ENHANCING AQUATIC CONNECTIVITY RESILIENCE AND FLOOD CAPACITY IN THE BLACK RIVER WATERSHED

BLADEN AND PENDER COUNTIES, NORTH CAROLINA

NOAA FY 2022 RESTORING FISH PASSAGE THROUGH BARRIER REMOVAL GRANT APPLICATION

PROJECT SUMMARY AND NARRATIVE

SUBMITTED BY:

CAPE FEAR RESOURCE CONSERVATION AND DEVELOPMENT

TABLE OF CONTENTS

SUPPORTING DOCUMENTATION

In addition to this Project Summary and Narrative, the following supporting documentation has been submitted on the Workspace on www.grants.gov:

- Budget Narrative
- Project Designs
- Supplemental Materials
- SF-424
- SF-424A
- SF-424B
- CD-511

PROJECT TITLE AND SUMMARY

Cape Fear Resource Conservation and Development, Inc. (CFRCD) is requesting $2,582,500 in federal funds for the ***Enhancing Aquatic Connectivity Resiliency and Flood Capacity in the Black River Watershed Project*** (the Project) through NOAA's FY22 Restoring Fish Passage through Barrier Removal Program grant program. The Project will complete the construction of a barrier (culvert) replacement on Big Branch, a tributary of the Black River, and complete engineering, design, acquisition of permits and replacement of four barriers (culverts) for the purpose of enhancing up to nine miles of stream spawning and foraging habitat within the lower Black River basin. This critical barrier removal work will improve aquatic connectivity and flood capacity resilience for local coastal communities and anadromous fish habitat within the Cape Fear River Basin. The proposed Project is a continuation and the next phase of a National Fish and Wildlife Foundation (NFWF)-funded stream crossing assessment of 200 barriers that was completed in partnership with the Southeast Aquatic Resources Partnership (SARP), the Cape Fear River Partnership, NC Wildlife Resources Commission and Pender and Bladen Counties to assess fish passability and conditions at stream crossings within the lower Black River Basin.

1. Applicant Organization

CFRCD is a 501(c)(3) organization that assists local governments and communities in southeastern North Carolina to conduct projects that improve the quality of life in the region. CFRCD's action-oriented projects protect, enhance and balance natural and human resources while promoting economic development.

CFRCD mission is to conserve natural resources while encouraging sound economic development and community development through project funding and implementation in southeastern North Carolina. CFRCD has been working with Bladen and Pender Counties to support fish passage and community resilience efforts since 2016.

2. Site Location

The five barriers for which federal funding is being requested are located within the lower Black River Basin, a tributary of the Cape Fear River Basin, within Bladen and Pender Counties in southeastern North Carolina. The Black River is approximately 50 miles long and is formed in Sampson County by the confluence of the Great Coharie and Six Runs Creeks. The Black River merges with the Cape Fear River approximately 12 miles north of Wilmington, North Carolina.

3. Brief Project Description

a) Program Goals

The Project is an outcome of the Cape Fear River Partnership Action Plan and subsequent Five-Year Implementation Plan. The five barriers proposed for removal in this funding request have become blocked from flood debris, scouring and sedimentation, and other natural and man-made causes. These blockages increase flooding along major transportation routes within this rural area of southeast North Carolina. Removing severe barriers will improve stream flow and aquatic connectivity of anadromous fish species, including, river herring and American eel, which

will improve resiliency of local coastal communities to flood risk. By removing these five barriers/culverts, fish passage will be restored along nine miles of stream within the lower Black River.

b) Regional and Watershed Context

The Project will restore aquatic connectivity within nine miles in the lower Black River Basin, a Tier 1 conservation priority of the Cape Fear River basin due to the presence of multiple Species of Greatest Conservation Need, to ensure passability for spawning migration and foraging, as well as improving the resiliency of surrounding rural coastal communities. The lower Black River Basin was chosen due to 1) Historical observation records of anadromous fish and important prey species, 2) designation as a high conservation priority for the North Carolina Wildlife Resources Commission (NCWRC) due to presence of rare aquatic species, 3) designation as an Outstanding Resource Water, which includes unique and special waters having excellent water quality and being of exceptional state or national ecological or recreational significance.

4. Timeline

The Project is proposed to be completed over a four year timeframe beginning January 2023 and include the following phases: 1) Stakeholder and Community Outreach (Spring 2023); 2) Construction of BR-236 (Spring - Summer 2023); 3) Survey, Design/Engineering, and Permitting of Four Barriers (Summer 2023 - Fall 2024); 4) Barrier Removal Implementation/Construction of Four Barriers (Winter 2024 – Spring 2026); and 4) Post-Construction Monitoring (Spring-Summer 2026).

5. Landowner and Stakeholder Outreach

Multiple partners are engaged with the Project and serve various roles to support the goals of fish passage through removal of barriers within the Black River including: Southeast Aquatic Resources Partnership (SARP), whom developed the Barrier Prioritization Tool; CFRCD as the project lead and grant administrator; Bladen and Pender Counties in building local landowner support; Moffatt & Nichol (M&N) provided the field assessment and preliminary engineering and design and will lead technical design and permitting; United States Fish and Wildlife Service (USFWS) as technical support and fish passage design guidance; NOAA Fisheries provides rare species historical observations; NC Department of Transportation (NCDOT) contributes staff technical review of barrier design; NCWRC aided in prioritizing barriers; and the Cape Fear River Partnership facilitates stakeholder engagement. CFRCD and County floodplain administrators will work with landowners to replace each culvert that may encroach upon private property.

