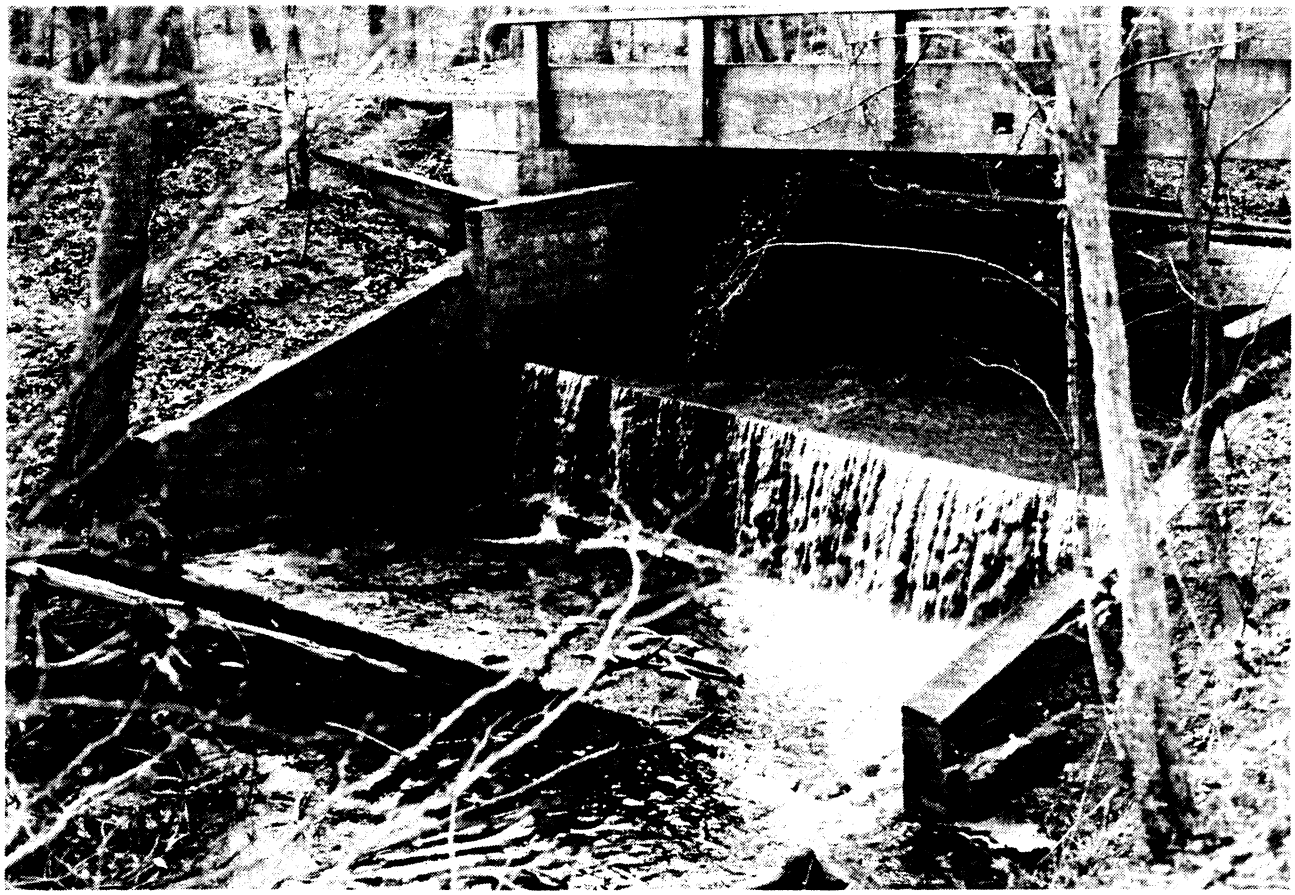
USE OF TRIBUTARIES OF THE LOWER

JAMES RIVER BY ANADROMOUS FISHES



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Final Report for Phase Two of an Analysis of the Impediments to Spawning Migrations of Anadromous Fish in Virginia Rivers

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ABSTRACT

The use of tributaries of the lower James River (downstream of Richmond, Virginia) by striped bass, American shad, alewife, and blueback herring was determined by reviewing literature, consulting knowledgeable agency personnel, and interviewing local fishermen and landowners. Barriers to upstream movement were identified for each tributary, and all highway crossings were evaluated for their impact on spawning migrations. Striped bass and American shad spawn primarily in the James River proper, but some spawning apparently occurs in the Chickahominy River. Both species ascend the Appomattox River, but only American shad are known to spawn in it. Because of their preference to spawn in large tributaries, which are usually bridged, highway crossings do not appear to impede either striped bass or American shad in the James River drainage.

Alewife and blueback herring (collectively known as river herring) ascend and spawn in most tributaries that empty into the James River upstream of River Mile 40 (the town of Scotland, Virginia), provided they have free access and adequate depth. A total of 54 streams were confirmed as having river herring spawning runs, and 38 were deemed

probable spawning streams. Seven highway crossings were identified as being impediments, or possible impediments, to river herring spawning runs. Modification of two of these crossings would open up as much as 1.25 miles of additional stream for spawning.

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INTRODUCTION

Striped bass (Morone saxatilis), American shad (Alosa sapidissima), alewife (A. pseudoharengus), and blueback herring (A. aestivalis) are anadromous fishes that ascend Virginia's rivers each spring to spawn in freshwater. These four species have historically provided a rich resource to Virginia's sport and commercial fishermen (Fig. 1); however, the harvest of each has declined to record low levels in recent years (Atran et al. 1983). Probable causes of this decline include habitat degradation, overfishing, and reduced access to historical spawning sites. Concern for these species has prompted efforts to reduce harvest, improve water quality, and restore access to ancestral spawning areas.

Highway crossings have the potential to obstruct upstream movements of anadromous fish by altering stream width, depth, velocity, and gradient, especially on smaller tributaries where culverts may be used instead of bridges. Culverts have been found to obstruct upstream fish movement in Canada (Jones et al. 1974) and Alaska (MacPhee and Watts 1976). However, the impact of culvert design and placement on upstream migrations of Atlantic coast anadromous species is poorly known.

Figure 1. Fishermen on Swift Creek catching river herring with dip nets and hook and line.

This multi-phase study was designed to provide an evaluation of the occurrence and significance of highway impediments to the migration of anadromous fish in Virginia's streams, now and in the future. Phase One of this study (Mudre et al. 1985) developed an overview of the issue. It determined: 1) the present and historic ranges of striped bass, American shad, and river herring (a collective term for alewife and blueback herring) in the mainstem James, Rappahannock, and York (including the Pamunkey and Mattaponi) Rivers; 2) the present instream barriers to passage in these rivers; and 3) the feasibility of eliminating the barriers. It also developed a state-of-knowledge synthesis of factors which limit instream migration of the aforementioned species.

This report details the findings of Phase Two of this study. The objectives of Phase Two were to: 1) identify the tributaries of the lower James River (downstream of Manchester Dam in Richmond) that are used by spawning striped bass, American shad, and river herring; 2) identify natural and anthropogenic barriers to spawning migrations in these tributaries; and 3) identify all highway crossings on these tributaries that anadromous fish would encounter, and evaluate each for its potential impact to spawning

migrations. The first part of this document presents the methods, results and discussion, and a summary of our findings. Following this text are individual tributary descriptions and road crossing evaluations, arranged in descending order from upstream to downstream.

METHODS

The report by Davis et al. (1970) provided a solid foundation for identifying tributaries of the lower James River that are, or may be, used by spawning anadromous fish. Aside from this report, there is little else in print that addresses the issue of spawning areas. Current information on anadromous fish runs was obtained by personal observation of spawning runs, interviews with local fisherman and landowners, and consultation with knowledgeable personnel of the Virginia Commission of Game and Inland Fisheries (VCGIF), Virginia Marine Resources Commission (VMRC), Virginia Institute of Marine Sciences (VIMS), and James R. Reed and Associates, Incorporated. Tributaries were categorized as: 1) confirmed; 2) probable; or 3) unlikely spawning streams for anadromous fish. Confirmed spawning streams are those in which: 1) Davis et al. (1970) reported finding evidence of Alosa spawning; 2) our field personnel observed or found evidence of spawning activity; or 3) knowledgeable agency personnel and/or local residents

(locals) identified as having spawning runs. Probable spawning streams are those not confirmed, yet: 1) are upstream of, or a tributary of, a confirmed tributary (therefore within the freshwater spawning range of anadromous fish); 2) are accessible to anadromous fish; and 3) have adequate depth for at least river herring to ascend. Streams that are too shallow for river herring to ascend, or are downstream of all confirmed tributaries were deemed to be unlikely spawning tributaries.

Impediments to spawning migrations of anadromous fish were identified by interviews with local fisherman and landowners, consultation with VCGIF enforcement officials, inspection of USGS 7.5 minute topographic maps, and field observations. Beaver dams may be effective barriers to anadromous fish migrations (Fig. 2), but for the purposes of this report, we did not consider them to be permanent structures. Our estimates of the upstream limits of anadromous fish runs are based on the scenario of no beaver-related obstructions. On many of the streams, there is no well-defined natural barrier, but rather a gradual shallowing of the stream that eventually stops river herring. In addition, the upstream limit of river herring runs on these streams may vary between years as a result of variable stream discharge. For many of these streams, we

Figure 2. Beaver dam at stream mile 0.9 on Proctors Creek.

made a subjective estimate of the upstream limit of river herring migrations, based on interviews with locals, and assessments of stream gradient and drainage area. Our bias was to err in favor of an overestimate, rather than an underestimate, of the lengths of stream used.

Highway crossings on the sections of all (confirmed, probable, and unlikely) tributaries of the lower James River that are open to anadromous fish were identified. Each crossing was evaluated with regard to its impact on stream flow, and this information was related to the known swimming abilities and limitations of the anadromous species that use, or may use, the tributary. Parameters of particular relevance included depth, velocity, gradient, and turbulence. Each highway crossing was categorized as: 1) passable; 2) impassable; or 3) questionably passable. Sites were visited more than once, as needed. When possible, we consulted with locals on the success of anadromous fish in negotiating given crossings.

All stream and place names are based on those printed on the USGS 7.5 minute topographic maps. Anastomoses, oxbows, tidal tributaries with little or no free-flowing headwaters, and unnamed freshwater tributaries with small drainage areas (therefore, little discharge), are not addressed in this study. Stream mileages are based on those

published in a report by the Virginia Department of Conservation and Economic Development (1969). If a particular mileage was not available in the aforementioned publication, measurements were taken from USGS 7.5 minute topographical maps, following the main channel as printed.

RESULTS AND DISCUSSION

Tributaries Used For Spawning

Striped bass spawn primarily in the tidal freshwater portion of the mainstem James River. Their spawning grounds in the James River have been officially defined (VMRC Emergency Regulation 450-01-0034) as being from Sunken Meadow Creek (River Mile 49) upstream to City Point (River Mile 75). Striped bass run up the Chickahominy River as far as Walkers Dam (Fig. 3), and apparently some spawn in this tributary (Olney et al. 1985, and Kyle Blanks, VMRC, pers. comm.). Interviewed locals reported that in the spring, striped bass run up the Appomattox River as far as the rapids just downstream of Harvell Dam in Petersburg (Fig. 3), but it is not known if they spawn in this tributary.

According to several locals that live in the Suffolk area, striped bass (as well as American shad and river herring) ascend the Nansemond River (confluence with James River at River Mile 8.2) up to the Lake Meade dam, and

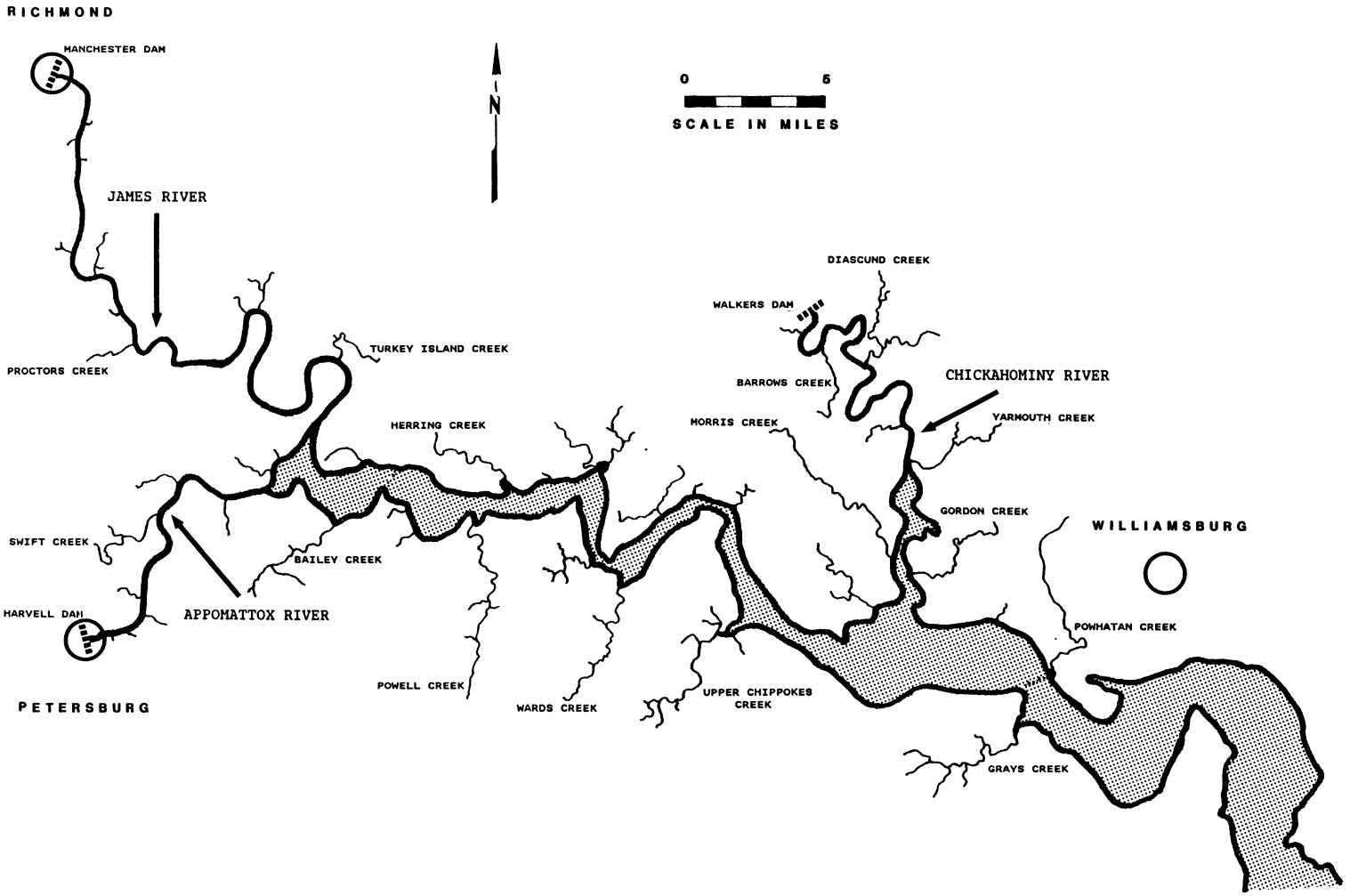

Figure 3. Confirmed and probable spawning tributaries of anadromous fish in the lower James River basin.

Western Branch (tributary of the Nansemond) up to the Western Branch Reservoir dam. Locals have observed these fish runs in the spring of the year, following storm events that result in an abundance of freshwater flowing over the dam spillways. These runs are short-lived, and the fish apparently return downstream when the flows diminish. The locals interviewed did not think that spawning occurs during these runs. During average spring flow conditions, the salinity levels below these dams would be unsuitable for eggs and larvae of anadromous fishes.

American shad spawning areas in the lower James River drainage are very similar to those of striped bass, with shad using more and smaller tributaries (Davis et al. 1970). American shad prefer to spawn over shallow tidal flats in water less saline than one ppt (Davis et al. 1970). American shad run up and spawn in both the Appomattox and Chickahominy Rivers (Kyle Blanks, VMRC, pers. comm.), but their upstream migrations are blocked by Harvell and Walkers Dams, respectively.

Davis et al. (1970) reported that river herring spawn in the tidal freshwater portion of the James River, and in most of the tributaries that empty into the James River, between River Mile 40 (the town of Scotland, VA), and Richmond. Gravid adults have been captured in the tidal

portion of at least one tributary downstream of River Mile 40, but spawning has not been documented (James R. Reed, James R. Reed and Associates, Inc., pers. comm.). No dip net fisheries for river herring have developed on any tributaries downstream of James River Mile 46. None of the locals interviewed were aware of spawning runs up any tributaries downstream of James River Mile 46, although two locals reported seeing "herring swirling" in the lower tidal portion of Grays Creek (confluence with the James at River Mile 40.4) and thought they may have been spawning. They did not capture any of the fish observed, so a positive identification was not made. Based on the above information, it appears unlikely that river herring spawn in any tributaries that empty into the James River downstream of River Mile 40.

A total of 96 tributaries of the James River, between Manchester Dam (Richmond) and River Mile 40, were identified from USGS 7.5 minute topographic maps (Table 1). Of these, 54 were found to have confirmed river herring spawning runs, 38 were deemed probable spawning streams, and four appear to be unlikely candidates for spawning runs.

Impediments to Spawning Migrations

Of the 54 tributaries known to have spawning runs of anadromous fish, 33 are unobstructed up to the fall line; 12

Table 1. Tributaries of the James River Basin that may be used by spawning river herring (alewife and blueback herring), and stream miles available for use. Tributary: 1 = first order, 2 = second order, 3 = third order tributaries. The numbers indicate the miles from the mouth of the receiving stream. Use: C = confirmed usage, P = probable usage, U = usage unlikely. Tributaries downstream of River Mile 40 (James River) are not listed because it is unlikely that herring spawn in them.

