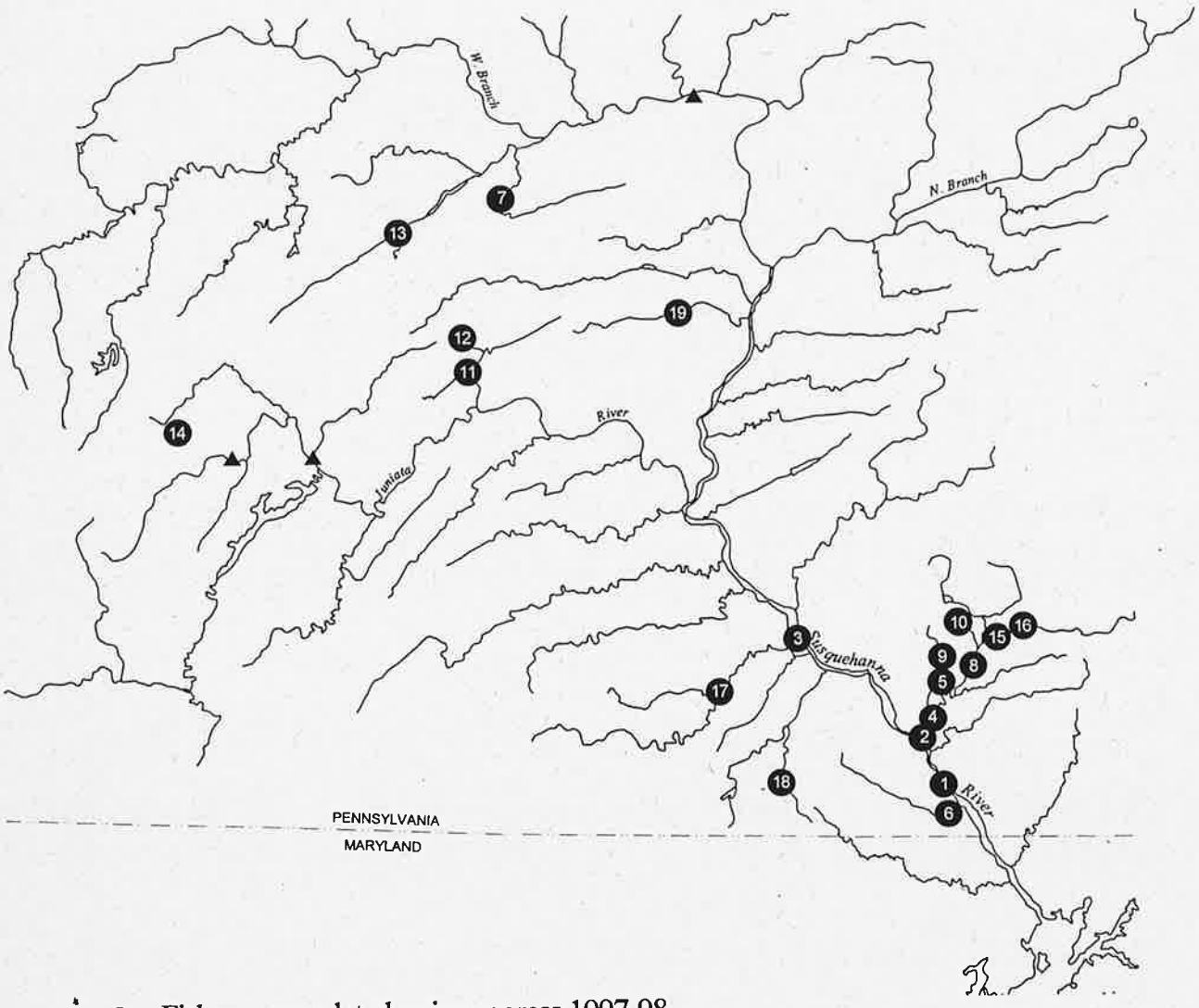
Table 3. Pennsylvania Fish Passage Projects (Cont'd.)

	Barnitz Mill Dam, Yellow Breeches Creek	Breach & remove	unknown	EPA/NMFS/PFBC/ Dickenson Twp.	Contract being drafted, completion fall 1999
	Carson Long Dam, Sherman's Creek	Denil (steep pass)	11	EPA/ NMFS/ PFBC Carson Long	Negotiations

Figure 3. Fish Passage Progress in Pennsylvania



Map 3: Fishway Progress in Pennsylvania



● Fishway completed or in progress 1997-98
▲ Fishway completed before 1997

20 0 20 40 Miles

N

VIRGINIA

I. Fish Passage Initiatives

Table 4, Figure 4 and Map 4 at the end of this chapter provide details of 1997-98 fish passage progress in Virginia.

A. Completed Fish Passage Projects

In 1997 construction of a Denil fishway on Harvell Dam (Appomattox River) began and was partially completed and operated in the spring of 1998. The Harvell fishway reopened 5.7 miles of the Appomattox River. Construction of a vertical slot fishway was begun in 1997 on Bosher Dam (on the James River) and was substantially completed in 1998, but will not be operational until the spring of 1999. The Bosher fishway reopens 137.6 miles of the James River.

B. Fish Passage Progress

Harvell Dam, Appomattox River, City of Petersburg: Most of the construction of a Denil fishway for this nine-foot-high dam was completed in accordance with Federal Energy Regulatory Commission (FERC) orders. FERC also granted the owner's request to generate up to March 1, 1997 even though the fishway was not yet completed. Permit amendments were obtained from the Virginia Marine Resources Commission (VMRC) and the U.S. Army Corps of Engineers (US COE) to allow for instream work during the 1997 spawning season, as long as work was directly related to fishway construction. An official waiver of the construction time-of-year restriction from FERC was granted, and fishway construction reconvened. FERC also permitted start of generation prior to June 30, 1997, which allowed for lowering the head pond elevation enough to continue construction.

Fortunately for the purposes of construction and dam leak repairs, Appomattox River flows were relatively low in 1997. By the spring of 1998, the spillway entrance channel went online. The owner did some preliminary fish counts at the exit channel window and reported seeing thousands of gizzard shad, a few herring and shad and at least one small striped bass. The Virginia coordinator worked with the owner to prepare him and his workers to identify fish.

After the 1998 spawning season, construction continued on the new hydropower units that are adjacent to the fishway. In the spring of 1999, the tailrace entrance channel should be operated to improve the fishway's efficiency at passing target species. The fishway reopened 5.7 miles of spawning habitat, up to the Abutment Dam at Petersburg.

Bosher Dam, James River, Henrico County: This 10-foot-high dam is the last blockage to migratory fishes on the James River in Richmond. The recently constructed vertical slot fishway reopens 137.6 mainstem miles of anadromous fish spawning habitat up to Lynchburg. Approximately 200 miles of potential spawning habitat on tributaries also will become accessible, including 36.3 miles of documented spawning habitat on the Rivanna River. This fishway is a major milestone for the Virginia Fish Passage Project as well as for the CBP.

