

903D88100

Fish Passage Workgroup

Draft
Removing Impediments
to Migratory Fishes in the
Chesapeake Bay Watershed

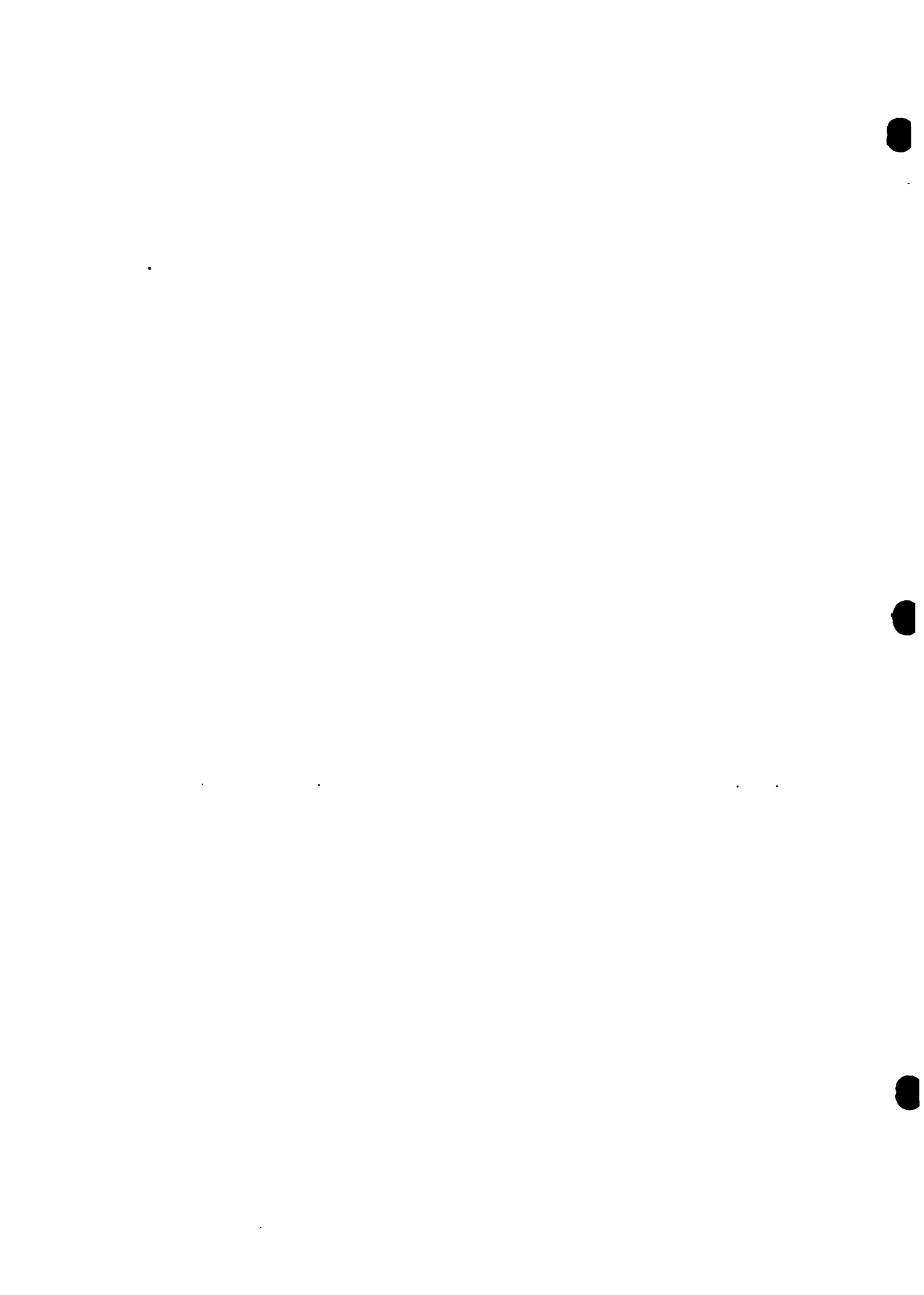
U.S. Environmental Protection Agency
Region III Information Resource
Center (CPM52)
841 Chestnut Street
Philadelphia, PA 19107

**Chesapeake
Bay
Program**

Agreement Commitment Report

TD
225
.C54
R257

September 1988



**DRAFT "REMOVING IMPEDIMENTS TO MIGRATORY
FISHES IN THE CHESAPEAKE BAY WATERSHED"**

An Agreement Commitment Report from the
Fish Passage Workgroup

U.S. Environmental Protection Agency
Region III Information Resource
Center (3PM52)
841 Chestnut Street
Philadelphia, PA 19107