#	STREAM	TRIBUTARIES 1	2	3	USE	UPSTREAM OBSTRUCTION	LENGTH OPEN
1	GILLIE CREEK	106.5	.	.	C	CONCRETE CHANNEL	< 0.1
2	ALMOND CREEK	105.2	.	.	C	FALL LINE	0.5
3	GOODE CREEK	104.7	.	.	C	FALL LINE	0.4
4	MILL CREEK	103.6	.	.	P	FALL LINE	0.4
5	FALLING CREEK	100.3	.	.	C	FALL LINE	0.6
6	GRINDALL CREEK	.	0.2	.	P	FALL LINE	0.2
7	CORNELIUS CREEK	98.6	.	.	C	FALL LINE	2.1
8	COLES RUN	.	0.3	.	P	POND DAM	0.3
9	KINGSLAND CREEK	96.6	.	.	C	PRIVATE CULVERT	0.4
10	UNNAMED TRIBUTARY	.	0.3	.	P	FALL LINE	0.2
11	PROCTORS CREEK	95.2	.	.	C	FALL LINE (OR CULVERT)	2.1
12	REDWATER CREEK	.	0.8	.	P	FALL LINE	0.1
13	ROUNDABOUT CREEK	88.4	.	.	C	FALL LINE	0.8
14	FOURMILE CREEK	88.1	.	.	C	GRIGGS POND DAM	1.9
15	BAILEY CREEK	.	0.7	.	C	FALL LINE	1.1
16	TURKEY ISLAND CREEK	79.8	.	.	C	SHIRLEY MILLPOND DAM	3.9
17	CREWES CHANNEL	.	0.9	.	P	FALL LINE	0.4
18	SHAND CREEK	75.6	.	.	P	FALL LINE	0.5

Table 1 (continued)

#	STREAM	TRIBUTARIES 1	2	3	USE	UPSTREAM OBSTRUCTION	LENGTH OPEN
19	JOHNSON CREEK	75.4	.	.	C	FALL LINE	2.2
20	APPOMATTOX RIVER	75.1	.	.	C	HARVELL DAM	11.2
21	FLEETS BRANCH	.	11.1	.	U	FALL LINE	0.0
22	LIEUTENANT RUN	.	10.0	.	C	PIPES UNDER BRIDGE	0.1
23	POOR CREEK	.	9.6	.	C	FALL LINE (OR CULVERT)	0.3
24	HARRISON CREEK	.	8.7	.	C	FALL LINE	0.8
25	OLDTOWN CREEK	.	7.9	.	P	FALL LINE	1.6
26	HARRISON BRANCH	.	6.1	.	P	MINING OPERATIONS	0.1
27	SWIFT CREEK	.	4.6	.	C	SWIFT CREEK MILL DAM	4.9
28	TIMSBURY CREEK	.	.	1.9	P	FALL LINE	0.9
29	ASHTON CREEK	.	3.6	.	C	FALL LINE	2.2
30	CABIN CREEK	.	1.7	.	C	FALL LINE	1.6
31	BULLHILL RUN	.	.	1.2	U	FALL LINE	0.0
32	GRAVELLY RUN	74.0	.	.	U	INDUSTRIAL DISCHARGE	0.0
33	BAILEY CREEK	73.7	.	.	C	FALL LINE	4.7
34	SOUTHERLY RUN	.	4.6	.	P	FALL LINE	0.3
35	MANCHESTER RUN	.	3.5	.	P	FALL LINE	1.6
36	CATTAIL CREEK	.	2.3	.	P	FALL LINE	0.4
37	EPPES CREEK	72.2	.	.	C	FALL LINE	2.0
38	KIMAGES CREEK	71.0	.	.	C	CHARLES LAKE DAM	0.1
39	JENNY CREEK	70.6	.	.	P	NONE	0.8

Table 1 (continued)

#	STREAM	TRIBUTARIES 1	2	3	USE	UPSTREAM OBSTRUCTION	LENGTH OPEN
40	BILLY CREEK	.	0.8	.	P	POND DAM	< 0.1
41	BICKERS CREEK	.	0.8	.	P	FALL LINE	0.3
42	CHAPPELL CREEK	69.9	.	.	C	POND DAM	0.8
43	UNNAMED TRIBUTARY	.	0.7	.	U	FALL LINE	0.0
44	POWELL CREEK	67.8	.	.	C	FALL LINE	8.6
45	MIKE RUN	.	6.3	.	P	FALL LINE	0.5
46	NOBLES SWAMP	.	4.7	.	C	FALL LINE	0.6
47	WALLS RUN	.	4.4	.	C	RUBBLE BELOW BRIDGE	0.7
48	HERRING CREEK	66.9	.	.	C	HARRISON LAKE DAM	6.0
49	BUCKLAND CREEK	65.5	.	.	P	FALL LINE	0.7
50	QUEENS CREEK	64.2	.	.	C	NONE	2.0
51	COURTHOUSE CREEK	.	2.0	.	C	FALL LINE (OR CULVERT)	1.1
52	GLEBE CREEK	.	.	1.0	C	FALL LINE	1.0
53	PARISH HILL CREEK	.	2.0	.	C	FALL LINE	0.7
54	GUNNS RUN	.	0.3	.	C	FALL LINE	4.1
55	FLOWERDEW HUNDRED CREEK	61.5	.	.	C	FALL LINE	3.1
56	UNNAMED TRIBUTARY	.	2.8	.	P	FALL LINE	0.4
57	UNNAMED TRIBUTARY	.	2.3	.	P	FALL LINE	0.3
58	UNNAMED TRIBUTARY	.	1.8	.	P	FALL LINE	0.8
59	WARDS CREEK	60.5	.	.	C	FALL LINE	7.6
60	UNNAMED TRIBUTARY	.	5.0	.	C	FALL LINE	0.4

Table 1 (continued)

#	STREAM	TRIBUTARIES 1	2	3	USE	UPSTREAM OBSTRUCTION	LENGTH OPEN
61	UNNAMED TRIBUTARY	.	2.7	.	P	FALL LINE	0.4
62	KITTEWAN CREEK	58.1	.	.	C	FALL LINE	2.6
63	MAPISCO CREEK	.	0.3	.	C	FALL LINE	2.8
64	TYLER CREEK	57.0	.	.	C	FALL LINE	0.7
65	KENNON CREEK	55.8	.	.	C	FALL LINE	2.0
66	UNNAMED TRIBUTARY	.	1.4	.	P	FALL LINE	0.3
67	UNNAMED TRIBUTARY	.	1.0	.	P	FALL LINE	0.4
68	UPPER CHIPPOKES CREEK	51.9	.	.	C	FALL LINE	8.1
69	UNNAMED TRIBUTARY	.	7.1	.	C	FALL LINE	0.1
70	UNNAMED TRIBUTARY	.	6.5	.	C	FALL LINE	1.4
71	BAILEY BRANCH	.	5.9	.	P	LOW POINT MILL DAM	0.5
72	UNNAMED TRIBUTARY	.	2.2	.	P	FALL LINE	1.0
73	UNNAMED TRIBUTARY	.	1.1	.	P	POND DAM	1.1
74	UNNAMED TRIBUTARY	.	.	0.1	P	FALL LINE	0.8
75	BRANDON GUT	.	0.6	.	P	POND DAM	0.9
76	SUNKEN MEADOW CREEK	49.1	.	.	C	SUNKEN MEADOW DAM	0.1
77	CHICKAHOMINY RIVER	46.5	.	.	C	WALKERS DAM	23.3
78	UNNAMED TRIBUTARY	.	22.3	.	P	POND DAM	1.2
79	BARROWS CREEK	.	20.8	.	C	FALL LINE	3.7
80	DIASCUND CREEK	.	15.3	.	C	RESERVOIR DAM	6.1
81	UNNAMED TRIBUTARY	.	.	4.1	P	FALL LINE	0.5

Table 1 (continued)

#	STREAM	TRIBUTARIES 1	2	3	USE	UPSTREAM OBSTRUCTION	LENGTH OPEN
82	MILL CREEK	.	.	1.4	C	FALL LINE	3.3
83	PARSONS CREEK	.	7.7	.	P	FALL LINE	2.2
84	YARMOUTH CREEK	.	5.7	.	C	SUBMERGED CULVERT	5.0
85	LITTLE CREEK	.	.	2.1	C	RESERVOIR DAM	1.1
86	MORRIS CREEK	.	2.7	.	C	FALL LINE	9.3
87	GORDON CREEK	.	1.6	.	C	JOLLY POND DAM	6.3
88	TOMAHUND CREEK	.	0.3	.	C	FALL LINE	5.0
89	UNNAMED TRIBUTARY	.	.	1.0	P	FALL LINE	1.3
90	UNNAMED TRIBUTARY	43.2	.	.	P	FALL LINE	1.1
91	POWHATAN CREEK	41.3	.	.	C	FALL LINE	8.7
92	GRAYS CREEK	40.4	.	.	C	FALL LINE	7.2
93	SPRING RUN	.	6.1	.	P	FALL LINE	1.3
94	DARK SWAMP	.	5.3	.	P	FALL LINE	1.3
95	HULLS SLASH GUT	.	4.0	.	P	FALL LINE	0.6
96	CROSS CREEK	.	2.0	.	P	FALL LINE	0.8

Note: In this usage, "FALL LINE" denotes an actual falls, or a shallowing of the stream that serves as the impediment to upstream migration.

have dams that block spawning migrations; six have highway crossings that are, or may be, impediments to river herring spawning runs; one is open its entire length; one has an impassable private culvert that stops river herring; and one flows through a concrete-lined channel that is too shallow for river herring to negotiate. Of the 38 tributaries that are probable spawning streams, 30 are unobstructed up to the fall line; six have dams that would impede river herring runs; one is probably open its entire length; and one has been altered by mining operations.

Of the 88 highway crossings evaluated, seven were either impassable or questionably passable; the remaining 81 were deemed passable for the anadromous species that would encounter them. All seven of the problem crossings are on confirmed spawning streams, and are described below. They are presented in descending sequence, from upstream to downstream.

Proctors Creek

The I-95 crossing at Proctors Creek may be a significant barrier to river herring spawning runs. Several locals testified that at one time, river herring ascended Proctors Creek up as far as the US 1 crossing, but now they get no further than the vicinity of the I-95 bridge, when beaver dams are not encountered. A sewer line installed

along this creek may stop, or at least delay, river herring at several crossings, contributing to the reduction in stream available to them. The I-95 crossing is a pair of single span bridges with a concrete apron (support) under the southbound bridge. The northbound bridge may have a similar support under it, but it is not visible. As the water of the main channel (right descending side) flows over the exposed concrete apron, it spreads out into a long, shallow (~ 5 cm deep on April 4, 1986), and fast-moving (~ 80 cm/sec on April 4, 1986) sheet (Fig. 4). River herring would not be able to ascend this under the observed flow conditions. There is a side channel on the left descending side that cuts through a gravel/cobble deposit. It carries considerably less water than the main channel, but is relatively narrow and has adequate depth and flow for river herring to ascend without too much difficulty. Because this channel has less discharge than the main channel, river herring may not be readily attracted to it. For these reasons, this crossing may be a barrier to river herring, and was labeled "questionably passable". If this structure was altered to allow river herring to pass with ease, it is difficult to estimate how much additional stream length would be used by river herring, if it would improve the spawning run at all. The river herring would still have to negotiate the problem areas downstream, created by

Figure 4. Proctors Creek under the I-95 bridge, looking downstream. The foreground shows the shallow water of the main channel as it flows over the concrete apron under the southbound lane.

installation of the sewer line as well as ephemeral beaver dams.

Lieutenant Run

According to locals, river herring run up Lieutenant Run, a tributary of the Appomattox River, and are usually stopped at the Bollingbrook Street bridge in Petersburg. Water and sewer pipes under this bridge trap logs and debris, forming a dam and impassable barrier in most years (Fig. 5). During some years, a hole in the debris dam permits river herring to get upstream of Bollingbrook Street. When this happens, river herring ascend an additional 75 m to a shallow riffle (fall line), which apparently stops them. Locals indicated that this small stream has never had large river herring runs, and they have been declining in recent years. This stream suffers from urban development, with its accompanying siltation, altered flow regimes, and abundant trash and debris.

Poor Creek

Locals have seen river herring spawning in Poor Creek, another tributary of the Appomattox River. River herring are known to come up as far as the intersection of Bank Street and Washington (Route 36), but no one reported seeing them upstream of the Route 36 crossing. Between the Route 36 crossing and the intersection of Route 36 and Bank

Figure 5. Impassable barrier on Lieutenant Run created by debris collected on pipes under the Bollingbrook Street bridge, Petersburg.

Street, Poor Creek passes through a culvert that is adjacent and parallel to Route 36 as it passes under an elevated Norfolk and Western railroad line. This culvert has a vertical drop of about 15 cm at its outlet (Fig. 6), which would be impassable for river herring except during high discharge. This culvert is probably the upstream limit for river herring runs, if the riffles below do not stop them. Further research is needed to make a final determination. If this culvert was modified, river herring could possibly run up this stream an additional 0.1 mile to the Route 36 culvert during years with above-average discharge. The water depth in the Route 36 culvert is too shallow (~ 3 cm deep on March 11, 1986) for river herring to negotiate during average spring flows (Fig. 7), but at above-average flows, there may be adequate depth for them to ascend through this structure. Consequently, the Route 36 culvert was labeled "questionably passable"; an evaluation during high discharge would be required to make a final determination. Approximately 80 m above Route 36, the stream cascades down a section of steep gradient through numerous cobbles and small boulders; this would stop river herring at all flow conditions. Locals indicated that the river herring runs on this stream are small and are not observed every year.

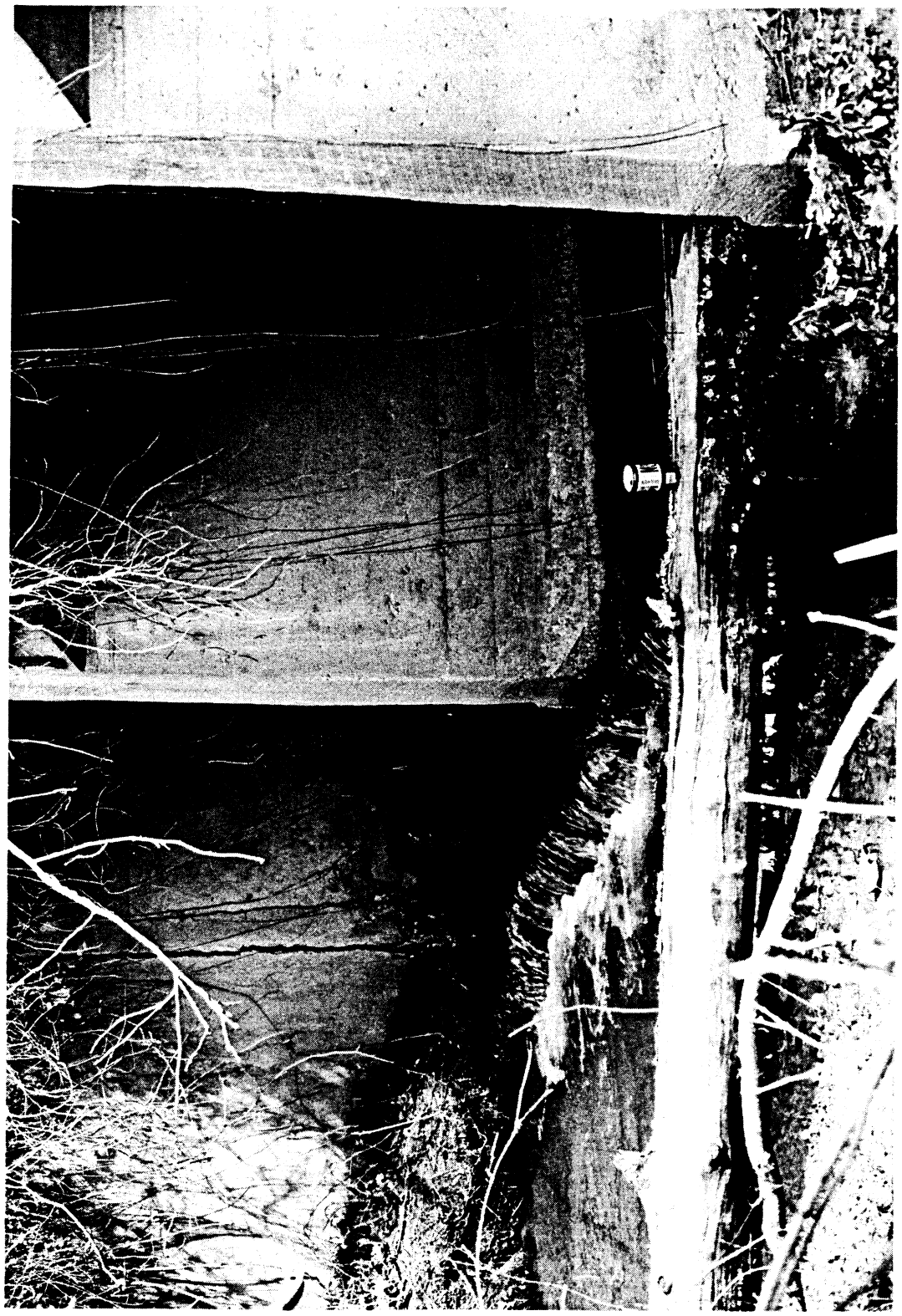

Figure 6. Poor Creek flowing out of the culvert parallel and adjacent to Route 36, as it passes under an elevated railroad. Note the vertical drop at the mouth of the culvert, and lack of depth in the cells.

Figure 7. Outlet of the Route 36 culvert on Poor Creek. Note the shallow water in the visible cell.

Walls Run

Walls Run, a tributary of Powell Creek, has a large river herring run every year. According to locals, some river herring reached upstream of Route 10 and were stopped below Route 635 by shallows or beaver dams. However, recent bridge construction at Route 10 has altered the stream so that river herring do not get above the new bridge. Rubble from the demolished bridge has been placed downstream of the current bridge. This rubble backs up water under the present bridge and forms a short stretch of steep gradient where the shallow water cascades down through the concrete rubble (Fig. 8). Locals claim that river herring do not ascend beyond this point. On April 23, 1986, dead river herring littered the stream downstream of this impediment following a spawning run, but none were found in the stream above this point. In addition to the created rubble riffle, there are several steel girders under the bridge that are partially submerged and may disorient river herring if they manage to ascend the riffle. If this crossing was modified, river herring could probably ascend an additional 1.2 miles.

Courthouse Creek

The Route 155 crossing over Courthouse Creek is "questionably passable". River herring ascend Courthouse Creek, a tributary of Queens Creek, upstream of Route 5, but

Figure 8. Concrete rubble placed in Walls Run, downstream of the Route 10 bridge. River herring do not ascend this steep gradient where the shallow water cascades down through the concrete pieces.

locals have never seen them above Route 155. Locals stated that river herring remain in the short stretch between Routes 5 and 155, but no obstructions were observed in this section of the creek. It appears possible for river herring to run up to the Route 155 culvert, especially during periods of above-average discharge. The stream flows through only one of the three cells of this box culvert, except during periods of high discharge. On April 3, 1986, the water depth at the inlet to the culvert (Fig. 9) was 13 cm, which is suboptimal for river herring passage (Mudre et al. 1985), and may therefore be impassable during average spring flows. At higher discharges, this culvert would likely be passable. If this culvert was properly modified, river herring could ascend only an additional 40 m upstream before encountering a natural shallow riffle that would stop them.

