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Approved by:

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__Oyster Disease Research
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Final Report for the period August 1, 1994 to December 31, 1997
for the project:

Anadromous Fish Restoration - State of Virginia

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Objectives

The main objectives of the study "Anadromous Fish Restoration - State of Virginia" are to supplement existing state, federal, and local efforts to restore anadromous fish populations throughout Virginia. Direct components of this study are:

1. To provide funding for a Virginia Fish Passage Coordinator position to facilitate the projects under this grant agreement.

2. To provide funding for the design and construction of a vertical slot fishway at Bosher Dam on the James River in Richmond.

3. To provide funding support for monitoring activities by the Virginia Department of Game & Inland Fisheries (VDGIF) for anadromous fishes within waters of the state.

4. To provide funding support for other related restorative activities by the VDGIF, such as trap and transport of river herring, and American shad brood collection, rearing, and stocking throughout the state.

Job I: Bosher Dam Vertical Slot Fishway Design

The main objective of Job I was for the VDGIF to provide grant funding and technical support to the City of Richmond (City) for the design of a suitable fishway at Bosher Dam on the James River. The USFWS provided engineering support throughout the design phase.

In June 1994, a fish passage coordination meeting was held with the City, CSX Railroad, the USFWS, and the VDGIF. CSX indicated their intention to transfer ownership of the dam to the City. From this point on the City was the Project Manager. Final details on the transfer of ownership are still being negotiated.

Fund raising efforts for the construction phase were coordinated by the Lower James River Association (now James River Association). By the end of 1994, most of the funding goal of $650,000 for fishway construction at Bosher Dam was accomplished and CSX agreed to allow the City to begin the design phase. This grant provided the additional $100,000 for final design.

Also in 1994, the Center for Historic Preservation at Mary Washington College completed an historic survey of Bosher Dam and its environs. Bosher Dam was constructed in 1823. One prehistoric site and one historic site were located within the test area but outside of the proposed construction area. However, it was recommended that an archeologist monitor the excavation during construction of the fishway.

In February 1995, the City advertised for an engineering firm to complete the final design of the fishway. In May 1995, the VDGIF and the City interviewed the two engineering firms that submitted proposals. Based on strict scoring criteria, J.K. Timmons and Associates was selected. In June 1995,

the fee for final design and construction management was negotiated and the design phase was scheduled to begin on August 1, 1995.

The VDGIF passed the funds from this grant designated for designing the fishway to the City through a grant contract that was executed in October 1995. Hiring was delayed and Timmons was finally hired by the City in February 1996. The contract included the option of retaining Timmons' services for construction management. It was established that the City, as Project Manager, would receive, and approve invoices from Timmons and then forward the invoices to the VDGIF for payment. Timmons worked very closely with Dick Quinn (USFWS) to assure a proper conceptual layout and in May 1996 Timmons submitted preliminary plans to the VDGIF, the City and the USFWS for review. Written comments were provided to Timmons by all three agencies. By the end of June 1996 Timmons had incorporated the requested changes and additions and were preparing to submit the first draft of the final plans.

Also in May 1996, the VDGIF met with the City and Timmons to set an expedited schedule to complete the design and construction of the fishway. Final plans and bid documents were to be submitted for review on August 1, 1996. Advertisement for bids was scheduled for early August and bid openings for early September. The possibility of inclement weather and high water was factored in to the amount of time given to the contractor to complete construction. While final design was ongoing, the Joint Permit Application (JPA) was filed in early June 1996 with the Virginia Marine Resources Commission (VMRC). The VMRC distributes the JPA to all of the review and permit agencies.

In May 1996, Dr. Douglas Sanford of Mary Washington College submitted a revised version of the Phase I archeological survey of Bosher Dam and its environs based on preliminary design plans. The Coordinator had provided Dr. Sanford with preliminary plans of the fishway so that he could review his assessment of the immediate construction area. In June 1996, the Coordinator submitted a letter to the Virginia Department of Historic Resources (VDHR) requesting a review of the potential effects to historic properties by the proposed construction of the fishway. VDHR also received a copy of the revised Phase I report and provided written comments for the permit process requirements dealing with historic properties.