6. Funding Request

CFRCD is requesting $2,582,500 in federal funds to complete the construction of a barrier (culvert) replacement on Big Branch, and complete engineering, design, acquisition of permits and replacement of four barriers (culverts) for the purpose of restoring up to nine miles of spawning and foraging stream habitat within the lower Black River basin.

PROJECT NARRATIVE

1. IMPORTANCE AND APPLICABILITY

a) Priority for Migratory Fish

Migratory fish species including American shad, river herring, Atlantic sturgeon, and striped bass migrate from the Atlantic Ocean and lower estuary upstream to spawn in the freshwater within the Cape Fear River basin. After spawning, the adults will migrate downstream to the lower estuary or ocean. Due to blockages in the fish migration and decline in water quality, migratory fish populations within the Cape Fear River basin have declined substantially within the past two decades. In partnership with NOAA, the Cape Fear River Partnership developed the Cape Fear River Basin Action Plan[1] for Migratory Fish to provide feasible actions to restore the declining fish populations. The actions include restoring access to historic migratory fish habitat and improve habitat conditions. Restoring migratory fish access to historic spawning and nursery habitats will help rebuild currently depressed populations to support healthy ecosystems and sustainable recreational and commercial fisheries.

Cape Fear Resource Conservation and Development, Inc. (CFRCD) is requesting $2,582,500 in federal funds for the ***Enhancing Aquatic Connectivity Resiliency and Flood Capacity in the Black River Watershed Project*** (Project) through NOAA's FY22 Restoring Fish Passage through Barrier Removal Program grant program. The Project will complete the construction of a barrier (culvert) replacement on Big Branch, a tributary of the Black River, and complete engineering, design, acquisition of permits and replacement of four barriers (culverts) for the purpose of enhancing up to nine miles of freshwater spawning and foraging stream habitat within the lower Black River basin. This critical barrier removal work will improve aquatic connectivity and flood capacity resilience for local coastal communities and anadromous fish habitat within the Cape Fear River Basin. The proposed Project focuses on barriers within the Cape Fear River Basin that are critical for smaller anadromous fish including river herring, American eel, and prey species which would support the larger anadromous fish, such as striped bass and American shad.

Streams are an important part of the ecosystem and landscape but are particularly vulnerable to fragmentation due to human activities, including the construction of culverts, that can disrupt the continuity of stream ecosystems. Undersized culverts can have extreme effects on hydrology, sediment transport, and the movement of fish and animals through a system. By restoring severe barriers identified through a joint study completed by CFRCD, SARP, and Pender and Bladen Counties, aquatic connectivity, hydrology, and sediment transport of the streams will be improved. The replacement of severe barriers plays an important role in community resiliency and will reduce the frequency of overtopping, as seen during Hurricanes Mathew (2016) and Florence (2018), by being able to safely pass a 100-year flow event.

b) Regional and Watershed Context

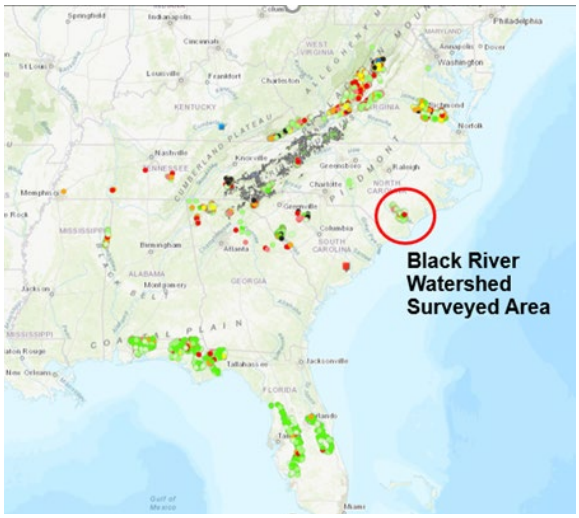
The Cape Fear River is North Carolina's largest and most diverse river basin, consisting of over 6,000 miles of tributaries. The river once supported thriving migratory fish populations including

[1] Cape Fear River Partnership - Working to Restore the Cape Fear River

American shad, sturgeon, river herring, American eel, and striped bass. Migratory fish populations within the Cape Fear River basin, including the Black River watershed, have declined substantially over the past two centuries, with current commercial landings 87 percent lower than historic estimates. The Cape Fear River Partnership Action Plan for Migratory Fish identified actions designed to restore fish passage, improve habitat, and water quality to revitalize populations of migratory fish and improve the overall condition of the river. The proposed Project aims to remove up to five barriers in the tributaries of the Cape Fear River as prioritized in the Partnership's Implementation Plan.

c) Enhancing Community Resilience to Climate Hazards and Other Co-Benefits

In addition to fish passage restrictions, local coastal communities within the Cape Fear River basin continue to be threatened by large storms. In 2016 and 2018, many areas in North Carolina were inundated with water, including rural coastal plain communities such as those along the Black River in Pender and Bladen Counties. The Black River, a tributary of the Cape Fear River, is approximately 50 miles long and is in southeastern North Carolina. It is formed in Sampson County by the confluence of the Great Coharie and Six Runs Creeks. It flows southeast, receiving the South River approximately 30 miles south of Clinton, then continues southeast until it merges with the Cape Fear River, approximately 12 miles north of Wilmington. CFRCD works with eight counties within the Cape Fear River and aquatic connectivity and improving resiliency to flood inundation has been defined as a high priority. CFRCD has worked towards this effort since 2017 by assessing over 200 stream crossings within the lower Black River (see map), in coordination with SARP, resource agencies, and Pender and Bladen Counties to assess aquatic connectivity, resulting in the five severe barriers proposed for NOAA funding.