Annapolis, Maryland

September 1988

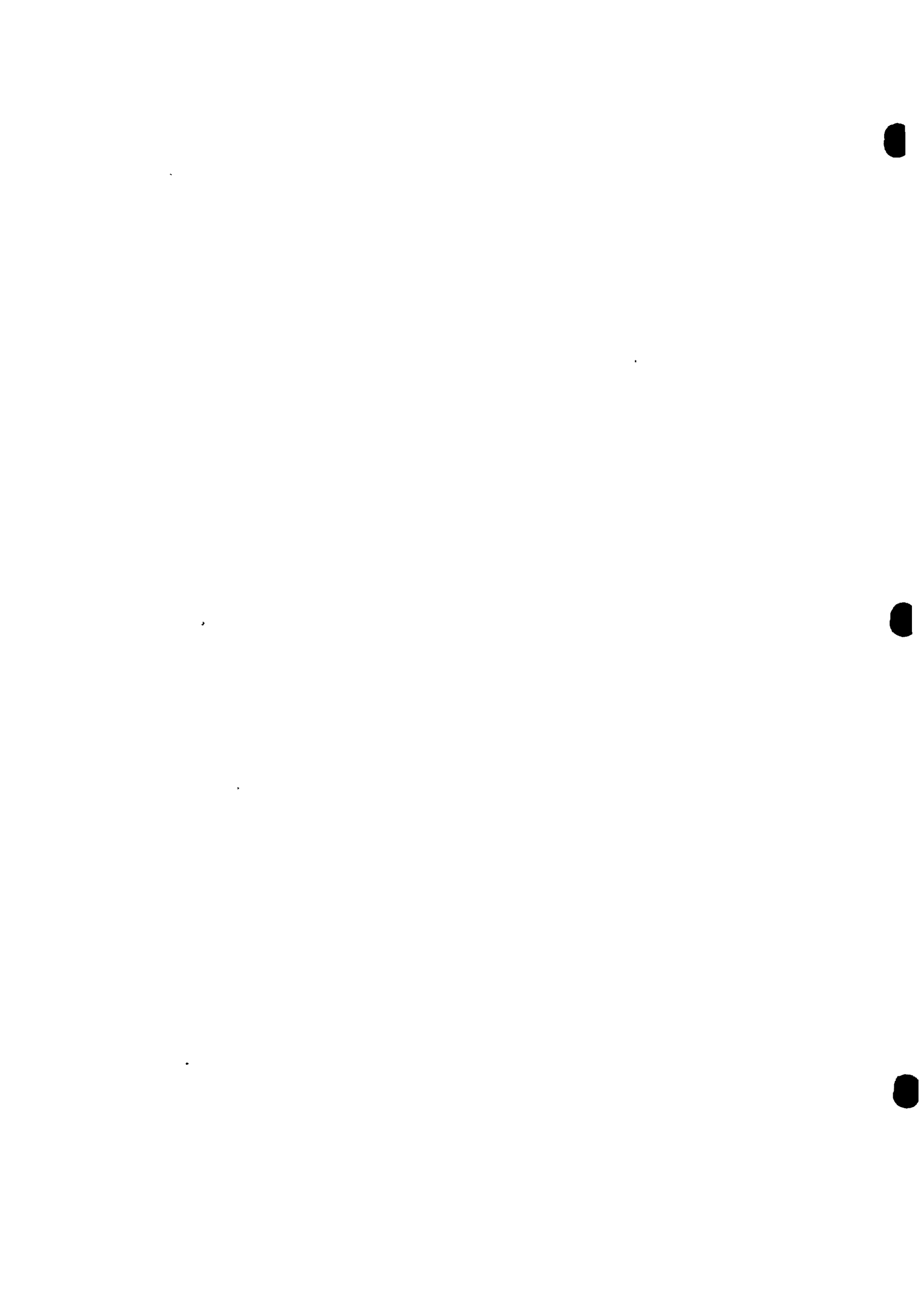


TABLE OF CONTENTS

EXECUTIVE SUMMARY.....PAGE 1

INTRODUCTIONPAGE 1

BARRIERS TO MIGRATION: AN
HISTORICAL PERSPECTIVE.....PAGE 2

A MULTI-FACETED APPROACH IS
RECOMMENDED TO ASSURE THE REMOVAL
OF IMPEDIMENTS TO FISH MIGRATION.....PAGE 5

TECHNICAL RESOURCES DEDICATED TO THE
REMOVAL OF IMPEDIMENTS TO FISH
MIGRATION IN THE BAY WATERSHED
SHOULD BE SUPPLEMENTED.....PAGE 9