Yarmouth Creek

The Route 632 culvert at Yarmouth Creek (a tributary of the Chickahominy River) is "questionably passable". It consists of four concrete pipes, each approximately 1.0 m in diameter. Of the four pipes, only one is not submerged, and it was clogged with debris and silt, making it impassable. The tops of the downstream openings of the three submerged pipes are 10-15 cm below the water's surface. According to

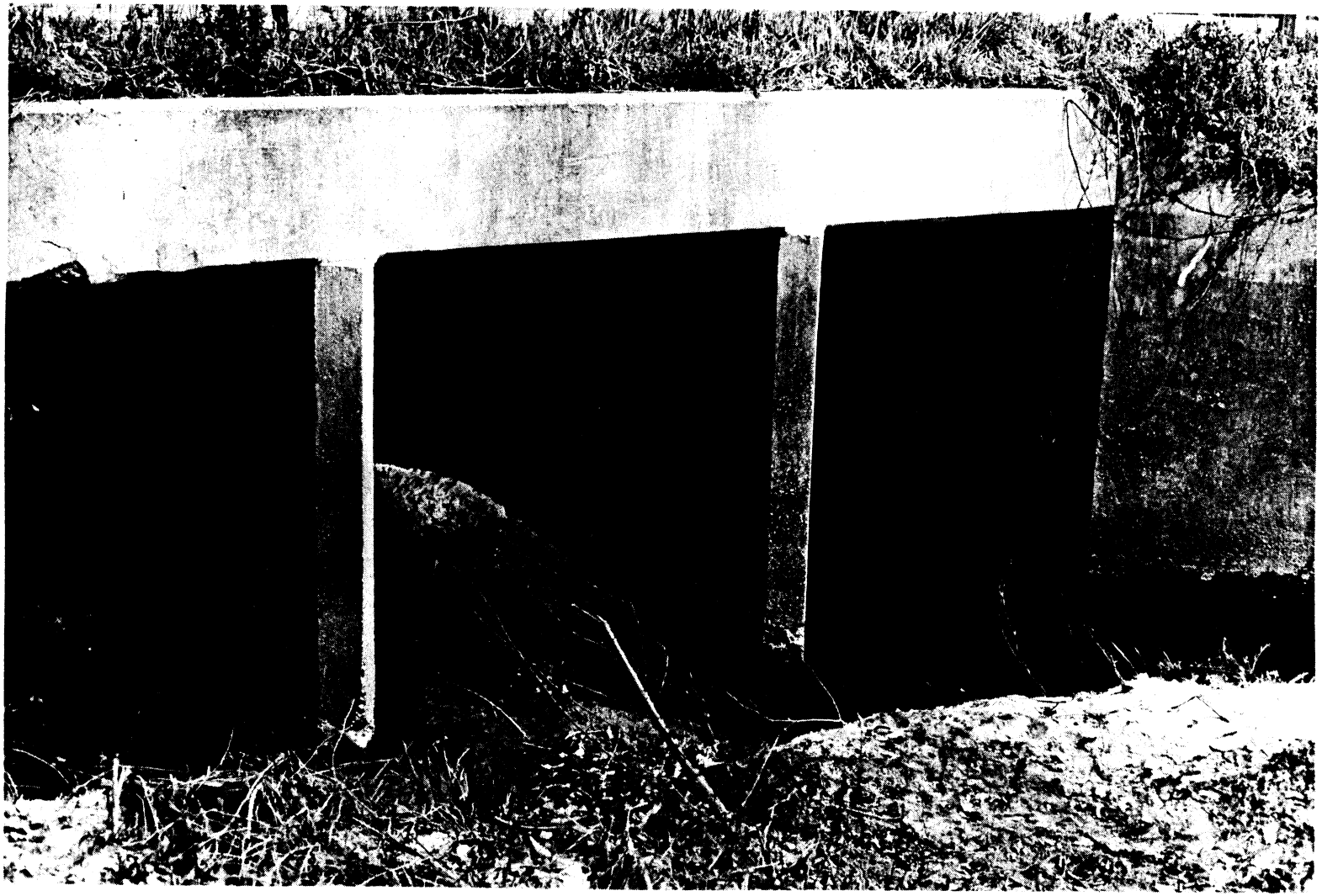

Figure 9. Inlet of the Route 155 culvert on Courthouse Creek. Nearly all of the water flows through the right cell, and water depth in it is suboptimal for river herring during average spring flows.

the locals interviewed, most river herring do not get above this crossing, but a few apparently negotiate the submerged pipes and run an additional 100 m upstream to the spillway for Cranstons Pond (impassable). The slow velocities at the mouth of the submerged culverts may be insufficient to attract most river herring to enter them. The stream between this culvert and Cranstons Pond is well suited for river herring, and modification of this culvert would open up another 100 m of good spawning habitat.

SUMMARY

Striped bass and American shad spawn primarily in the freshwater portion of the James River proper. Both species ascend the Chickahominy and Appomattox Rivers to Walkers and Harvell Dams, respectively. Spawning of both species is known to occur in the Chickahominy River, but only American shad are known to spawn in the Appomattox. River herring ascend and spawn in most tributaries that empty into the lower James River upstream of River Mile 40, provided they have free access and adequate depth. Of the 96 accessible tributaries identified upstream of River Mile 40, 54 were found to be confirmed spawning streams for river herring, 38 were deemed probable spawning streams, and four are probably not used. Anadromous fish enter and explore tributaries downstream of River Mile 40, but they are not known to spawn in them.

Highway structures do not appear to impede either striped bass or American shad spawning runs, because these species prefer to spawn in large tributaries, which are usually bridged. However, river herring ascend much smaller tributaries, and seven of the 88 highway crossings evaluated are either impassable or questionably passable for river herring. All seven problem crossings are on confirmed spawning tributaries for river herring. Four of these are located in close proximity to the natural upstream limit for river herring migrations, and corrective modifications would result in limited additional spawning habitat (two crossings on Poor Creek, one on Lieutenant Run, and one on Courthouse Creek). We do not know whether modification of the I-95 crossing on Proctors Creek would significantly increase available river herring spawning habitat due to other anthropogenic obstructions and beaver dams downstream. However, modification of the Route 10 crossing on Walls Run, and the Route 632 culvert on Yarmouth Creek would open up significant spawning habitat for river herring (possibly as much as 1.25 additional miles of quality stream).

TRIBUTARY DESCRIPTIONS AND ROAD CROSSING EVALUATIONS

Descriptions of individual tributaries of the James River downstream of Manchester Dam (Richmond), their usage by anadromous fishes, and evaluations of public road structures that cross them, are presented in the following pages. The streams are listed in descending sequence, from upstream to downstream, and their names correspond to those printed on the 1:24,000 scale USGS topographic maps. The terms "river herring" and "herring" are used interchangeably in the following text, and refer to both alewife and blueback herring. The following are definitions of the terminology used in the tributary descriptions and road crossing evaluations.

USGS topographic quadrangle. This is the name of the 1:24,000 scale USGS topographic map that contains the mouth of the tributary.

Tributary of. This is the name of the water body into which the tributary flows.

Miles above mouth. This is the distance from the mouth of the tributary to the mouth of the water body into which it flows.

Use category. This indicates the usage of the tributary by spawning anadromous fish. Tributaries that are known to be used by spawning anadromous fish are designated as "confirmed". Confirmed spawning streams listed by Davis et al. (1970) are denoted with a "D". Streams that knowledgeable agency personnel and/or locals identified as having spawning runs are denoted with an "L". Those streams in which our field personnel observed, or found evidence of, spawning runs are denoted with a "P". Tributaries that the locals and agency personnel were not familiar with, yet appear to be suitable for spawning anadromous fish (freshwater and adequate depth), are designated as "probable". Confirmation of these tributaries would likely require field observation and sampling. Tributaries that do not appear suitable for spawning anadromous fish (brackish water or inadequate depth) are classified as "unlikely".

Mileage open. This is the estimated length (in miles) of stream open to anadromous fish for spawning or exploratory movements.

Migration obstruction. Identified migration obstructions are given here. For the purposes of this report, "fall line" denotes an actual falls or shallowing of the stream that would impede upstream migration of anadromous fish. If a beaver dam was observed and known to

impede upstream migration, the designation "(or beaver dam)" is specified.

Road crossing. This is the name and/or number of the public road that crosses the tributary. These are listed in descending sequence, from upstream to downstream.

Date evaluated. This is the date when the site measurements and evaluation were made.

Passage status. Each road crossing is categorized as "passable", "impassable", or "questionable", based on the size and swimming ability of the anadromous fish species that would ascend the tributary. Structures that are passable only at high tide are denoted with a "(T)".

Structure type. The type of structure that supports the road as it crosses the tributary is described here. "CMP" denotes corrugated metal pipe. The term "cell" refers to an individual rectangular opening in a box culvert.

Size. This is the approximate size of each pipe or cell in a culvert. The inside diameter is given for pipes, the maximum width for arches, and the height and width are listed for cells. The cells of most examined box culverts appeared to be square; only one value is given for these.

Vertical drop. This identifies a vertical falls (laminar water flow descending over a ledge) associated with the highway structure, that anadromous fish would have to negotiate under the observed flow conditions. The measurement given is the vertical difference between the surface of the water below the falls, and the lip of the structure from where the water falls.

Depth in culvert. This is the minimum water depth of the thalweg in the culvert (or under the bridge) at the time the evaluation was made.

Velocity in culvert. This is the maximum surface water velocity measured in the culvert (or under the bridge) at the time the evaluation was made.

Notes. These are relevant notes about the site, including descriptions of any difficult sections of the stream resulting from the installation of the road crossing.

GILLIE CREEK

USGS topographic quadrangle: Richmond, VA

Tributary of: James River Miles above mouth: 106.5

Use category: confirmed (D, L, P) Mileage open: < 0.1

Migration obstruction: concrete channel

Narrative: Urban development has altered the flow regime of this stream so that little flow occurs except during high discharge periods. During high tide, the lower 75 m (the area below Route 5) has adequate depth to attract herring; spawning was observed here on April 3, 1986. Above Route 5 the normal stream channel has been modified into a wide, shallow concrete channel. Water depth was approximately 5 cm in this concrete channel on April 3, 1986, much too shallow for herring. A local fisherman said that herring do not go above the Route 5 culvert.

Structural Evaluations

Road crossing: Route 5

Date evaluated: 04/03/86 Passage status: passable (T)

Structure type: four-cell box Size: ~ 3.5 m each

Vertical drop: none Depth in culvert: ~ 30 cm

Velocity in culvert: < 10 cm/s

Notes: This culvert appears passable at high tide, but fish probably do not come up through this. The stream above this culvert flows through a shallow concrete channel with no suitable spawning areas. At low tide, stream depth is too shallow to permit herring access up to this crossing.

Road crossing: Dock Street

Date evaluated: 04/03/86 Passage status: passable (T)

Structure type: bridge Size: -

Vertical drop: none Depth in culvert: > 1.0 m

Velocity in culvert: < 10 cm/s

Notes: The depth measurement was made at high tide, and herring were observed under this bridge at that time. At low tide, stream depth is too shallow to permit herring access up to this crossing.

ALMOND CREEK

USGS topographic quadrangle: Richmond, VA

Tributary of: James River Miles above mouth: 105.2

Use category: confirmed (D, L) Mileage open: 0.5

Migration obstruction: fall line

Narrative: A local fisherman said that herring use this stream for spawning, and have run up at least as far as Route 5 when water depths are adequate. He said herring can not get much above Route 5, because of an increase in stream gradient.

Structural Evaluations

Road crossing: Route 5

Date evaluated: 04/03/86 Passage status: passable

Structure type: bridge Size: -

Vertical drop: none Depth in culvert: ~ 6 cm

Velocity in culvert: ~ 50 cm/s

Notes: If water flows are high enough to allow herring to ascend the riffles below this bridge, there will be adequate depth in the riffles under the bridge for their passage.

GOODE CREEK

USGS topographic quadrangle: Richmond, VA

Tributary of: James River Miles above mouth: 104.7

Use category: confirmed (D) Mileage open: 0.4

Migration obstruction: fall line

Narrative: The upstream limit of the herring run is defined by instream boulders and cobbles in a relatively steep gradient portion of the stream, approximately two hundred meters downstream of I-95. There are no road crossings below this. Stream appears polluted from runoff or effluent from the surrounding industries. Although identified as a confirmed spawning tributary by Davis et al. (1970), none of the locals interviewed were aware of herring using this stream.

MILL CREEK

USGS topographic quadrangle: Drewrys Bluff, VA

Tributary of: James River Miles above mouth: 103.6

Use category: probable Mileage open: 0.4

Migration obstruction: fall line

Narrative: The lower end of this stream is probably used by herring for spawning, given proper tides and/or stream discharge. No roads cross the portion of the stream that herring would use. None of the locals interviewed were aware of herring using this stream.

FALLING CREEK

USGS topographic quadrangle: Drewrys Bluff, VA

Tributary of: James River Miles above mouth: 100.3

Use category: confirmed (D, L) Mileage open: 0.6

Migration obstruction: fall line

Narrative: Upstream limit of herring migration appears to be a natural falls between US 1 and I-95. The falls consist of two steep-gradient drops of at least one meter each, in close succession. All of the locals that were interviewed said that herring do not get above this.

Structural Evaluations

Road crossing: I-95

Date evaluated: 03/06/86 Passage status: passable

Structure type: bridge Culvert size: -

Vertical drop: none Depth in culvert: > 1.0 m

Velocity in culvert: < 25 cm/s

Notes: Creek is tidal, deep, and wide at this crossing no passage problems.

GRINDALL CREEK

USGS topographic quadrangle: Drewrys Bluff, VA

Tributary of: Falling Creek Miles above mouth: 0.2

Use category: probable Mileage open: 0.2

Migration obstruction: fall line

Narrative: Stream visited on March 6, 1986. Below sewage treatment outfall, the stream is influenced by tides and has sufficient flow and depth to permit herring passage. However, on the date visited, the sewage treatment outflow was contributing at least 75% of the stream discharge. Above the sewage outfall, the gradient increases and the stream becomes too shallow for herring. None of the locals interviewed were aware of herring using this stream. There are no road crossings below the sewage outfall.

CORNELIUS CREEK

USGS topographic quadrangle: Drewrys Bluff, VA

Tributary of: James River Miles above mouth: 98.6

Use category: confirmed (D, L) Mileage open: 2.1

Migration obstruction: fall line

Narrative: Locals that were contacted said that during years with adequate stream discharge, herring will run to the vicinity of Mill Road. A local that lives at this crossing said that herring do not get much above Mill Road. The remains of herring were observed in the stream below Mill Road on April 3, 1986. There was an old mill dam above Mill Road, but the owner said that 1) it washed out sometime in the spring of 1986, and 2) herring do not get up as far as the old dam. The dam site was not visited.

Structural Evaluations

Road crossing: Mill Road

Date evaluated: 04/03/86 Passage status: passable

Structure type: four-cell box Size: ~ 3.0 m each

Vertical drop: none Depth in culvert: ~ 25 cm

Velocity in culvert: < 25 cm/s

Notes: No passage problems.

COLES RUN

USGS topographic quadrangle: Drewrys Bluff, VA

Tributary of: Cornelius Creek Miles above mouth: 0.3

Use category: probable Mileage open: 0.3

Migration obstruction: pond dam

Narrative: The USGS topographic map shows an instream pond 0.3 mile above the mouth which may stop herring. The property is owned by Lone Star Industries and was not accessible on the days visitation was attempted. If herring could negotiate this pond, they could ascend an additional 0.3 mile to the fall line, given adequate stream discharge. No locals contacted had knowledge of herring using this stream. There are no public road crossings over the portion of the stream that herring could use.

KINGSLAND CREEK

USGS topographic quadrangle: Drewrys Bluff, VA

Tributary of: James River Miles above mouth: 96.6

Use category: confirmed (D, L) Mileage open: 0.4

Migration obstruction: private road culvert

Narrative: A security guard at Lone Star Industries said that herring come up this stream, but do not get above a culvert on one of the company's roads. This culvert is located in an area of relatively steep gradient and has a shallow riffle at it's downstream end that herring cannot traverse. If this culvert was lowered, a pond dam (owned by Lone Star Industries) 0.1 mile above would stop herring. Measurements were not taken at this culvert because it is not a public road, and passage modifications would not increase spawning habitat substantially. There are no public road crossings below this point.

UNNAMED TRIBUTARY OF KINGSLAND CREEK

USGS topographic quadrangle: Drewrys Bluff, VA

Tributary of: Kingsland Creek Miles above mouth: 0.3

Use category: probable Mileage open: 0.2

Migration obstruction: fall line

Narrative: None of the locals contacted were aware of herring runs up this creek. Herring would likely use the lower portion of this small stream given proper tides and/or stream discharge. No public road cross the portion of stream that herring could use.

PROCTORS CREEK

USGS topographic quadrangle: Drewrys Bluff, VA

Tributary of: James River Miles above mouth: 95.2

Use category: confirmed (D, L) Mileage open: 2.1

Migration obstruction: fall line (?) (or road crossing) (or beaver dam)

Narrative: Several locals stated that many years ago, herring did come up this creek as far as US 1, and sometimes further. They all agreed that even with high tides, adequate stream flows, and no beaver dams, herring no longer get much above I-95. There may be no single reason for this observed change. A sewer line was installed along this stream, and crosses it at several points; placement has resulted in at least one obstruction for herring. At stream mile 0.5, the sewer line crosses the stream, and with the exception of high tide, water flows over this exposed pipe create an impassable falls where herring congregate. At high tide, the pipe becomes submerged and herring often manage to get over it. At stream mile 0.9, there is a recently constructed beaver dam that will definitely stop herring for several years to come if it is not removed. Immediately above this beaver dam, the stream has been altered by sewer line installation, and several resultant shallow riffles could stop herring during periods of low flow. At the I-95 crossing (stream mile 1.8),bridge construction has resulted in a possible obstruction (see Notes below). If these impediments do not stop herring outright, they may in combination prevent them from ascending as far as they once did. The present upstream limit of herring runs was estimated as that portion of stream between the 40 and 50-foot elevation contour (between US 1 and I-95). This section of stream has considerably more gradient than the downstream reach.

Structural Evaluations

Road crossing: US 1

Date evaluated: 04/23/86 Passage status: passable

Structure type: bridge Size: -

Vertical drop: none Depth in culvert: ~ 35 cm

Velocity in culvert: < 25 cm/s

Notes: Herring no longer come up this far, but if they did, they could pass here without difficulty.

Road crossing: I-95

Date evaluated: 04/23/86 Passage status: questionable

Structure type: bridge with apron

Vertical drop: none Depth in culvert: ~ 5 cm

Velocity in culvert: ~ 80 cm/s

Notes: This appears to be a double bridge, but the southbound span has a concrete apron under it. This apron spreads out the water of the main channel (right descending side) into a relatively long, shallow (~ 5 cm on April 23, 1986), fast-moving sheet. Herring would not be able to ascend this under the observed flow conditions. There is a side channel on the left descending side that cuts through a gravel and cobble deposit. It carries considerably less water than the main channel, but it is relatively narrow and has adequate depth and flow for herring to ascend without apparent difficulty. Because this channel has less discharge than the main channel, herring may not be readily attracted to it; consequently, this crossing may be a barrier to herring. If this structure was altered to allow passage of herring, it is difficult to estimate how much more of the stream herring would use.

REDWATER CREEK

USGS topographic quadrangle: Drewrys Bluff, VA

Tributary of: Proctors Creek Miles above mouth: 0.8

Use category: probable Mileage open: 0.1

Migration obstruction: fall line

Narrative: This stream is relatively small, but the lower 0.1 mile may be used by herring during periods of above-average discharge. Above 0.1 mile, stream gradient increases, and herring would not likely ascend. None of the locals interviewed were aware of herring runs up this creek. No roads cross the portion of stream that herring could likely use.

ROUNDABOUT CREEK

USGS topographic quadrangle: Dutch Gap, VA

Tributary of: James River Miles above mouth: 88.4

Use category: confirmed (L) Mileage open: 0.8

Migration obstruction: fall line

Narrative: Landowner that lives adjacent to this creek (off WRVA Road) said that herring run up it in the spring. He said that most herring stop just below his house, but a few go up as far as the natural falls at stream mile 0.8. No roads cross the portion of stream used by herring.

