Revised Programmatic Biological/Conference Opinion

Bridge and Culvert Replacements/Repairs/Rehabilitations in Eastern North Carolina, NCDOT Divisions 1-8

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APPENDIX B: PROTOCOL FLOWCHARTS

CONSULTATION/CONFERENCE HISTORY

This section lists key events and correspondence during the course of this consultation/ conference. A complete administrative record of this consultation/conference is on file in the U.S. Fish and Wildlife Service's (Service) Raleigh Field Office.

2017-04-24 – The Service met with the North Carolina Department of Transportation (NCDOT), Federal Highway Administration (FHWA), and U.S. Army Corps of Engineers (USACE) to discuss the development of a programmatic approach to consultation.

2017-06-15 – The Service met with the NCDOT, FHWA, USACE, North Carolina Wildlife Resources Commission (NCWRC), and RK&K to discuss the programmatic approach to consultation.

2017-10-12 – The Service met with NCDOT and RK&K to discuss the development of a draft Biological Assessment (BA).

2017-12-26 – The Service provided comments on a draft BA.

2018-01-30 – The Service provided comments on a revised draft BA.

2018-02-13 – The Service met with NCDOT, FHWA, USACE, NCWRC, and RK&K to finalize the programmatic approach and discuss the draft BA.

2018-03-07 – The Service provided comments on a revised draft BA.

2018-03-30 – The Service received the final BA and a letter from the FHWA and USACE requesting initiation of formal Section 7 consultation for Dwarf Wedgemussel and Tar River Spinymussel and formal Section 7 conference for Yellow Lance.

2018-04-03 – The Yellow Lance was listed as a federally threatened species.

2018-04-11 – The Service provided a letter to FHWA and USACE stating that all information required for initiation of formal consultation was either included with their 2018-03-30 letter or was otherwise available.

2018-05-01 – The Service provided the FHWA, USACE, and NCDOT with a draft Biological Opinion.

2018-06-13 – The Service provided the FHWA, USACE, and NCDOT with a final Biological Opinion.

2018-10-11 – The Service proposed listing the Atlantic Pigtoe as a threatened species with critical habitat.

2019-03-08 – The Service met with NCDOT, FHWA, NCWRC, and RK&K to discuss initiating formal Section 7 conference for the proposed threatened Atlantic Pigtoe and proposed critical habitat.

2019-03-25 – The Service provided comments on a draft addendum to the BA.

2019-06-03 – The Service received the final addendum to the BA and a letter from the FHWA and USACE requesting initiation of formal Section 7 conference for Atlantic Pigtoe.

2019-07-08 – The Service provided a letter to FHWA and USACE stating that all information required for initiation of formal conference was either included with their 2019-05-00 letter or was otherwise available.

2019-07-22 – The Service provided the FHWA, USACE, and NCDOT with a draft revised Biological/Conference Opinion.

PROGRAMMATIC BIOLOGICAL/CONFERENCE OPINION

1. INTRODUCTION

A Biological Opinion (BO) is the document that states the opinion of the U.S. Fish and Wildlife Service (Service) under the Endangered Species Act of 1973, as amended (ESA), as to whether a Federal action is likely to:

- jeopardize the continued existence of species listed as endangered or threatened; or
- result in the destruction or adverse modification of designated critical habitat.

A Conference Opinion (CO) is equivalent to a BO, but addresses species that are not yet listed under the ESA and/or proposed critical habitats not yet designated. Therefore, the ESA prohibitions against jeopardizing species, destroying critical habitat, and taking animals do not yet apply. The Service may adopt a CO as a BO if and when the evaluated species/critical habitat are listed/designated and while the action agency's discretion and involvement in the action continue.

A Programmatic Biological/Conference Opinion (PBO) addresses multiple actions on a program and/or regional basis, thus achieving efficiencies in the process. The federal actions addressed in this PBO are bridge and culvert replacement/repair/rehabilitation projects implemented by the North Carolina Department of Transportation (NCDOT) in eastern North Carolina (NCDOT Divisions 1-8). For bridge and culvert projects that are federally funded, the Federal Highway Administration (FHWA) serves as the lead federal action agency. For bridge and culvert projects that are not federally funded, the U.S. Army Corps of Engineers (USACE) generally serves as the lead federal action agency when a Clean Water Act Section 404 permit is required. For the purposes of this PBO, these individual projects shall be collectively referred to as the Action. The FHWA and USACE have jointly initiated formal ESA Section 7 consultation/conference. This PBO only considers the effects of the Action on Dwarf Wedgemussel, Tar River Spinymussel, Yellow Lance, Atlantic Pigtoe, and proposed critical habitat for Atlantic Pigtoe. All other species must be evaluated independently.