A COMPREHENSIVE INVENTORY OF
OBSTRUCTIONS TO FISH MIGRATION
IN THE BAY WATERSHED SHOULD
BE COMPILED.....PAGE 11

TABLES AND FIGURES

TABLE 1: RECENT COMMERCIAL HARVESTS OF
MIGRATORY SPECIES.....PAGE 2

FIGURE 1: ESTIMATED HISTORIC RANGE OF
MIGRATORY FISH OBSTRUCTED BY STREAM
BLOCKAGES: CHESAPEAKE BAY WATERSHED.....PAGE 4

EXECUTIVE SUMMARY

The 1987 Chesapeake Bay Agreement includes a commitment that the signatories will "provide for fish passage at dams, and remove stream blockages wherever necessary to restore passage for migratory fish." This commitment was made in response to precipitous declines in the Bay's migratory fisheries and because of the recognition that these declines may be attributable, in part, to the loss of historic spawning and nursery habitat as a consequence of dams and other impediments. In January of 1988 the Living Resources Subcommittee appointed a work group to develop a strategy for implementing the Bay Agreement's commitments regarding fish passage. This work group included representatives from each of the Bay states, the District of Columbia, appropriate federal resource agencies, and the environmental community. This report contains the work group's findings and recommendations.

During the past two centuries, a major portion of the historic migratory fish spawning and nursery habitat has been lost as a consequence of dams and other obstructions. The removal of these obstructions is an essential element in our efforts to reestablish healthy migratory fisheries in the Bay watershed. Because the structures that act as impediments to fish migration are diverse, ranging from small road culverts to major hydroelectric facilities, it is important that all responsible parties work together to assure the provision of fish passage. Remedying this problem will require a new level of commitment from our state highway departments, from local government, from our state and federal resource agencies, and from utilities operating hydroelectric dams in the watershed.

In addition to the construction of fish passages at dams and other blockages, the work group recommends that jurisdictions in the watershed initiate programs aimed at reintroducing migratory species in rivers and streams targeted for restoration. Furthermore, measures should be taken that will assure the protection of newly introduced fish and the maintenance of water quality levels that will support their successful reestablishment. It is also important that programs be established to monitor the success of fish passage initiatives and to assure that the public is made aware of the importance of this issue to Bay fisheries.

There was a consensus among work group members that technical expertise in the Bay watershed needs to be supplemented if we are to implement an effective fish restoration program.

This shortcoming should be remedied by the addition of personnel in our state resource agencies capable of designing and supervising the construction of fish passage projects. State efforts should be supplemented by additional technical assistance from the Fish and Wildlife Service. Long term technical needs should be addressed, in part, by taking steps that will encourage educational institutions in the watershed to focus resources on this important problem. It is also recommended that an ongoing workgroup be appointed by the Living Resources Subcommittee to coordinate future activities relating to the provision of fish passage.

Finally, the workgroup recommends the compilation of a comprehensive inventory of obstructions to fish passage in the Bay watershed. Accurate information on the nature and location of impediments to fish passage is essential to the success of any fishway program. A substantial body of information on obstructions to migration is currently available. Major impediments to fish passage in the watershed have already been identified. These impediments should be the initial focus of our remedial efforts. The report summarizes the currently available information on stream blockages and notes gaps in the data where they exist.

INTRODUCTION

Of the approximately 260 fish species that occur in the Chesapeake Bay, perhaps the most revered, and most sought after by both sport and commercial fishermen, are the migratory species. These include "anadromous" fish, such as striped bass, river herring, sturgeon and shad, that spend most of their adult lives in saltier coastal waters but return each year to spawn in freshwater, as well as semi-anadromous species such as white and yellow perch. The term anadromous is taken from the Greek words "ana", meaning upward, and "dromos", meaning a running. Another class of migratory fish are the "catadromous" species, represented in the Bay watershed by the American eel. Catadromous fish spend most of their lives in freshwater, returning to ocean waters to spawn. Together, anadromous and catadromous species are described as diadromous.

At one time, the Chesapeake Bay abounded with migratory fish. Today, however, these once thriving fisheries are in a depressed state. No longer do sturgeon, striped bass, shad and river herring support extensive recreational and commercial fisheries. In Maryland, the catch of American shad declined from over 7 million pounds a century ago to approximately 20,000 pounds in 1980, prompting the state to ban fishing for this species. Populations of shad in Virginia waters have experienced a similar decline, with current annual harvests averaging 900,000 pounds, compared to over 11 million pounds a hundred

years ago. The total annual commercial landings of river herring in Maryland has dropped from over 8 million pounds 50 years ago to approximately 200,000 pounds in 1985. The striped bass commercial catch Bay-wide has declined from 14.7 million pounds in the early 1970's to 1.7 million pounds in the early 1980's. Table 1 illustrates the precipitous decline of the Bay's migratory fisheries.

