

National Culvert Removal, Replacement, and Restoration Aquatic Organism Passage Grant Program

Fiscal Year 2023

For

Division 1 Replacement of Structure No. BP-021-2074

On Pembroke Creek

Hickory Fork Road

State Road 1202

Chowan County, NC

Submitted By:

North Carolina Department of Transportation



February 2023

**FY 2022 National Culvert Removal, Replacement, and Restoration Grant Program
(Culvert AOP Program)**

The North Carolina Department of Transportation (NCDOT) provides this FY 2022 Culvert AOP Program Application Template to assist project sponsors who intend to apply for a Culvert AOP Program FY 2022 grant. Interested eligible applicants should read the FY 2022 Culvert AOP Notice of Funding Opportunity (NOFO) in its entirety and especially where noted in this application template to submit eligible and competitive applications.

This is a copy of the official Application Template that is found on Grants.gov.

Basic Project Information

Basic Project Information – Provide a narrative for the below items on basic details pertinent to the project, including project name, description, location, involved parties, etc. Items in this section will be used to determine grant program eligibility as detailed in Section C of the NOFO.

1. Project Name	Replacement of Culvert (structure # BP-021-2074) over Pembroke Creek on State Road (SR) 1202 (Hickory Fork Road) in Chowan County, North Carolina to Improve Aquatic Organism Passage
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Eligibility Criteria

<p>2. Project Description</p> <p align="center">See Narrative below for full details</p>	<p>The culvert replacement project (Project) for which Culvert AOP Program funding is being requested occurs in Chowan County, which is within the NCDOT Highway Division 1. The project will involve upgrading the culvert to a single box culvert design that will improve AOP. The existing crossing structure over Pembroke Creek is a two-barrel 60" x 52" Corrugated Metal Pipe Culvert, with a streambed to crown clearance of 7.02'. The two pipes are severely deteriorated and experience frequent blockages from drift and have contributed flooding issues during major storms.</p> <p>The Project will significantly improve aquatic habitat connectivity to approximately 3,185 linear meters (10,451 linear feet) in the Pembroke Creek watershed. Additionally, the replacement structure will reduce flooding potential.</p>
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<p>3. Which of the following selection priorities does your project meet?</p> <p>See Narrative below for details</p>	<p><i>(Check all that apply)</i></p> <p><input type="checkbox"/> Anadromous fish listed as endangered or threatened under the Endangered Species Act.</p> <p>Potential small, indirect benefits for the Atlantic Sturgeon and Shortnose Sturgeon are outlined in Narrative</p> <p><input type="checkbox"/> Anadromous fish identified by NMFS or USFWS that could reasonably become listed as a Federally endangered species or a threatened species.</p> <p>While in 2013 and again in 2019 the NMFS determined that listing of river herring under the endangered species act was “not warranted”, this determination was based in part by the various management and regulatory protective initiatives that are in place. Additionally, the status assessment defined “the foreseeable future” for river herring as 12–18-year time frame (i.e., out to 2030-2036). Thus, it is possible that over this time the conservation and management initiatives prove to not be adequate to offset the various threats to the species. As such, it is very possible that one, or both species of river herring will warrant listing under the ESA in the future. More detailed information on this process is provided in Narrative below.</p> <p><input checked="" type="checkbox"/> Anadromous fish identified by NMFS or USFWS as prey for endangered species, threatened species, or protected species.</p> <p><input checked="" type="checkbox"/> Anadromous fish identified by NMFS or USFWS as climate resilient stock. See Section H of the NOFO.</p> <p><input checked="" type="checkbox"/> Project that opens up more than 200 meters of upstream habitat for anadromous fish before the end of the natural habitat.</p>
<p>4. Which anadromous species does your project propose to benefit by meaningfully improving or restoring fish passage?</p>	<p><i>Alosa aestivalis</i> - Blueback Herring (increased spawning habitat) <i>Alosa pseudoharengus</i> – Alewife (increased spawning habitat) <i>Morone Saxiilis</i>- Striped Bass (increased food resource)</p> <p>See Narrative below for full details.</p>
<p>5. Briefly describe how the proposed project benefits the anadromous species in item 4 above?</p>	<p>Description outlined in Narrative below</p>
<p>6. Culvert AOP Program Request amount:</p>	<p>Exact amount in year-of-expenditure dollars: <u>\$479,200.00</u></p>
<p>7. Total Project Cost:</p>	<p>Estimate in year-of-expenditure dollars: <u>\$599,000.00</u></p>

8. Who is the Project Sponsor?	<p><i>(Name and identify which eligible applicant category applies. Select from the below statutory eligible applicants)</i></p> <p><input checked="" type="checkbox"/> State</p> <p><input type="checkbox"/> Unit of local government</p> <p><input type="checkbox"/> Indian Tribe</p>
9. If a State or a unit of local government, indicate the percentage, type, and source of non-Federal match.	20% non-Federal matching funds will be provided from NCDOT Division 1 Maintenance funds.

10. Eligible Facility Type:	<p><i>(Identify which eligible structure that the proposed project addresses. Select from the below statutory eligible applicants)</i></p> <p><input checked="" type="checkbox"/> Culvert</p> <p><input type="checkbox"/> Weir</p>
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Additional Project Information