USFWS provided a conceptual plan in 1994. Funding for the final design was provided by an

EPA/NOAA grant to the VDGIF, which was, in turn, granted to the City of Richmond (City) to hire J.K. Timmons & Associates in February 1996. The final design was completed in August 1996. Three construction bids were opened on September 13, 1996 and, unfortunately, the lowest bid was more than twice the budget. A construction grant was approved by City Council pending sufficient fund raising.

Additional fund raising, coordinated by the James River Association, became the main focus of this project. The following entities committed additional funding to the project: (1) the Virginia General Assembly, (2) VMRC (from recreational and commercial licenses), (3) the City of Richmond, (4) Henrico County and (5) several charitable foundations. Also, additional EPA/NOAA grant funds became available because the Ashland Mill Dam and Ruffins Pond Dam projects were postponed and the funding was transferred to the Bosher project to help meet the low bid.

All permitting was finalized, and an official Notice to Proceed was issued on June 23, 1997. A ground-breaking ceremony followed in July. Despite relatively low flows on the James River early on, progress was delayed significantly by high water when the river rose to three-fourths bank full in November. After raising and armoring the lower cofferdam, English Construction, Inc. installed the attraction water manhole and 48-inch pipe. Completion was initially scheduled for March 1998, in time for the spring spawning run of American shad and river herring.

Severe flooding of the James River occurred from January through May 1998, thus preventing construction progress. The 1998 spawning run was missed. The river returned to and remained at normal flows through the end of 1998, allowing the fishway to be substantially completed. The only remaining work at the end of 1998 was to finish installing some baffles and remove the cofferdams. In 1999 the VDGIF will evaluate the efficiency of the fishway and collect a small subsample of adult shad as part of the hatchery product evaluation.

Ashland Mill Dam, South Anna River: No action was taken on this issue in 1997 or 1998, other than to continue to document the shad and herring reaching the dam. This project was postponed in 1995 when the owner would not fully cooperate. CBP funds originally granted for the Ashland project were extended and transferred to the Ruffins Pond Dam fishway project in 1995 and then to the Bosher Dam fishway project in 1997.

Ruffins Pond Dam, Massaponax Creek, Rappahannock River: CBP funds originally designated for fish passage at Ashland Mill Dam were extended and transferred in 1995 to Ruffins Pond Dam near Fredericksburg. There is a good herring run at this dam, which is about a quarter mile from the confluence with the Rappahannock River. This 16-foot-high dam blocks 3.5 miles of Massaponax Creek and 4.5 miles of a permanent tributary for a total of eight miles.

J.K. Timmons & Associates completed the final design for this fishway in 1996, and bids were opened on February 26, 1997. Unfortunately, both bids were more than twice the amount of grant money remaining for construction. The dam owner, Tarmac, considered donating concrete and rip-rap. However, there was still insufficient funding to proceed. Since the Grant Contract between VDGIF and Tarmac clearly stated that neither party was obligated over and above the original grant contract amount, VDGIF received a grant amendment and extension to use the money on the Bosher Dam fishway.

Embrey Dam, Rappahannock River, Spotsylvania County: This 22-foot-high dam on the Rappahannock River in Fredericksburg is the only mainstem migration impediment. Fish passage at Embrey would reopen 70.6 miles of the mainstem Rappahannock. In 1994 a sediment study was conducted to determine if toxic substances are present in the sediment behind the dam. Early in 1995 the Virginia DEQ determined that these sediments are comparable to other sediments upstream and that there was very low probability of characterizing them as hazardous waste as defined in VR 672-20-10. These results allow for consideration of removing all or part of the dam.

The City of Fredericksburg and Spotsylvania County are building a cooperative water plant at Mott's Run Reservoir, which is on a tributary to the Rappahannock a few miles upstream of Embrey. This will make Embrey obsolete as a drinking water supply by early 1999.

In February 1997 the VDGIF was instructed by Virginia Senate Joint Resolution No. 296 to conduct a feasibility study on providing fish passage at Embrey Dam. J.K. Timmons & Associates was hired in June 1997 to complete this study, which included a synthesis of all previous studies; the development of technical and local decision matrices; recommendations; and cost estimates for various scenarios. Timmons subcontracted GKY & Associates to evaluate the sediment load entrapped by the dam and to conduct a sediment fate and transport study (HEC-6 model). Throughout the study all interested parties and agencies were included in discussions, and their comments were incorporated in the decision-making process. The report was submitted to the General Assembly in December for review in the 1998 session. The study (*Senate Document 18*) is now available for use in the decision-making process.

In 1998 the U.S. Army Corps of Engineers conducted a reconnaissance study of the proposed environmental restoration project on the Rappahannock River that consists primarily of the Embrey issue. The reconnaissance phase was 100 percent federally funded. During that phase a federal interest was determined and the potential cost-sharing partners for a three-year feasibility study were identified. The feasibility study will require a 50 percent non-federal match. If the Commonwealth of Virginia, the City of Fredericksburg and possibly Stafford County, agree to the project and secure the appropriate funding, the feasibility study will proceed. Under this scenario, the dam would not be removed until at least 2003.

C. Monitoring and Stream Surveys

Adult Alosid Monitoring: During the springs of 1997 and 1998 shad and herring spawning runs were monitored by the Fish Passage Coordinator and other Fish Division staff throughout Virginia. Electrofishing for *Alosa* spp. was conducted at the following sites: below Harvell Dam on the Appomattox River; in Swift Creek (tributary to Appomattox); below Walker's Dam on the Chickahominy River; below Embrey Dam down to the fall line/tidal interface on the Rappahannock River at Rt. 1; below Ashland Mill Dam on the South Anna River; and in the upper Mattaponi River. American shad showed up in collections for the first time in several years at Harvell and Embrey dams in 1998. Under a City of Richmond contract, Virginia Commonwealth University (VCU) monitored the James River at the base of the fall line (at 14th Street) and below Bosher Dam. A few bluebacks were also seen at Bosher Dam in 1998. Commercial watermen working for VDGIF and USFWS also monitored American shad on the Pamunkey River during egg collection. VCU biologists determined age and growth rates for broodstock shad.

Juvenile Alosid Monitoring: One important addition to the sampling protocol was the establishment of a coding system for one-half-mile transects on the James. Sites are randomly picked, and the code identifies the river, river mile, gear and location. Data collected now will be very important when natural spawning information is collected above Bosher Dam in the future.

Nighttime ichthyoplankton samples were taken on the James River above Bosher Dam by pushing a 500μ mesh net in front of a jon boat. Small (30-40 mm) juvenile American shad were collected with the ichthyoplankton net in June and July of 1997 and 1998.

Juvenile American shad were collected above and below Bosher Dam on the James River from July through October of 1997 using pushnet and electrofishing sampling techniques. This documented the initial success for the 1997 shad stocking program. All of the shad otoliths examined from fish collected above Bosher Dam displayed the oxytetracycline (OTC) mark received in the hatchery prior to stocking. Approximately 80 percent of the American shad juveniles collected below Bosher Dam were also of hatchery origin. OTC marking is a valuable tool for evaluating the overall contributions of wild and hatchery fish to the system, and will be especially valuable after the fishway is passing fish above Bosher Dam.