The economic impact of this decline is significant. In the early twentieth century the shad and river herring fisheries were the two most economically important commercial fisheries in the Bay watershed. Today Maryland's commercial shad fishery is closed as a result of a moratorium imposed in 1980 and the herring fishery is a shadow of its former self. The economic importance of the Bay's migratory species to the sportfishing industry is equally apparent.

This decline cannot be attributed to a single cause. Rather, an intricate complex of factors -- some natural, most man-made -- can be identified. Among those most often cited are pollution and siltation of spawning areas, overharvesting, and construction of dams and other obstructions across the Bay's tributary streams and rivers, preventing access to historic spawning areas. Through the multi-agency Bay restoration program, significant progress has been made in addressing the degradation of Bay water quality. The 1987 Bay Agreement has bolstered these efforts by establishing specific commitments to reduce nutrient input and sedimentation into Bay waters. Harvest

TABLE 1

RECENT COMMERCIAL HARVESTS OF MIGRATORY SPECIES

(average annual tons for each 10-year period)

		<u>1966-75</u>	<u>1976-85</u>	<u>% Decline</u>
American Eel	VA	427.1	257.0	40%
	MD	117.8	106.7	9%
American Shad	VA	1,114.0	454.0	59%
	MD	409.7	37.4*	91%
Hickory Shad	VA	18.8	0.5	97%
	MD	8.7	0.6	93%
River Herring	VA	9,486.0	725.0	92%
	MD	1,094.7	71.0	94%
Striped Bass	VA	1,059.0	226.0	79%
	MD	1,803.3	642.4*	64%
White Perch	VA	173.8	65.0	63%
	MD	650.8	341.9	47%
Yellow Perch	VA	1.9	0.2	90%
	MD	51.8	14.9	71%
TOTAL	VA	12,280.6	1,727.7	86%
	MD	<u>4,136.8</u>	<u>1,214.9</u>	<u>71%</u>
		16,417.4	2,942.6	82%

* -- pre-moratorium

restrictions have been placed on the taking of some migratory species in an attempt to arrest further decline. Until recently, however, little had been done to address the blockage of historic diadromous fish spawning habitat by dams, culverts and other physical obstructions.