Bosher Dam is on the Virginia Historic Landmarks Register and the National Register of Historic Places. Mary Washington College issued some additional recommendations about the archeological concerns at Bosher Dam which stressed the limited need for monitoring during excavation and construction. The VDHR responded to the U.S. Army Corps of Engineers (COE) explaining that the project will have no adverse effects on historic properties as long as the COE permit includes some specific conditions (i.e. archeological monitoring).

In early July 1996, Timmons conducted an on site meeting with the agencies involved in permitting. The following agencies were represented; VDGIF, VMRC, Virginia Department of Environmental Quality (DEQ), COE, Henrico County (County), and the City. The DEQ planned to issue a permit waiver and the VMRC planned to issue a full project permit. The COE indicated that a permit would be issued after receiving some additional information from the applicant (City).

In late July 1996, Timmons issued "final plans" to the VDGIF, the City, and the USFWS for review. Several rounds of comments and revisions ensued. The final design is the main deliverable product of this grant. Also, Timmons provided a construction cost estimate of $587,700 which included a 15% contingency. In the mean time, the project was put out for bids on August 11, 1996 by the City. Only four prequalified contractors were eligible to bid. During the bidding period several addenda were made to the plans in response to the agency reviews. The bid opening was delayed one week to September 13, 1996 to allow the contractors to adjust their bids after receiving the addenda. The bids were then opened on September 13, 1996 by the Richmond Department of General Services. Unfortunately, the lowest bid was $1,292,000 which was roughly twice the amount that was available for construction at that time.

The Grant Contract between the City and VDGIF that outlines funding, maintenance, and operation went before City Council on September 23, 1996. The Council voted in favor of the ordinance which allowed the City Manager to sign the Grant Contract which was already signed by the VDGIF Director in June 1996. The funding level was set at $675,000 with language that called for both parties to work together to find additional funds if necessary. According to the contract, maintenance will be handled by the City and the VDGIF will operate and monitor the facility.

In August 1996, the City received the VMRC permit for construction of the fishway. The County had concerns about the operating rules of the fishway because they will be building a water withdrawal facility about two miles upstream of Bosher Dam. Their concern was that the attraction water system (200 CFS) on the fishway might lower the pool to unacceptable levels during a low flow spring. We proposed to establish an operating rule that requires the attraction water system to be shut off if the flow in the James River drops to 2200 CFS, which is the lower limit of the fishway operating range.

In early October 1996, a multi-agency meeting was held to discuss potential COE permit conditions for the Bosher fishway. Numerous letters had been exchanged between the City, the COE, and the County. Finally, a letter from the VDGIF to the County satisfied their concerns by making it clear that the attraction flow for the fishway would be shut off when a low flow threshold was reached.

Also in October 1996, Dick Quinn and Rob Kelsey (USFWS) met with the VDGIF, the City and Timmons to discuss design change options to cut construction costs of the fishway. Only minimal cost savings measures were identified. A major benefit of the meeting was to discuss the project with the USFWS and answer any design questions that were still pending.

In late November 1996, two representatives from English (low bidder) met with the City and the VDGIF. English was not willing to negotiate a lower price and indicated that if the project was rebid the cost would most likely increase. One major point of discussion was the micro silica concrete that was specified by the structural engineer (Daniels, Timmons' sub). According to English, they could not find a source in Richmond so they could only estimate the unit cost. English recommended standard 4,000 psi concrete. Changing the concrete, however, would have required redesign by Daniels and thus a "change order" payment.

By January 1997, a major effort was launched by the VDGIF, the City and the James River Association to raise the remaining money that was needed for construction. The funding deficit was over $600,000. Patti Jackson of the James River Association took the lead on coordinating this second

round of major fund raising. The Virginia General Assembly committed an additional $250,000 to the project which is in addition to $200,000 previously committed. The VMRC approved granting an additional $105,000 of saltwater recreational and commercial fishing license funds to the project which is in addition to $150,000 previously committed. The City also made a commitment of $112,400. Several charitable foundations also committed new and additional funds. By the end of March 1997, approximately $200,000 was still needed to meet construction and construction management costs. Every possible funding option was being examined at that time.