FOURMILE CREEK

USGS topographic quadrangle: Dutch Gap, VA

Tributary of: James River Miles above mouth: 88.1

Use category: confirmed (D, L) Mileage open: 1.9

Migration obstruction: Griggs Pond dam

Narrative: All locals agreed that herring run up to Griggs Pond dam, which serves as an effective barrier. The pond spillway is a vertical drop of approximately 2.0 m.

Structural Evaluations

Road crossing: Kingsland Road

Date evaluated: 11/13/85 Passage status: passable

Structure type: bridge Size: -

Vertical drop: none Depth in culvert: > 50 cm

Velocity in culvert: < 25 cm/s

Notes: Water depth was not measured, but it was greater than 50 cm, which is more than adequate for herring.

BAILEY CREEK

USGS topographic quadrangle: Dutch Gap, VA

Tributary of: Fourmile Creek Miles above mouth: 0.7

Use category: confirmed (L) Mileage open: 1.1

Migration obstruction: fall line

Narrative: Several local sources said that herring migrate up this stream at least as far as Route 5. I talked to a landowner living adjacent to this stream at Long Bridge Road who said herring stop somewhere between Long Bridge Road and Route 5. The upstream limit for herring was estimated to be a shallow riffle downstream of Long Bridge Road.

Structural Evaluations

Road crossing: Route 5

Date evaluated: 11/13/85 Passage status: passable

Structure type: bridge Size: -

Vertical drop: none Depth in culvert: > 50 cm

Velocity in culvert: < 25 cm/s

Notes: No depth or velocity measurements were made because it was obvious that there was adequate depth and barely perceptible flow. Herring will pass this with no problems.

TURKEY ISLAND CREEK

USGS topographic quadrangle: Roxbury, VA

Tributary of: James River Miles above mouth: 79.8

Use category: confirmed (D, L) Mileage open: 3.9

Migration obstruction: Shirley Millpond dam

Narrative: Several locals said herring run up as far as Shirley Millpond dam, which is impassable. The owner of this pond said that herring do not make it up to the dam every year.

Structural Evaluations

Road crossing: Carters Mill Road (Route 606)

Date evaluated: 11/13/85 Passage status: passable

Structure type: bridge Size: -

Vertical drop: none Depth in culvert: ~ 1.0 m

Velocity in culvert: < 25 cm/s

Notes: Measurements of depth and velocity were not taken due to obvious suitability; depth was approximately 1.0 m, and there was little current. No passage problems for herring.

Road crossing: Route 5

Date evaluated: 11/13/85 Passage status: passable

Structure type: bridge Size: -

Vertical drop: none Depth in culvert: ~ 1.0 m

Velocity in culvert: < 25 cm/s

Notes: Tidal influence here. No passage problems for herring.

CREWES CHANNEL

USGS topographic quadrangle: Dutch Gap, VA

Tributary of: Turkey Island Creek Miles above mouth: 0.9

Use category: probable Mileage open: 0.4

Migration obstruction: fall line

Narrative: We could not locate anyone with knowledge of this stream, but it is likely that herring use the portion influenced by tides. The stream is very shallow and has little flow immediately below Route 5. On April 3, 1986, the numerous riffles below Route 5 were only 1-2 cm deep, much too shallow for herring. The upstream limit of probable herring runs was estimated to be at the head of tidal influence, which is below Route 5. No roads cross the portion of stream that herring could use.

SHAND CREEK

USGS topographic quadrangle: Hopewell, VA

Tributary of: James River Miles above mouth: 75.6

Use category: probable Mileage open: 0.5

Migration obstruction: fall line

Narrative: None of the locals contacted were familiar with this stream. It is likely that herring use the tidal portion of this small stream. Above tidal influence, the stream becomes shallow and has inadequate flow for herring. No roads cross the portion of stream that herring could use.

JOHNSON CREEK

USGS topographic quadrangle: Hopewell, VA

Tributary of: James River Miles above mouth: 75.4

Use category: confirmed (D, L) Mileage open: 2.2

Migration obstruction: fall line (or beaver dam)

Narrative: The locals that were interviewed said that herring run up this creek every year, and beaver dams between Spruce Avenue (Route 724) and Route 827 usually stop them. A new beaver dam approximately 100 m above Route 827 will probably stop the run for the next few years. A fireman at the Enon Volunteer Fire Department has watched the herring run on this stream for many years (> 30 years). He said that even in years when beaver dams were absent, the numerous shallow riffles usually prevent herring from getting up as far as Route 10. He has seen herring come up to just below the Route 10 crossing only once or twice, many years ago, and only a few fish made it that far.

Structural Evaluations

Road crossing: Spruce Avenue (Route 724)

Date evaluated: 03/06/86 Passage status: passable

Structure type: bridge Size: -

Vertical drop: none Depth in culvert: > 50 cm

Velocity in culvert: < 25 cm/s

Notes: Herring do not usually make it up this far. If they were to get to this road crossing, they could pass here without difficulty.

Road crossing: Route 827

Date evaluated: 11/13/85 Passage status: passable

Structure type: three-cell box Size: > 2 m

Vertical drop: none Depth in culvert: > 1 m

Velocity in culvert: < 25 cm/s

Notes: Stream is deep and tidal at this location, and presents no passage problems.

APPOMATTOX RIVER

USGS topographic quadrangle: Hopewell, VA

Tributary of: James River Miles above mouth: 75.1

Use category: confirmed (D, L, P) Mileage open: 11.2

Migration obstruction: Harvell Dam

Narrative: Herring and American shad run up to the base of Harvell Dam. Locals that were interviewed said that striped bass do not usually go above the riffles/fast water just downstream of the dam. A large herring run was observed below the dam on April 22, 1986. Harvell Dam is approximately 3.0 m high and is impassable despite the presence of a fish ladder. Locals said that herring sometimes try to get up the old fish ladder, but are unsuccessful in ascending. High water prevented examination of the fish ladder, but it appears to be a pool and weir type.

Structural Evaluations

Road crossings: US 1, I-95, and Route 10

Date evaluated: 03/06/86 Passage status: passable

Structure types: bridges Size: -

Vertical drop: none Depth in culvert: > 1 m

Velocity in culvert: < 25 cm/s

Notes: These road crossings are bridges over the deep tidal portion of the Appomattox, and are not obstructions to anadromous fish species.

FLEETS BRANCH

USGS topographic quadrangle: Petersburg, VA

Tributary of: Appomattox River Miles above mouth: 11.1

Use category: unlikely Mileage open: 0.0

Migration obstruction: fall line

Narrative: This stream is too small and shallow to be used by herring, except possibly at the mouth where it joins the Appomattox River. Herring were not seen in this creek on the dates they were observed spawning in the Appomattox.

LIEUTENANT RUN

USGS topographic quadrangle: Petersburg, VA

Tributary of: Appomattox River Miles above mouth: 10.0

Use category: confirmed (L) Mileage open: 0.1

Migration obstruction: pipes under Bollingbrook St. bridge

Narrative: Locals that work in a lumber store next to this creek said that herring often run up this stream to spawn. They often make it up as far as the Bollingbrook Street bridge, which normally serves as an effective barrier. Water and sewer pipes under this bridge trap logs and debris, forming an effective dam in most years. On May 21, 1986, this debris dam was ~ 40 cm high and impassable; gizzard shad had run up the creek to spawn and could not get above this crossing. Since gizzard shad often manage to get above barriers that block herring, it is reasonable to assume that herring could not get above this site. During some years, a hole in the debris dam permits herring to get above Bollingbrook Street. When this happens, locals have witnessed herring running up another 75 m to a shallow riffle (fall line), which apparently stops them. This stream has silted in substantially with bedload sediment, and appears unsuitable as spawning habitat. Locals said that herring runs have declined substantially in this stream in recent years.

Structural Evaluations

Road crossing: Bollingbrook Street

Date evaluated: 03/11/86 Passage status: impassable

Structure type: bridge Size: -

Vertical drop: ~ 40 cm Depth in culvert: adequate

Velocity in culvert: < 25 cm/s

Notes: Water and sewer pipes under this bridge trap logs and debris, forming a dam and effective barrier to herring in most years. If this problem was alleviated, herring could run upstream only an additional 75 m.

POOR CREEK

USGS topographic quadrangle: Petersburg, VA

Tributary of: Appomattox River Miles above mouth: 9.6

Use category: confirmed (L) Mileage open: 0.3

Migration obstruction: fall line or culvert

Narrative: Locals have seen herring using this creek every few years or so. Herring are known to come up as far as the intersection of Bank Street and Washington (Route 36), but no one interviewed has seen them above the Route 36 crossing. Between the Route 36 crossing and the intersection of Route 36 and Bank Street, Poor Creek flows through a culvert that is adjacent and parallel to Route 36 as it passes under an elevated Norfolk and Western railroad line. This culvert has a vertical drop of about 15 cm at its outlet, which would stop herring except during high discharge (see Notes below). This culvert is probably the upstream limit for herring runs, if the riffles below do not stop them. Further research is needed to make a final determination. The stream above this culvert and below Route 36 is small (2-3 m wide) with deep pools (> 75 cm deep) punctuated with shallow riffles; herring would be able to negotiate these riffles only in above-average spring flows. Approximately 80 m above Route 36, the stream cascades down a section of steep gradient through numerous cobbles and small boulders; this would stop herring at all flows.

Structural Evaluations

Road crossing: Route 36

Date evaluated: 03/11/86 Passage status: questionable

Structure type: five-cell box Size: ~ 2.0 m each

Vertical drop: none Depth in culvert: ~ 3 cm

Velocity in culvert: ~ 100 cm/s

Notes: Herring could not normally get to this crossing, due to the obstruction described below; however, it may be possible for herring to get here during years with high stream discharge. On the date evaluated, water was flowing

through two of the five cells of this box culvert, and was only a few centimeters deep. The shallow water, combined with the length of this culvert (~ 35 m), gradient, and velocity, would make this impassable at normal flows. During periods of high discharge, the depth and flow characteristics of this culvert may permit herring passage; an evaluation after a storm event is required to make a final determination. If this culvert was modified for herring passage, herring could ascend only an additional 80 m above Route 36 to a section with impassable steep gradient.

Road crossing: Culvert parallel Route 36 under N&W railroad

Date evaluated: 03/11/86 Passage status: impassable

Structure type: four-cell box Size: ~ 2.0 m each

Vertical drop: ~ 15 cm Depth in culvert: ~ 4 cm

Velocity in culvert: ~ 30 cm/s

Notes: The vertical drop at the mouth of this culvert would stop herring except during periods of high discharge. On the date evaluated, water was flowing through only two of the cells of this culvert; the other two were largely silted in. Water depth in these cells was not adequate for herring passage. Locals were not sure if herring make it up as far as this culvert since riffles below may stop them. If this culvert was properly modified, herring could probably run up an additional 0.1 mile to the Route 36 culvert.

HARRISON CREEK

USGS topographic quadrangle: Petersburg, VA

Tributary of: Appomattox River Miles above mouth: 8.7

Use category: confirmed (L) Mileage open: 0.8

Migration obstruction: fall line

Narrative: Three locals were familiar with the herring runs in this stream. An employee at the Petersburg landfill said that herring run up the lower portion of this creek, but he did not think they normally get above a poorly placed culvert at a landfill road crossing. Two other locals have dipped herring above the landfill, just upstream of Puddledock Road (Route 645), but they have not monitored the run in recent years. The landfill culvert may be relatively recent. All locals interviewed said herring do not make it up to Route 36; the stream is probably too shallow from sedimentation.

Structural Evaluations

Road crossing: Puddledock Road (Route 645)

Date evaluated: 03/11/86 Passage status: passable

Structure type: three-cell box Size: ~ 2.0 m each

Vertical drop: none Depth in culvert: > 50 cm

Velocity in culvert: < 25 cm/s

Notes: Deep water with little velocity makes this culvert passable without problems. Only one of the three cells of this box culvert carries water during average flows; the other two are silted in.

OLDTOWN CREEK

USGS topographic quadrangle: Chester, VA

Tributary of: Appomattox River Miles above mouth: 7.9

Use category: probable Mileage open: 1.6

Migration obstruction: fall line

Narrative: Employees at the sewage disposal center at Conduit Road have worked next to and observed this stream for years. They have never seen herring up this far or in the braided channel within the wooded swamp downstream. If herring use this stream, they are probably restricted to the lower tidal reaches. No roads cross the portion that could be used by herring.

HARRISON BRANCH

USGS topographic quadrangle: Hopewell, VA

Tributary of: Appomattox River Miles above mouth: 6.1

Use category: probable Mileage open: 0.1

Migration obstruction: mining operations

Narrative: This small stream has been diverted and altered several times by mining operations, according to a Lone Star Industries employee. He was not even sure if he could find the stream, except for the old mouth. He said the stream has been diverted through several of the old pits, which are now filled with water. He and another employee have never seen herring in the mouth of this creek, but they thought it may be used. No roads cross the portion that could be used by herring.

SWIFT CREEK

USGS topographic quadrangle: Hopewell, VA

Tributary of: Appomattox River Miles above mouth: 4.6

Use category: confirmed (D, L, P) Mileage open: 4.9

Migration obstruction: Swift Creek Mill Dam

Narrative: Herring run up this stream to the base of Swift Creek Mill Dam, immediately downstream of US 1. The dam is about 4.0 m high and impassable at all times. There is a good herring run up here in most years. The only road crossing over the portion used by herring is I-95.

Structural Evaluations

Road crossing: I-95

Date evaluated: 11/13/85 Passage status: passable

Structure type: bridge Size: -

Vertical drop: none Depth in culvert: adequate

Velocity in culvert: < 25 cm/s

Notes: Herring pass under this bridge with no problems.

TIMSBURY CREEK

USGS topographic quadrangle: Chester, VA

Tributary of: Swift Creek Miles above mouth: 1.9

Use category: probable Mileage open: 0.9

Migration obstruction: fall line

Narrative: The locals that were interviewed were unaware of herring using this creek. One local that lives at the Route 619 crossing has lived there for years and has never seen herring in this creek. If herring do use it, they are probably restricted to the lower tidal portion, below the Department of Highways Equipment Center. The stream has numerous shallow riffles and some log jams in the vicinity of the Equipment Center; these would likely block herring runs in most years. This portion of stream was visited on April 22,1986, when the herring were actively migrating in Swift Creek, but no herring were observed in the vicinity of the Equipment Center. No roads cross the portion of stream that herring could use.

ASHTON CREEK

USGS topographic quadrangle: Hopewell, VA

Tributary of: Appomattox River Miles above mouth: 3.6

Use category: confirmed (D, L) Mileage open: 2.2

Migration obstruction: fall line (or beaver dam)

Narrative: Locals have seen herring in the vicinity of Route 746, but they have not seen any up at Route 620. Above Route 746, there are numerous log chutes, resulting from previous beaver activity, that would make passage difficult for herring during average flows. There is evidence of old beaver dams both immediately above and below Route 746, but no current activity. Just below Route 620 there is a string of recently constructed beaver dams, but it is doubtful that herring would ascend this far. The upstream limit was estimated to be between Routes 746 and 620.

Structural Evaluations

Road crossing: Route 746

Date evaluated: 11/13/85 Passage status: passable

Structure type: bridge Size: -

Vertical drop: none Depth in culvert: > 50 cm

Velocity in culvert: < 25 cm/s

Notes: No passage problems.

CABIN CREEK

USGS topographic quadrangle: Hopewell, VA

Tributary of: Appomattox River Miles above mouth: 1.7

Use category: confirmed (D, L) Mileage open: 1.6

Migration obstruction: fall line

Narrative: A local that lives near the mouth of this creek said that herring use the tidal portion only, and can run up it only at high tide. This creek is shallow in the tidal area as a result of sedimentation. He believes the creek is too shallow for herring much above the tidal influence, and felt strongly that herring did not run as far up as Route 645. A young man that lives near the Route 645 crossing said that herring normally stop below 645, but one year he saw fish that looked like herring up almost to Jackson Farm Road. Because it seemed doubtful that the fish he saw were herring due to extensive shallow riffles they would have to ascend, several locals near the Jackson Farm Road crossing were interviewed. One individual confirmed the story that a fish run occurred almost up to this crossing during high water, but this local said they were not herring. He said they were herring-like in shape and color, but had a small mouth. This description matches that of gizzard shad, which are more adept at ascending riffles and steep gradients than herring. Therefore, the upstream limit of herring may be just downstream of Jackson Farm Road until further data proves otherwise. Species identification of this herring-like fish is needed.

Structural Evaluations

Road crossing: Route 645

Date evaluated: 03/11/86 Passage status: passable

Structure type: bridge Size: -

Vertical drop: none Depth in culvert: ~ 8 cm

Velocity in culvert: 50 cm/s

Notes: The water depth at this crossing was less than desirable for herring on the day evaluated, but it was considerably deeper than in the numerous riffles downstream.

If the creek discharge was high enough for herring to ascend the riffles below, then they could pass under this bridge crossing with ease.

BULLHILL RUN

USGS topographic quadrangle: Hopewell, VA

Tributary of: Cabin Creek Miles above mouth: 1.2

Use category: unlikely Mileage open: 0.0

Migration obstruction: fall line

Narrative: None of the locals interviewed were aware of herring using this tributary. This stream appears to be too shallow to support a herring run.

GRAVELLY RUN

USGS topographic quadrangle: Hopewell, VA

Tributary of: James River Miles above mouth: 74.0

Use category: unlikely Mileage open: 0.0

Migration obstruction: industrial discharge (?)

Narrative: This small stream has been altered by the influx of industrial discharge; there is a constant high water discharge from adjacent industrial plants. A guard at the entrance to The Stone Company said he has never seen herring in this stream, only carp and an occasional catfish. He did not think the water quality would be suitable for herring. No public roads cross the portion of creek that herring could use if water quality were acceptable.

BAILEY CREEK

USGS topographic quadrangle: Hopewell, VA

Tributary of: James River Miles above mouth: 73.7

Use category: confirmed (L) Mileage open: 4.7

Migration obstruction: fall line

Narrative: Employees at a sewage disposal plant at the junction of Cattail Creek and Bailey Creek said that many herring run up this stream to just above the mouth of Cattail Creek. They said that some herring continue further, but they did not think herring went much above the Route 156 bridge. Upstream of Route 156 there are many log chutes and shallow riffles that would make passage difficult. During average flows, herring could not make it up as far as Southerly Run. During high flows, herring may be able to get up to the mouth of Southerly Run, but it is doubtful they would go much further.

Structural Evaluations

Road crossing: Route 156

Date evaluated: 11/14/85 Passage status: passable

Structure type: bridge Size: -

Vertical drop: none Depth in culvert: > 50 cm

Velocity in culvert: < 25 cm/s

Notes: The stream is deep and wide; there would be no passage problems under this crossing.

Road crossing: Route 10

Date evaluated: 11/14/85 Passage status: passable

Structure type: bridge Size: -

Vertical drop: none Depth in culvert: > 1.0 m

Velocity in culvert: < 25 cm/s

Notes: The stream is deep and wide; no passage problems under this crossing.