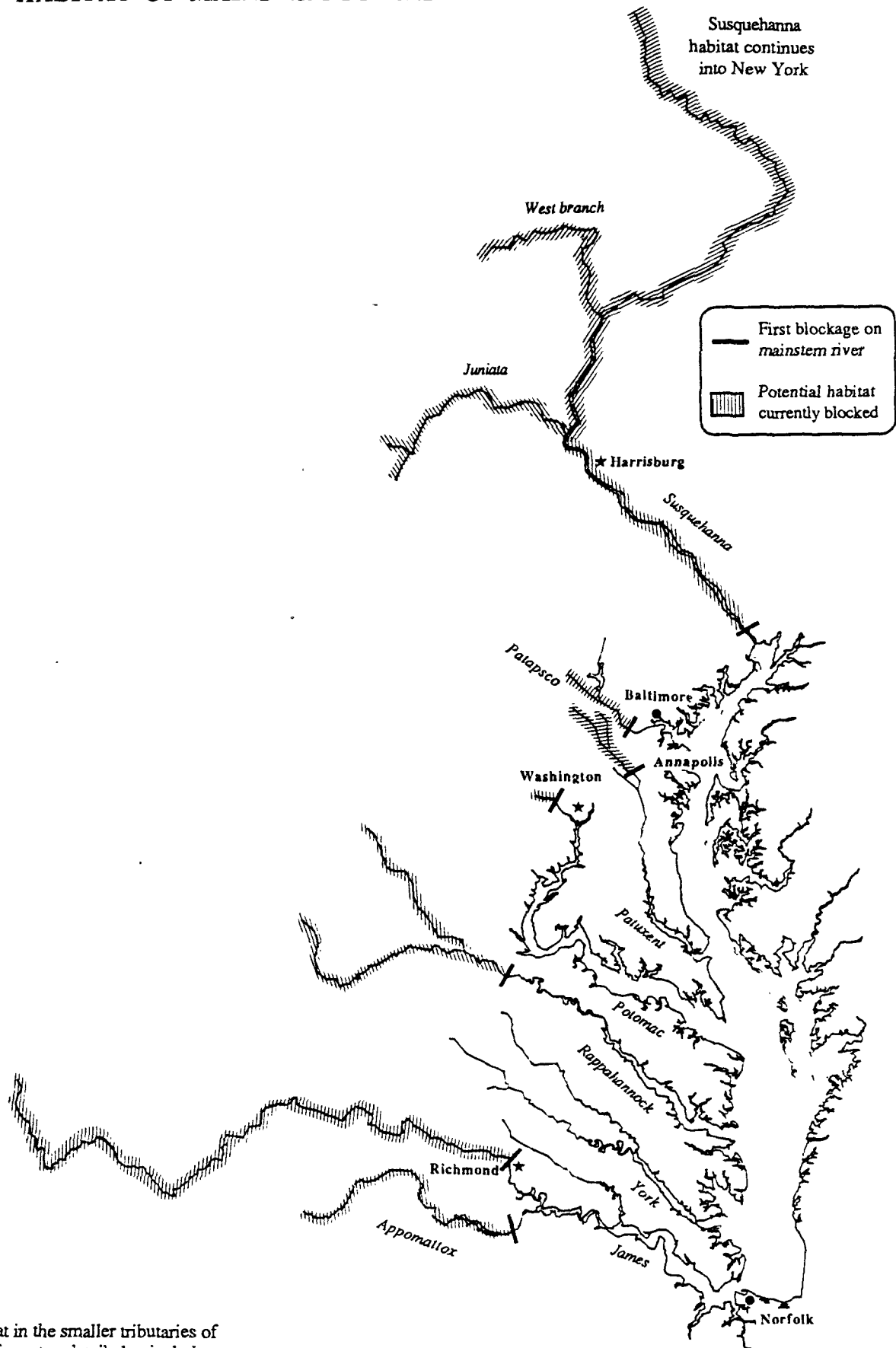
BARRIERS TO MIGRATION: AN HISTORICAL PERSPECTIVE

Altering and impounding streams and rivers to meet the needs of a growing populace is a practice as old as the Nation itself. Beginning in colonial times, mill dams multiplied to meet the growing needs of commerce. As early as 1774, a navigation canal was proposed for the James River. Many of our founding fathers were actively involved in improving navigation on the James and other Virginia Rivers, facilitating better transportation but creating impediments to migrating fish and restricting once productive spawning areas.

As domestic and foreign commerce began to flourish throughout the fledgling Nation, canal systems were developed on most major East Coast rivers to facilitate the transport of goods and people. An integral part of these early systems was the construction of locks created by dams. While these structures improved navigation for boats and barges, for the first time spawning and nursery rivers used over the centuries by migratory fish began to be obstructed.

With the advent of the Industrial Revolution, the potential energy of the rivers was harnessed as dams were built to provide

POTENTIAL AMERICAN SHAD SPAWNING AND NURSERY HABITAT OF MAINSTEM RIVERS *



* Potential habitat in the smaller tributaries of the mainstem rivers too detailed to include

a source of impounded water to drive the mills. Mill dams gave way to huge concrete structures built to provide a source of electricity for growing metropolitan areas. Overland transportation expanded as the horse and buggy gave way to the automobile and dirt trails were paved and expanded into roads and highways. Culverts and other structures placed in or across streams and rivers to support these roads were added to the growing inventory of blockages. Thus, the foundation was laid for a conflict between commercial interests and the environment that would plague natural resource managers into the 20th century.

During the past two centuries, a major portion of migratory fish spawning and nursery habitat throughout the Bay has been lost due to downstream obstructions. The Susquehanna River is perhaps the most dramatic example of the impacts of blockages on migratory fish. Construction of the Conowingo Dam on the East Coast's largest river in 1928 blocked nearly 300 miles of habitat historically used by American shad and other herrings. The river's annual shad harvest, which reached 7.1 million pounds in 1890, plunged to a meager 34,000 pounds in 1979, causing resource managers to impose a full moratorium on the catch of this fish.

Further south, a similar fate has befallen the migratory fishery resources of the James River. At one time anadromous fish migrated nearly 300 miles upstream, to the river's origin at the confluence of the Jackson and Cowpasture Rivers. Today, however, 5 concrete dams located in the vicinity of Richmond

block fish access to nearly two-thirds of historic habitat. While the Susquehanna and James Rivers may be two of the more dramatic illustrations of the problem, blockages plague virtually every major tributary of the Bay. Figure 1 depicts historical spawning and nursery areas currently precluded by impediments to fish migration. Nearly a thousand such blockages are documented in both Virginia and Maryland. In response, in recent years resource managers have begun to assess this problem more closely to identify remedial measures. These concerns culminated in 1987 when the authors of the new Chesapeake Bay Agreement included a specific commitment "to provide for fish passage at dams, and remove stream blockages wherever necessary to restore passage for migratory fish."