11. State(s) and/or tribal land in which the project is located:	Chowan County, North Carolina
12. If a joint application, please provide organizational names of sub-recipients that will receive funds and other key partners.	N/A
13. Identify the Lead Applicant (who will also be the applicant responsible for administration of Culvert AOP Program funds if application is selected and the point of contact for the application).	<p>Lead Applicant North Carolina Department of Transportation 1536 Mail Service Center, Raleigh NC, 27699-1536</p> <p>Point of Contact Kevin Bowen, PE, Eastern Deputy Chief Engineer kgbowen@ncdot.gov</p>
14. What are the proposed design standards and specifications for ensuring resulting infrastructure provides for the safety of the traveling public over the service life of that infrastructure?	<p>Culvert and associated roadway design will follow the design practices laid out in NCDOT's Roadway Design Manual, Structures Management Design Manual, and the NCDOT Guidelines for Drainage Studies and Hydraulic Design (2022).</p> <p>The objective of NCDOT Hydraulic design standards is to provide a 25 Year LOS for SR routes and a 50 Year LOS for NC, US, and Interstate routes, while also considering impacts for the 100 Year event, especially if in FEMA flood zones. If these design standards cannot be met (e.g., existing road overtops in less than the design year and limitations in raising road grade, limitations in structure replacement size due to road grade constraints, etc.) then the desire is to at least maintain existing LOS or improve relative to existing conditions. Preliminary design indicates that the recommended structure for the Pembroke Creek site reduces backwater effects and reduces velocities while maintaining existing roadway grades.</p>

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Location Information

<p>A. Location of eligible facility and project area:</p>	<p>SR 1202, Hickory Fork Road, Chowan County, NC</p>
<p>B. Provide name and description of the waterway and watershed.</p>	<p>Pembroke Creek is a tributary of the Chowan River Basin. The basin originates in the foothills of Virginia, with the North Carolina portion being located in the Middle Atlantic Coastal Plain and Southeastern Plain ecoregions. Approximately 25% (1,300 square miles) of the 3,600 square miles basin occurs in North Carolina (NCDEQ 2021). Pembroke Creek is approximately 6.00 miles in length and flows directly into the Chowan River (Edenton Bay) in the city of Edenton approximately 2.6 river miles (RM) downstream of the Project, where the mouth of the Chowan River enters the Albemarle Sound. The drainage area at the Project crossing is 1.9 square miles (USGS StreamStats, 2023).</p> <p>The watersheds surrounding Edenton are reflective of much of North Carolina’s northern coastal area. Before reaching its confluence with Edenton Bay, Pembroke Creek has a confluence with Pollock Swamp just upstream of US 17. The land use of the combined watershed is made up of nearly 37% evergreen forest and woody wetlands, 40% cultivated crops, with the remainder a mixture of low-density rural development.</p> <p>Over 30% of the watershed of Pembroke Creek upstream of the Project culvert is comprised of woody wetlands, which function to retain and regulate flows from the agricultural areas that make up much of the remaining watershed (USGS StreamStats, 2023). Therefore, Pembroke Creek and its floodplain are essential to safeguard the surrounding areas from flooding. Based on the First Street Foundation Flood Model Flood Factor Tool (Find Your Property's Climate Risks - Homepage Risk Factor), the city of Edenton has a moderate risk of severe flooding, with approximately 52% of properties subject to flooding. Likewise, the properties along Hickory Fork Road near the Project crossing of Pembroke Creek have a “Moderate” risk of severe flooding. The proposed replacement structure will further the system’s ability to buffer the potential for severe flooding.</p>
<p>C. Provide Census FIPS codes or other geographic code identifiers for the facility location and project area.</p>	<p>Chowan County NC FIPS Code – 37041</p>

D. Provide geographic coordinates for the project.	36.06745, -76.65658
E. Is the project located (entirely or partially) in a Federally designated community development zone?	<p><i>(Please select one)</i></p> <p><input checked="" type="checkbox"/> Yes</p> <p><input type="checkbox"/> No</p> <p>If Yes, please describe in which of the four Federally designated community development zones your project is located.</p> <p><input checked="" type="checkbox"/> Opportunity Zones: (https://opportunityzones.hud.gov/) 37041930200</p> <p><input type="checkbox"/> Empowerment Zones: (https://www.hud.gov/hudprograms/empowerment_zones)</p> <p><input type="checkbox"/> Promise Zones: (https://www.hud.gov/program_offices/field_policy_mgt/fieldpolicymgtpz)</p> <p><input type="checkbox"/> Choice Neighborhoods: (https://www.hud.gov/program_offices/public_indian_housing/programs/ph/cn)</p> <p>While the project area is not located within a Choice Neighborhood, its socioeconomic similarity to a nearby past award grantee could make the area a beneficial target for future endeavors. The project is located in Block Group 370419302006, with a long-term vacancy rate of 15.54%, and Maximum Poverty/ELI value of 13.25.</p>

<p>F. Does the eligible project benefit an economically disadvantaged community or an area of persistent poverty? <i>(See Section H of the NOFO – Definitions)</i></p>	<p>The project is situated in a Persistent Poverty Tract (#9301.01) as well as a Historically Disadvantaged Community Tract (#9301). Given the area’s susceptibility to flood events, the upgraded culvert passage would facilitate flows to mitigate flood danger for the local population. Given the deteriorated nature of the current structure, this project would also help to mitigate risk of emergency road closure due to failure.</p>
<p>G. Are the eligible facility and project area located on Federally recognized Tribal land?</p>	<p>The project area is not located within a FRTL. However, the Meherrin Indian Tribe has land in nearby Gates, Hertford, and Berties counties, NC, which all share the banks of the Chowan River with Pembroke Creek and Chowan County, NC. The Meherrin Indian Tribe is not currently Federally Recognized; however, it is State Recognized in several states including North Carolina and is in the process of seeking Federal Recognition.</p>
<p>H. Is the project located in a rural area? <i>(See Section H of the NOFO – Definitions)</i></p>	<p>The US Census Bureau uses the population threshold of 50,000 as a defined urbanized area. In 2021, Chowan County had a total population of 13,712, with only 4,391 people living in Edenton, the closest town to the project area. Edenton is also the county seat for Chowan County (2021 US Census Data).</p>

Project Costs

Project Costs – Provide information detailing the costs associated with the project. These costs will be used to determine the eligible award amount, how the project supports financial goals of the program, and other factors. More information on this section can be found in Section D.2.II of the NOFO.