Rural areas along the Cape Fear River faced significant threats from inland flooding as Hurricane Florence left many without power and many properties underwater. According to the National Hurricane Center, during Hurricane Florence, "high water levels in the Cape Fear River backed up the Black River and Moore's Creek, leading to exceptional flooding in the Currie and Canetuck communities. According to the Pender County planning department, 6,294 homes were damaged by Hurricane Florence with 2,797 of these having major damage or destruction. The estimated value of damage to homes and commercial property in Pender County was $268,067,825. In Bladen County, an estimated 500+ homes were damaged extensively. Many property owners were just returning to their homes after being devastated by Hurricane Matthew in 2016 when their properties were destroyed again by flooding due to Hurricane Florence.

Additionally, loss of roads due to flooding and washout made travel in these areas difficult to impossible, keeping owners away from their property for weeks following the storm events. In Pender County, there were 1,600 rescues for people who could not leave their flooding residences. This was half of the state total for rescues due to Hurricane Florence. Bladen County accomplished nearly 300 rescues, 125 of them by air. The impact of road closures and washouts was extensive. Scouring and road topping of flood water are indicative of the effects of undersized, damaged, perched, or blocked culverts. Replacing these culverts will serve to reduce the effects of flooding and washing out roads thus keeping roads open for transportation and delivery. Safety (e.g., the ability to evacuate or get emergency services) is primary but following storms flooded roads disrupt the economic and social fabric of the rural community and delay and hamper recovery efforts.

d) Providing Benefits to Underserved Communities

The lower Black River Watershed is comprised of mostly rural communities. The 2010 Census identified 68.8% of Pender County and 91.2% of Bladen County as rural areas. In 2017, it was estimated that 12.6% of Pender County and 20.7% of Bladen County was below the poverty line. Having safe and accessible roads is of the utmost importance to the residents of these communities, as in 2016 about 80% of each county claimed a personal vehicle as their mode of transportation to and from work (Access NC, 2019). Flooding events caused by severe barriers (culverts) can lead to unsafe road conditions and the possibility of residents missing workdays and losing valuable income.

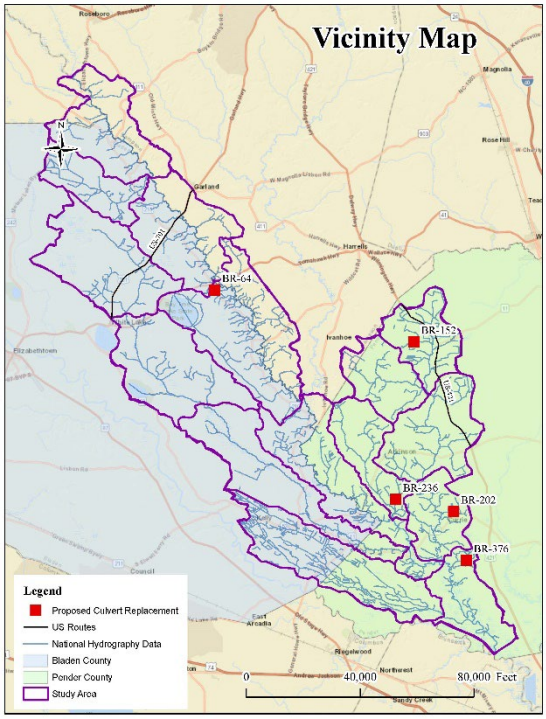
This Project proposes to restore five severe barriers in the lower Black River watershed, specifically Bladen and Pender County. By restoring or retrofitting culverts, there will not only be improvements to the drainage in these rural areas, but also decreases the likelihood of overbank flooding and road overtopping from storm events. Many undersized culverts act as barriers, impeding the flow of necessary drainage. Undersized culverts can also be more easily blocked by debris and vegetation, further degrading the resiliency of the drainage system. By removing the barrier, these communities facing flooding issues can have greater resilience for storms and localized flooding.

2. Technical and Scientific Merit

a) Project Site Characteristics and Methods

Approximately 200 culverts were evaluated in 2018 by a team of field biologists as to the effect they are having on fish passage and aquatic connectivity within the lower Black River Basin to prioritize those deemed severe barriers by SARP through the Barrier Prioritization Tool. These barriers were prioritized based on 1) watersheds with potential for presence of anadromous fish and known populations of targeted endemic aquatic species as indicated by the NC Wildlife Resources Commission (NCWRC) and NOAA Fisheries, 2) hydrologic unit codes (HUC12) provided in the NC Wildlife Action Plan, and 3) the degree of blockage and the effectiveness of remediation, i.e. sites that when rectified will provide high quality and quantity (miles) of stream habitat. Groundtruthing of those barriers designated as moderate and/or severe was conducted in 2019, with preliminary engineering completed in 2020 (Appendix/PDF 3 – Project Designs).