SOUTHERLY RUN

USGS topographic quadrangle: Hopewell, VA

Tributary of: Bailey Creek Miles above mouth: 4.6

Use category: probable Mileage open: 0.3

Migration obstruction: fall line

Narrative: Locals know of no herring runs up this stream. A man that lives on Route 646 has never seen herring in this creek up at Route 646. He said they may use the lower end during certain years, but he is unaware of it. The stream has a few deep pools in the lower end, but above that, it is shallow with a shifting sand substrate. No roads cross the portion of stream that could be used by herring.

MANCHESTER RUN

USGS topographic quadrangle: Hopewell, VA

Tributary of: Bailey Creek Miles above mouth: 3.5

Use category: probable Mileage open: 1.6

Migration obstruction: fall line

Narrative: None of the locals interviewed were aware of herring using this stream. It is likely that they use the lower end near its junction with Bailey Creek; but how far up they would run is unknown. In the vicinity of Route 156, this stream is about 4.0 m wide and averages about 10 cm deep during average spring flows. There are very few pools, mostly just shallow runs with shifting sand substrate (heavy sedimentation). It appears possible, but unlikely, for herring to ascend this stream to some point above Route 156 during high water.

Structural Evaluations

Road crossing: Route 156

Date evaluated: 03/12/86 Passage status: passable

Structure type: two-cell box Size: ~ 3.0 m each

Vertical drop: none Depth in culvert: ~ 20 cm

Velocity in culvert: 40 cm/s

Notes: It is unlikely that herring would come up this far, but it may be possible with high water. During high water, this culvert would be passable with no difficulties. On the date visited, only one cell of this culvert carried water; the other had extensive sand deposits.

CATTAIL CREEK

USGS topographic quadrangle: Hopewell, VA

Tributary of: Bailey Creek Miles above mouth: 2.3

Use category: probable Mileage open: 0.4

Migration obstruction: fall line

Narrative: Employees at the sewage treatment plant near the mouth of this creek have never noticed herring in it, but they felt the lower 50 m or so has adequate depth for herring. To be liberal, the upstream limit of a possible herring run was demarcated as being well above their estimate. No roads cross the portion of stream that herring could use.

EPPES CREEK

USGS topographic quadrangle: Westover, VA

Tributary of: James River Miles above mouth: 72.2

Use category: confirmed (D) Mileage open: 2.0

Migration obstruction: fall line

Narrative: This creek is essentially a tidal gut. Locals interviewed were unaware of a herring run up this creek; however, Davis et al. (1970) reported herring spawning in this tributary. The upstream limit of the herring run was estimated to be at the head of tidal influence. No roads cross the portion of stream that herring could use.

KIMAGES CREEK

USGS topographic quadrangle: Westover, VA

Tributary of: James River Miles above mouth: 71.0

Use category: confirmed (L) Mileage open: 0.1

Migration obstruction: Charles Lake dam

Narrative: According to locals, there is a good herring run up the mouth of this creek to the base of Charles Lake dam. No roads cross the portion of stream used by herring.

JENNY CREEK

USGS topographic quadrangle: Westover, VA

Tributary of: James River Miles above mouth: 70.6

Use category: probable Mileage open: 0.8

Migration obstruction: none (probably open entire length)

Narrative: A local that lives near the creek mouth was uncertain if herring ran up this creek; all other locals interviewed were not familiar with this stream. It is likely that herring run up this creek since the entire length is probably under tidal influence, and is available to herring. No public roads cross this creek.

BILLY CREEK

USGS topographic quadrangle: Westover, VA

Tributary of: Jenny Creek Miles above mouth: 0.8

Use category: probable Mileage open: < 0.1

Migration obstruction: pond dam

Narrative: All but the lower few meters (< 30) of this stream are blocked by a pond dam. If herring run all the way up Jenny Creek to spawn, they may use the unblocked section of this stream, also. None of the locals interviewed knew of herring using this stream. No roads cross the portion of stream that herring could use.

BICKERS CREEK

USGS topographic quadrangle: Westover, VA

Tributary of: Jenny Creek Miles above mouth: 0.8

Use category: probable Mileage open: 0.3

Migration obstruction: fall line

Narrative: If herring run all the way up Jenny Creek to spawn, they may use this tributary, also. None of the locals interviewed knew of herring using this stream. The upstream limit of a possible run was estimated to be at the limit of tidal influence. There are no road crossings over this stream.

CHAPPELL CREEK

USGS topographic quadrangle: Westover, VA

Tributary of: James River Miles above mouth: 69.9

Use category: confirmed (L) Mileage open: 0.8

Migration obstruction: pond dam (or fall line)

Narrative: Local sources said that herring run up this creek until it becomes too shallow (stop below Route 10). During years with adequate discharge, it may be possible for herring to ascend above Route 10 to the base of a pond dam that is impassable. This pond dam is approximately 40 m above Route 10 and is not shown on the USGS topographic map.

Structural Evaluations

Road crossing: Route 10

Date evaluated: 05/22/86 Passage status: passable

Structure type: two-cell box Size: ~ 1.8 m each

Vertical drop: none Depth in culvert: 42 cm

Velocity in culvert: < 25 cm/s

Notes: If herring make it this far, they could pass through this culvert without difficulty.

UNNAMED TRIBUTARY OF CHAPPELL CREEK

USGS topographic quadrangle: Westover, VA

Tributary of: Chappell Creek Miles above mouth: 0.7

Use category: unlikely Mileage open: 0.0

Migration obstruction: fall line

Narrative: None of the locals interviewed were aware of herring using this tributary. This tributary is shallow and does not appear to be a likely candidate for a herring run.

POWELL CREEK

USGS topographic quadrangle: Westover, VA

Tributary of: James River Miles above mouth: 67.8

Use category: confirmed (D, L, P) Mileage open: 8.6

Migration obstruction: fall line (or beaver dam)

Narrative: Local sources said that herring used to run up well above Route 10, probably as far as the mouth of Mike Run. Beaver dams now stop most of them just above Route 10. The upstream limit was estimated to be above Mike Run, and about one mile downstream of Route 616.

Structural Evaluations

Road crossing: Route 10

Date evaluated: 03/12/86 Passage status: passable

Structure type: bridge Size: -

Vertical drop: none Depth in culvert: ~ 25 cm

Velocity in culvert: ~ 25 cm/s

Notes: This crossing has adequate water depth for herring passage. Herring should be able to pass this without difficulty.

MIKE RUN

USGS topographic quadrangle: Disputanta North, VA

Tributary of: Powell Creek Miles above mouth: 6.3

Use category: probable Mileage open: 0.5

Migration obstruction: fall line

Narrative: Locals do not believe herring use this creek, because it is too small and shallow. A local that lives adjacent to this creek at the Route 635 crossing said that herring have never come up the stream to the vicinity of the Route 635 crossing. As a liberal estimate, the upstream limit of a possible herring run was set at the 20-foot elevation contour. No roads cross the portion of stream that herring could use.

NOBLES SWAMP

USGS topographic quadrangle: Westover, VA

Tributary of: Powell Creek Miles above mouth: 4.7

Use category: confirmed (L) Mileage open: 0.6

Migration obstruction: fall line

Narrative: Locals have seen herring run up this stream a short distance, but they do not think herring go much more than 200 m above the mouth. The braided channel of this stream likely stops them after a short distance. To be liberal, the upstream limit of the herring run was estimated to be in the vicinity of the 10-foot elevation contour.

Structural Evaluations

Road crossing: Route 639

Date evaluated: 03/12/86 Passage status: passable

Structure type: arch CMP Size: ~ 1.75 m across

Vertical drop: none Depth in culvert: ~ 40 cm

Velocity in culvert: < 25 cm/s

Notes: No passage problems for herring.

WALLS RUN

USGS topographic quadrangle: Westover, VA

Tributary of: Powell Creek Miles above mouth: 4.4

Use category: confirmed (L, P) Mileage open: 0.7

Migration obstruction: rubble from Route 10 bridge construction

Narrative: Locals said that herring can not get past the construction rubble placed below the new Route 10 bridge. Before the new bridge went in, some herring used to run up above Route 10, and were stopped by shallow water, or in more recent years, by beaver dams. Locals said that herring have never run up as far as Route 635. The upstream limit of the historical herring run was estimated to be immediately below Route 635 (in absence of beaver dams). The present upstream limit appears to be just below Route 10, 1.2 miles below the estimated historical limit.

Structural Evaluations

Road crossing: Route 10

Date evaluated: 03/12/86 Passage status: impassable

Structure type: bridge Size: -

Vertical drop: none Depth in culvert: > 75 cm

Velocity in culvert: < 25 cm/s

Notes: The above measurements were taken under the bridge, although the main problem at this crossing is downstream of the bridge. Recent bridge construction has altered the stream so that herring cannot reach the new bridge. Rubble from the old bridge that was demolished has been placed downstream of the current bridge. This rubble backs up water under the present bridge and forms a short stretch of steep gradient where the shallow water cascades down through the concrete rubble. Locals claim that herring cannot ascend beyond this point. On April 23, 1986, dead herring littered the stream below here following a run, but none were found upstream. In addition to the rubble riffle, there are several steel girders under the bridge that are partially submerged and may disorient herring if they manage to ascend the riffle. These girders may also catch debris

moving downstream and form a debris dam that could serve as an effective barrier (see the description of the Bollingbrook Street bridge over Lieutenant Run, a tributary of the Appomattox River). If this crossing was properly modified, herring could probably ascend an additional 1.2 miles.

Road crossing: Route 641

Date evaluated: 11/14/85 Passage status: passable

Structure type: bridge Size: -

Vertical drop: none Depth in culvert: ~ 75 cm

Velocity in culvert: < 25 cm/s

Notes: No passage problems.

HERRING CREEK

USGS topographic quadrangle: Westover, VA

Tributary of: James River Miles above mouth: 66.9

Use category: confirmed (D, L, P) Mileage open: 6.0

Migration obstruction: Harrison Lake dam

Narrative: This stream has a good herring run up to the vicinity of Route 5 every year, and some fish make it up to Harrison Lake dam. During some years, many herring run all the way to the dam. This dam is currently being rebuilt, and a denil fish ladder is to be installed by the summer of 1987. Should it prove effective at passing herring, future investigations will be required to ascertain how far herring migrate above the lake.

Structural Evaluations

Road crossing: Route 5

Date evaluated: 11/14/85 Passage status: passable

Structure type: bridge Size: -

Vertical drop: none Depth in culvert: > 1.0 m

Velocity in culvert: < 25 cm/s

Notes: No passage problems at this crossing.

Road crossing: Route 640

Date evaluated: 11/14/85 Passage status: passable

Structure type: bridge Size: -

Vertical drop: none Depth in culvert: > 1.0 m

Velocity in culvert: < 25 cm/s

Notes: No passage problems at this crossing.

BUCKLAND CREEK

USGS topographic quadrangle: Charles City, VA

Tributary of: James River Miles above mouth: 65.5

Use category: probable Mileage open: 0.7

Migration obstruction: fall line

Narrative: None of the locals interviewed were familiar with this creek. Herring likely use the tidal portion of this small stream. No roads cross the portion of stream that could be used by herring.

QUEENS CREEK

USGS topographic quadrangle: Charles City, VA

Tributary of: James River Miles above mouth: 64.2

Use category: confirmed (D, L) Mileage open: 2.0

Migration obstruction: none

Narrative: Herring run up the entire length of this creek. There are no road crossings over this creek.

COURTHOUSE CREEK

USGS topographic quadrangle: Charles City, VA

Tributary of: Queens Creek Miles above mouth: 2.0

Use category: confirmed (L) Mileage open: 1.1

Migration obstruction: fall line or culvert

Narrative: Locals catch herring in this creek every year. Several locals agreed that they have never seen herring above the Route 155 crossing; they said herring stop between Route 155 and the mouth of Glebe Creek. No obstructions were observed below Route 155. It would be possible for herring to run up to the Route 155 culvert which may be impassable most years (see description below). Approximately 40 m upstream of Route 155, is a natural riffle that is shallower than the culvert, and would stop herring if they could get above Route 155.

Structural Evaluations

Road crossing: Route 155

Date evaluated: 04/03/86 Passage status: questionable

Structure type: three-cell box Size: ~ 2.0 m each

Vertical drop: none Depth in culvert: 13 cm

Velocity in culvert: ~ 50 cm/s

Notes: This culvert would be passable with above-average spring discharges, but at the flow present on April 3, 1986, herring would likely have difficulty negotiating the upper end. Two of the cells of this box culvert are silted in, and only one carried water on the day evaluated. The one cell that was carrying water had no sediment in the bottom, and the above depth measurement was the water depth at the upper end. This culvert has noticeable gradient, but nothing that herring could not negotiate with adequate depth. Locals said that herring do not come up this far, but the stream below does not appear to have any obstructions. Herring may ascend this far during periods of high discharge, and this culvert may be passable at those times. If the culvert was modified for passage, herring would encounter a shallower natural riffle approximately 40 m upstream that would stop them.

Road crossing: Route 5

Date evaluated: 11/14/85

Passage status: passable

Structure type: bridge

Size: -

Vertical drop: none

Depth in culvert: ~ 1.0 m

Velocity in culvert: < 25 cm/s

Notes: No passage problems.

GLEBE CREEK

USGS topographic quadrangle: Charles City, VA

Tributary of: Courthouse Creek Miles above mouth: 1.0

Use category: confirmed (L) Mileage open: 1.0

Migration obstruction: fall line

Narrative: Locals dip herring in the lower portion of this stream during years with adequate discharge. Several locals said that herring do not go above a shallow riffle that is about 0.1 mile above the mouth, but one contradicted this by saying they sometimes run up about one mile above the mouth. To be liberal, the higher upstream limit was accepted. No roads cross the portion of stream that herring could use.

PARRISH HILL CREEK

USGS topographic quadrangle: Charles City, VA

Tributary of: Queens Creek Miles above mouth: 2.0

Use category: confirmed (L) Mileage open: 0.7

Migration obstruction: fall line (or beaver dam)

Narrative: All of the locals interviewed agreed that herring ran up to the vicinity of Route 5; one individual said herring go a short distance above Route 5, but stop within 200 m. An individual that lives adjacent to the stream, approximately 0.5 mile upstream of Route 5, said that he has never seen herring up this far. Some years, beaver dams in the vicinity of Route 5 may stop herring from ascending to the fall line.

Structural Evaluations

Road crossing: Route 5

Date evaluated: 04/03/86 Passage status: passable

Structure type: two-cell box Size: ~ 2.75 m each

Vertical drop: none Depth in culvert: > 1.0 m

Velocity in culvert: < 25 cm/s

Notes: There should be no problem for herring to pass this structure.

GUNNS RUN

USGS topographic quadrangle: Charles City, VA

Tributary of: Queens Creek Miles above mouth: 0.3

Use category: confirmed (D, L) Mileage open: 4.1

Migration obstruction: fall line

Narrative: Locals said that herring run up this stream to somewhere above Route 5. No individual was familiar enough with the stream to refine the upstream limit further. Shallow riffles, brush obstructions, and beaver dams likely stop herring well below Route 618, but to be liberal, the upstream limit of herring migration was estimated to be above Route 618.

Structural Evaluations

Road crossing: Route 618

Date evaluated: 11/14/85 Passage status: passable

Structure type: bridge Size: -

Vertical drop: none Depth in culvert: > 75 cm

Velocity in culvert: < 25 cm/s

Notes: If herring could get to this crossing (which is very unlikely) they should pass without difficulty.

Road crossing: Route 5

Date evaluated: 11/14/85 Passage status: passable

Structure type: three-cell box Size: ~ 2.8 m ?

Vertical drop: none Depth in culvert: ~ 25 cm

Velocity in culvert: < 25 cm/s

Notes: Herring should pass this without difficulty. The size of the cells was not noted by the field worker, but was estimated from a photograph.

FLOWERDEW HUNDRED CREEK

USGS topographic quadrangle: Charles City, VA

Tributary of: James River Miles above mouth: 61.5

Use category: confirmed (D, L) Mileage open: 3.1

Migration obstruction: fall line (or beaver dam)

Narrative: According to locals that dip herring from this creek, herring used to run up to where logs, debris, and riffles stopped them; however, in recent years, beaver dams have shortened their run by 0.3 mile. No roads cross the portion of stream that herring use now or have used historically.

UNNAMED TRIBUTARY OF FLOWERDEW HUNDRED CREEK

USGS topographic quadrangle: Charles City, VA

Tributary of: Flowerdew Hundred Cr. Miles above mouth: 2.8

Use category: probable Mileage open: 0.4

Migration obstruction: fall line

Narrative: This small creek is probably used by herring for spawning, but none of the locals contacted were aware of herring in this creek. No roads cross the portion of this creek that herring could use.

UNNAMED TRIBUTARY OF FLOWERDEW HUNDRED CREEK

USGS topographic quadrangle: Charles City, VA

Tributary of: Flowerdew Hundred Cr. Miles above mouth: 2.3

Use category: probable Mileage open: 0.3

Migration obstruction: fall line

Narrative: This small creek is probably used by herring for spawning, but none of the locals contacted were aware of herring in this creek. No roads cross the portion of this creek that herring could use.

UNNAMED TRIBUTARY OF FLOWERDEW HUNDRED CREEK

USGS topographic quadrangle: Charles City, VA

Tributary of: Flowerdew Hundred Cr. Miles above mouth: 1.8

Use category: probable Mileage open: 0.8

Migration obstruction: fall line

Narrative: This small creek is probably used by herring for spawning, but none of the locals contacted were aware of herring in this creek. No roads cross the portion of this creek that herring could use.

WARDS CREEK

USGS topographic quadrangle: Charles City, VA

Tributary of: James River Miles above mouth: 60.5

Use category: confirmed (D, L) Mileage open: 7.6

Migration obstruction: fall line (or beaver dam)

Narrative: Locals said that in the absence of beaver dams, herring can ascend to some point upstream of Route 10, but they have never seen them as far up as Route 658 or Lone Oak Mill dam. Most of the locals said that herring do not get much above Route 10. To be liberal, the upstream limit of herring runs (in the absence of beaver activity) was estimated to be in the vicinity of the 20-foot elevation contour.

Structural Evaluations

Road crossing: Route 10

Date evaluated: 11/14/85 Passage status: passable

Structure type: bridge Size: -

Vertical drop: none Depth in culvert: > 50 cm

Velocity in culvert: < 25 cm/s

Notes: No passage problems

UNNAMED TRIBUTARY OF WARDS CREEK

USGS topographic quadrangle: Savedge, VA

Tributary of: Wards Creek Miles above mouth: 5.0

Use category: confirmed (L) Mileage open: 0.4

Migration obstruction: fall line (or beaver dam)

Narrative: According to a local that has lived next to this stream for most of his life, herring run up this creek a short distance, and locals dip herring from it. He showed us where the herring used to run before beavers dammed up the stream. Recent beaver dams have reduced the length of the stream open to herring by about 0.3 mile.

Structural Evaluations

Road crossing: Route 614

Date evaluated: 03/12/86 Passage status: passable

Structure type: one CMP (arch?) Size: 1.8 m wide

Vertical drop: none Depth in culvert: > 40 cm

Velocity in culvert: 4 cm/s

Notes: No passage problems.