<p>1. Culvert AOP Program Request Amount:</p>	<p>Exact amount in year-of-expenditure dollars: \$ <u>472,000.00</u></p>
<p>2. Estimated Total of Other Federal funding (excluding Culvert AOP Program request):</p>	<p>Estimate in year-of-expenditure dollars: \$ <u>0.00</u></p>

3. Estimated Other Federal funding (excluding Culvert AOP Program) further detail:	<p><i>(List each Federal Program and identify Formula or Discretionary, and the amount for each Federal Program, e.g.:</i></p> <p><i>Program:</i> <u>N/A</u></p> <p><i>Amount:</i> <u>\$ 0.00</u></p>
4. Estimated non-Federal funding:	<p><i>(Identify each source of non-Federal funding and estimated amount, e.g.</i></p> <p><i>Source:</i> <u>NCDOT Division 1 Maintenance Funds</u></p> <p><i>Amount:</i> <u>\$ 118,000.00</u></p>
5. Future Eligible Project Cost (Sum of Culvert AOP Program request, Other Federal Funds, and non-Federal Funds, above):	Estimate in year-of-expenditure dollars: \$ <u>590,000.00</u>
6. Previously incurred project costs (if applicable):	Estimate in year-of-expenditure dollars: \$ <u>0</u>
7. Total Project Cost (Sum of 'previous incurred' and 'future eligible')	Estimate in year-of-expenditure dollars: \$ <u>590,000.00</u>
8. If more than one culvert or weir, will project bundling be used to deliver the Project?	Yes or No. If yes, explain the intended benefits of project bundling. No
9. If proposed project utilizes bundling, Cost of Unbundled Projects	Estimate in year-of-expenditure dollars: \$ N/A

<p>10. Amount of Future Eligible Costs by Project Type (if applicable):</p>	<p>Project type by structure (if bundling, include the unbundled cost in brackets [\$_])¹ (Ex. Culvert Replacement: \$1,000,000 [\$1,500,000])</p> <p>1. Project Type _____ \$ _____ [\$_]</p> <p>2. Project Type _____ \$ _____ [\$_]</p>
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¹ Costs of unbundled project will be compared with bundled costs to determine potential amount of cost savings and as a factor in the ability to unbundle projects for an award

Project Selection Criteria

Project Selection Criteria – Provide a narrative response on how the project responds to the selection criteria in Section E.1.a of the NOFO. In responding to Project Selection Criteria, refer to statutory selection priorities included in Section E of the NOFO and address them in the appropriate Project Selection Criteria.

<p>Criterion #1: Conservation Benefits to Anadromous Fish</p>	<p>Improving river herring access to potential spawning habitat is consistent with federal and state management initiatives to recover stocks to previous levels and prevent the need to list the species in the future. This improved access is expected to lead to increased reproduction and recruitment; thus, with more individuals being produced with each successive generation, there is a better chance that the local population could withstand some of the negative impacts of climate change into the future.</p>
<p>Criterion #2: Regional and Watershed Context</p>	<p>The localized improvements to spawning habitat access that will result from the culvert replacement project will benefit river herring stocks in the larger Chowan River Basin, the Albemarle Sound region of North Carolina, as well as the overall Mid-Atlantic DPS.</p> <p>The river herring population of the Chowan River Basin is important to the overall Albemarle Sound population, which also receives the Roanoke River watershed. The NCWRC recognized the importance of the Chowan and chose that watershed to implement a Pilot Stocking Project to evaluate the effectiveness of a stocking in increasing population size (Potoka 2021).</p> <p>The Chowan River Basin is within the Mid-Atlantic DPS of both the Alewife and Blueback Herring. While river herring have close affinities to their natal rivers, there is a certain degree of straying (genetic exchange) between river basins within the overall metapopulations of both species. As such, any localized population improvements, such as those expected as a result of this project will contribute to the overall health of the large metapopulations.</p>
<p>Criterion #3: Ecosystem Benefits</p>	<p>In addition to the localized benefits to the river herring populations in the Chowan River Basin and the regional benefits to the Mid-Atlantic DPS metapopulation expected from this project, there are several expected benefits to general ecosystem of the Chowan River/Albemarle Sound.</p> <p>Overall ecosystem benefits associated with the project include improved habitat connectivity, as well as localized</p>

	<p>nutrient retention and reduction in flooding effects (See Narrative 2, Applicable Selection Priority 3.1).</p> <p>Additionally, increases in river herring numbers as a result of improved access to spawning habitat will benefit species that feed on river herring, most notably Bald Eagle and Striped Bass (See Narrative 2, Applicable Selection Priority 3.3).</p>
<p>Criterion #4: Project Design and Delivery Methods</p>	<p>The project will involve upgrading the culvert to a single aluminum box culvert design that will improve AOP. The existing crossing structure over Pembroke Creek is a two-barrel 60" x 52" Corrugated Metal Pipe Culvert, with a streambed to crown clearance of 7.02'. The two pipes are severely deteriorated and experience frequent blockages from drift, that have resulted in flooding issues during major storms. Aluminum box culverts allow for a better fit to natural stream dimensions. The culvert will be buried 1-foot into natural substrate. The Project will significantly improve aquatic habitat connectivity to approximately 3.185 RKM (10,449 linear feet) in the Pembroke Creek watershed. Additionally, the replacement structure will reduce flooding potential by reducing backwater effects and reducing hydraulic velocities. All necessary roadway, hydraulic, and structural design will follow established NCDOT design guidelines and policies. The project will take place within existing NCDOT right of way. The project will be documented with a CE and should only require general state and federal regulatory permits.</p>
<p>Criterion #5: Project Monitoring and Evaluation</p>	<p>The North Carolina Division of Marine Fisheries currently conducts River Herring Spawning Area Surveys to determine the presence of spawning anadromous fish in tributaries of the Albemarle Sound and to identify spawning habitats, including Pembroke Creek. These surveys will continue in the future with the approval of the project.</p> <p>The NC Wildlife Resource Commission has committed to performing a fish migration barrier assessment at Pembroke Creek before and after culvert replacement.</p> <p>In addition, NCDOT has approached the North Carolina Cooperative Fish and Wildlife Research Unit to develop a more extensive research and monitoring plan for this project should the grant be awarded.</p>