In January, 1988 the Living Resources Subcommittee appointed a work group to develop a strategy for implementing the Bay Agreement's commitment to restore passage for migratory fish. The work group is composed of representatives from each of the Bay states, the District of Columbia, appropriate federal resource agencies, and the environmental community. At its first meeting in February the work group identified several issues that would be the focus of future deliberations. These key issues are summarized below:

A MULTI-FACETED APPROACH IS RECOMMENDED TO ASSURE THE
REMOVAL OF IMPEDIMENTS TO FISH MIGRATION

The structures that act as impediments to fish migration are diverse, ranging from major hydroelectric facilities to road

culverts. No one solution or instrumentality can effectively assure the provision of fish passage. Instead, it is essential that all responsible parties work together to remove stream blockages that impede the spawning runs of migratory species. The work group thus recommends a multi-faceted approach to this problem. Beginning with the smallest impediments to fish passage, we make the following recommendations:

- All future road and highway culverts should be designed and constructed to assure the passage of migratory fish species present or potentially present in the affected stream. Within each Bay state, the highway department should prepare, with the assistance of other responsible agencies, an inventory of existing culverts that act as impediments to migratory fish, and prepare a strategy for remedying this problem.

- Many of the dams that impede fish passage are small structures. Designing fishways for these structures is often a relatively straightforward process. We recommend that each Bay state compile an inventory of impediments to fish passage and establish a priority list for future fishway projects at these smaller obstructions. As mentioned below, it is essential that each state possess the technical expertise necessary to make provision for fish passage at these obstructions.

We believe that our ability to provide fishpassage at small dams would be greatly improved by the active participation of local governments. The current fishway program in Massachusetts demonstrates the value of such cooperative efforts. The

Massachusetts Division of Marine Fisheries designs and assists in the construction of small fish passages. Local townships contribute through the provision of heavy equipment and the purchase of concrete and other building materials. As a consequence of these cooperative efforts, the cost of constructing fish passage facilities is in many cases significantly reduced. The excellent record of the Massachusetts program has generated an extraordinary level of public support.

The Massachusetts program is one possible model for the Bay states to consider. Whatever option they choose, the Bay states should take steps to assure that adequate resources are provided to permit meaningful progress in creating fish passages at these small dams. We recommend that the states creatively explore ways to assure the provision of adequate funding for these projects. We further recommend that all jurisdictions in the watershed take steps to assure that they possess adequate legal authority to carry out an effective fish passage program. A brief summary of the current law in the Bay watershed as it relates to fish passage is attached to this report as Appendix 4. Finally, it is essential that steps be taken to assure that adequate resources exist to operate and maintain fishways once they are constructed.

-Although the number of major hydroelectric facilities in the Bay region is not large, these large dams currently prevent migratory fish from utilizing hundreds of miles of potential spawning and nursery habitat. Efforts to provide fish passages at these facilities have accelerated in recent years, partly as a

consequence of voluntary agreements between state and federal resource agencies and utilities, but much work remains to be done. It should be recognized that efforts at smaller, upstream blockages will not be completely successful absent a similar commitment at the hydroelectric facilities and other blockages that obstruct the downstream areas of many of the Bay's tributaries. It is the workgroup's recommendation that the licensing process for all facilities regulated by the Federal Energy Regulatory Commission be reopened, where necessary, to assure that adequate provisions are made for fish passage within a reasonable time frame. In no case should any new licenses for hydro-electric projects be issued in the watershed absent the assurance that adequate steps will be taken to assure the passage of migratory fish.

- The workgroup recommends that state and federal resource agencies initiate reintroduction programs for migratory fish, when necessary and appropriate, above impediments that have been targeted for fish passage projects. The upstream introduction of migratory species prior to the construction of fish passage facilities "imprints" young fish and increases their disposition to return, in future years, to the targeted stream. This practice can expedite the recovery of migratory species in waters where they are currently few in number. One way to do this is to trap adult fish below the targeted blockage and transport them upstream to spawn. A second method is to stock young hatchery produced fish above the impediment. To implement this

recommendation the Bay states should identify potential sources of migratory fish for transport efforts, and acquire any equipment necessary for the transport of these fish. It is also suggested that the states implement management plans, regulatory measures and monitoring programs that will protect newly introduced fish until a self sustaining population has been established. In addition, measures should be taken to assure that water quality in targeted streams is maintained at levels necessary for the reestablishment of migratory species.