UNNAMED TRIBUTARY OF WARDS CREEK

USGS topographic quadrangle: Savedge, VA

Tributary of: Wards Creek Miles above mouth: 2.7

Use category: probable Mileage open: 0.4

Migration obstruction: fall line

Narrative: The lower portion of this small creek may be used by herring for spawning, but none of the locals interviewed were familiar with this creek. No roads cross the portion of this creek that could be used by herring.

KITTEWAN CREEK

USGS topographic quadrangle: Charles City, VA

Tributary of: James River Miles above mouth: 58.1

Use category: confirmed (D) Mileage open: 2.6

Migration obstruction: fall line

Narrative: None of the locals interviewed were familiar with herring runs up this stream. The upstream limit of herring runs was estimated to be at the head of tidal influence. No roads cross the portion of stream that herring could use.

MAPISCO CREEK

USGS topographic quadrangle: Charles City, VA

Tributary of: Kittewan Creek Miles above mouth: 0.3

Use category: confirmed (D, L) Mileage open: 2.8

Migration obstruction: fall line (or beaver dam)

Narrative: Herring runs in recent years have been stopped short of the fall line by beaver dams. The upstream limit was estimated to be where natural gradient would stop herring (in the absence of beaver dams). No public roads cross the portion of stream that herring could use.

TYLER CREEK

USGS topographic quadrangle: Charles City, VA

Tributary of: James River Miles above mouth: 57.0

Use category: confirmed (D) Mileage open: 0.7

Migration obstruction: fall line

Narrative: None of the locals interviewed were familiar with the herring run up this creek. The upstream limit of the herring run was estimated to be at the head of tidal influence. No roads cross this creek.

KENNON CREEK

USGS topographic quadrangle: Brandon, VA

Tributary of: James River Miles above mouth: 55.8

Use category: confirmed (D, L) Mileage open: 2.0

Migration obstruction: fall line

Narrative: Locals said that herring run up this creek to the head of tidal influence. No roads cross the portion of the creek that herring could use.

UNNAMED TRIBUTARY OF KENNON CREEK

USGS topographic quadrangle: Brandon, VA

Tributary of: Kennon Creek Miles above mouth: 1.4

Use category: probable Mileage open: 0.3

Migration obstruction: fall line

Narrative: Herring likely spawn in the tidal portion of this small creek, but none of the locals interviewed were familiar with this creek. No roads cross the portion of the creek that herring could use.

UNNAMED TRIBUTARY OF KENNON CREEK

USGS topographic quadrangle: Brandon, VA

Tributary of: Kennon Creek Miles above mouth: 1.0

Use category: probable Mileage open: 0.4

Migration obstruction: fall line

Narrative: Herring likely spawn in the tidal portion of this small creek, but none of the locals interviewed were familiar with this creek. No roads cross the portion of the creek that herring could use.

UPPER CHIPPOKES CREEK

USGS topographic quadrangle: Claremont, VA

Tributary of: James River Miles above mouth: 51.9

Use category: confirmed (D, L) Mileage open: 8.1

Migration obstruction: fall line (or beaver dam)

Narrative: According to several locals, herring runs up this stream have always stopped at some point less than one mile above Route 10, even when there were no beaver dams on the creek. In recent years, beaver dams immediately above Route 10 have shortened the distance of the herring runs slightly.

Structural Evaluations

Road crossing: Route 10

Date evaluated: 03/13/86 Passage status: passable

Structure type: bridge Size: -

Vertical drop: none Depth in culvert: ~ 50 cm

Velocity in culvert: < 25 cm/s

Notes: Herring can pass this without difficulty.

UNNAMED TRIBUTARY OF UPPER CHIPPOKES CREEK

USGS topographic quadrangle: Savedge, VA

Tributary of: Upper Chippokes Creek Miles above mouth: 7.1

Use category: confirmed (L) Mileage open: 0.1

Migration obstruction: fall line

Narrative: A local that lives and dips herring on this stream said that herring use the lower 100 meters or so. The stream has numerous shallow areas that prevent herring from running up very far. No roads cross the portion of stream that herring use.

UNNAMED TRIBUTARY OF UPPER CHIPPOKES CREEK

USGS topographic quadrangle: Savedge, VA

Tributary of: Upper Chippokes Creek Miles above mouth: 6.5

Use category: confirmed (L) Mileage open: 1.4

Migration obstruction: fall line

Narrative: Locals said the herring runs up this stream have always stopped at some point just above Route 10, even in the absence of beaver dams. About 100 m above Route 10 is the remains of an earthen dam that was breached decades ago. The stream above the old dam is a braided channel through a herbaceous/shrub swamp; herring would have a difficult time negotiating the numerous shallow areas and debris dams (not to mention beaver dams) in this section.

Structural Evaluations

Road crossing: Route 10

Date evaluated: 03/13/86 Passage status: passable

Structure type: bridge Size: -

Vertical drop: none Depth in culvert: > 1.0 m

Velocity in culvert: < 25 cm/s

Notes: Herring could pass this without difficulty.

BAILEY BRANCH

USGS topographic quadrangle: Savedge, VA

Tributary of: Upper Chippokes Creek Miles above mouth: 5.9

Use category: probable Mileage open: 0.5

Migration obstruction: Low Point Mill dam

Narrative: This stream is probably used by herring for spawning, but none of the locals interviewed were aware of herring using this tributary. Any herring runs would be blocked by the Low Point Mill dam, which is at least 6.0 m high. No roads cross the portion of this creek that herring could use.

UNNAMED TRIBUTARY OF UPPER CHIPPOKES CREEK

USGS topographic quadrangle: Savedge, VA

Tributary of: Upper Chippokes Creek Miles above mouth: 2.2

Use category: probable Mileage open: 1.0

Migration obstruction: fall line

Narrative: None of the locals interviewed knew if herring used this small tributary. Herring probably use the tidal portion of this stream. No roads cross the portion of stream that herring could use.

UNNAMED TRIBUTARY OF UPPER CHIPPOKES CREEK

USGS topographic quadrangle: Claremont, VA

Tributary of: Upper Chippokes Creek Miles above mouth: 1.1

Use category: probable Mileage open: 1.1

Migration obstruction: pond dam

Narrative: None of the locals interviewed knew if herring used this small tributary. Herring probably use the tidal portion of this stream, and run up as far as the spillway of a small pond. No roads cross the portion of stream that herring could use.

UNNAMED TRIBUTARY OF UNNAMED TRIBUTARY OF UPPER CHIPPOKES CREEK

USGS topographic quadrangle: Claremont, VA

Tributary of: unnamed tributary of Upper Chippokes Creek, 1.1 miles upstream of the mouth of Upper Chippokes Creek

Miles above mouth: 0.1

Use category: probable Mileage open: 0.8

Migration obstruction: fall line

Narrative: None of the locals interviewed knew if herring used this small tributary. Herring probably use the tidal portion of this stream. No roads cross the portion of stream that herring could use.

BRANDON GUT

USGS topographic quadrangle: Claremont, VA

Tributary of: Upper Chippokes Creek Miles above mouth: 0.6

Use category: probable Mileage open: 0.9

Migration obstruction: pond dam (or beaver dam)

Narrative: None of the locals interviewed were familiar with herring runs up this small stream. Herring probably use the lower portion of this creek. Herring would be stopped immediately above the Route 642 crossing by a pond spillway that is impassable, if beaver dams do not stop them sooner. No roads cross the portion of stream that herring could use; the old bridge at the mouth has either fallen or been torn down.

Structural Evaluations

Road crossing: Route 642

Date evaluated: 03/13/86 Passage status: passable

Structure type: concrete pipe Size: ~ 1.5 m

Vertical drop: none Depth in culvert: ~ 75 cm

Velocity in culvert: 15 cm/s

Notes: No passage problem for herring. The water level at this crossing appeared to be impounded by beaver dams on the day the evaluation was made. If so, then the water level in the culvert may be considerably lower in the absence of beaver activity. Herring could run up only an additional 3.0 m above this culvert before encountering the pond spillway.

SUNKEN MEADOW CREEK

USGS topographic quadrangle: Claremont, VA

Tributary of: James River Miles above mouth: 49.1

Use category: confirmed (L) Mileage open: 0.1

Migration obstruction: Sunken Meadow Pond dam

Narrative: Locals dip herring near the mouth of this creek and just below the spillway of Sunken Meadow Pond dam, which is an impassable obstacle to herring (~ 1.0 m vertical drop at high tide). The dam spillway is right above the Route 609 crossing.

Structural Evaluations

Road crossing: Route 609

Date evaluated: 03/13/86 Passage status: passable (T)

Structure type: three-cell box Size: ~ 2.0 m each

Vertical drop: none Depth in culvert: variable

Velocity in culvert: variable

Notes: Water depth and velocity vary with the tide. At high tide, this culvert is passable with ease, but herring have nowhere to run because of the spillway on the upstream side of the culvert. At low tide, the water depth in this culvert may be too shallow for herring passage.

CHICKAHOMINY RIVER

USGS topographic quadrangle: Claremont, VA

Tributary of: James River Miles above mouth: 46.5

Use category: confirmed (D, L) Mileage open: 23.3

Migration obstruction: Walkers Dam

Narrative: American shad, striped bass, and herring run up the Chickahominy River to the base of Walkers Dam. Walkers Dam is only about 30 cm high during high tide, but it is a barrier to fish during most years. Several locals have remarked that during some years, an unusually high tide will allow herring to get over this dam and into the impoundment above. How far herring will run above Walkers Dam is unknown at this time. Passage does not happen every year, so few fisherman and locals look for them above the dam; consequently, local knowledge is lacking. The crossings above Walkers Dam were not evaluated in this study.

Structural Evaluations

Road crossing: Route 5

Date evaluated: 04/04/86 Passage status: passable

Structure type: bridge Size: -

Vertical drop: none Depth in culvert: > 1.0 m

Velocity in culvert: < 25 cm/s

Notes: This is a draw bridge with no passage problems.

UNNAMED TRIBUTARY OF CHICKAHOMINY RIVER

USGS topographic quadrangle: Walkers, VA

Tributary of: Chickahominy River Miles above mouth: 22.3

Use category: probable Mileage open: 1.2

Migration obstruction: pond dam

Narrative: None of the locals interviewed were familiar with this stream, but herring probably use it for spawning. If herring run up this stream, they probably get as far as a pond dam immediately above a private road crossing. No public roads cross the portion of stream that herring could use.

BARROWS CREEK

USGS topographic quadrangle: Walkers, VA

Tributary of: Chickahominy River Miles above mouth: 20.8

Use category: confirmed (D) Mileage open: 3.7

Migration obstruction: fall line (or beaver dam)

Narrative: None of the locals interviewed were familiar with the herring runs up this creek. Beaver dams above and below Route 615 probably stop herring. In the absence of beaver dams, herring could probably run up as far as the shallow riffles downstream of the lower Route 624 crossing.

Structural Evaluations

Road crossing: Route 615

Date evaluated: 11/14/85 Passage status: passable ?

Structure type: three-cell box Size: ~ 3.0 m

Vertical drop: none Depth in culvert: > 1.0 m

Velocity in culvert: < 25 cm/s

Notes: This site was visited twice, and both times there was deep water in the culvert. Herring could pass this culvert easily with the depths observed. The deep water in the culvert and the presence of dead standing trees suggests that this portion of the stream is a beaver impoundment. If so, then depths would be reduced if the beaver dam was eliminated and the water level lowered. Cell sizes were estimated from a photo.

DIASCUND CREEK

USGS topographic quadrangle: Walkers, VA

Tributary of: Chickahominy River Miles above mouth: 15.3

Use category: confirmed (D, L) Mileage open: 6.1

Migration obstruction: Diascund Creek Reservoir dam

Narrative: Local sources said that herring run up this large stream to the base of Diascund Creek Reservoir dam, which is about 8.0 m high and impassable.

Structural Evaluations

Road crossing: Route 622

Date evaluated: 11/14/85 Passage status: passable

Structure type: bridge Size: -

Vertical drop: none Depth in culvert: > 1.0 m

Velocity in culvert: < 25 cm/s

Notes: No passage problems.

Road crossing: US 60

Date evaluated: 11/14/85 Passage status: passable

Structure type: bridge Size: -

Vertical drop: none Depth in culvert: > 1.0 m

Velocity in culvert: < 25 cm/s

Notes: No passage problems.

UNNAMED TRIBUTARY OF DIASUND CREEK

USGS topographic quadrangle: Walkers, VA

Tributary of: Diascund Creek Miles above mouth: 4.1

Use category: probable Mileage open: 0.5

Migration obstruction: fall line

Narrative: None of the locals interviewed knew if this stream was used by herring, and they had never seen herring in the vicinity of Route 603. Herring probably use the tidal portion of this creek. No roads cross the portion of stream that herring could use.

MILL CREEK

USGS topographic quadrangle: Walkers, VA

Tributary of: Diascund Creek Miles above mouth: 1.4

Use category: confirmed (L) Mileage open: 3.3

Migration obstruction: fall line (or beaver dam)

Narrative: According to locals, herring run up this creek at least as far as Route 603, when beaver dams do not stop them. Above Route 603, the stream channel becomes braided as it meanders through a wooded swamp containing beaver dams. The upstream limit of herring migration, in the absence of beaver dams, was estimated to be at the mouth of Edwards Swamp.

Structural Evaluations

Road crossing: Route 603

Date evaluated: 04/05/86 Passage status: passable

Structure type: two-cell box Size: ~ 3.0 X 2.5 m each

Vertical drop: none Depth in culvert: ~ 75 cm

Velocity in culvert: ~ 25 cm/s

Notes: Culvert is passable with ease. Just a few days prior to this evaluation, a beaver dam was removed from the upstream end of this culvert.

PARSONS CREEK

USGS topographic quadrangle: Brandon, VA

Tributary of: Chickahominy River Miles above mouth: 7.7

Use category: probable Mileage open: 2.2

Migration obstruction: fall line

Narrative: None of the locals interviewed were familiar with this stream. It is likely that herring spawn in the tidal portion of this stream; above the tidal influence, the stream is probably too shallow for herring. No roads cross the portion of stream that herring could use.

YARMOUTH CREEK

USGS topographic quadrangle: Norge, VA

Tributary of: Chickahominy River Miles above mouth: 5.7

Use category: confirmed (D, L) Mileage open: 5.0

Migration obstruction: Cranstons Pond dam

Narrative: Local sources said that herring run up this stream, and most fish do not get beyond the Route 632 crossing. Two locals that were interviewed said they have seen a few herring get above the submerged culvert at Route 632, and run up another 100 m to the spillway for Cranstons Pond, which has a vertical drop of ~ 75 cm (impassable).

Structural Evaluations

Road crossing: Route 632

Date evaluated: 04/04/86 Passage status: questionable

Structure type: four concrete pipes Size: ~ 1.0 m each

Vertical drop: none Depth in culvert: > 50 cm

Velocity in culvert: < 25 cm/s

Notes: Of the four pipes, only one is not submerged, and it is clogged with debris and silt so that little water flows through it. The tops of the downstream openings of the submerged pipes are 10-15 cm under the water's surface. This site was visited three times at different tidal stages; the water level appeared the same on each visit, indicating that this site is probably above the normal tidal influence. According to the locals familiar with the herring run, most herring do not get above this culvert. The stream above this crossing is well suited for herring passage. If this culvert was properly modified, herring could ascend approximately 100 m further to the spillway of Cranstons Pond.

LITTLE CREEK

USGS topographic quadrangle: Norge, VA

Tributary of: Yarmouth Creek Miles above mouth: 2.1

Use category: confirmed (L) Mileage open: 1.1

Migration obstruction: Little Creek Reservoir dam

Narrative: A local said that herring run up to the spillway of Little Creek Reservoir in some years. This dam is ~ 20.0 m high (impassable), and on April 4, 1986, there was essentially no flow coming out of this water supply reservoir. No roads cross the portion of stream that herring use.

MORRIS CREEK

USGS topographic quadrangle: Brandon, VA

Tributary of: Chickahominy River Miles above mouth: 2.7

Use category: confirmed (D, L) Mileage open: 9.3

Migration obstruction: fall line (or beaver dam)

Narrative: According to local sources, herring run up this stream to some point above Route 623. One local said that herring run about 500 m above Route 623, to where the stream gets shallow. Another local said that a beaver dam now stops the herring short of the natural fall line. Due to the large drainage area and shallow gradient of this stream, the upstream limit was estimated to be at the 15-foot elevation contour (well above local estimates). There are several small unnamed tributaries of this stream that herring may use, but are not addressed in this report because the available spawning habitat is limited to the lower reaches, and no roads cross the portions of these streams that herring could use.

Structural Evaluations

Road crossing: Route 623

Date evaluated: 04/04/86 Passage status: passable

Structure type: four-cell box Size: ~ 2.3 m each

Vertical drop: none Depth in culvert: > 1.0 m

Velocity in culvert: < 25 cm/s

Notes: The culvert was filled to within 35 cm of the top on the date evaluated. On November 11, 1985, this site was visited, and the culvert was submerged. It appears that the creek at this crossing may fluctuate with the tide, or there may be beaver dams downstream that influence the water level at this crossing. Locals claim herring get above this crossing.

GORDON CREEK

USGS topographic quadrangle: Brandon, VA

Tributary of: Chickahominy River Miles above mouth: 1.6

Use category: confirmed (D, L, P) Mileage open: 6.3

Migration obstruction: Jolly Pond dam

Narrative: According to locals, herring run up this creek to the spillway of Jolly Pond, which is ~ 1.5 m high and impassable. Herring were observed in this stream on April 22, 1986, approximately 200 m downstream of Jolly Pond. No roads cross the portion of this creek that herring use; the Route 633 crossing is a bridge over the spillway for Jolly Pond. There are a few small unnamed tributaries of this stream that herring may use, but are not addressed in this report because the available spawning habitat is limited to the lower reaches, and no roads cross the portions of these streams that herring could use.

TOMAHUND CREEK

USGS topographic quadrangle: Claremont, VA

Tributary of: Chickahominy River Miles above mouth: 0.3

Use category: confirmed (D, L) Mileage open: 5.0

Migration obstruction: fall line (or beaver dam)

Narrative: Herring ascend this stream to where the creek becomes too shallow for passage, or where they encounter a beaver dam. Field personnel could not locate any locals that knew how far herring run up this stream in the absence of beaver dams. Currently, beaver dams upstream and downstream of Route 623 would stop herring. The upstream limit of herring migration in the absence of beaver dams was estimated to be at the 10-foot elevation contour. There are a few small unnamed tributaries of this stream that herring may use, but are not addressed in this report because the available spawning habitat is limited to the lower reaches, and no roads cross the portions of these streams that herring could use.

Structural Evaluations

Road crossing: Route 623

Date evaluated: 04/04/86 Passage status: passable ?

Structure type: two-cell box Size: ~ 2.3 m each

Vertical drop: none Depth in culvert: > 1.0 m

Velocity in culvert: < 25 cm/s

Notes: A beaver dam below this point has impounded water back up under this crossing, creating a greater depth than what would exist if the stream were free-flowing. Herring could pass this culvert easily with its present depth, but they undoubtedly do not make it this far. It is uncertain whether this culvert would be passable if the stream were free-flowing, and open to herring.