The Project proposes to replace five barriers (culverts) as shown in the Vicinity Map and Table 1. The retrofit or replacement of these structures will improve biological and aquatic connection between the upstream and downstream of the existing stream crossings where this connection has been broken due to various reasons like extensive scour at the downstream end causing the culvert to be perched well above the normal water surface which inhibits the free passage of aquatic organisms under normal flow conditions, or the structures being possibly built at improper outlet invert elevations.



The culverts were assessed and assigned a SARP score by using a Barrier Prioritization Tool. This scoring and field visit established a level of severity for the identified barriers and field data from the entire set of crossings were reviewed. These five locations, along with their SARP scores, are shown in Table 1 and provided in Appendix/PDF 3: Project Designs.

Table 1: Ratings for Five Barriers/Culverts Identified for Replacement

Site	SARP Score	Barrier Type	Latitude	Longitude
152	0.46	Moderate	34.63770	-78.13776
376	0.47	Moderate	34.42688	-78.07896
64	0.22	Significant	34.68921	-78.37003
236	0.19	Severe	34.48575	-78.16040
202	0.08	Severe	34.47356	-78.09328

Site-specific characteristics of each culvert proposed for replacement are described below and described in further detail in PDF 3: Project Designs.

i. BR-152

The existing BR-152 culvert was assessed with a SARP score of 0.46. Field measurements indicate that the culvert is perched about 1.8’ above the normal water surface elevation, which inhibits the free passage of aquatic organisms under normal flow conditions. This scoring and field visit established that the crossing was to be classified as a moderate barrier.

The existing structure is a double-barreled 48” Corrugated Steel Pipes which are about 51’ in length providing crossing for Bulltail Creek under Indian Hill Road.

USGS Streamstats indicates a drainage area of 2.67 square miles at the existing crossing with 0.03% impervious area. A proposed replacement culvert was conservatively sized using future

flow conditions. The proposed replacement culvert is a double-barreled 72" Reinforced Concrete Pipe.

ii. BR-376

The existing BR-376 culvert was assessed with a SARP score of 0.47. The site has significant buckling towards its center which could lead to upstream flooding, and field measurements indicate that the culvert is perched about 1.2' above the stream bed invert which inhibits the free passage of aquatic organisms under normal flow conditions. This scoring classified the crossing as a moderate barrier.

The existing structure is a double-barreled 60" Corrugated Steel pipes about 83' in length providing crossing for Bear Branch under Blueberry Road.

USGS Streamstats indicates a drainage area of 0.69 square miles at the existing crossing with 0.76 % impervious area. A proposed culvert replacement was conservatively sized using future flow conditions. The proposed culvert is a double-barreled 72" Reinforced Concrete Pipe.

iii. BR-64

The existing BR-64 culvert was assessed with a SARP score of 0.22. Field measurements indicate that the culvert is perched about 0.9' above the normal water surface elevation which inhibits the free passage of aquatic organisms under normal flow conditions. This scoring and field visit established that the crossing was to be classified as a significant barrier.

The existing structure is a 48" Corrugated Steel pipe about 53' in length providing crossing for an upper tributary to South River under NC 210.

USGS Streamstats indicates a drainage area of 0.18 square miles at the existing crossing with 0.0 % impervious area. However, to account for future development, 5% of the total catchment area was assumed to be impervious. A proposed replacement culvert was conservatively sized using future flow conditions. The proposed culvert replacement is a single 60" Reinforced Concrete Pipe.

iv. BR-202

The existing BR-202 culvert was assessed with a SARP score of 0.08. Field measurements indicate that the culvert is perched about 1.5' above the normal water surface elevation which inhibits the free passage of aquatic organisms under normal flow conditions. The scoring and field visit established that this crossing was to be classified as a severe barrier.

The existing structure is a 48" Reinforced Concrete pipe about 53' in length providing crossing for an upper tributary to Deer Valley Branch under NC 210.

USGS Streamstats indicates a drainage area of 0.39 square miles at the existing crossing with 0.30 % impervious area. A proposed replacement culvert was conservatively sized using future flow conditions. The proposed culvert replacement is a double-barreled 60" Reinforced Concrete Pipe.

v. BR-236

The existing BR-236 culvert was assessed with a SARP score of 0.19. Field measurements indicate that the culvert is perched about 1.2' above the normal water surface elevation which inhibits

the free passage of aquatic organisms under normal flow conditions. Also, there is some undermining of the downstream culvert segment along with some joint separation. This scoring and field visit established that the crossing was to be classified as a severe barrier.

The existing structure is a four-barreled 54" reinforced concrete pipe culvert about 53' in length providing crossing for Big Branch under Slocum Trail.

USGS Streamstats indicates a drainage area of 1.78 square miles at the existing crossing with 0.22 % impervious area. A proposed replacement culvert was conservatively sized using future flow conditions. The proposed culvert replacement is a four-barreled 72" Reinforced Concrete Pipe. The final design of barrier BR-236 has been completed and included in Appendix/PDF 3: Project Designs.

b) Project Description and Milestones

The scope of the Project is to complete the design and construct four culvert replacements, and construct a fifth culvert replacement, currently in final design phase, with the outcome of removing five barriers to restore up to nine miles of stream channel in the Black River watershed over a four year timeframe (Table 2).

Engineering design tasks for the proposed sites BR-152, BR-376, BR-64, and BR-202, as described below, will include surveying, utility coordination roadway design, drainage design, pavement design, structural design, hydrology and hydraulic modeling and design, geotechnical investigation, subsurface investigations, traffic control plans, erosion control design, stream/wetland delineation, environmental permits, FEMA coordination, right-of-way acquisition, preparation of plans, specifications, and cost estimates, bid documents, and construction management. Moffatt & Nichol (M&N) will complete the technical tasks through an engineering consulting contract with CFRCD, similar to the agreement provided in Appendix/PDF 3: Project Designs.