In 1998 juvenile American shad were far more scarce above Bosher Dam than in 1997. Only six individuals were collected above the dam from May through November. The June ichthyoplankton sampling resulted in only one individual, and the pushnet sampling also resulted in only one individual in November. In July, one individual was collecting by boat electrofishing and in November three more individuals were collected. The visual location and prepositioned shocking technique that was successful in 1997 was unsuccessful in 1998 after several attempts.

Juvenile blueback herring were collected above Bosher Dam with the pushnet in August 1997 and from July through December below the dam (tidal areas) in both 1997 and 1998. Finding herring juveniles above Bosher Dam provides evidence that at least a portion of the stocked adults were able to spawn successfully in 1997, and that the eggs hatched and the fry survived to the juvenile phase. This adds to the significance of finding American shad juveniles above the dam: it indicates that the habitat is conducive to natural alosid spawning and recruitment to the juvenile life stage.

Rappahannock River Basin Impediment Survey: VCU completed Year 2 and Year 3 of this four-year study, and the contract continues with VDGIF to complete Year 4 in 1999. CBP funds are being used to conduct a comprehensive survey of impediments on Rappahannock River tributaries. Biological sampling in the second year focused on boat electrofishing in larger, non-wadeable streams. The 1996-97 sampling collected a total of 67 fish species, representing 21 families in the study area. This included all four *Alosa* species. Years 2 and 3 also included further habitat data collection, and several statistical analyses were initiated that describe habitat relationships of the target alosids. This may lead to a quantitative alosid habitat model that could be a useful tool for setting habitat restoration goals. The entire basin will be surveyed over the four-year period, and these surveys will provide information necessary for setting fish passage priorities in the basin.

D. Trap, Transport and Stocking

Herring Trap and Transport: The Fish Passage Coordinator and other Fish Division staff, in cooperation with USFWS, conducted a trap and transport project for blueback herring in late April and early May 1997. A total of 5,092 prespawned blueback herring were collected by electrofishing below Walker's Dam on the Chickahominy River and transported in circular tanks to several stocking sites. These included 3,576 to Columbia on the James (45 miles above Bosher Dam), 956 in Byrd Creek (a tributary above Bosher) and 560 in Harrison Lake (on Herring Creek–a tributary of the lower James). There is a Denil fishway at Harrison Lake Dam.

A new 950-gallon circular tank was delivered to the VDGIF in June of 1997 and was outfitted for use in 1998. Blueback herring trap and transport was conducted from April 13 through April 30, 1998. A total of 5,649 prespawned blueback herring were transported from the Chickahominy River at Walker's Dam to the James River and several James River tributaries. USFWS personnel helped haul approximately 1,000 of those fish for the VDGIF to Maiden's Landing. The electrofishing catch per unit effort (CPUE) varied greatly at the collection site, ranging from 221 fish/hr up to 2,662 fish/hr. Average herring CPUE in 1998 was only 842/hr, which is indicative of a weak spawning run, considering a rough yearly average of about 2000 fish/hr. Fish were dense enough at the dam to allow for rapid collection on only two of 12 collection days. Transport mortality was greatly reduced with the use of the new VDGIF tank compared to previous years. Resulting herring juveniles should imprint on the upstream habitat, and those that successfully recruit to the adult stock should return to the James River in three to five years to spawn.

American Shad Restoration: In 1997 VDGIF biologists, assisted by 11 Virginia watermen (funded by VMRC), captured 1,444 brood shad on the Pamunkey River. Approximately 15.3 million eggs were taken from the brood fish and sent to VDGIF's King and Queen State Fish Cultural Station and USFWS's Harrison Lake National Fish Hatchery. The James River was stocked with 5.9 million fry, and the Pamunkey River was stocked with 1.3 million fry. Samples taken from more than 300 adult fish during broodstock collection are being analyzed by the VDGIF to locate any fish that carry an OTC mark received in the hatchery. Each river has its own unique mark sequence. Three male American shad collected below Bosher Dam in spring 1997 by VCU carried the James River OTC mark. These fish were three years old and would have been stocked as fry in 1994. This is a milestone for the Virginia stocking program.

In 1998, again working with VMRC-funded watermen, the VDGIF collected and fertilized a total of 26.3 million American shad eggs from the Pamunkey River during the spring spawning run. A total of 14 million fry were produced and stocked from April 1 to May 7. The James River received 10 million of these fry, while the Pamunkey received 4 million.

Of the brood fish collected on the Pamunkey River in 1998, and examined for OTC tags, five proved to be of hatchery origin. The majority of the tagged fish were stocked in 1994, including one fish that carried a 20- and 30-day tag, which had been used on 151,000 shad fry stocked by the Harrison Lake National Fish Hatchery in 1994. Hatchery-marked shad made up less than 1 percent of the brood fish sampled from the Pamunkey.

On the James River, below Bosher Dam, VCU biologists collected 18 adult shad. OTC tag

analysis of these fish proved that 15 (83 percent) were of hatchery origin. Two of the fish carried a three-day tagging sequence, which had been used on 6,800 shad fry that were stocked in 1992–the first shad stocked in the state for this project. The remaining hatchery fish were returning adults from stockings in 1994 and 1995.

II. Fish Passage Support Activities

A. Public Relations and Education: The Fish Passage Coordinator participated in the following activities in 1997 and 1998:

- The Science Museum of Virginia sample gear display and Bosher Dam fish passage plan display on January 11, 1997.
- Fish passage presentation to "90 + 9" men's breakfast club in Richmond on January 21, 1997.
- Bosher Dam and Ruffins Pond Dam poster presentation at the annual meeting of the AFS Tidewater Chapter (January 22-24, 1997).
- Fish passage presentation at the midyear meeting of the Southern Division of the AFS in San Antonio, Texas (February 13-16, 1997).
- Presentation of the Bosher Dam fishway project to the VMRC Commercial Advisory Board on February 18, 1997.
- Fish passage presentation at the 43rd Tri-State Fisheries Conference in Lexington, Virginia (March 4-6, 1997).
- Presentation of the Bosher Dam fishway project to the VMRC Recreational Advisory Board on March 10, 1997.
- Fish passage presentation for the Urban/Environmental Class at VCU on March 20, 1997.
- Fish passage display and alosid electrofishing demonstration on the Rappahannock River at the First Annual Shad Festival at Old Mill Park on April 19, 1997. The Friends of the Rappahannock and the Chesapeake Bay Foundation sponsored this event.
- The Friends of the Rappahannock and the VDGIF sponsored a "bucket brigade" on May 9, 1997 when approximately 200 "symbolic" herring were moved from just below Embrey Dam to the head pond during a VDGIF electrofishing survey.
- Fish passage presentation to the Sandston Rotary Club on May 12, 1997.
- Bosher Dam fishway ground-breaking ceremony on July 22, 1997.
- Site visit at Bosher Dam by the Richmond chapter of the ASCE on October 14, 1997.
- Three "Ecology Day" classes conducted on January 22, 1998 at Crestwood Elementary School.
- Virginia Fish Passage Project update at the Roanoke Rapids Fish Passage Workshop on February 11, 1998.
- Fish passage display and alosid electrofishing demonstration on the Rappahannock River at the Second Annual Shad Festival at Old Mill Park on April 25, 1998. The Friends of the Rappahannock and the CBF sponsored this event.
- Fish passage and fish identification presentation to James River Rafting Company recruits on May 9, 1998.
- Outdoor writers float on the Rappahannock River on September 11, 1998.
- Bosher Fishway tour to regional conservation agencies group on September 21, 1998.
- Fish Passage Exhibit at the State Fair of Virginia from September 23 to October 4,