<p>Criterion #6: Climate Change, Sustainability, and Resilience</p>	<p>The NCDOT has a Resilience Policy to consider resilience to all disruptions, including those anticipated due to climate change, in all its work practices.</p> <p>The objective of NCDOT Hydraulic design standards is to provide a 25 Year LOS for SR routes and a 50 Year LOS for NC, US, and Interstate routes, while also considering impacts for the 100 Year event, especially if in FEMA flood zones. If these design standards cannot be met (e.g., existing road overtops in less than the design year and limitations in raising road grade, limitations in structure replacement size due to road grade constraints, etc.) then the desire is to at least maintain existing LOS or improve relative to existing conditions. Preliminary design indicates that the recommended structure for the Pembroke Creek site will reduce backwater effects and reduce hydraulic velocities while maintaining existing roadway grades.</p> <p>Although the NMFS considers river herring as “more vulnerable to climate effects”, the improved access to spawning grounds that will occur as a result of the project, is expected to lead to increased recruitment; thus, with more individuals that are produced with each generation, there is a better chance that overtime the population could withstand some of the negative impacts of climate change (See Narrative 2, Applicable Selection Priority 3.4 for further discussion).</p>
<p>Criterion #7: Equity and Barriers of Opportunity</p>	<p>The project is expected to benefit the two species of river herring, which historically had and continue to have cultural and dietary importance for many Indian Tribes along the Atlantic Coast, As an example of their cultural importance, the Passamaquoddy People in Maine entered into a cooperative restoration effort with USFWS, NOAA, and the ASMFC TEWG to restore the St. Croix Watershed and the once abundant river herring that the communities sustained themselves on for generations. River Herring was a traditional food fish, with evidence of the species’ use as far back as 4,000 years in Passamaquoddy fishing village sites. Members of the Meherrin Indian Tribe reside in the portion of North Carolina where the project is located (See Location Information Section G).</p> <p>This project also meets the Opportunity criterion because NCDOT in partnership with its Office of Civil Rights actively seeks to certify disadvantaged business enterprises and advertise available opportunities.</p>

Project Readiness Criteria

Project Readiness Criteria– Submit the requested information in Section E.1.b. for the DOT to conduct a review of the project readiness and environmental review and permitting risk criteria for the project and provide a summary. If the project includes multiple culverts or weirs, indicate the information for each structure included in the application and what impact would occur on the timeframes if the project were unbundled.

1. Environmental Review and Permitting Risk	The project addresses the Environmental Review and Permitting Risk criterion by ...
A. NEPA Status – Indicate if the determination will likely be the result of a Categorical Exclusion (CE), Environmental Assessment (EA), or Environmental Impact Statement (EIS).	<p>Planned or Actual Start of NEPA Date: <u>30 days after grant award</u></p> <p>Planned or Actual Completion of NEPA Date: <u>150 days after start</u></p> <p>Final NEPA Determination or current status of NEPA process:</p> <p>The Pembroke Creek culvert replacement will be classified as a Type I(A) CE action as defined in the Programmatic Agreement between USDOT FHWA NC Office and NCDOT (2019).</p>
B. Will all necessary environmental approvals and permits meet the project delivery timeline specified in the project schedule?	<p><input checked="" type="checkbox"/> Yes (<i>Please provide documentation</i>)</p> <p><input type="checkbox"/> No</p> <p>The NCDOT has designated liaisons within all the necessary regulatory agencies. These liaisons are assigned to work specifically on NCDOT projects. This ensures streamlined coordination and timely issuance of permits.</p>
C. Are there any prepared environmental studies or documents describing known project impacts and possible mitigation for those impacts?	<p><input checked="" type="checkbox"/> Yes (<i>Please provide documentation, preferably through a website link</i>)</p> <p><input type="checkbox"/> No</p> <p>Any unavoidable stream or wetland impacts that may be associated with the Pembroke Creek project will be mitigated through NCDOT's MOA with the NC Division of Mitigation Services.</p> <p>https://deq.nc.gov/about/divisions/mitigation-services/about-dms/enabling-legislation</p>

<p>D. Is the project currently programmed in the</p> <ul style="list-style-type: none"> • TIP • STIP • MPO Long Range Transportation Plan • State Long Range Transportation Plan 	<p><input type="checkbox"/> Yes</p> <p><input checked="" type="checkbox"/> No</p> <p><i>(Please specify in which plans the project is currently programmed, the year in which the project is currently programmed and provide the identifying number if applicable)</i></p>
<p>E. Have there been public engagement opportunities?</p>	<p><input type="checkbox"/> Yes <i>(Provide details, including the degree to which public comments and commitments have been integrated into project development and design)</i></p> <p><input checked="" type="checkbox"/> No</p>
<p>F. Will there be public engagement opportunities?</p>	<p><input checked="" type="checkbox"/> Yes <i>(Please provide details)</i></p> <p><input type="checkbox"/> No</p> <p>Adjacent property owners will be notified when ground surveys begin. Local law enforcement and school districts will be notified prior to construction.</p>
<p>2. Indicate detailed project schedule, including all major project milestones.</p>	<p>See Attachment 3. Actual schedule dates will depend on date of grant award. Scheduling will also be timed so that construction can be performed outside in-water work moratorium for anadromous fish.</p>
<p>3. Is right-of-way acquisition necessary?</p>	<p><input type="checkbox"/> Yes</p> <p><input checked="" type="checkbox"/> No</p> <p><input type="checkbox"/> Not Applicable</p> <p>If Yes, Planned or Actual Start of Right-of-Way Acquisition Date: _____</p> <p>Planned or Actual Completion of Right-of-Way Acquisition Date: _____</p>