Tasks to complete the replacement of culvert site BR-236 will include construction and construction management and is anticipated to be conducted during the Spring – Summer 2023 timeframe. Final design has been completed via leveraged federal funds awarded through NFWF Emergency Coastal Resilience Funds (see final design plans in Appendix/PDF 3: Project Designs).

The below summary further outlines the technical tasks and key milestones listed below to complete engineering, design, permitting and surveying for four barriers proposed for federal funding.

Table 2: Project Schedule

Project Phase	Timeframe
Stakeholder and Community Outreach	Spring 2023
Construction of BR-236	Spring - Summer 2023
Survey, Design/Engineering, and Permitting of Four Barriers	Summer 2023 - Fall 2024
Barrier Removal Implementation/Construction of Four Barriers	Winter 2024 – Spring 2026
Post-Construction Monitoring	Spring-Summer 2026

The following engineering/design tasks will be completed by M&N during Summer 2023 – Fall 2024:

Stream and Wetland Delineation: M&N will identify, evaluate, and delineate any jurisdictional stream and/or wetland boundaries within the project area based on methods established by the United States Army Corps of Engineers.

Surveying Services: M&N will coordinate with a surveying subconsultant to complete the following:

- Obtain deeds and plats for properties within survey limits. Set one new benchmark at the site.
- Survey the existing pavement within the project limits (300 feet north and 300 feet south from culvert site).
- Hydrographic Surveys and T-Lines: Survey the existing Creek within the survey limits (40 feet upstream and downstream of the bridge). Survey 6 floodplain/stream cross sections (40' upstream/downstream, 100' upstream/downstream, and 400' upstream/downstream).
- Supplemental DTM's: Survey the obscured areas, ditches, etc. within the survey limits, left and right to the toe of slope or top of cut.

Field Reconnaissance: A field reconnaissance/photo survey will be completed to field verify the survey and the FEMA model's roughness coefficients, if required.

Geotechnical Services: M&N will perform geotechnical services to support design, including collected core samples, performing soil testing, and defining required geotechnical requirements for culverts and pavement.

Hydrology and Hydraulic Modeling Services: M&N will create a hydraulic model for the culvert. M&N will evaluate FEMA impacts and impacts to the scheduled sub-basin delineation. M&N will verify the hydrology for the FEMA model, if required.

Final Design: M&N will complete the final design and the construction bid package. The plans and specifications will include general civil specifications and details as required by the local jurisdiction. M&N envisions those three separate submittals will be completed within the design process including a 60% submittal, a 90% submittal and the final bid package. These phased submittals will allow stakeholders to review at various stages and M&N to incorporate stakeholders' comments and direction within the design. The easement plats will be included in the 60% submittal for right-of-way acquisition (if any is required). M&N will develop an opinion of probable cost, which will include design and construction cost.

Permitting Services: M&N will coordinate and obtain the permits from USACE and NC Department of Environmental Quality. M&N will obtain the FEMA No Rise/CLOMR/LOMR approval, if required. The City will be responsible for the required permitting/submittal fees. For culvert replacement projects that take place within Pender County that involve crossings of waters classified under the N.C. Coastal Area Management Act (CAMA) as Coastal Wetlands (15A NCAC 07H.0205), Estuarine Waters (15A NCAC 07H.0206), and/or Public Trust Waters (15A NCAC 07H.0207), CAMA General Permit 2300 (15A NCAC 07H.2300) is likely to apply. This General

Permit applies to culvert and bridge replacements where the total area of open water and wetlands to be excavated or filled does not exceed a total of 2,500 square feet, with the exception that the Coastal Wetland component shall not exceed 750 square feet. The N.C. Division of Coastal Management is the agency responsible for issuing these GP's.

In addition to CAMA General Permit 2300, authorizations for culvert replacements within both Bladen and Pender Counties will likely require Section 404 (Clean Water Act) and Section 10 (Rivers and Harbors Act) authorizations from the U.S. Army Corps of Engineers (USACE) – Wilmington District, and Section 401 (Clean Water Act) certification the N.C. Division of Water Resources (NCDWR). The USACE has a Regional General Permit (RGP 198200031) for NCDOT construction, maintenance, and bridge repair projects, provided that the permanent impacts resulting in a loss of waters of the U.S. will be less than or equal to 500 linear feet of stream and/or one acre of wetland/non-tidal open water area. The NCDWR has an associated 401 Water Quality Certification (GC 4135).

Utility Coordination Services: M&N will coordinate with private and public utilities and develop items as required for the implementation of the selected alternative. The utility owners will be responsible for the design and construction cost of repairs to their systems. If required, utility surveys will be performed during final design to locate any buried utilities.

Right-of-way Acquisition: If required, M&N will assist the local jurisdiction in acquiring the right-of-way and / or easements required for the subject project. If needed, M&N can add ROW acquisition subconsultant to perform parts of this work if requested.

Bidding/Negotiating: M&N will assist during the bidding/construction award phase of the project. M&N will provide a set of reproducible plans, specifications, and contract documents. M&N will also attend a pre-bid meeting and will include time to answer bidding contractors' questions, providing addendums (if needed), and helping to evaluate bids and providing recommendations concerning the contract award.