1998. Approximately 10,000 visitors to the VDGIF pavilion.

- Participation as a panelist for the Chesapeake Bay Foundation's "Bridging the River" workshop in Warsaw on October 11, 1998. The Countryside Exchange program focused on improvement and preservation of the Rappahannock River.
- Embrey Dam fish passage update to the Rappahannock River Basin Commission in Tappahannock on October 28, 1998.

B. Future Public Relations and Education

- Participate in the Shad Festival on the Rappahannock River in Fredericksburg in April 1999.
- Participate in Bosher Dam fishway dedication in April 1999.
- Bosher Dam fishway tours for James River Month in June 1999.
- Upon request and as opportunities arise, the anadromous fish restoration efforts will be presented to the public to educate and gain support.

III. Future Activities

A. Plans for 1999

- Obtain a fishway design and construction cost estimate for the Abutment Dam on the Appomattox River.
- Monitor the efficiency of the Bosher fishway for passing target fish species.
- Work closely with Greenwood Ironworks on the first full season of operation and monitoring of a Denil fishway on Harvell Dam on the Appomattox River.
- Continue efforts toward achieving fish passage at Embrey Dam on the Rappahannock River. Removal is currently the preferred option.
- Conduct trap and transport of blueback herring to rebuild James River run up to and upstream of Bosher Dam.
- Monitor adult alosids in the spring and juveniles in the summer and fall.
- Set future goals for passage in Virginia.

B. Meeting the Chesapeake Bay Program's Five- and 10-Year Goals (1998 and 2003)

Virginia's five-year goal is 308 miles. William's Island Dam Notch was completed in November of 1993 and reopened 2.6 miles of the James River up to Bosher Dam. Also in 1993, a fish lift was installed on Brassfield Dam (Appomattox River), but the actual hopper is not yet in place. This lift will be completed when passage is provided at the downstream abutment dam, and together passage at all three Appomattox River dams will reopen an additional 127.1 miles. In 1995 a Denil fishway on Chandler's Mill Dam (Rappahannock drainage) reopened 7.7 miles of the two tributaries feeding Chandler's Pond. The Bosher fishway was substantially completed in 1998, which reopened 137.6 miles. The Ashland Mill Dam (S. Anna River) project was moved to the 10-year goal (nine miles). Through 1998 a total of 190.6 accessible miles were reopened in Virginia. Approximately 168 additional miles of major James River tributaries were also made accessible to migratory fishes with the opening of Bosher Dam.

Virginia's 10-year goal is 415.5 miles, which includes 107.5 miles in addition to the five-year

goal. Besides completing projects listed above, the 10-year goal will be achieved by providing 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 (a total of 37 miles).

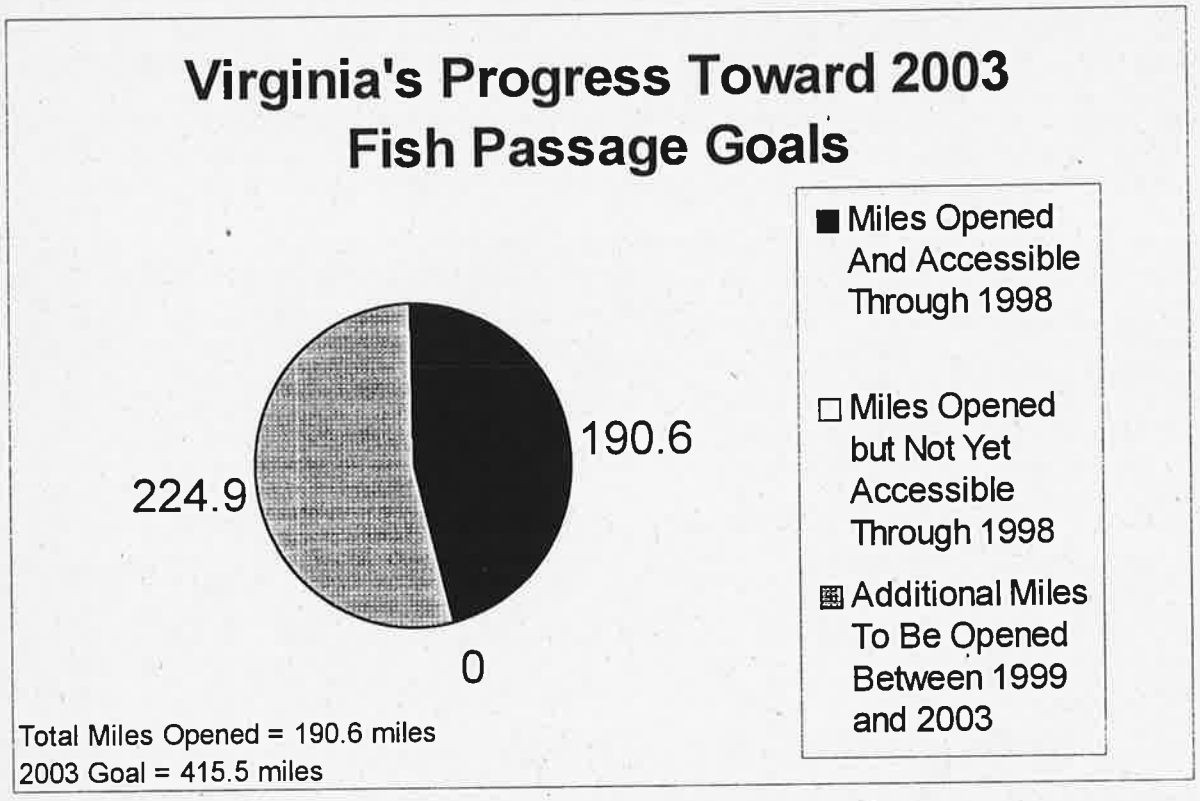
Table 4
1997-98 Virginia Fish Passage Projects
Completed, in Progress and Planned