While fund raising efforts were being conducted negotiations with English continued. On February 17, 1997, English issued a letter to the City agreeing to hold to their original bid price until April 21, 1997 as long as several conditions were met. Most of those conditions were not a problem and the micro silica concrete supply issue was finally resolved.

The COE issued their permit to the City with a condition that requires shutting off the attraction water flow if the river gage drops to a predetermined level. Also, an instream work "time of year restriction" was in effect until June 30, 1997. The VMRC permit was issued in 1996 and did not include a "time of year restriction." DEQ issued a permit waiver. A letter from CSX Railroad to the City essentially gave the City permission to proceed with construction. However, the actual transfer of the dam from CSX still had not taken place.

This grant (NA46FU0284) was extended until December 31, 1997 to complete the final design changes and to pay a portion of the engineer's construction management fee.

From April through June 1997, the additional funds (about $200,000) were secured from private foundations via the James River Association and by amending and further extending NOAA Grant #NA36FU0326. With enough funding in place, VDGIF Director William Woodfin, Jr. signed a Grant Contract with the City for $1,224,600. On May 6, 1997 the VDGIF increased the funding limit by $76,000 to allow for inclusion of entrance channel gates (in lieu of stop logs) bringing the total of the Grant Contract up to $1,300,600. The City agreed to provide the remaining $112,400 to meet total project costs of $1,413,000 and City Manager, Robert Bobb signed the Grant Contract on May 14, 1997. Total project cost breakdown: 1) English Construction, Inc. - $1,368,000 and 2) J.K. Timmons and Associates, Inc. - $44,800. On May 30, 1997, Richmond City Manager Robert Bobb signed the construction contract which finalized the deal with English Construction, Inc.

On June 18, 1997 a pre-construction meeting was called by Timmons and held on site at Bosher Dam. Weekly progress meetings were held during the first month. Progress meetings are being held as necessary. Timmons is performing project management and inspection which was partially funded by the remaining portion of this grant ($\sim$$27,000). English Construction received a Notice To Proceed from the City to begin construction activities on June 23, 1997 and by the end of June 1997 English was on site doing some minor improvements to the access road and preparing the canal bridge for construction traffic.

Construction of the fishway was originally scheduled to be completed no later than February 1998 in time for the spring spawning run of American shad and river herring. After some initial site preparations, a ground breaking ceremony was held on July 22, 1997. The initial work involved construction of cofferdams and excavation for the structure including rock blasting. In late August, the

upstream cofferdam began leaking considerably. Ultimately, the cofferdam had to be "filled" with large volumes of grout to seal off the leaks. This slowed progress significantly and at the end of September 1997 English Construction was continuing to excavate down to bedrock. Additional rock blasting was required to complete excavation. Archaeologists were on site during excavation and several timbers and miscellaneous metals from the old mill were unearthed and stored on site temporarily. It was fortuitous that the James River was extremely low during the early phase of the construction process. Despite some initial delays, at the end of September 1997 construction of the fishway was still scheduled to be completed in time for the spring spawning run of American shad and river herring.

On November 10, 1997, the lower cofferdam was overtopped when the James River rose to ¾ bank full (9'). This led to significant delays in the work schedule. The cofferdam was rebuilt and the elevation was raised several feet. Additional large stone was placed at the upper end of the cofferdam just below the dam itself. Because the project was getting further behind schedule, several meetings were held to discuss how the contractor would still meet the migration season deadline of March 1, 1998. An additional delay occurred when the contractor had to install a three sided steel frame and sheet piling barrier in the exit channel area for safety reasons. After blasting was completed, the 48" attraction water pipe and 6' manhole were set and back-filled. A construction mud slab was poured in the exit channel area which will facilitate construction of the foundation. The exit channel gate will be one 10' by 20' gate instead of two 10' by 10' sections as originally designed. At the end of 1997, the contractor had not yet stated that the March 1, 1998 deadline was out of reach. However, winter weather was approaching and further delays were expected.