UNNAMED TRIBUTARY OF TOMAHUND CREEK

USGS topographic quadrangle: Brandon, VA

Tributary of: Tomahund Creek Miles above mouth: 1.0

Use category: probable Mileage open: 1.3

Migration obstruction: fall line

Narrative: Herring probably use the lower tidal portion of this creek for spawning. No roads cross the portion of stream that herring could use.

UNNAMED TRIBUTARY OF JAMES RIVER

USGS topographic quadrangle: Surry, VA

Tributary of: James River Miles above mouth: 43.2

Use category: probable Mileage open: 1.1

Migration obstruction: fall line

Narrative: None of the locals interviewed were familiar with this creek. Herring probably use the tidal portion of this small creek for spawning. It is unlikely that they would get up as far as Route 5. No roads cross the portion of stream that herring could use.

POWHATAN CREEK

USGS topographic quadrangle: Surry, VA

Tributary of: James River Miles above mouth: 41.3

Use category: confirmed (D) Mileage open: 8.7

Migration obstruction: fall line

Narrative: Eight locals that live or work adjacent to this creek were interviewed, and all said that to their knowledge, herring did not run up this creek to spawn. They all said that on the north side of the James River, there are no herring runs up any creeks downstream of the Chickahominy. Dean Heath of Jamestown Marina said that commercial fisherman formerly captured some herring in the tidal portion of this creek, but to his knowledge, they have not caught any in about 8-10 years. He has never heard of a spawning run up the freshwater portion of this creek, but does not know why they would not be attracted to it. Assuming that there is a herring run up this stream, as reported by Davis et al. (1970), no barriers are present to impede herring migration. The upstream limit for herring runs was therefore estimated to be in the vicinity of the 20-foot elevation contour above Route 613, if beaver dams below do not stop them. There are a few small unnamed tributaries of this stream that herring may use, but are not addressed in this report because the available spawning habitat is limited to the lower reaches, and no roads cross the portions of these streams that herring could use.

Structural Evaluations

Road crossing: Route 613

Date evaluated: 04/06/86 Passage status: passable

Structure type: three-cell box Size: ~ 3.0 m each

Vertical drop: none Depth in culvert: ~ 50 cm

Velocity in culvert: < 25 cm/s

Notes: Easy passage for herring if they were to get this far upstream.

Road crossing: Route 5

Date evaluated: 04/06/86 Passage status: passable

Structure type: bridge Size: -

Vertical drop: none Depth in culvert: ~ 1.0 m

Velocity in culvert: < 25 cm/s

Notes: Herring could pass under this structure easily.

Road crossing: Route 31

Date evaluated: 04/02/86 Passage status: passable

Structure type: bridge Size: -

Vertical drop: none Depth in culvert: > 1.0 m

Velocity in culvert: < 25 cm/s

Notes: The stream under this bridge is deep and wide. Herring could pass here without difficulty.

Road crossing: Colonial Nat. Hist. Parkway (upper crossing)

Date evaluated: 04/02/86 Passage status: passable

Structure type: bridge Size: -

Vertical drop: none Depth in culvert: > 1.0 m

Velocity in culvert: < 25 cm/s

Notes: Creek is large, deep, and tidal here; herring could pass without difficulty.

Road crossing: Colonial Nat. Hist. Parkway (lower crossing)

Date evaluated: 04/02/86 Passage status: passable

Structure type: bridge Size: -

Vertical drop: none Depth in culvert: > 1.0 m

Velocity in culvert: < 25 cm/s

Notes: Bridge over the mouth of this creek. Creek is large, deep, and tidal here; herring could pass without difficulty.

GRAYS CREEK

USGS topographic quadrangle: Surry, VA

Tributary of: James River Miles above mouth: 40.4

Use category: confirmed (D) Mileage open: 7.2

Migration obstruction: fall line (or beaver dam)

Narrative: Davis et al. (1970) reported herring spawning in this creek. Two of the locals that were interviewed said they have seen "herring swirling" in the lower tidal portion of this creek, and thought they may have been spawning. Neither individual caught any to make a positive identification. Four locals that live in the vicinity of the Route 618 crossing said they have never seen or heard of herring in the upper tidal or free-flowing portion of this creek or its tributaries. They said that locals living in this area drive upriver to other tributaries to dip herring. Assuming the presence of herring runs up this stream, a beaver dam downstream of Route 618 would stop them now. If this dam and the others above were removed, then herring could run to above the Route 626 crossing. The upstream limit was estimated to be in the vicinity of 10-foot elevation contour. There are several small named and unnamed tributaries of this stream that herring may use, but are not addressed in this report because the available spawning habitat is limited to the lower reaches, and no roads cross the portions of these streams that herring could use.

Structural Evaluations

Road crossing: Route 626

Date evaluated: 06/16/86 Passage status: passable

Structure type: two-cell box Size: ~ 1.8 x 2.5 m each

Vertical drop: none Depth in culvert: 45 cm

Velocity in culvert: < 25 cm/s

Notes: There may be a beaver dam downstream that backed water up into this culvert, resulting in greater depth than if the stream were free-flowing. At present, this culvert could be negotiated by herring with ease, if they were to get this far.

Road crossing: Route 618

Date evaluated: 04/01/86 Passage status: passable

Structure type: bridge Size: -

Vertical drop: none Depth in culvert: > 1.0 m

Velocity in culvert: < 25 cm/s

Notes: A beaver dam immediately downstream has backed up water under this bridge. Herring could probably negotiate this crossing easily if the beaver dam were removed; there is sufficient depth and little gradient. Two locals that have lived on the hill above this crossing for over 30 years said they have never seen or heard of herring at this crossing.

SPRING RUN

USGS topographic quadrangle: Surry, VA

Tributary of: Grays Creek Miles above mouth: 6.1

Use category: probable Mileage open: 1.3

Migration obstruction: fall line

Narrative: None of the locals interviewed were aware of herring runs up this tributary. If herring come up Grays Creek to the mouth of this stream, then they would probably use this tributary also. The upstream limit was estimated to be in the vicinity of the 10-foot contour, if beaver dams downstream would not stop them. No roads cross the portion of stream that herring could use.

DARK SWAMP

USGS topographic quadrangle: Surry, VA

Tributary of: Grays Creek Miles above mouth: 5.3

Use category: probable Mileage open: 1.3

Migration obstruction: fall line (or beaver dam)

Narrative: None of the locals interviewed were aware of herring runs up this tributary. If herring run up Grays Creek to spawn, they would probably use this tributary also. If herring were to use this stream for spawning, they would be stopped by a beaver dam presently downstream of the Route 626 crossing. In the absence of beaver dams, the upstream limit was estimated to be in the vicinity of the 10-foot elevation contour.

Structural Evaluations

Road crossing: Route 626

Date evaluated: 04/01/86 Passage status: passable

Structure type: three-cell box Size: ~ 3.0 m

Vertical drop: none Depth in culvert: > 1.0 m

Velocity in culvert: < 25 cm/s

Notes: A beaver dam presently downstream has impounded water under this crossing, and has nearly submerged the culvert. If the beaver dam was removed and the stream made free-flowing, there would likely be adequate depth in this culvert for herring passage.

HULLS SLASH GUT

USGS topographic quadrangle: Surry, VA

Tributary of: Grays Creek Miles above mouth: 4.0

Use category: probable Mileage open: 0.6

Migration obstruction: fall line

Narrative: None of the locals interviewed were aware of herring runs up this tributary. If herring run up Grays Creek to spawn, they would probably use this tributary also. If herring spawn in this creek, the upstream limit of their run is well below the Route 620 crossing. No roads cross the portion of stream that herring could use.

CROSS CREEK

USGS topographic quadrangle: Surry, VA

Tributary of: Grays Creek Miles above mouth: 2.0

Use category: probable Mileage open: 0.8

Migration obstruction: fall line

Narrative: None of the locals interviewed were aware of herring runs up this tributary. If herring run up Grays Creek to spawn, they would probably use this tributary also. If herring spawn in this creek, they do so only in the lower tidal portion. No roads cross the portion of stream that could be used by herring.

CROUCH CREEK

USGS topographic quadrangle: Surry, VA

Tributary of: James River Miles above mouth: 39.1

Use category: unlikely Mileage open: 3.3

Migration obstruction: fall line

Narrative: None of the locals that were interviewed knew of herring, or other anadromous fish, using this creek for spawning. Davis et al. (1970) found no evidence of American shad or herring spawning in tributaries that empty into the James River downstream of Grays Creek. For these reasons, it is unlikely that anadromous fish run up this tributary to spawn. If herring were to run up this creek, they could run to the fall line if no beaver dams were encountered.

Structural Evaluations

Road crossing: Route 637

Date evaluated: 04/01/86 Passage status: passable

Structure type: bridge Size: -

Vertical drop: none Depth in culvert: > 2.0 m

Velocity in culvert: < 25 cm/s

Notes: If herring were to run up this creek, they could pass this structure without difficulty.

TIMBER NECK CREEK

USGS topographic quadrangle: Surry, VA

Tributary of: Crouch Creek Miles above mouth: 0.7

Use category: unlikely Mileage open: 2.1

Migration obstruction: fall line

Narrative: None of the locals that were interviewed knew of herring, or other anadromous fish, using this creek for spawning. Davis et al. (1970) found no evidence of American shad or herring spawning in tributaries that empty into the James River downstream of Grays Creek. For these reasons, it is unlikely that anadromous fish run up this tributary to spawn. If herring were to run up this creek, they could run to the fall line if no beaver dams were encountered. No roads cross the portion of stream that herring could use.

COLLEGE RUN

USGS topographic quadrangle: Hog Island, VA

Tributary of: James River Miles above mouth: 36.9

Use category: unlikely Mileage open: 3.1

Migration obstruction: fall line (or beaver dam)

Narrative: None of the locals that were interviewed knew of herring, or other anadromous fish, using this creek for spawning. Davis et al. (1970) found no evidence of American shad or herring spawning in tributaries that empty into the James River downstream of Grays Creek. For these reasons, it is unlikely that anadromous fish run up this tributary to spawn. If herring were to run up this creek, they would be stopped by a beaver dam presently between Routes 783 and 634. If the beaver dam were removed, they would likely get above Route 634 to the fall line.

Structural Evaluations

Road crossing: Route 634

Date evaluated: 04/01/86 Passage status: passable

Structure type: bridge Size: -

Vertical drop: none Depth in culvert: > 1.5 m

Velocity in culvert: < 25 cm/s

Notes: The evaluation was made when a beaver dam below backed up water under the bridge. If the beaver dam was removed and the stream free-flowing, this crossing would likely have adequate depth for herring passage.

Road crossing: Route 783

Date evaluated: 04/01/86 Passage status: passable

Structure type: bridge Size: -

Vertical drop: none Depth in culvert: > 2.0 m

Velocity in culvert: < 25 cm/s

Notes: If herring were to run up this creek, they could pass this structure with ease.

MILL FARM RUN

USGS topographic quadrangle: Surry, VA

Tributary of: College Run Miles above mouth: 2.4

Use category: unlikely Mileage open: 0.3

Migration obstruction: fall line

Narrative: None of the locals that were interviewed knew of herring, or other anadromous fish, using this creek for spawning. Davis et al. (1970) found no evidence of American shad or herring spawning in tributaries that empty into the James River downstream of Grays Creek. For these reasons, it is unlikely that anadromous fish run up this tributary to spawn. If herring were to ascend College Run to spawn, they would probably use the lower portion of this stream also. No roads cross the portion of stream that herring could use.

LOWER CHIPPOKES CREEK

USGS topographic quadrangle: Hog Island, VA

Tributary of: James River Miles above mouth: 36.6

Use category: unlikely Mileage open: 5.8

Migration obstruction: fall line

Narrative: None of the locals that were interviewed knew of herring, or other anadromous fish, using this creek for spawning. Davis et al. (1970) found no evidence of American shad or herring spawning in tributaries that empty into the James River downstream of Grays Creek. For these reasons, it is unlikely that anadromous fish run up this tributary to spawn. If herring were to run up this stream, they could probably run up to some point between Route 10 and Route 634, if beaver dams were absent.

Structural Evaluations

Road crossing: Route 634

Date evaluated: 04/02/86 Passage status: passable

Structure type: bridge Size: -

Vertical drop: none Depth in culvert: ~ 1.0 m

Velocity in culvert: < 25 cm/s

Notes: If herring were to run up this creek, they could pass this with ease.

CASTLE MILL RUN

USGS topographic quadrangle: Hog Island, VA

Tributary of: Lower Chippokes Creek Miles above mouth: 2.8

Use category: unlikely Mileage open: 0.5

Migration obstruction: fall line

Narrative: None of the locals that were interviewed knew of herring, or other anadromous fish, using this creek for spawning. Davis et al. (1970) found no evidence of American shad or herring spawning in tributaries that empty into the James River downstream of Grays Creek. For these reasons, it is unlikely that anadromous fish run up this tributary to spawn. If herring were to run up this creek, they could run to the fall line if beaver dams were absent. No roads cross the portion of stream that herring could use.

MILL CREEK

USGS topographic quadrangle: Hog Island, VA

Tributary of: James River Miles above mouth: 34.6

Use category: unlikely Mileage open: 2.5

Migration obstruction: Lake Powell dam

Narrative: None of the locals that were interviewed knew of herring, or other anadromous fish, using this creek for spawning. Davis et al. (1970) found no evidence of American shad or herring spawning in tributaries that empty into the James River downstream of Grays Creek. For these reasons, it is unlikely that anadromous fish run up this tributary to spawn. If herring were to run up this creek, they would be stopped by the spillway for Lake Powell (a vertical drop of ~ 2.5 m). Route 618 crosses this stream over the Lake Powell spillway.

Structural Evaluations

Road crossing: Colonial Nat. Hist. Parkway

Date evaluated: 04/06/86 Passage status: passable

Structure type: bridge Size: -

Vertical drop: none Depth in culvert: > 1.0 m

Velocity in culvert: < 25 cm/s

Notes: If herring were to run up this creek, they could pass this structure with ease.

COLLEGE CREEK

USGS topographic quadrangle: Hog Island, VA

Tributary of: James River Miles above mouth: 33.0

Use category: unlikely Mileage open: 5.7

Migration obstruction: Matoaka Lake dam

Narrative: None of the locals that were interviewed knew of herring, or other anadromous fish, using this creek for spawning. Davis et al. (1970) found no evidence of American shad or herring spawning in tributaries that empty into the James River downstream of Grays Creek. For these reasons, it is unlikely that anadromous fish run up this tributary to spawn. Local fisherman said they catch some herring at the mouth of this creek before the spawning season. If herring were to run up this creek, they could probably make it as far as the Matoaka Lake spillway (> 3.0 m vertical drop). Route 5/31 crosses this creek over the spillway.

Structural Evaluations

Road crossing: Route 199

Date evaluated: 04/06/86 Passage status: passable

Structure type: bridge Size: -

Vertical drop: none Depth in culvert: > 1.0 m

Velocity in culvert: < 25 cm/s

Notes: If herring were to run up this creek, they could pass this structure with ease.

Road crossing: Colonial Nat. Hist. Parkway

Date evaluated: 04/06/86 Passage status: passable

Structure type: bridge Size: -

Vertical drop: none Depth in culvert: > 2.0 m

Velocity in culvert: ~ 50 cm/s

Notes: If herring were to run up this creek, they could pass this structure without difficulty.

PAPER MILL CREEK

USGS topographic quadrangle: Williamsburg, VA

Tributary of: College Creek Miles above mouth: 4.4

Use category: unlikely Mileage open: 0.0

Migration obstruction: fall line

Narrative: None of the locals that were interviewed knew of herring, or other anadromous fish, using this creek for spawning. Davis et al. (1970) found no evidence of American shad or herring spawning in tributaries that empty into the James River downstream of Grays Creek. For these reasons, it is unlikely that anadromous fish run up this tributary to spawn. This stream is too small and shallow to be used by herring, except possibly at its mouth.

HALFWAY CREEK

USGS topographic quadrangle: Hog Island, VA

Tributary of: College Creek Miles above mouth: 2.7

Use category: unlikely Mileage open: 2.4

Migration obstruction: Kingsmill Pond dam

Narrative: None of the locals that were interviewed knew of herring, or other anadromous fish, using this creek for spawning. Davis et al. (1970) found no evidence of American shad or herring spawning in tributaries that empty into the James River downstream of Grays Creek. For these reasons, it is unlikely that anadromous fish run up this tributary to spawn. If herring were to run up this creek, they could probably run up as far as the Kingsmill Pond spillway, which is impassable. The private road crossing about 0.5 mile below Kingsmill Pond is a bridge that is passable with ease.

Structural Evaluations

Road crossing: Colonial Nat. Hist. Parkway

Date evaluated: 04/06/86 Passage status: passable

Structure type: bridge Size: -

Vertical drop: none Depth in culvert: > 1.0 m

Velocity in culvert: < 25 cm/s

Notes: If herring were to run up this creek, they could pass this structure with ease.

UNNAMED TRIBUTARY OF HALFWAY CREEK

USGS topographic quadrangle: Hog Island, VA

Tributary of: Halfway Creek Miles above mouth: 1.0

Use category: unlikely Mileage open: 1.5

Migration obstruction: fall line

Narrative: None of the locals that were interviewed knew of herring, or other anadromous fish, using this creek for spawning. Davis et al. (1970) found no evidence of American shad or herring spawning in tributaries that empty into the James River downstream of Grays Creek. For these reasons, it is unlikely that anadromous fish run up this tributary to spawn. If herring were to run up this creek, they would probably stop at the fall line above Route 199.

Structural Evaluations

Road crossing: Route 199

Date evaluated: 04/06/86 Passage status: passable

Structure type: two-cell box Size: ~ 2.5 m each

Vertical drop: none Depth in culvert: > 1.0 m

Velocity in culvert: < 25 cm/s

Notes: If herring were to run up this creek, they could pass this crossing with ease. The above evaluation was made at high tide, and there was plenty of depth for herring. No measurements were made at low tide, but the depth would probably be adequate.

GROVE CREEK

USGS topographic quadrangle: Hog Island, VA

Tributary of: James River Miles above mouth: 31.0

Use category: unlikely Mileage open: 1.1

Migration obstruction: fall line

Narrative: None of the locals that were interviewed knew of herring, or other anadromous fish, using this creek for spawning. Davis et al. (1970) found no evidence of American shad or herring spawning in tributaries that empty into the James River downstream of Grays Creek. For these reasons, it is unlikely that anadromous fish run up this tributary to spawn. If herring were to run up this creek, they would probably run to the fall line above tidal influence. No public roads cross the portion of stream that herring could use. There are two small unnamed tributaries of this stream that are not addressed in this report because it is unlikely that herring would enter them, and no roads cross the portions of these streams that herring could ascend.