Map ID#	Project (stream & river drainage)	Passage Type	Habitat Opened (miles)	Funding Source	Status
1	Bosher Dam, James River	Vertical Slot	137.6 mainstem 168 major tributaries	Federal, State, Private, Corporate, Local (construction)	Construction substantially complete (1998)
2	Harvell Dam, Appomattox River	Denil	5.7	Private FERC #	Construction substantially complete (1998)
3	Brasfield Dam, Appomattox River	Lift	120.1 (updated figure)	Appomattox Water Authority	Construction 90% complete
	Ruffins Pond Dam, Massaponax Creek Rappahannock River	Denil	8	Federal	Design Completed construction postponed due to lack of funding
	Embrey Dam, Rappahannock River	Removal considered	70.6	Undetermined	U. S. COE Reconnaissance phase completed
	Ashland Mill Dam, S. Anna River, York River	Denil	9	Private	No current negotiations
	Ashland Water Supply Dam, S. Anna River, York River	Undetermined	28	Undetermined	Planned

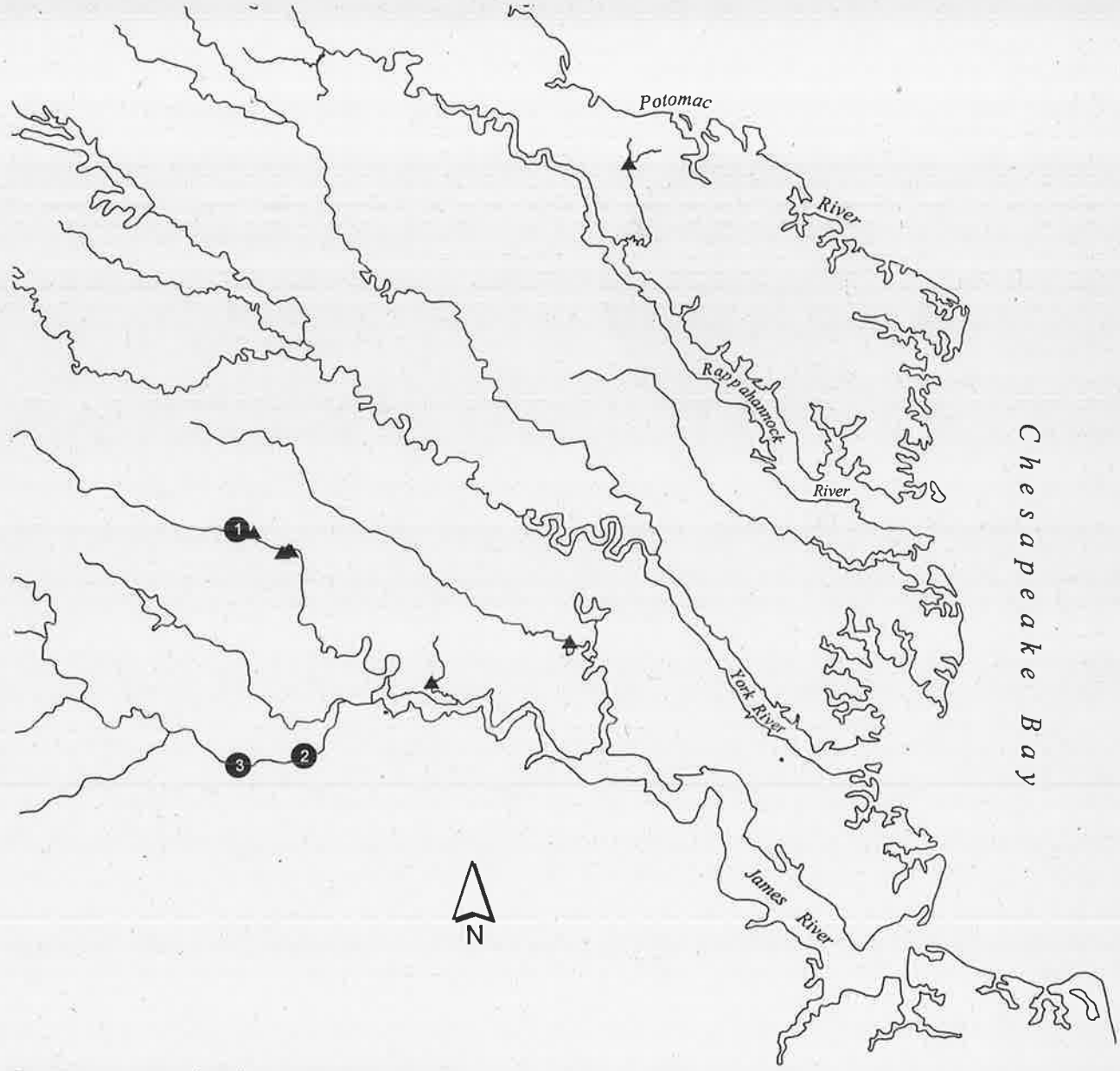
Table 4. Virginia Fish Passage Projects (Cont'd.)

Map ID#	Project (stream & river drainage)	Passage Type	Habitat Opened (miles)	Funding Source	Status
	Unnamed Dam, Mill Creek, Rappahannock River	Undetermined	2.5	Undetermined	Planned
	Bridge on Walls Creek, James River	Undetermined	1.2	Undetermined	Planned
	Gouldman Pond Dam, Rappahannock River	Undetermined	2	Undetermined	Planned
	Unnamed Pond Dam, Haskins Creek, Rappahannock River	Undetermined	2	Undetermined	Planned
	Pipe on Proctors Creek, James River	Undetermined	Undetermined	Undetermined	Planned

Figure 4. Fish Passage Progress in Virginia



Map 4: Fishway Progress in Virginia



● Fishway completed or in progress 1997-98
▲ Fishway completed before 1997

20 0 20 Miles

U.S. Environmental Protection Agency (US EPA)

In fiscal year 1997 the US EPA allocated a total of $651,000, and in 1998 a total of $576,400, for fish passage activities in the Chesapeake Bay Watershed. These activities included the coordination of fish passage efforts, stream blockage surveys, design and construction of fish passage facilities and support for shad hatchery projects. The surveys assess the potential for anadromous fish species spawning habitat.

Two Inter-Agency Agreements (IAGs) were signed between the US EPA and the US FWS to fund the monitoring and stocking of American shad at Little Falls Dam on the Potomac River and US FWS engineering expertise for fish passage design in the Chesapeake Bay watershed. Upon completion, the fish passage construction activities are anticipated to open hundreds of 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 CBP's Fish Passage grants, through an IAG with the US EPA's CBPO.

During fiscal year 1993 the CBPO, working in cooperation with the NMFS, entered into their first IAG to fund strategies to coordinate fish passage efforts, stream blockage surveys and design and construction of fish passage facilities in the Chesapeake Bay. The IAG entitled, *Fisheries and Habitat Restoration in the Chesapeake Bay* was renewed in fiscal years 1997 and 1998, providing $576,000 and $278,000, respectively, for fish passage activities in the Chesapeake Bay Watershed. Under the provision of each IAG, grant applications were received from the Pennsylvania Fish and Boat Commission, the Maryland Department of Natural Resources and the Virginia Department of Game and Inland Fisheries. Project work focused on restoration activities within the Susquehanna, Choptank, Patapsco, Patuxent, James and Rappahannock River watersheds.