Construction: Once the construction contract has been awarded, M&N can provide limited construction administration services for the project. M&N expects that construction administration services will consist of meetings with the contractor to resolve issues, review/processing of submittals/shop drawings/change orders, and answer contractor questions as they arise, and field inspections and reports.

Table 3 provides the milestones and timeline for the BR-236 culvert replacement, which is currently under final design. The other four culvert replacements will follow a similar timeline in terms of duration of each task.

Table 3: Key Milestones for BR-236

BR-236 Milestone	Timeline	Responsible Partner
Pre-Design, Review, and Data Collection/Evaluation	June 2019 – December 2019	CFRCD/M&N/SARP
Selection of Severe Barriers for Retrofit	March 2020	CFRCD /M&N/SARP
Project Kickoff with Partners	July 2020	CFRCD/M&N

BR-236 Milestone	Timeline	Responsible Partner
Stream / Wetland Delineation	November 2021	M&N
Survey Services	March – April 2022	M&N
Field Reconnaissance	May – June 2022	M&N
Geotechnical Services	June 2022	M&N
Hydrology and Hydraulic Modeling Services	July - August 2022	M&N
Final Design	September - October 2022	M&N
Permitting	October - November 2022	CFRCD/M&N
Utility Coordination	December 2022	CFRCD/M&N
Right-of-way Acquisition	January 2023	CFRCD/M&N
Bidding/Negotiating	February 2023	CFRCD/M&N
Construction	March – June 2023	M&N/Contractor
Biological/Physical Monitoring	July – August 2023	Contractor
Final Report	September 2023	CFRCD/M&N

c) Fish Passage Implementation Monitoring and Evaluation

CFRCD proposes to conduct Tier 1 monitoring for the proposed Project and each replaced barrier/culvert. A monitoring plan will be developed with project partners, including NOAA, and will include the following metrics: 1) Site Passability: channel width, channel gradient, and jump height 2) Presence of Target Fish Species: presence/absence of diadromous fish species, life stage limited by barrier 3) Annual Operating, Maintenance, and Liability Costs: annual for next five-year period 4) Safety Hazard: describe hazard diminished or eliminated 5) Civic or Community Enhancement: changes to infrastructure, utilities or recreational facilities.

Specific aquatic fish species of interest for the project area and that pass through the five culverts proposed for funding include:

- Atlantic and Shortnose Sturgeon (Federal and State Endangered)
- Thinlip Chub (State Special Concern)
- Broadtail Madtom (Federal Species of Concern)

The following Species of Greatest Conservation Need (SGCN) are also present:

- American Eel
- Ironcolor Shiner
- Blackbanded Sunfish
- Coastal Plain Crayfish
- Striped Bass
- River Herring

CFRCD will provide project designs to NOAA Technical Monitors before implementation to ensure site passability meets fish passage design standards.

d) Socioeconomic Performance Measures

CFRCD will coordinate directly with Pender and Bladen County staff, NCDOT, and Soil and Water Conservation staff to support the evaluation of the proposed Project on community resilience, as well as other co-benefits such as public safety and community enhancement. CFRCD will work with NOAA to refine the following socioeconomic performance measures if the proposal is selected for funding.

Public safety benefits will include infrastructure improvements to five stream and road crossings, reduce the risk of flood overtopping during major events, and enhance stream flows during normal conditions. The restoration of five barriers and stream crossings will reduce the exposure of flood inundation to evacuation routes and local community residents. The impacts from road overtopping can be widespread for the community and region. It can take NCDOT anywhere from several hours to several weeks to repair a washed-out road. If these roads are down for several weeks, residents in the area will have more trouble reaching their jobs, rescue workers will have restricted access to residents during emergency response situations, and commerce will be slowed as it deviates from its most direct routes. Returning to normal functioning capacity as quickly as possible is the goal of improved resilience. Ensuring roads are open and functional is the greatest step towards returning to standard capacity. By being proactive in our approach to replacing outdated infrastructure that is likely to wash out or cause road failure during the next heavy rain event, we can reduce the amount of disruption to area residents and regional commerce.

e) Sustainability

Bladen and Pender County have been in support of the Project (see letters of support in Appendix/PDF 4: Supplemental Materials) since the culvert assessment began in 2018 and will provide floodplain administrative staff to monitor the success of the replacement culverts after construction is complete. Tracking metrics to measure the impact of the Project include the following:

- **Upstream flood level reduction: I**dentify and evaluate reduction in upstream flood levels for design events as a result of the Project.
- **Recurrence interval of roadway overtopping: I**dentify the approximate recurrence interval at which roadway overtopping occurs for the pre-project and post-project conditions.
- **Reassessment of passage effectiveness through SARP protocol:** After the culverts are replaced, the SARP score will be reassessed to determine the anticipated effectiveness of the installed solution. Protocol data form and instructions is provided in Appendix/PDF 3 – Design Documents.
- **Observance of fish species during post-construction monitoring:** Fisheries biologists will monitor presence/absence of fish species after implementation and compare to pre-construction conditions using backpack shockers. Monitoring data will be evaluated and compared to historical data.

- **Operation and maintenance of structures by NCDOT:** Barriers to be replaced will be managed by NCDOT as all sites are located within NCDOT ROW. In addition, the culverts will be maintained through the Counties' roadway maintenance program to ensure no significant blockages or channel degradation would occur.

f) Data Management Plan

The Project's Data Management Plan is provided in Appendix/PDF 4: Supplemental Materials.