<p>4. Right-of-way acquisition considerations (<i>if applicable</i>):</p>	<p>If right-of-way must be acquired for the project:</p> <p>1. Would right-of-way acquisition require relocation of any people or businesses?</p> <p><input type="checkbox"/> Yes</p> <p><input type="checkbox"/> No</p> <p>2. If Yes, are people or businesses being relocated members of traditionally underserved and underrepresented populations (Environmental Justice communities)? If Yes, please describe.</p>
<p>5. Design Status (<i>if applicable</i>):</p>	<p>Planned or Actual Start of Preliminary Design Date: _____</p> <p>Planned or Actual Completion of Preliminary Design Date: _____</p> <p>Planned or Actual Start of Final Design Date: _____</p> <p>Planned or Actual Completion of Final Design Date: _____</p>
<p>6. Anticipated Construction Start Date (<i>if applicable</i>):</p>	<p>Date: _____</p>
<p>7. Anticipated Project Completion Date (<i>if applicable</i>):</p>	<p>Date: _____</p>
<p>8. Indicate potential project risks and strategies undertaken or that might be taken to mitigate those risks.</p>	<p>The Pembroke Creek project will take place entirely within existing NCDOT right of way. Utility conflicts at the site are minimal and coordination can begin as soon as funding is announced. Potential regulatory and permitting concerns have been mitigated through early coordination in the site selection process and designated liaisons within the regulatory agencies will ensure streamlined coordination and timely issuance of permits.</p>
<p>9. The summary on Project Readiness Criteria demonstrates...</p>	<p>NCDOT has both the financial capacity and staff (in-house and/or consultant) capacity to begin the project as soon as funding is announced.</p>

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Basic Project Information Sections #1-5

1. Project Name

Replacement of Culvert (structure # BP-021-2074) over Pembroke Creek on State Road (SR) 1202 (Hickory Fork Road) in Chowan County, North Carolina to Improve Aquatic Organism Passage:

The North Carolina Department of Transportation (NCDOT) is requesting \$ 472,000.00 in federal funds through the Culvert Aquatic Organism Passage (AOP) Program under the National Culvert, Replacement and Restoration Grant Program, for the replacement of the existing culvert (structure # BP-021-2074) over Pembroke Creek on State Road (SR) 1202 (Hickory Fork Road) in Chowan County, North Carolina, to improve aquatic organism passage, particularly for two anadromous fish species, the Alewife (*Alosa pseudoharengus*) and Blueback Herring (*Alosa aestivalis*), collectively referred to as river herring.

The NCDOT operates and maintains one of the nation's largest state-maintained highway systems, responsible for maintaining nearly 80,000 miles of roadways and over 18,000 bridges, culverts and pipes. These responsibilities are divided across the state into 14 regions, or highway divisions. The portion of the state immediately along the Atlantic Coastline is covered by three divisions, divisions 1-3 from north to south.

2. Project Description

The culvert replacement project (Project) for which Culvert AOP Program funding is being requested occurs in Chowan County, which is within the NCDOT Highway Division 1. This structure is in the Northeast Coastal Plain approximately 4.8 river kilometers (RKM) (3.0 river miles (RM)) upstream of the Chowan River where the river drains directly into the Albemarle sound (Edenton Bay), a designated anadromous fish spawning area (AFSA) water and River Herring Management Area (15A NCAC 03R .0202). Edenton Bay is a portion of the Albemarle/Pamlico Sound, which is the second largest estuary in the continental United States that is flanked by the chain of barrier islands referred to as the Outer Banks.

The project will involve upgrading the culvert to a single aluminum box culvert design that will improve AOP. The existing crossing structure over Pembroke Creek is a two-barrel 60" x 52" Corrugated Metal Pipe Culvert, with a streambed to crown clearance of 7.02'. The two pipes are severely deteriorated and experience frequent blockages from drift, that have resulted in flooding issues during major storms. The Project will significantly improve aquatic habitat connectivity to approximately 3.185 RKM (10,449 linear feet) in the Pembroke Creek watershed. Additionally, the replacement structure will reduce flooding potential.

NCDOT Culvert AOP Program Stakeholders Group (Stakeholders), which consists of representatives from NCDOT, NC Wildlife Resources Commission (WRC), NC Division of Marine Fisheries (DMF) and the National Marine Fisheries Service (NMFS), has identified various culvert crossing structures

in the Highway Divisions 1-3 that pose varying degrees of impediments to aquatic The species passage. As such, their respective removals would benefit anadromous fish species, particularly river herring. Potential sites were assigned a priority category of 1 through 3, with Tier 1 being the highest priority. Due to time constraints, the prioritization was primarily a “desktop” evaluation. The structure over Pembroke Creek was assigned a Tier 1 (highest priority) status for structure replacement to eliminate the barrier.

Factors considered in assigning the priority Tier were proximity to a designated AFSA¹ as well as the length of upstream reach that would be opened. An AFSA designation confirms presence of anadromous species; however, areas not identified as AFSA does not mean there is no presence of anadromous species. The closer the proximity to AFSA the higher the site was ranked and secondly the upstream reach length was factored in. A longer upstream reach increased the benefit of structure removal and therefore a higher priority compared to a short reach.

Additionally, fisheries biologist from WRC and DMF with experience in the respective watersheds also weighed in on prioritizing several of these sites and to confirm the potential benefit of the crossing improvements. While the portion of Pembroke Creek within and above the project area is currently not designated as AFSA, it occurs 0.6 RKM (0.4 RM) upstream of a designated AFSA (Pollock Swamp) and the culvert’s removal is expected to improve accessibility of river herring to nearly 3.185 RKM of habitat upstream of the culvert.