SKIFFES CREEK

USGS topographic quadrangle: Yorktown, VA

Tributary of: James River Miles above mouth: 28.4

Use category: unlikely Mileage open: 4.0

Migration obstruction: Skiffes Creek Reservoir dam

Narrative: None of the locals that were interviewed knew of herring, or other anadromous fish, using this creek for spawning. Davis et al. (1970) found no evidence of American shad or herring spawning in tributaries that empty into the James River downstream of Grays Creek. For these reasons, it is unlikely that anadromous fish run up this tributary to spawn. If herring were to run up this creek, they could get as far as the impassable spillway for Skiffes Creek Reservoir. No roads cross the portion of stream that herring could use. None of the tributaries below the reservoir would be used by herring for spawning because of moderate salinity. No roads cross the portions of these tributaries that herring could ascend.

HUNNICUT CREEK

USGS topographic quadrangle: Hog Island, VA

Tributary of: James River Miles above mouth: 26.7

Use category: unlikely Mileage open: 1.4

Migration obstruction: fall line

Narrative: None of the locals that were interviewed knew of herring, or other anadromous fish, using this creek for spawning. Davis et al. (1970) found no evidence of American shad or herring spawning in tributaries that empty into the James River downstream of Grays Creek. For these reasons, it is unlikely that anadromous fish run up this tributary to spawn. If they were to ascend this creek, they could run unobstructed to the fall line or a beaver dam. No roads cross the portion of stream that herring could use.

LAWNES CREEK

USGS topographic quadrangle: Hog Island, VA

Tributary of: James River | Miles above mouth: 26.3

Use category: unlikely | Mileage open: 7.2

Migration obstruction: fall line

Narrative: A commercial fisherman (Fritz Zeiner of Claremont) said herring ascend this creek, but all other locals interviewed were not aware of any anadromous fish spawning runs up this creek or its tributaries. No dip net fishery has developed on this sizeable tributary. Davis et al. (1970) found no evidence of American shad or herring spawning in tributaries that empty into the James River downstream of Grays Creek. For these reasons, it is unlikely that anadromous fish run up this tributary to spawn. It could be that herring explore this creek during pre-spawning movements, but do not spawn in it. If herring were to run up this creek to spawn, they would likely get up as far as the mouth of Pooles Creek; above this, there is probably inadequate depth.

Structural Evaluations

Road crossing: Route 10

Date evaluated: 04/02/86 | Passage status: passable

Structure type: bridge | Size: -

Vertical drop: none | Depth in culvert: ~ 40 cm

Velocity in culvert: < 25 cm/s

Notes: If herring were to run up this far, they could pass under the bridge proper with ease. The problem here is a riffle on the downstream end of the bridge. On April 2, 1986, the water depth in this riffle was 13-15 cm and the velocity was ~ 2.0 m/s. Determined herring could probably negotiate this short stretch of steep gradient, especially with above-average flows. The only time that herring would possibly reach this point would be during a spawning run. Herring probably would not spawn in this creek unless there was above-average discharge.

Road crossing: Route 628

Date evaluated: 04/02/86 Passage status: passable

Structure type: bridge Size: -

Vertical drop: none Depth in culvert: > 1.0 m

Velocity in culvert: < 25 cm/s

Notes: If herring were to run up this creek, they would pass this structure with ease.

POOLES CREEK

USGS topographic quadrangle: Bacons Castle, VA

Tributary of: Lawnes Creek Miles above mouth: 7.2

Use category: unlikely Mileage open: 1.5

Migration obstruction: fall line

Narrative: None of the locals that were interviewed knew of herring, or other anadromous fish, using this creek for spawning. Davis et al. (1970) found no evidence of American shad or herring spawning in tributaries that empty into the James River downstream of Grays Creek. For these reasons, it is unlikely that anadromous fish run up this tributary to spawn. If herring were to run up Lawnes Creek to the mouth of this creek, they would probably reach some point above Route 627, especially with above-average flows.

Structural Evaluations

Road crossing: Route 627

Date evaluated: 04/02/86 Passage status: passable

Structure type: bridge Size: -

Vertical drop: none Depth in culvert: > 50 cm

Velocity in culvert: < 25 cm/s

Notes: Deep hole under this bridge is considerably deeper than most of the stream above and below. If herring get this far (which would be unlikely except with above-average flows) they would pass this structure with ease.

PIERCE CREEK

USGS topographic quadrangle: Bacons Castle, VA

Tributary of: Lawnes Creek Miles above mouth: 5.9

Use category: unlikely Mileage open: 0.4

Migration obstruction: fall line

Narrative: None of the locals that were interviewed knew of herring, or other anadromous fish, using this creek for spawning. Davis et al. (1970) found no evidence of American shad or herring spawning in tributaries that empty into the James River downstream of Grays Creek. For these reasons, it is unlikely that anadromous fish run up this tributary to spawn. If herring were to run up Lawnes Creek to spawn, they would probably use this creek also. They could probably run to the fall line below Route 627.

WARWICK RIVER

USGS topographic quadrangle: Mulberry Island, VA

Tributary of: James River Miles above mouth: 18.8

Use category: unlikely Mileage open: 10.2

Migration obstruction: City Reservoir dam

Narrative: None of the locals that were interviewed knew of herring, or other anadromous fish, using this river, or its tributaries, for spawning. Davis et al. (1970) found no evidence of American shad or herring spawning in tributaries that empty into the James River downstream of Grays Creek. For these reasons, it is unlikely that anadromous fish run up this tributary to spawn. Much of the freshwater of the Warwick River is diverted for water supply, and on April 6, 1986, no flow was coming out of City Reservoir. During periods of high discharge, freshwater flows out of the reservoir may attract anadromous species up the river (see description of Nansemond River and Western Branch). Herring could run up as far as the spillway for City Reservoir, but the other species would likely stop below US 60. This would be a short-lived phenomenon in late-winter or early-spring; once the discharge drops and salinity increases, the anadromous fish would move back out into the James River. The tributaries below the reservoir are probably too saline to be attractive to herring.

Structural Evaluations

Road crossing: US 60

Date evaluated: 04/06/86 Passage status: passable

Structure type: two-cell box Size: ~ 2.0 m each

Vertical drop: none Depth in culvert: 10-15 cm

Velocity in culvert: none

Notes: No flow was measured because no water was coming over the dam. This crossing has adequate depth if herring were to use it. The river is too shallow at this crossing for any species except herring.

ALL TRIBUTARIES ON THE NORTH SIDE OF THE JAMES RIVER DOWNSTREAM OF THE WARWICK RIVER

Tributaries of: James River Miles above mouth: 0-18.2

Use category: unlikely

Narrative: None of the locals that were interviewed knew of herring, or other anadromous fish, using these small creeks for spawning. Davis et al. (1970) found no evidence of American shad or herring spawning in tributaries that empty into the James River downstream of Grays Creek. For these reasons, it is unlikely that anadromous fish run up these tributaries to spawn. Herring may enter these small tributaries during exploratory movements prior to spawning. No roads cross the portions of these creeks that herring could use during exploratory movements.

PAGAN RIVER

USGS topographic quadrangle: Mulberry Island, VA

Tributary of: James River Miles above mouth: 17.0

Use category: unlikely Mileage open: 9.9

Migration obstruction: Wrenns Millpond dam

Narrative: None of the locals that were interviewed knew of herring, or other anadromous fish, using this river for spawning. Davis et al. (1970) found no evidence of American shad or herring spawning in tributaries that empty into the James River downstream of Grays Creek. For these reasons, it is unlikely that anadromous fish run up this tributary to spawn. One local thought that herring and possibly other anadromous species entered the lower part of this stream, but not to spawn. It could be that anadromous fish are temporarily attracted to this river during the early part of their migration upstream, especially during periods of high discharge (see description of Nansemond River and Western Branch). If herring were to run up this river, they could go as far as the spillway of Wrenns Millpond with above-average flows; the other species would stop below this. Route 677 crosses this creek over the spillway to Wrenns Millpond.

Structural Evaluations

Road crossings: Route 10 and Route 10 Business

Date evaluated: 04/02/86 Passage status: passable

Structure types: bridges Size: -

Vertical drop: none Depth in culvert: > 2.0 m

Velocity in culvert: < 25 cm/s

Notes: The river at both these crossings is tidal, deep, and wide. Anadromous fish could pass under both structures easily.

ALL PAGAN RIVER TRIBUTARIES EXCEPT CYPRESS AND JONES CREEKS

USGS topographic quadrangles: Bacons Castle, Smithfield, Benns Church, and Mulberry Island, VA

Tributaries of: Pagan River

Use category: unlikely

Narrative: None of the locals that were interviewed knew of herring, or other anadromous fish, using these creeks for spawning. Davis et al. (1970) found no evidence of American shad or herring spawning in tributaries that empty into the James River downstream of Grays Creek. For these reasons, it is unlikely that anadromous fish run up these tributaries to spawn. Herring may enter the lower tidal portions of these small tributaries during exploratory movements prior spawning. On all but one tributary, no roads cross the portions of these creeks that herring could use during exploratory movements. The exception is the Route 626 crossing over Blairs Creek, which is a bridge presenting no passage problems for any anadromous species.

CYPRESS CREEK

USGS topographic quadrangle: Benns Church, VA

Tributary of: Pagan River Miles above mouth: 4.3

Use category: unlikely Mileage open: 5.1

Migration obstruction: fall line

Narrative: None of the locals that were interviewed knew of herring, or other anadromous fish, using this creek for spawning. Davis et al. (1970) found no evidence of American shad or herring spawning in tributaries that empty into the James River downstream of Grays Creek. For these reasons, it is unlikely that anadromous fish run up this tributary to spawn. Anadromous fish may be temporarily attracted to this creek during the early part of their migration upstream, especially during periods of high discharge (see description of Nansemond River and Western Branch). If herring were to run up this stream, they could probably get to the fall line above Route 644; the other anadromous species would stop below this. It is unlikely that anadromous fish would be attracted to, or enter, Little Creek or other small tributaries of this creek.

Structural Evaluations

Road crossing: Route 644

Date evaluated: 04/24/86 Passage status: passable

Structure type: two-cell box Size: ~ 2.5 m each

Vertical drop: none Depth in culvert: > 1.0 m

Velocity in culvert: < 25 cm/s

Notes: There is sufficient depth and essentially no gradient at this crossing; there should be no passage problems for any species that can negotiate the freshwater tidal stream below.

Road crossings: US 258/Route 10 and US 258/Route 10 Business

Date evaluated: 04/24/86 Passage status: passable

Structure types: bridges Size: -

Vertical drop: none Depth in culvert: > 2.0 m

Velocity in culvert: < 25 cm/s

Notes: No passage problems for any species. The creek is deep, wide, and tidal at these bridge crossings.

CHAMPION SWAMP

USGS topographic quadrangle: Benns Church, VA

Tributary of: Cypress Creek Miles above mouth: 2.9

Use category: unlikely Mileage open: 4.5

Migration obstruction: fall line

Narrative: None of the locals that were interviewed knew of herring, or other anadromous fish, using this creek for spawning. Davis et al. (1970) found no evidence of American shad or herring spawning in tributaries that empty into the James River downstream of Grays Creek. For these reasons, it is unlikely that anadromous fish run up this tributary to spawn. Anadromous fish may be temporarily attracted to this creek during the early part of their migration upstream, especially during periods of high discharge (see description of Nansemond River and Western Branch). If herring were to run up this stream, they could probably get to the fall line below Route 654; the other anadromous species would stop below Route 620. It is unlikely that anadromous fish would be attracted to, or enter, the small unnamed tributaries of this creek.

Structural Evaluations

Road crossing: Route 620

Date evaluated: 04/24/86 Passage status: passable

Structure type: bridge Size: -

Vertical drop: none Depth in culvert: > 1.0 m

Velocity in culvert: < 25 cm/s

Notes: No passage problems at this crossing. The creek is freshwater but has tidal influence; the channel is deep with little gradient.

JONES CREEK AND TRIBUTARIES

USGS topographic quadrangle: Benns Church, VA

Tributary of: Pagan River Miles above mouth: 0.6

Use category: unlikely

Narrative: None of the locals that were interviewed knew of herring, or other anadromous fish, using this creek or its tributaries for spawning. Davis et al. (1970) found no evidence of American shad or herring spawning in tributaries that empty into the James River downstream of Grays Creek. For these reasons, it is unlikely that anadromous fish run up these tributaries to spawn. This creek and its tributaries are brackish, have small drainage areas, and no sizeable stretches of freshwater. It is doubtful that anadromous fish would enter this drainage, even during exploratory movements. Two crossings on Jones Creek are evaluated below, should anadromous fish happen to enter this creek.

Structural Evaluations

Road crossings: Routes 669 and 704

Date evaluated: 04/24/86 Passage status: passable

Structure types: bridges Size: -

Vertical drop: none Depth in culvert: > 1.0 m

Velocity in culvert: < 50 cm/s

Notes: Both crossings would be passable with ease.

CHUCKATUCK CREEK

USGS topographic quadrangle: Newport News South, VA

Tributary of: James River Miles above mouth: 8.7

Use category: unlikely Mileage open: 7.5

Migration obstruction: Godwins Millpond dam

Narrative: None of the locals that were interviewed knew of herring, or other anadromous fish, using this creek for spawning. Davis et al. (1970) found no evidence of American shad or herring spawning in tributaries that empty into the James River downstream of Grays Creek. For these reasons, it is unlikely that anadromous fish run up this tributary to spawn. This creek and its tributaries are brackish, and have small drainage areas. Anadromous fish have been known to enter this tributary, but these are probably exploratory movements. If herring were to run up this creek to spawn, it would be during a period of high discharge; at above-average flows, herring could possibly ascend as far as Godwins Millpond, which is impassable. Brewers Creek and the other tributaries to this creek are not addressed in this report because it is unlikely that they are used by anadromous fish, and lack road crossings over the sections with adequate depth for anadromous fish.

Structural Evaluations

Road crossing: Route 10/32

Date evaluated: 06/16/86 Passage status: passable

Structure type: bridge Size: -

Vertical drop: none Depth in culvert: ~ 20 cm

Velocity in culvert: < 25 cm/s

Notes: The above measurements were made during low-flow conditions. Herring could only get this far during periods of high discharge, and at that time, this crossing should be passable without difficulty.

Road crossing: US 17

Date evaluated: 04/24/86 Passage status: passable

Structure type: bridge Size: -

Vertical drop: none Depth in culvert: > 2.0 m

Velocity in culvert: < 25 cm/s

Notes: No passage problems here.

NANSEMOND RIVER

USGS topographic quadrangle: Newport News South, VA

Tributary of: James River Miles above mouth: 8.2

Use category: unlikely Mileage open: 19.2

Migration obstruction: Lake Meade dam

Narrative: Several of the locals that were interviewed agreed that striped bass, American shad, and herring run up this river to the spillway of Lake Meade, but this only happens when storm events provide sufficient freshwater flowing over the dam spillway. These runs are usually seen in late-winter or early-spring, are short-lived, and the fish disappear when flows diminish. The locals interviewed did not think that these fish spawn below the dam, but are merely attracted to the freshwater flow early in their migrations. Once the water flows return to normal, much of the river's discharge is diverted for water supply use, and the river below the dam becomes brackish (unsuitable for eggs and larvae of anadromous fish). Davis et al. (1970) found no evidence of American shad or herring spawning in tributaries that empty into the James River downstream of Grays Creek. For these reasons, it is unlikely that anadromous fish run up this tributary to spawn. All the tributaries of this river, with the exception of Western Branch, are not addressed in this report because it is doubtful that anadromous fish enter them.

Structural Evaluations

Road crossings: US 460 Business (Route 10/32), US 58/460, Route 125, and US 17

Date evaluated: 04/24/86 Passage status: passable

Structure types: bridges Size: -

Vertical drop: none Depth in culvert: > 2.0 m

Velocity in culvert: < 25 cm/s

Notes: All of these bridge crossings are passable by all species.

WESTERN BRANCH

USGS topographic quadrangle: Chuckatuck, VA

Tributary of: Nansemond River Miles above mouth: 11.6

Use category: unlikely Mileage open: 2.5

Migration obstruction: Western Branch Reservoir dam

Narrative: Locals that live at the dam for Western Branch Reservoir said striped bass, American shad, and herring run up to the dam when storm events result in sufficient quantities of freshwater released over the spillway. These runs are short-lived, and the fish disappear when flows diminish. The locals interviewed did not think that these fish spawn below the dam, but are merely attracted to the freshwater flow early in their migrations. Once the water flows return to normal, much of the creek's discharge is diverted for water supply use, and the river below the dam becomes brackish (unsuitable for eggs and larvae of anadromous fish). Davis et al. (1970) found no evidence of American shad or herring spawning in tributaries that empty into the James River downstream of Grays Creek. For these reasons, it is unlikely that anadromous fish run up this tributary to spawn. The tributaries of this creek are not addressed in this report because it is doubtful that anadromous fish enter them.

Structural Evaluations

Road crossing: Route 10/32

Date evaluated: 04/24/86 Passage status: passable

Structure type: bridge Size: -

Vertical drop: none Depth in culvert: > 2.0 m

Velocity in culvert: < 25 cm/s

Notes: This bridge is passable with ease, for all species.

ALL TRIBUTARIES ON THE SOUTH SIDE OF THE JAMES RIVER DOWNSTREAM OF THE NANSEMOND RIVER

Tributaries of: James River Miles above mouth: 0-8.2

Use category: unlikely

Narrative: None of the locals that were interviewed knew of herring, or other anadromous fish, using these tributaries for spawning. Davis et al. (1970) found no evidence of American shad or herring spawning in tributaries that empty into the James River downstream of Grays Creek. For these reasons, it is unlikely that anadromous fish run up these tributaries to spawn. Anadromous fish may explore the lower tidal portions of these tributaries during pre-spawning movements. The road crossings over the larger tidal tributaries are bridges that anadromous fish could negotiate with ease.

LITERATURE CITED

Atran, S.M., J.G. Loesch, W.H. Kriete, Jr., and B. Rizzo. 1983. Feasibility study of fish passage facilities in the James River, Richmond, Virginia. VIMS Special Report No. 269, Virginia Institute of Marine Science, Gloucester Point, VA. 109 p.

Davis, J., J.P. Miller, and W.L. Wilson. 1970. Biology and utilization of anadromous alosids. Completion Report 1967-1970. Anadromous Fish Project VA AFC-1, Virginia Institute of Marine Science, Gloucester Point, VA.

Jones, D.R., J.W. Kiceniuk, and O.S. Banford. 1974. Evaluation of the swimming performance of several fish species from the Mackenzie River. Journal of the Fisheries Research Board of Canada 31(10): 1641-1647.

MacPhee, C., and F.J. Watts. 1976. Swimming performance of Arctic grayling in highway culverts. University of Idaho, College of Forestry, Wildlife, and Range Sciences, Bulletin No. 13. 41 p.

Mudre, J.M., J.J. Ney, and R.J. Neves. 1985. An analysis of the impediments to spawning migrations of anadromous fish in Virginia rivers. Final Report. Virginia Highway Research Council, Virginia Department of Highways and Transportation, Charlottesville, VA. 81 p.

Olney, J.E., G.C. Grant, and G. Hill. 1985. Relative contribution of three Virginia rivers to spawning activity of striped bass, Morone saxatilis. Completion Report for Project AFC-14-1. Virginia Institute of Marine Science, Gloucester Point, VA. 53 p.

Virginia Department of Conservation and Economic Development. 1969. James River Basin, comprehensive water resources plan. Division of Water Resources, Planning Bulletin 213. 93 p.

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