- Public education is essential to the long term success of this initiative, just as it is the cornerstone of all our efforts to restore the Chesapeake Bay. All possible avenues for public involvement in and sponsorship of activities related to the provision of fish passage should be actively explored.

- Finally, it is important that, from the beginning, the fishery management agencies monitor the results of their efforts. Such monitoring is essential in gauging the impact of fish passage projects on populations of migratory species, and in assuring the cost effectiveness of future efforts. As recommended below, the creation of an ongoing Baywide fish passage workgroup will provide an institutional framework for the assessment of current and future fish passage initiatives.

TECHNICAL RESOURCES DEDICATED TO THE REMOVAL OF
IMPEDIMENTS TO FISH MIGRATION IN THE BAY WATERSHED
SHOULD BE SUPPLEMENTED

There was a consensus among work group members that technical expertise in the Bay watershed needs to be supplemented if we are to implement an effective fish passage restoration program. In particular, there is a strong need to establish expertise in the area of fishway engineering and design.

In general, the work group felt that these resource needs could best be met through a cooperative effort by the responsible state and federal agencies. Specifically, the work group concluded that a need exists at the state level for personnel familiar with the principles of fishway design and capable of designing and supervising the construction of fish passage projects. The capabilities of state fish passage programs could be greatly enhanced in the Bay region by the establishment, in the U.S. Fish and Wildlife Service, of a technical advisory office that would act as a resource to state and local government agencies within the watershed. This office would act as clearinghouse for information relating to fishway construction and would act as consultant to the Bay states on selected fishway projects. As a modest first step, we recommend that the Fish and Wildlife Service consider enhancing their anadromous coordinator initiative to provide additional assistance in the Bay region. A similar state\ federal cooperative effort currently exists in New England between the Fish and Wildlife Service and the Massachusetts Division of Marine Fisheries.

The work group also suggests that an ongoing Baywide workgroup of the Living Resources Subcommittee be appointed to

coordinate future activities relating to the provision of fish passage. The committee would serve as a forum for the evaluation of past remedial efforts and the development of future fish passage initiatives. The committee should include representatives from federal agencies whose activities might contribute to the removal of impediments to fish migration and a representative from the Chesapeake Bay Commission. We believe that the committee would also benefit from the insight that representatives of local governments in the watershed could provide. The committee would assure that the responsible authorities work cooperatively in the removal of blockages to fish passage. In addition it would serve as a forum for the exchange of information and for the dissemination of that information to interested members of the public. The committee would prepare an annual report documenting progress in the provision of fish passage.

The workgroup also suggests that the following additional steps be taken to address existing gaps in technical knowledge. First, we propose that a technical workshop be held in the Bay area to apprise interested parties of recent developments relating to fishway design and construction. This workshop could be sponsored jointly with the Fish and Wildlife Service through their short course program on fish passage. We also suggest that steps be taken that will encourage regional educational institutions to focus resources on this important problem. The Fish and Wildlife Service should consider encouraging

"cooperative units" in the watershed to focus on migratory fish issues and the engineering and design of fishways.

A COMPREHENSIVE INVENTORY OF OBSTRUCTIONS TO FISH
MIGRATION IN THE BAY WATERSHED SHOULD BE COMPILED

Accurate information on the nature and location of impediments to fish passage is essential to the success of any fishway program. The workgroup recommends that as a long term goal the responsible agencies work together to compile an up-to-date, comprehensive inventory of dams and other obstructions to fish migration in the Bay states. One function of the previously recommended Baywide work group should be the coordination of this effort. The inventory should include information on the current ownership and use of each impediment, the species and numbers of migratory fish present below the obstruction, and the quality and quantity of upstream habitat. The inventory should also identify the location of each blockage by river section and stream order and provide a physical description of the obstruction. Where relevant, information concerning the status of any license issued by the Federal Energy Regulatory Committee should be provided. Ideally, this information should be compiled in a central computer data base accessible to all interested agencies.

Although data gaps exist, the workgroup believes that existing information supports the need to take immediate steps to remove known impediments to fish passage. The location of major

impediments to fish passage in the Bay watershed have already been inventoried. Those impediments should be the initial focus of our remedial efforts. We recommend that the states periodically reassess their priorities as additional information becomes available. In the paragraphs that follow currently available sources of information on impediments to fish migration in the watershed are summarized.