NOAA CBPO staff continued to attend workgroup meetings, provide technical input to workgroup goals and progress, and attempt to link NOAA Restoration Center funding opportunities with workgroup priority projects, where possible.

NMFS Habitat and Fisheries Engineering staff continued to provide review and comments on the actual completion of the proposed Denil fishway for Harvell Dam, located on the Appomattox River near Petersburg, Virginia. Staff continue to be involved in the modifications to the design and operation of fish lifts at Holtwood and Safe Harbor dams, located on the Susquehanna River

in Pennsylvania, and of the vertical slot fishway proposed for the York Haven Dam. Staff has recommended and given strong support for providing fish passage and/or dam removal in Rock Creek and the Anacostia watershed as part of the mitigation package for SAV impacts for the proposed Woodrow Wilson Bridge replacement.

NMFS also 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 (SRAFRC). NMFS reviews and provides input to activities included in SRAFRC's annual workplan.

U. S. Fish and Wildlife Service (USFWS)

Fish Passage and Stocking Activities

The US FWS Engineering Field Office at Newton Corner, MA provided considerable support throughout 1997-98 to state fish passage coordinators who were participating in numerous site inspections and meetings. Service engineers assisted in fishway designs for the York Haven hydroelectric project and prepared conceptual plans for fish passage at Johnson's Pond Dam (Wicomico River, MD); Lake Allen Dam (Midway Branch, MD); Hershey Food Corporation Dam (Swatara Creek, PA); Lancaster Water Supply Dam (Conestoga River, PA); Carson Long Dam (Sherman's Creek, PA); Lock Haven Dam (W. Branch Susquehanna, PA); and Abutment Dam (Appomattox River, VA). Engineering assistance also was provided for reviewing various percent-complete fish passage design plans for Deer Creek, Johnson's Pond, Lake Bonnie, Midway Branch and Sawmill Creek (all in Maryland) and for review and comment on the Corps of Engineers's final design report for construction of a labyrinth weir for fish passage at Little Falls Dam on the Potomac River, MD.

The Little Falls Fishway Task Group, chaired by USFWS, met in June 1997 and April 1998 and provided technical assistance to the Corps of Engineers on their final designs for the Little Falls fishway. Passage at Little Falls Dam is planned for 1999 and will open 10 miles of anadromous fish spawning habitat up to Great Falls, the historic natural limit of fish migrations. The unusual fishway design at Little Falls involves a 24-foot-wide notch with three labyrinth weirs located 75 feet from the Virginia side of the dam. The weirs act as flow dissipators to reduce velocity and promote passage for a variety of migratory species. The S. O. Conte Anadromous Fish Research Center (USGS) was responsible for the conceptual fishway design, and the U.S. Army Corps of Engineers is responsible for the final engineering design.

The USFWS Susquehanna River Coordinator continued to coordinate the multi-agency shad restoration program on the Susquehanna River. The program involves large-scale egg collection, larval culture and marking and stocking of the Susquehanna mainstem and tributaries. Other components include the trap and transfer of adult shad and herring from the Conowingo West fish lift, fish passage operations and fish counts at Conowingo East lift, Holtwood and Safe Harbor dams, planning and construction of a new fishway at York Haven Dam, summer-fall juvenile shad

collections and otolith analysis. In 1998 the USFWS Northeast Fishery Center in Lamar, PA initiated hormone-induced tank spawning of American shad using brood fish from Conowingo Dam. Over three million eggs were produced, with most being supplied to PFBC's Van Dyke hatchery.

The Harrison Lake National Fish Hatchery and Virginia Fisheries Coordinator Office cooperated with the Interstate Commission on the Potomac River Basin and the Little Falls Task Group to produce, mark and stock more than three million American shad fry in the Potomac River above Little Falls in 1997-98. The Harrison Lake NFH and Virginia Fisheries Coordinator Office also cooperated with VDGIF and VMRC to produce, mark and stock several million American shad fry in support of the James River restoration project. Assessment of the VDGIF and USFWS shad fry stockings indicated that all juveniles above Bosher's Dam were hatchery produced, as were about 80 percent of those downstream of Bosher's Dam. Tetracycline-marked adults were captured on the spawning grounds below Bosher's dam by VDGIF and VCU.

Service personnel from the Virginia Fisheries Coordinator Office and Harrison Lake worked cooperatively with VDGIF to trap-and-transfer approximately 1,500 prespawned blueback herring for reintroduction into the upper watershed of Herring Creek, above the Service's Harrison Lake Dam in the James River watershed. A total of about 5,000 prespawned blueback herring also were moved above Bosher's Dam each year in 1997-98.

The Service's Fish Health Unit from Lamar, PA conducted routine disease analysis for wild American shad samples from the Potomac and Susquehanna rivers. Screening was negative for *Vibrio* spp., *Oncorhynchus masou* virus, *Aeromonas salmonicida*, enteric redmouth bacterium, viral hemorrhagic septicemia virus, infectious hematopoietic necrosis virus and infectious pancreatic necrosis virus.

Outreach and Education

The Susquehanna River Coordinator and fish passage engineer Dick Quinn attended the annual meeting of the American Society of Civil Engineers (ASCE) in Washington D.C. in November 1997 and presented information on the Chesapeake Bay fish passage program.

At a dedication ceremony for new fish elevators at Safe Harbor and Holtwood dams on the Susquehanna River in May 1997, the USFWS Regional Director presented the Director's Corporate Wildlife Stewardship Award to PP&L and Safe Harbor Water Power Corporation. Numerous Bay Program dignitaries attended.

Little Falls Fishway Web Page

A new web page (http://www.chesapeakebay.net/bayprogram/bay_eco/lfpg.htm) was created in late 1997 on the CBP's web server, written by Peter Bergstrom (USFWS) with graphics assembly and programming by CRC fellow Karen Hester.

One or more wayside signs that will explain the project and its benefits to Potomac fisheries are

planned for installation along the towpath, where there is a view of the Little Falls Dam. In 1997 and 1998 local grade school students raised some of the shad fry released back to the Potomac River through the "Schools in Schools" program, which is conducted in cooperation with USFWS and the Chesapeake Bay Foundation.

U.S. Geological Survey, Biological Resources Division

American eels were historically ubiquitous and ecologically important in most coastal waters of the eastern seaboard, including the Chesapeake Bay, ranging as far inland as they could ascend past natural and man-made obstructions. Passage facilities for upstream and downstream migrant eels are lacking at hundreds of hydroelectric and other dams along rivers and tributaries of the Atlantic coast, reducing recruitment of eels into upstream habitats. Recent negotiations for relicensing hydroelectric dams have included eels as a species to be passed, yet the technologies required for eel passage have not been tested or implemented in the U.S.

Studies on natural behaviors of migrant eels, response to attraction flows and turbine intakes, run characteristics (size, sex ratio and age class structure) and migration timing are required for the development of improved eel passage structures. Research on downstream migrant behavior, guidance and bypass technologies is still in a formative stage. Application of effective eel passage is a key point for ongoing settlement negotiations involving presently appealed and pending licenses for a number of hydroelectric dams that currently possess no upstream or downstream eel passage structures. In cooperation with the Conte Anadromous Fish Research Center (USGS-BRD), the US FWS initiated pilot eel passage and migration studies in the laboratory and at several hydroelectric dam sites in the Chesapeake Bay watershed.