3. Applicable Selection Priorities

Eight species of anadromous fish known to occur in North Carolina (Table 1). Of the anadromous species listed in Table 1, the two species of river herring, Alewife and Blueback Herring are most likely to experience migration barriers from culverts, as they utilize smaller waterbodies to spawn compared to the other species, and culverts are more likely to occur over smaller waterbodies. Culverts have been identified as potential barriers to aquatic organism passage due to channel constriction, increased slope, unnatural channel bottom, perched outlets and susceptibility to damming and flooding effects caused by trapping debris. In addition to physical barriers to passage associated with culverts, low light levels inside culverts have been demonstrated to impede migration of river herring in North Carolina (Moser and Terra 1999). There also appears to be a relationship with higher flow velocity and turbidity in low light conditions that inhibit upstream migration (Kynard 1993). Peak spawning runs of river herring in North Carolina occur from early March to early May, a time of year where flows of the highest mean river flow.

Table 1. Anadromous Fish Species of North Carolina

Scientific Name	Common Name
<i>Acipenser brevirostrum</i>	Shortnose Sturgeon ¹
<i>Acipenser oxyrinchus oxyrinchus</i>	Atlantic Sturgeon ¹
<i>Alosa aestivalis</i>	Blueback Herring
<i>Alosa mediocris</i>	Hickory Shad

¹ Anadromous fish spawning areas are those areas where evidence of spawning of anadromous fishes has been documented by direct observation of spawning, capture of running ripe females, or capture of eggs or early larvae (15A NCAC 10C.0602)

<i>Alosa pseudoharengus</i>	Alewife
<i>Alosa sapidissima</i>	American Shad
<i>Morone saxatilis</i>	Striped Bass
<i>Petromyzon marinus</i>	Sea Lamprey ²

1-Federally and State Endangered.

2- The Sea Lamprey is on the NCWRC freshwater list prioritized for conservation.

Upgrading this culvert to a single culvert with headwalls and endwalls that has a larger opening (at least 10' 9" recommended) helps to mitigate the impediment of constricted channels caused by small pipe culverts to migrating fish. The larger opening allows for the stream's increased light penetration and less restricted flow within the crossing structure. This not only helps to lessen flow to allow for easier transition for migrating fish, but also lessens the susceptibility for the upstream area to flood during high flow events. The substrate in this case will also be improved, as the culvert will be buried allowing for the natural substrate to be present through the road crossing.

3.1 Anadromous fish listed as endangered or threatened

The Atlantic Sturgeon and Shortnose Sturgeon are the only two anadromous fish species protected under the Endangered Species Act (ESA) that occur in North Carolina. Both species are known to occur within the Chowan River Basin. In 2019 an individual was observed in the Chowan River just below Salmon Creek (Tracy et al. 2020), which enters the river on the opposite side where Pembroke Creek enters. There are also recent records of the Atlantic Sturgeon in the Chowan River (Tracy et al. 2020). While neither species is expected to utilize Pembroke Creek due to its small size and are thus, unlikely to directly benefit from the culvert replacement project, small indirect benefits might occur as a result of the overall ecosystem benefits realized through improved habitat connectivity, as well as localized nutrient retention and reduction in flooding effects. Smaller watersheds like Pembroke Creek help to process upland pollutants and mitigate flooding events, and these functions can be improved by improving aquatic organism passage and restoring a more naturalized flow regime.

3.2 Anadromous fish that could reasonably become Federally listed under the ESA

As mentioned in Section 3.1, the Atlantic Sturgeon and Shortnose Sturgeon, are the only two anadromous fish species in North Carolina protected under the endangered species act. However, stocks of the other anadromous fish species in the state have experienced significant declines compared to historical levels. Causes for the decline of river herring stocks have been attributed to overfishing, habitat degradation, and complete, or partial loss of access to historical spawning habitat by dam and culvert construction. As such, in an effort to protect and restore existing stocks, many states have enacted harvest restrictions in waters under their respective jurisdictions. A river herring harvest moratorium was enacted in North Carolina in 2007 and in coastal waters in Virginia that drain to North Carolina in 2008.

Harvest moratoria and catch limits have also been enacted on nearly all anadromous species in North Carolina. In addition to the various harvest restrictions, various recovery initiatives have been implemented for river herring. The WRC began a blueback herring stocking program in the Chowan River Basin in 2012 (Potoka and Smith 2021).

Because of the declining stocks, the NMFS evaluated whether listing river herring (Blueback Herring and/or River Herring) under the Endangered Species Act was warranted. In 2013 the NMFS issued a “not warranted” determination. However, after a lawsuit challenging this decision, the NMFS initiated a species status review, that led to a revised listing determination, which again led to a “not warranted” determination in 2019. Various existing conservation initiatives and regulatory protections were factored in to the decision not to list. However, the status assessment defined “the foreseeable future” for river herring as 12–18-year time frame (*i.e.*, out to 2030-2036), or a three-generation timeframe. Thus, it is possible that over this time period the conservation and management initiatives that are in place or not adequate to offset the various threats to the species, which would necessitate the need for a re-evaluation. As such, it is very possible that one, or both species of river herring will warrant listing under the ESA in the future. More detailed information on this process is provided below.

On August 12, 2013, the NMFS issued a determination that listing was not warranted at that time. However, it was noted that they were committed to revisit the status of both river herring species in “three to five years” as there were significant data deficiencies. A lawsuit was brought against NMFS in February of 2015 challenging this decision not to list the Blueback Herring. As part of a negotiated agreement with the plaintiffs, NMFS committed to publishing a revised listing determination for Blueback Herring by 2019. A status review of both river herring species was then initiated in August 2017 to gather the necessary data on whether listing was warranted. The status review (NMFS 2019) identified four Distinct Population Segments (DPS) for the Alewife (Canada, Northern New England, Southern New England and Mid-Atlantic) and three DPS for Blueback Herring (Canada/Northern New England, Mid-Atlantic, and Southern Atlantic. The Chowan River Basin is within the Mid-Atlantic DPS for both Alewife and Blueback Herring.