In Virginia several surveys have been conducted which collectively provide an inventory of the larger impediments to fish passage in the tidewater area. Information on smaller impediments is currently lacking. The "Virginia Hydro Dam Inventory" was prepared in 1981 to provide information about the hydroelectric potential at existing dams. The inventory includes descriptions of the physical condition of the state's larger dams as well as information on ownership. Two regional surveys by the Virginia Polytechnic Institute and State University document stream blockages and water quality on the mainstems of the Rappahannock, James and York Rivers and tributaries of the lower James. "An Analysis of the Impediments to Spawning Migrations of Anadromous Fish in Virginia Rivers" was prepared in 1985 and describes physical impediments to migration on the main stems of the James, York and Rappahannock Rivers. "Use of Tributaries of the Lower James River by Anadromous Fishes" identifies the first downstream impediment encountered on 96 tributaries to the Lower James. The studies include a description of the historic and present ranges of anadromous

migrations. Detailed information about the use and ownership of the obstructions and the quality of upstream habitat is not included. In addition, field biologists with the Department of Game and Inland Fisheries have compiled a "Statewide Inventory of Dams". This inventory is the most inclusive list of dams that impede fish passage, but does not contain information on non-dam impediments. In summary, while much information has already been compiled on stream blockages in Virginia, it needs to be consolidated and gaps in the data must be filled. Virginia representatives on the work group suggested that additional resources may be necessary to collect and organize needed information. A more detailed description of the aforementioned surveys, along with a summary of current fishway projects in Virginia, is attached as Appendix 1.

In Maryland a more centralized but similar body of information on impediments to fish passage exists. Between 1968 and 1980 the Maryland Department of Natural Resources compiled a "Survey of Anadromous Fish Spawning Areas". The survey identifies all natural and manmade stream blockages impeding the passage of migratory fish in 15 of 17 tidewater counties. Another, similar survey provides a description of impediments in the two remaining counties. Although the surveys are fairly comprehensive, some of the information is dated, and there are gaps in the available data. Specifically, the current ownership and use of impediments needs to be documented, and information on

the presence and abundance of migratory species below blockages needs to be updated.

Detailed physical information about larger dams in the state is compiled in the "Inventory of Maryland Dams and Assessment of Hydropower Resources", also published by the Department of Natural Resources. The inventory does not describe habitat conditions or whether migratory species are present below the listed dams. A more comprehensive discussion of the status of fishpassage efforts underway in Maryland is attached as Appendix 2.

Information on stream blockages in Pennsylvania is also incomplete at this time. However, migratory fish access to the main stem of the Susquehanna River will be possible once passage has been achieved around the four hydroelectric dams in the lower river. Emphasis has been placed on negotiations with the utilities that operate these hydroelectric facilities, and on upstream stocking. A survey of habitat quality in the river has been completed. Many impediments in the river are identified in the Water Resources Bulletin for Dams, Reservoirs, and Natural Lakes, published by the state in 1970. The historical importance of the Susquehanna's anadromous fisheries is documented in a review authored by Richard St. Pierre of the U.S. Fish and Wildlife Service. A copy of the review is attached as Appendix 3.

Information on blockages to fish passage within the District of Columbia is primarily restricted to the Rock Creek system and summarized in several publications and studies. The Rock Creek

Watershed Conservation Study compiled by the National Park Service provides a detailed account of water quality, hydrology, land usage, spawning conditions and barriers to fish migration. A subsequent study conducted in 1983 (Liz Houghton) specifically evaluates stream barriers and proposes recommendations for mitigation. The D. C. Fisheries Program is currently collaborating with the National Park Service to monitor resident and migratory fish populations in this system in order to make additional recommendations and prioritize restoration efforts.

The fish populations of the Anacostia River drainage are described with reference to earlier studies in a report entitled Resource Identification Study for the Anacostia River (Dietemann and Giraldi 1973). While the report does not specifically describe the effect of barriers to fish migration, the distribution of fish populations are compared to historical ranges, providing insight into the extent of habitat degradation and current usage. The D. C. Fisheries program is supporting a present ICPRB study designed to update this work. It is expected that detailed information on the Anacostia system, particularly with respect to blockages and their effect on anadromous fisheries resources, will be available within a year.

Other blockages, located outside the jurisdiction of the District of Columbia, directly impinge on local anadromous fishery resources and are of concern to District fisheries managers; notably, the municipal water supply dam at Little Falls situated on the Potomac River and several smaller blockages

in the Anacostia drainage streams that terminate in the District require fish passage. The District has substantial interest in identifying and mitigating these blockages and is prepared to lend support to future fish passage restoration.