Final design and permitting costs were $75,900 and the remaining funds ($27,007) in this grant (#NA46FU0284) were spent for a portion of construction management services provided by J.K. Timmons & Associates, Inc. (as a reminder, when this grant was extended and amended in January 1996, approval was granted to use funds not spent on design and coordination for construction management services). This expenditure zeroed the federal grant fund balance. A copy of the final design and specifications is on file at the Ashland Field Office of the VDGIF and is available, upon request, for inspection. This grant ended on December 31, 1997 and the final financial report was sent electronically to Stephen Smith by the VDGIF grants coordinator, Karen Fleri, on January 30, 1998.

When the fishway is completed it will reopen 137.6 miles of the mainstem James River up to Lynchburg. Approximately 200 miles of potential spawning habitat on tributaries will also become accessible to migrating alosids. This fishway is a major milestone for the Virginia Fish Passage Project as well as for the Chesapeake Bay Program.

Job II. Anadromous Fish Restoration

The main objective of Job II was to stock historic spawning areas of the James River with American shad fry and pre-spawn adult herring in preparation for passage at Bosher Dam. This final report covers the 1995 efforts.

Trap and Transport

During the month of April 1995, with the assistance of USFWS personnel from Harrison Lake National Fish Hatchery, VDGIF personnel conducted trap and transport of pre-spawn river herring. Approximately 5,450 blueback herring were collected below Walker's Dam on the Chickahominy River by electrofishing, transported by tank truck and about 4,380 live fish were stocked into locations targeted for re-seeding. Maidens Landing on the James River received 2,320 herring over a two week period. An experimental lot of 630 herring was stocked in Big Lickinghole Creek, a tributary of the James River just above Maidens Landing. Other stocking locations were Harrison Lake and Herring Creek which received 1,132 and 300 fish, respectively. The season average Catch Per Unit of Effort (CPUE) for herring at Walker's Dam was substantially lower in 1995 than in 1994. Average CPUE for 1994 was approximately 2,765 herring per hour of electrofishing while in 1995 the average CPUE was only 815 herring per hour. The maximum CPUE in 1994 (5487/hr) was also substantially higher than the maximal CPUE (2070) in 1995.

The intent of trap and transport is for the offspring of the stocked fish to return as mature adults (3 to 5 years), migrate through breaches and fishways in the target streams and spawn. If successful, trap and transport will contribute to the reestablishment of natural populations of river herring in these streams where none have existed for almost 200 years.

Shad Production

As in previous years, VDGIF biologists and the commercial watermen (funded by VMRC) coordinated their efforts to successfully collect 17.5 million shad eggs from brood stock in the Pamunkey River. The majority of eggs were taken to King and Queen State Fish Hatchery and some were taken to Harrison Lake National Fish Hatchery. After hatching, the fry were raised to seven days old for stocking. The James River received 5 million fry and the Pamunkey River received 2.4 million fry. While in the hatchery, the shad fry were marked with oxytetracycline (OTC) for future evaluation of stocking contribution to the shad population. Fry were stocked at seven days versus the previous 21 day protocol. In Pennsylvania, this protocol has resulted in increased fry survival to the juvenile phase, but this phenomenon has not been fully explained because conditions are so variable from year to year.

Job III: Anadromous Fish Monitoring

The main objective of Job III was to monitor the anadromous fish populations of coastal and piedmont streams in Virginia's portion of the Chesapeake Bay Drainage. Describing the upstream extent and magnitude of anadromous fish migrations is important to developing Virginia's Fish Passage Program.