The status assessment used a “likelihood analysis” to evaluate the overall risk of extinction of both species, with a numerical ranking system that corresponded to “very low, low, medium and high” rankings. The range wide level of extinction risk for Alewife was rated as “low”, with each of the DPSs also low. Although the Mid-Atlantic DPS was ranked as low, it was slightly higher than the other DPSs (NMFS 2019). The Blueback Herring likewise had a range wide mean extinction risk score of “low” and “low” in the three DPSs (NMFS 2019)

Based on the level of extinction risks determined in the status assessment, the National Oceanic and Atmospheric Administration (NOAA) issued a determination on June 19, 2019, that listing of the Blueback Herring and Alewife was not warranted at that time (NOAA 2019). The factors that support this determination were the justification supporting this conclusion: “(1) The species are broadly distributed over a large geographic range, with no marine barriers to dispersal; (2) genetic data indicate that populations are not isolated; (3) overfishing is not currently occurring within the range; (4) the population size is sufficient to maintain population viability into the foreseeable future (5) there is no evidence that disease or predation is contributing to increasing the risk of extinction; and (6) there is no evidence that the species is currently suffering from compensatory processes (such as reduced likelihood of finding a mate or mate choice or diminished fertilization and recruitment success) or is at risk of extinction due to environmental variation or anthropogenic perturbations” (NOAA 2019).

While the final determination indicated both Alewife and Blueback Herring populations were at “historical low levels”, NOAA noted that “improved fisheries management efforts in recent years

have reduced fishing mortality rates in stocks and that hundreds of habitat improvement projects have been completed in the past 20 years” (NOAA 2019). This was one of the factors why the two river herring species did not meet the definition of either Endangered or Threatened under the ESA. There are several Federal, State, and non-governmental groups that support the ongoing research of the species as well as evaluate and guide the management efforts for the species. One such group, the Atlantic Coast River Herring Collective (River Herring Forum), is supported by NOAA Fisheries and Atlantic States Marine Fisheries (ASMFC) staff to “promote the conservation of the species, support information exchange, and encourage collaboration.” Therefore, although the species are not officially Federally listed, there are monitoring and species augmentation efforts in place to mitigate the ongoing loss of abundance.

While listing of the two river herring species under the ESA is currently not warranted, it is important to note that the status assessment defined “the foreseeable future” for river herring as 12-18 year time frame (*i.e.*, out to 2030-2036), or a three-generation time period. This is due to their species inherent reproductive strategy of high numbers of offspring, with short generation times. Thus, it is possible that over this time period the conservation and management initiatives that are in place or not adequate to offset the various threats to the species, which would necessitate the need for a re-evaluation.

3.3 Anadromous fish identified as prey for endangered, threatened, or protected species

While no longer protected under the ESA, the Bald Eagle (*Haliaeetus leucocephalus*), which is protected under the Bald and Golden Eagle Protection Act and is listed as “Threatened” in North Carolina (NCNHP 2022), occurs throughout the Chowan River Basin and Albemarle Sound and has been documented to prey on river herring. Restoration of river herring spawning runs in the Sebasticook River in Maine via a combination of dam removal and fish lift installations in the system were shown to boost survival of immature Bald Eagles as it provided an abundant and “seasonably reliable food resource” (DeSorbo et al. 2015). In addition to the Bald Eagle species of wading birds like the Tri-colored Heron (*Egretta tricolor*), which is listed as a species of Special Concern in North Carolina may also benefit from increases in river herring spawning runs in the project area, as over 90% of their diet consists of fish.

River herring are also a major food resource for many predatory fish species, including the anadromous Striped Bass. This species has long been an important commercial and recreational species that has provided economic benefit to states along the Atlantic Coastline, including North Carolina. It was also noted to be a major component of Native Americans diet. Striped Bass stocks have been subject to large fluctuations in numbers particularly since the mid-20th Century. Identified reasons for the fluctuations include fishing pressure, environmental pollution, loss and alteration of habitat, inadequacy of fisheries conservation and management practices, and natural causes. In the 1960’s there were consecutive years of reproductive failure in the rivers of North Carolina. Due to the risk of potential depletion of the species and its cultural and economic importance, the Atlantic Striped Bass Conservation Act was passed in 1984, which in conjunction with the Atlantic Coastal Cooperative Management Act of 1993 direct state and federal efforts to manage and protect the species. The Chowan River and Edenton Bay that Pembroke Creek drains to (5.2 RKM downstream of project area) is a designated Striped Bass Management Area (15A NCAC 03R .0201).

3.4 Anadromous fish identified as climate resilient stock

The NMFS considers river herring as “more vulnerable to climate effects”. Threats associated with climate change were identified in the status review on river herring (NMFS 2019) and ranked for both species as a whole as well as each DPS. Potential consequences associated with climate change that were considered included changes in amount of preferred marine habitat, due to increased water temperature and changes in water composition, as well as adverse effects to spawning and early life stages due to changes in riverine flow, all of which could result in a contraction of range and increased risk of extinction.

The threats associated with climate change and vulnerability ranked “medium” for Alewife range wide. However, the southern portions of the range were at slightly higher risk than the northern portion (NMFS 2019). Likewise, the Blueback Herring rank was “medium” range wide. Since the Blueback Herring’s range occurs further south than the range of the Alewife, the species currently persists in warmer habitats and therefore, may be more resilient to warmer temperatures (NMFS 2019). The “medium” risk determination may suggest that river herring are moderately resilient to the effects of climate change. While improving access to spawning grounds will not in of itself increase resiliency to climate change, increasing spawning access, is expected to lead to increased recruitment; thus, the more individuals that are produced with each generation, there is a better chance that overtime the population could withstand some of the negative impacts of climate change.