3. Overall Qualifications of Applicant

CFRCD was incorporated in 1992 and has an outstanding record for design, funding, and completion of projects that improve the quality of life in southeastern North Carolina. CFRCD has managed large and small grants and projects including the $4.7 million Maple Hill Alternative Sewer project (grant procurement and management) and $951,500 Columbus County Landfill Gas Project (grant procurement and project management). Sources for these grants include NC Clean Water Management Trust Fund, NC Rural Center, and ARRA.

The following staff play key roles in the Project and all resumes are provided in Appendix/PDF 4: Supplemental Materials.

Danielle Darkangelo, Executive Director of CFRCD: Ms. Darkangelo has worked within and for nonprofits for much of her 25+ year professional career. She has experience with program development as well as corporate and government funding regarding securing, managing, and implementing funds as outlined in proposals, LOIs, and MOAs. She has been an administrator and consultant to numerous nonprofits with services focused on improving community resources. She has strengths regarding building community awareness and increasing education on natural resources and is passionate about effective project implementation and revenue utilization. For the past five years, she has taken CFRCD from no projects, grants, or adequate funding to multiple, large-scale projects, millions in grants and resources, and execution and completion of water resource projects positively impacting natural resources and community functions. Collaborations in the last five years have increased exponentially and CFRCD is able to execute significant grant funding to complete the Black River Aquatic Activity Culvert Restoration Phase II Project focused on improving community resources and the health of the community population.

Dawn York, Moffatt & Nichol, Senior Coastal Scientist, Program Manager: Ms. York is a senior coastal scientist and project manager for M&N and serves as the Coordinator for the Cape Fear River Partnership, a coalition of federal, state, industry, private, non-profit organizations working towards the restoration of anadromous fish species in the Cape Fear River watershed. She works closely with fisheries scientists from National Oceanic and Atmospheric Administration, US Fish and Wildlife Service, NC Division of Marine Fisheries and NC Wildlife Resources Commission to implement the goals and targets for restoring fisheries populations in the Cape Fear River.

Jeff Crump, PE, Moffatt & Nichol, Senior Civil Engineer: Mr. Crump is a senior civil engineer at M&N. Mr. Crump was the lead civil engineer to evaluate potential aquatic connectivity projects for constructability, cost, and feasibility. As lead engineer, he directed efforts to prepare

conceptual layouts and designs of the proposed projects to improve aquatic connectivity while balancing upstream and downstream hydraulic impacts.

Trent Huffman, PE Moffatt & Nichol, Civil and Transportation Engineer: Mr. Huffman has more than 20 years of civil engineering experience and provides planning, analysis, evaluation, design, construction document preparation, and post-construction-award services for a variety of civil engineering projects, particularly for site work associated with transportation, port and urban waterfront projects. He recently led the design of the Culvert Replacement on Slocum Trail over Big Branch (BR-236), Pender County, North Carolina.

Daniel Adams, Floodplain Administrator, Pender County Government: Mr. Adams is a certified floodplain administrator for Pender County and will provide critical community outreach and private landowner engagement for the five barriers to be replaced.

4. Project Costs

The Enhancing Aquatic Connectivity Resilience and Flood Capacity in the Black River Watershed Project will be implemented through a non-profit/public/private/state/federal partnership administered by Cape Fear Resource Conservation & Development (CFRCD). As described in the Project Narrative, the project implementation team includes grant and contract administrative and public outreach staff from CFRCD; and project management, environmental planners, permit specialists, and civil engineers from Moffatt & Nichol (M&N). Hydrographic and topographic surveys will be conducted by local survey crew and a to-be-selected contractor to construct the five barrier replacements.

Table 4: Project Costs & Funding Sources

Project Component		Cost	Funding Allocation	
			CFRCD	NOAA
1	Project Management/Grant Administration	$122,500	$0	$122,500
2	Engineering/Design/Permitting/Monitoring	$777,000	$0	$777,000
3	Construction of 5 Barrier Replacements	$1,623,000	$0	$1,623,000
5	Outreach and Education	$60,000	$0	$60,000
	TOTAL	$2,582,500	**$0**	$2,582,500

a) Cost-Sharing and Leveraging Federal Funds

The Project is supported by leveraged federal funds from a National Fish and Wildlife Foundation (NFWF) Southeast Aquatics Grant for $130,000 for the initial pilot project that provided an opportunity to assess 200 barriers and rank them for severity through SARP's Barrier Prioritization Tool and a NFWF Emergency Coastal Resilience Grant ($500,000) for the replacement of one severe barrier in Pender County.

b) Funding Allocation and Cost-Effectiveness

Engineering (Design) and Construction costs have been updated from the 2019 Preliminary Engineering Report to better align with current year costs. Costs have been impacted due to

COVID, supply chain struggles as well as recent inflation hikes. M&N has updated these costs based on the latest information from both local and national resources. In addition, M&N has provided sufficient cost based on projected permitting, possible utility relocations and proposed right of way / easement purchases to construct these projects.

c) Budget Detail

The Project costs are categorized down by culvert in Table 5. The full Cost Estimates are included in Appendix/PDF 3: Project Designs.