Catadromous eels have been extirpated from the upper portions of the James and Roanoke River drainages in Virginia due to a series of dams. Eel abundance and size in these rivers are strongly related to their distance inland. Eels currently are present in the Shenandoah River mainstem (Potomac drainage), but their distribution and abundance has not been quantified, and the cumulative impacts of dams on eel movements and the upstream migrant eel population within the watershed is unknown. A three-year study has been implemented between USGS, USFWS and Virginia Polytechnic University to address these questions at three dams within the Shenandoah River mainstem. Results to date have indicated low eel abundance within the watershed, with high site fidelity of older eels. Few juvenile eels have been captured at the dams.

These and future studies by USGS-BRD are critical for providing sound biological data; design criteria and evaluation of passage structures; and a basis for future eel mitigation efforts and enhancement of coastal freshwater and inland populations on a coastwide scale.

BAYWIDE SUMMARY OF PROGRESS

When the CBP's Executive Council signed Directive 93-4 on December 27, 1993, they charged the Bay's jurisdictions with opening 1,356.75 miles of migratory fish spawning habitat along the major tributaries of the Chesapeake Bay by 2003. This 10-year goal includes 143.1 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 for the Fish Passage Workgroup for the past five years.

The workgroup has worked steadily to meet these goals. By end of 1998 a total of 645 miles of stream habitat had been reopened, including 523.5 miles currently available to anadromous fish (Table 5) and 121.5 miles of potential anadromous habitat which is not yet accessible due to downstream blockages. In 1997 and 1998 a total of 361.3 miles were opened. Although anadromous fish mileage results through 1998 were short of the five-year goal amount, projects expected to be completed in 1999 will greatly exceed that target and set the stage for surpassing the 10-year goal.

The following table and figures illustrate the Baywide success of the fish passage program 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 Through 1998

Jurisdiction	Miles Opened and Accessible		Five-Year Goal 1993-1998	10-Year Goal Pre 1993 - 2003
	Before 9/93	9/93-12/98		
District of Columbia	0	1	32	32.6
Maryland	97.1	175.3	210.05	388.65
Pennsylvania	9	50.5	32	520
Virginia	37	153.6	308	415.50
Total	**143.1**	**380.4**	**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 essential 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 will continue to be expanded throughout the watershed by the Fish Passage Workgroup.

Figure 5. Fish Passage Progress Baywide

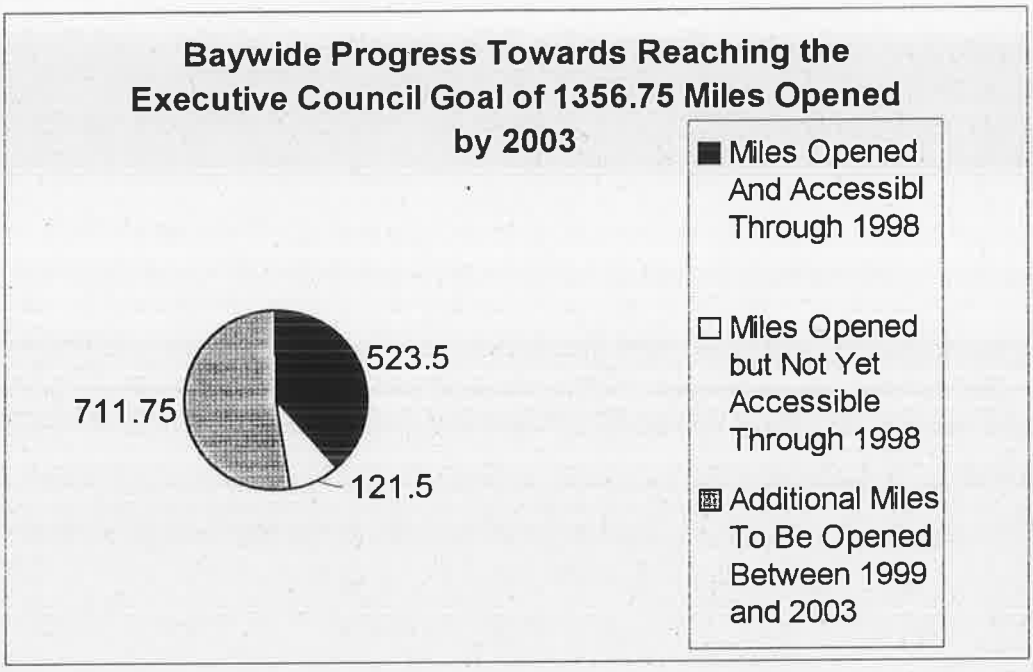
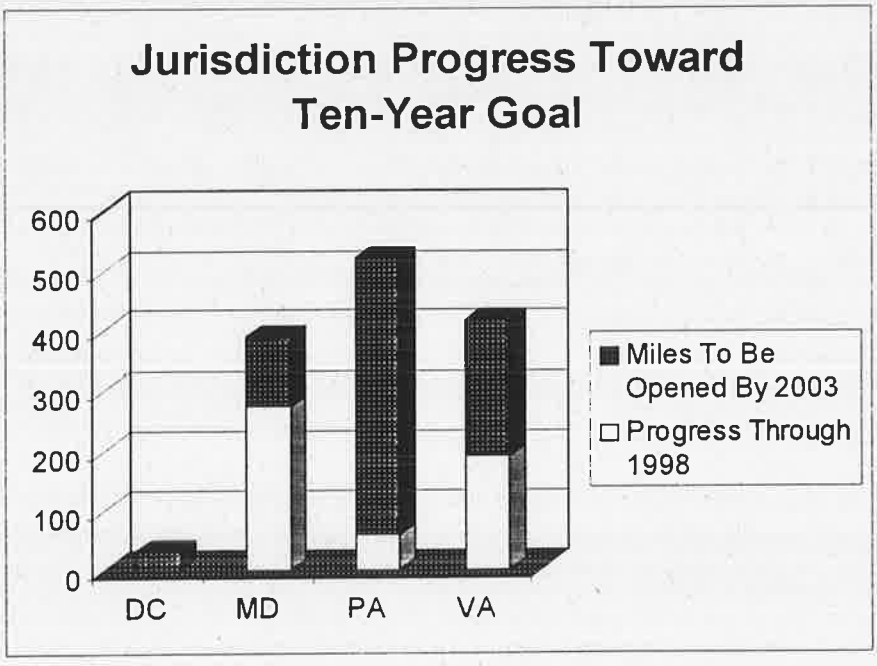