Alosa monitoring was conducted on the James, Appomattox, Rappahannock, Chickahominy and Mattaponi rivers in April, May and June. Table 1 shows the maximum Catch Per Unit Effort (CPUE; fish/hr) by site for each alosa taxa during the spring of 1995. Blueback herring were very abundant at the base of Embrey Dam on the Rappahannock River and were also abundant at Route 1 which is at the base of the fall line. Bluebacks were scarce at the 14th St. Bridge on the James River which is at the base of the fall line. However, anecdotal evidence indicates that dipnetters were able to catch a fair number of herring near the 14th St. Bridge. One blueback herring was collected just below Bosher Dam. This fish is the first documented herring above the breaches in Richmond and above the Williams Island Dam Notch (created in 1993). Pre-spawn adult herring were stocked several miles upstream of Bosher Dam during Trap and Transport which raises some question about the "origin" of this herring. However, the fish was in good shape and did not show signs of being netted several times (i.e. missing scales). Therefore, it is certainly likely that this herring did migrate to Bosher Dam on its own.

Bluebacks were very abundant at Walker's Dam on the Chickahominy River and were fairly abundant at the base of Harvell Dam on the Appomattox River. Hickory shad were occasionally caught in the Rappahannock and Chickahominy rivers. American shad were present at the base of Bosher Dam on the James River and were occasionally caught in the Chickahominy River. A relatively abundant American shad run was documented on the Mattaponi River near Aylett. These fish were collected for brood stock for the American Shad Restoration Project. Electrofishing catch rates will be used for comparison and evaluation of the relative magnitude of future migrations.

Juvenile alosid monitoring began in late June on the James River at Maidens Landing. This site was used for both shad fry and adult river herring stocking. No alosa species were collected during the effort. It should be noted that this sampling was conducted immediately prior to the onset of a substantial period of flooding that occurred on the James River at the end of June.

Nighttime electrofishing was conducted from Bosher Dam up to Watkins Landing (about 8 miles) on July 26, 1995. Daytime electrofishing was conducted in the Watkins Landing area on August 24, 1995. Daytime electrofishing was conducted below the James River fall line near Osborne Landing on August 11, 1995. On September 14, 1995 seine sampling was conducted near Maidens Landing on the James River. No alosids were collected on these sampling trips. On October 17, 1995 several American shad and blueback herring juveniles were collected by electrofishing in the James River just below the fall line in Richmond.

Swift Creek was monitored just downstream of I95 on July 28, 1995 for juvenile alosids. During about one hour of electrofishing, 135 blueback herring juveniles were collected. Swift Creek is a tributary of the Appomattox River which is a major focus for fish passage (e.g. Harvell Dam).

Juvenile monitoring was conducted to establish baseline data sets for several rivers to compare to future sampling years. The data is viewed strictly as being qualitative and is not intended to be used to estimate actual recruitment success or population size. When juvenile alosids are collected in areas where shad fry and pre-spawn herring are stocked we will be able to evaluate the relative contribution of our efforts to the restoration program. For example, collecting shad fry with the OTC marking will verify that stocking is making a contribution. In the future, when shad are passing Bosher Dam and spawning naturally, we will be able to track the relative contribution of stocked fish to the wild population.

Overall, the adult and juvenile monitoring effort in 1995 was limited because the Fish Passage Coordinator did not yet have technician support. Sampling was done with the assistance of other VDGIF personnel or volunteers as time allowed.

Table 1. Maximum CPUE (fish/hr) for alosids collected by electrofishing, by site, during Spring 1995 qualitative sampling. Dashes indicate species that were not targeted at a given site.

Site	No. Trips	Max CPUE (fish/hr) by Species			
		Blueback herring	Alewife	American shad	Hickory shad
14th St. James River	4	2.13	0.00	0.00	0.00
Bosher Dam James River	3	1.03	0.00	16.87	0.00
Harvell Dam Appomattox River	2	467.00	8.51	0.00	2.13
Embrey Dam Rappahannock River	2	458.82[a]	0.00	0.00	7.00
Route 1 Rappahannock River	2	60.53[b]	0.00	0.00	42.86
Walkers Dam Chickahominy River	17	2070[c]	42.86	2.99	2.99
Aylett Mattaponi River	2	--	--	14.69	--

[a] CPUE biased downward because thousands of herring were shocked and observed but only a representative sample was actually collected.

[b] Herring were observed on both trips but were only collected during the second trip of the season.

[c] Every effort was made to collect all fish shocked. The majority was from Trap and Transport efforts.