3.5 Project that opens up more than 200 meters of upstream habitat

As mentioned in the project description, this culvert replacement project will significantly improve access to nearly 3.185 RKM (10,451 linear feet) of upstream habitat, which makes up nearly a third of the entirety of Pembroke Creek’s course.

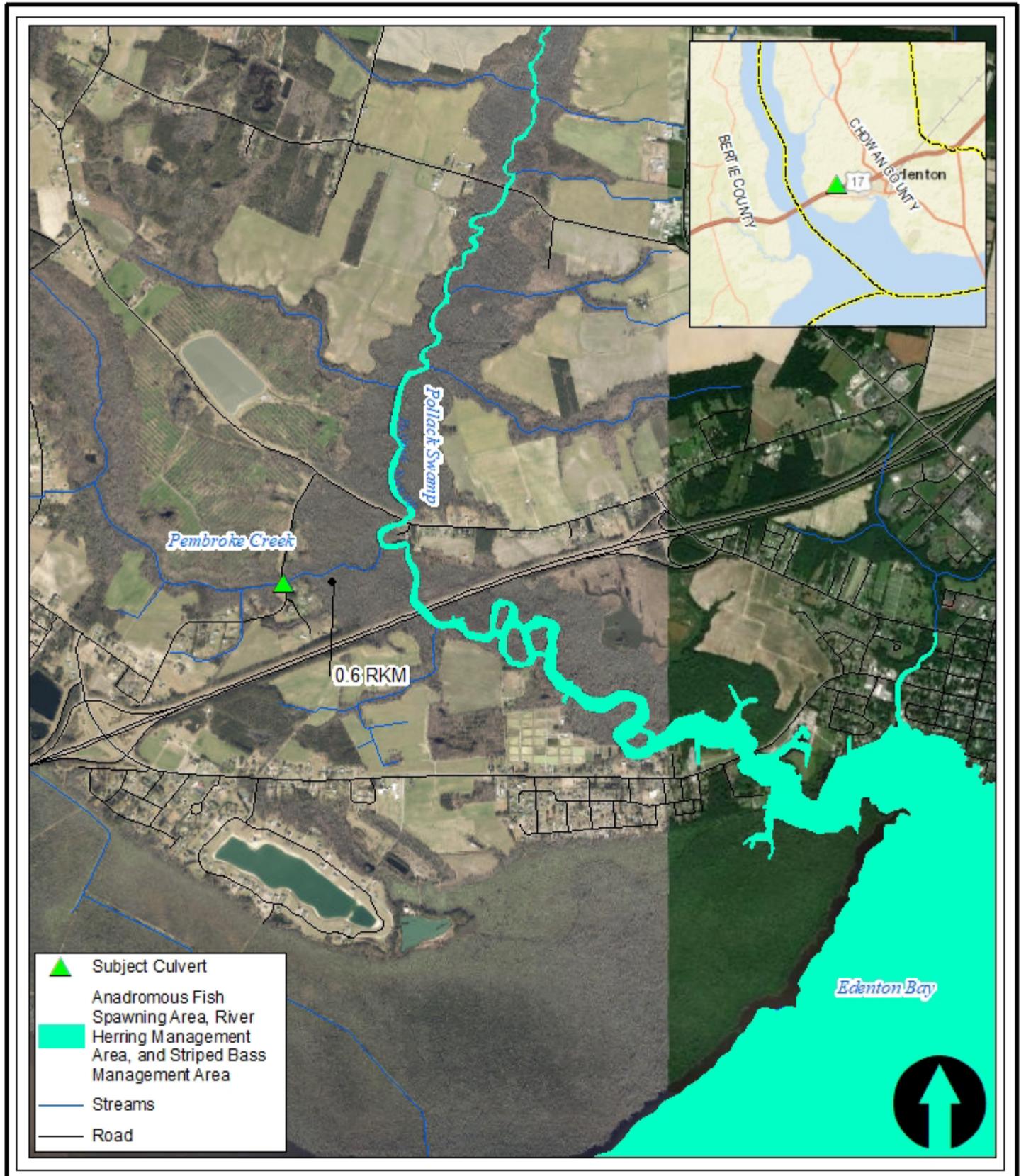
4. Anadromous Species Project Will Benefit

As mentioned, the two river herring species, Alewife and Blueback Herring are most likely to directly benefit from this project’s completion, by improving access to 3.185 RKM of potential spawning habitat upstream of the project area. Additionally, the anadromous Striped Bass population in the Chowan River Basin will directly benefit from the anticipated increased reproduction and recruitment of river herring populations, as they are a major food resource for Striped Bass. The other anadromous fish species known to occur in North Carolina, including the Chowan River Basin, could indirectly benefit from the project as a result of the overall ecosystem benefits.

5. Description of benefits to Anadromous Species

The culvert replacement project will improve river herring access to 3.185 RKM of potential spawning habitat upstream of the project area and will increase food resources for the Striped Bass. Ecosystem benefits in the form of improved habitat connectivity, as well as localized nutrient retention and reduction in flooding effects will also benefit river herring as well as other anadromous species in the river basin (See Section 4.0). This type of restoration is consistent with federal and state management initiatives to recover stocks to previous levels and prevent the need to list the species in the future.

Vicinity Map Including Closest AFSA and Other Common Management Rules



National AOP Grant Program
 Replacement of Culvert BP-021-2074
 Over Pembroke Creek
 On SR 1202 (Hickory Fork Road)
 Vicinity Map and Nearest AFSA
 Chowan County, North Carolina

Date: February 2023
 Scale: 0 500 1,000 Feet
 Job No.: 21-330
 Drawn By: TDH Checked By: TWS

Figure
1