Figure 6. Jurisdictional Fish Passage Progress



APPENDIX A

Fish Passage Projects Completed between 1989 and 1998

State/District	Project	Fish Passage Type	Year
District of Columbia			
	Abandoned Weir #1 (Sewer Line), Rock Creek, Potomac River	Removal	1995
	Metro Dam, Rock Creek, Potomac River	Removal	1995
	Ford #3, Rock Creek, Potomac River	Removal	1991
Maryland			
	Cypress Branch Dam, Cypress Branch, Chester River	Breach	1998
	Waugh Chapel Road, Towers Branch, Little Patuxent River	Replacement & fishway	1998
	USGS Gage, St. Leonard Creek, Patuxent River	Weir collapse & removal	1998
	Pipeline crossing, Hunting Creek, Patuxent River	Weir collapse & removal	1998
	Small dam, Cocktown Creek, Patuxent River	Structure collapse	1998
	USGS Gage, Western Branch, Patuxent River	Weir collapse & removal	1998
	USGS Gage, Mattawoman Creek, Potomac River	Weir collapse & removal	1998
	Baptist Church Rd. Culvert, Hancock Run, Potomac River	Replacement	1998

	Route 232 culvert, Gilbert Run, Wicomico River	Collapse & debris removal	1998
	Boy Scout Dam, Octoraro Creek, Susquehanna River	Collapse & removal	1998
	Simkins Dam, Patapsco River	Denil	1997
	Rt 6 Culvert, Gilbert Run Wicomico River	Pool and Weir	1997
	Rt 12 Culvert/USGS Weir, Nassawango Cr. Pocomoke River	Notch	1997
	Culvert, Rt. 495 East, Paint Branch, Anacostia River	Pool and Weir	1995
	Culvert, Rt. 495 West, Paint Branch, Anacostia River	Alaskan Steeppass	1995
	Rt. 40 Culvert, Whitemarsh Run, Bird River	Alaskan Steeppass	1994
	Dam #1, Northeast Branch, Anacostia River	Notch	1990
	Van Bibber Dam, Winter's Run, Bush River	Denil	1990
	Weir Morgan Creek, Chester River	Notch	1989
	Weir, Beaverdam Creek, Choptank River	Notch	1989
	Dam, Tuckahoe Creek, Choptank River	Denil	1993
	Elkton Dam, Big Elk Creek, Elk River	Denil	1993
	Railroad Bridge, Little Elk Creek, Elk River	Removal	1992
	Fort Meade Dam, Little Patuxent River	Denil	1991

	Railroad Trestle, Dorsey Run, Little Patuxent	Removal	1994
	Culvert, Dorsey Run, Little Patuxent River	Replacement	1994
	Sewer Line, Little Patuxent River	Replacement	1990
	Lake Waterford Dam, Lake Waterford, Magothy River	Pool and Weir	1993
	North East Dam, North East River	Breach	1992
	Bloede Dam, Patapsco River	Denil	1993
	Daniels Dam, Patapsco River	Denil	1997
	Dam, Deep Run, Patapsco River	Removal	1989
	Dam, Stony Run, Patapsco River	Removal	1990
	Trail Culvert, Sawmill Creek Patapsco River	Pool and Weir	1994
	Union Dam, Patapsco River	Breach	1997
	Rt. 6 Culvert, Hoghole Run, Port Tobacco River	Alaskan Steeppass	1994
	Rt. 214 Dam, Western Branch, Patuxent River	Removal	1994
	Bacon Ridge Branch Weir, South River	Removal	1991
	Culvert, North River, South River	Replacement	1990
	Conowingo Dam, Susquehanna River	Fishlift (2)	1991
	MD Rt. 648, Cattail Creek, Magothy River	Alaskan Steeppass	1995
	Evergreen Road Culvert, Patuxent River	Replacement	1995

	Dam, Horsepen Branch, Patuxent River	Removal	1995
	MD Rt. 234, Budd's Creek (Western Shore)	Alaskan Steeppass	1995
	Rt. 208 (38th St.) Dam, Northwest Branch, Anacostia River	Notch	1995
	Dam #1, Paint Branch, Anacostia River	Breach	1995
	Rt. 1 Culvert, Rhode Island Ave., Northwest Branch, Anacostia River	Pool and Weir	1995
	Unicorn Dam, Unicorn Branch, Chester River	Alaskan Steeppass	1996
	Simkins Dam, Patapsco River	Denil	1997
	Rt. 12 Culvert, USGS Weir, Nassawango Creek, Pocomoke River	Notch	1997
	Sewer Crossing, Northeast Branch, Anacostia Branch	Breach	1995
	Culvert, Dogwood Run, Elk River	Pool & Weir	1990
	Rt. 6 Culvert, Gilbert Creek, Wicomico River, Western Shore	Pool & Weir	1997
Pennsylvania			
	Holtwood Dam, Susquehanna River	Lift	1997
	Safe Harbor Dam, Susquehanna River	Lift	1997
	Rock Hill Dam, Conestoga River	Breach & remove	1997
	Maple Grove Dam, L. Conestoga River	Breach & remove	1997

	Castle Fin Dam, Muddy Creek	Breach & remove	1997
	Unnamed Dam, Fishing Creek, Clinton Co.	Breach & remove	1997
	American Paper Products Co. Dam, Conestoga River	Breach & remove	1998
	East Petersburg Authority Dam, Little Conestoga River	Breach & remove	1998
	Yorkana Dam, tributary to Codorus	Breach & remove	1997
	Yorktown Paper Co. Dam, tributary to Codorus Creek	Breach & remove	1997
	Millport Conservancy Dam, Lititz Run	Breach & remove	1998
	Unnamed dam (road crossing), Lititz Run	Breach & remove	1998
	Unnamed dam, Kishacoquillas Creek	Breach & remove	1998
	Unnamed dam, Laurel Run	Breach & remove	1998
	Milesburg Power Generating Station, Spring Creek, Centre Co	Breach & remove	1998
	Rose Hill Intake Dam, Kettle Creek	Vertical slot	1998
	Williamsburg Station Dam, Frankstown Branch, Juniata River	Breach and Removal	1996
	Huntingdon Water Supply, Standing Stone Creek, Juniata River	Denil	1996
Virginia			
	Bosher Dam, James River	Vertical Slot	1998
	Harvell Dam, Appomattox River	Denil	1998

	Battersea Dam, Appomattox River, James River	Natural Breach	
	Walkers Dam, Chickahominy River; James River	Denil (2)	1989
	Harrison Lake Dam, Herring Creek; James River	Denil	1989
	Manchester Dam, James River	Breach	1989
	Browns Island Dam, James River	Breach	1989
	Chandler's Mill Dam, Rappahannock River	Denil	1995
	Williams Island Dam, James River	Notch	1993

APPENDIX B

Fish Passage Workgroup Members

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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 Marine Fisheries Service
Richard Quinn	U.S. Fish and Wildlife Service
Jon Siemien	District of Columbia Fisheries Branch
Albert Spells	U.S. Fish and Wildlife Service
Dave Sutherland	U.S. Fish and Wildlife Service
Rich Takacs	National Ocean and Atmosphere Administration
Alan Weaver	Virginia Department of Game and Inland Fisheries
Howard Weinberg	Chesapeake Bay Program/ University of Maryland Eastern Shore