Table 5: Budget Detail

Project Element	Total Budget	NOAA Request	Matching Funds	Leveraged Funds
Site BR-152				
Replace existing 2 @ 48" corrugated steel pipes with 2 @ 72" Reinforced Concrete Pipes under Indian Hill Road crossing Bulltail Creek in Pender County, NC				
Personnel	$24,000	$24,000	-	-
Fringe	-	-	-	-
Travel	$500	$500	-	-
Contractual	$600,000	$600,000	-	-
Supplies	-	-	-	-
Phase Total	**$24,500**	**$24,500**	-	-
Site BR-376				
Replace existing 2 @ 60" corrugated steel pipes with 2 @ 72" Reinforced Concrete Pipes under Blueberry Road crossing Bear Branch in Pender County, NC				
Personnel	$24,000	$24,000	-	-
Fringe	-	-	-	-
Travel	$500	$ 500	-	-
Contractual	$700,000	$700,000	-	-
Phase Total	**$724,500**	**$ 724,500**	-	-
Site BR-64				
Replace existing 1 @ 48" corrugated steel pipe with 1 @ 60" Reinforced Concrete Pipe under NC 210 crossing an upper tributary to South River in Bladen County, NC				
Personnel	$24,000	$24,000	-	-
Fringe	-	-	-	-
Travel	$500	$ 500	-	-
Contractual	$450,000	$450,000	-	-
Supplies	-	-	-	-
Other	-	-	-	-
Phase Total	**$474,500**	**$ 474,500**	-	-

Project Element	Total Budget	NOAA Request	Matching Funds	Leveraged Funds
Site BR-236				
Replace existing 4 @ 54" reinforced concrete pipes with 4 @ 72" Reinforced Concrete Pipes under Slocum Trail crossing Big Branch in Pender County, NC				
Personnel	$24,000	$24,000	-	-
Fringe	-	-	-	-
Travel	$500	$500	-	-
Contractual	$ 130,000	$130,000	-	-
Supplies	-	-	-	-
Other	-	-	-	-
Phase Total	**$154,500**	**$154,500**	-	-
Site BR-202				
Replace existing 1 @ 48" reinforced concrete pipe with 1 @ 60" Reinforced Concrete Pipe under NC 210 crossing an upper tributary to Deer Valley Branch in Pender County, NC				
Personnel	$24,000	$24,000	-	-
Fringe	-	-	-	-
Travel	$500	$500	-	-
Contractual	$520,000	$520,000	-	-
Supplies	-	-	-	-
Other	-	-	-	-
Phase Total	**$544,500**	**$544,500**	-	-
Project Total	**$2,522,500**	**$2,522,500**	-	-

5. Outreach and Education

a) Stakeholder Support

Stakeholders within the Cape Fear River basin have identified as a high priority action the evaluation and improvement (i.e. removal and/or modification) of stream crossing structures (i.e. culverts) and dams in focal watersheds of the Cape Fear River basin, including the Black River watershed. Through this partnership came the development of the Five-Year Implementation Plan. A goal of the 5-Year Implementation Plan is to restore access to historic migratory fish habitat. A target of that goal is to have at least five obstructions on tributaries be removed or modified. As a result of collaboration within the Cape Fear River Partnership and its Dam Removal Subgroup, this proposed Project was developed in coordination with CFRCD, SARP, and M&N to target up to five of the most severe barriers for removal or modification. The funding of this Project would meet the goals of the Cape Fear River Partnership and Five-Year Implementation Plan.

b) Inclusive Planning and Engagement

Community involvement has been an integral part of the Project. Two public information meetings were held on February 12, 2019, in Bladen and Pender County, to inform the

communities of the barrier assessment results, as supported by SARP's Barrier Prioritization Tool. Comments received from residents helped to prioritize specific areas most in need of surveying due to high frequency of flooding, overtopping of critical transportation routes, flood inundation from previous hurricanes, that led to the selection of the five barriers to be replaced in this funding proposal.

CFRCD will coordinate and invite project partners including SARP, NCDOT, Pender and Bladen County staff, the Board of CFRC&D, and M&N to present the activities, outcomes, and goals of the project in public information meetings.

c) Community Outreach and Education

CFRCD, M&N, and SARP have previously presented the Project at technical conferences, Cape Fear River Partnership quarterly meetings, and NC Aquatic Connectivity Team meetings (NCACT). These community outreach and education efforts will continue throughout the project timeframe (2023 – 2026) and will allow CFRCD and partners to share project experiences, lessons, and restoration plans in communications, marketing, and technical conferences. As each barrier is replaced, CFRCD will continue to promote and transfer barrier assessment concepts and lessons that are replicable in other Southern Atlantic coastal communities through engagement with the Coastal Resilience Community of Practice, led by the NC Division of Coastal Management.

Specific community outreach and education deliverables includes the following:

a. Participate and facilitate two public information meetings. Provide regular progress updates on CFRCD website (https://www.capefearrcd.org/aquatic-activity-project) and Cape Fear River Partnership website (Cape Fear River Partnership - Working to Restore the Cape Fear River).

b. Present project results at two Annual Resource Conservation & Development Meetings.

c. Engage up to ten local and state elected officials, including County Commissioners, on the results, outcome, and benefits of barrier replacements.

d. Present project results at a quarterly Cape Fear River Partnership meeting and engage fifteen state and federal resource agencies and stakeholders.

e. Present project results at two NC Aquatic Connectivity Team meetings in coordination with SARP.

f. Develop a Storymap to share project information with the community and stakeholders.

g. Attend and present project results at one technical conference.