In addition to individual projects programmatically addressed through formal Section 7 consultation/conference, the programmatic scope of the Action also includes individual projects which may affect, but are not likely to adversely affect (MA-NLAA) the Dwarf Wedgemussel, Tar River Spinymussel, Yellow Lance, Atlantic Pigtoe, and proposed critical habitat for Atlantic Pigtoe. Section 3 of this PBO provides advance Service concurrence with MA-NLAA biological conclusions that are consistent with protocols defined in Section 2.7 and graphically depicted in flowcharts in Appendices B1-B3.

A PBO evaluates the effects of a federal action along with those resulting from interrelated and interdependent actions, and from non-federal actions unrelated to the proposed Action (cumulative effects), relative to the status of listed/proposed species and the status of designated critical habitat. A Service opinion that concludes a proposed federal action is *not* likely to jeopardize species and is *not* likely to destroy or adversely modify critical habitat fulfills the federal agency's responsibilities under Section 7(a)(2) of the ESA.

"*Jeopardize the continued existence*" means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR §402.02). "*Destruction or adverse modification*" means a direct or indirect alteration that appreciably diminishes the value of designated critical habitat for the conservation of a listed species. Such alterations may include, but are not limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features (50 CFR §402.02). The Action assessed in this PBO does not affect designated critical habitat; therefore, this PBO does not further address critical habitat.

This PBO uses hierarchical numeric section headings. Primary (level-1) sections are labeled sequentially with a single digit (e.g., 2. PROPOSED ACTION). Secondary (level-2) sections within each primary section are labeled with two digits (e.g., 2.1. Action Area), and so on for level-3 sections. The basis of our opinion for each listed/proposed species identified in the first paragraph of this introduction is wholly contained in a separate level-1 section that addresses its status, environmental baseline, effects of the Action, cumulative effects, and conclusion.

2. PROPOSED ACTION

The Action includes the replacement of existing bridges, the repair and/or rehabilitation of existing bridges, the replacement or extension of existing culverts/pipes, and the bridge and culvert portions of highway widening projects within NCDOT Divisions 1-8 for a period of ten years (beginning in May 2018). For the purposes of this PBO, pipes are considered as culverts. Some of the individual projects are listed in the current State Transportation Improvement Program (STIP, NCDOT 2018). However, the STIP is a 10-year planning document which is revised every two years; therefore, the exact number of bridge replacements may fluctuate as revisions occur and priorities change. In addition to the STIP, some bridge and culvert projects occur at the NCDOT Division level. Division level projects typically have a shorter planning horizon of approximately three years. Therefore, to obtain the approximate total number of projects to be covered at the Division level over ten years, extrapolation from the current known number is necessary. Currently, it is estimated that 300 individual projects may have adverse effects on one or more of the four federally listed/proposed species addressed in this PBO. However, due to fluctuations in the STIP and uncertainty in extrapolation for Division level projects, an extra 10% is conservatively added for a total of 330 projects assumed. The Action will be evaluated here in four components: 1) in-water work, 2) land-based work, 3) post-construction activities, and 4) conservation measures. Given the programmatic nature of the evaluation, each component will be described in general terms with a list of standard activities. However, each individual bridge or culvert project will not utilize all activities listed.

2.1. Programmatic Action Area

For purposes of consultation/conference under ESA Section 7, the action area is defined as "all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action" (50 CFR §402.02). For an individual bridge or culvert project, the action area generally includes the limits of construction of the structure, the approach road, and any area receiving runoff from the construction activity, including the receiving stream extending over the distance potential discernible sedimentation effects are assumed to occur. For most bridge or culvert projects, sedimentation effects are presumed to extend no more than 400 meters (1/4 mile) downstream, although very large projects may exceed this presumed limit.

Since this PBO collectively evaluates a large number of individual projects, the action area for this PBO includes all the locations of individual bridge and culvert projects within NCDOT Divisions 1-8 (Figure 2.1) and is hereafter referred to as the Programmatic Action Area. The Programmatic Action Area occurs within the easternmost 59 counties of North Carolina, which encompass all of the Service's Raleigh Field Office work area.

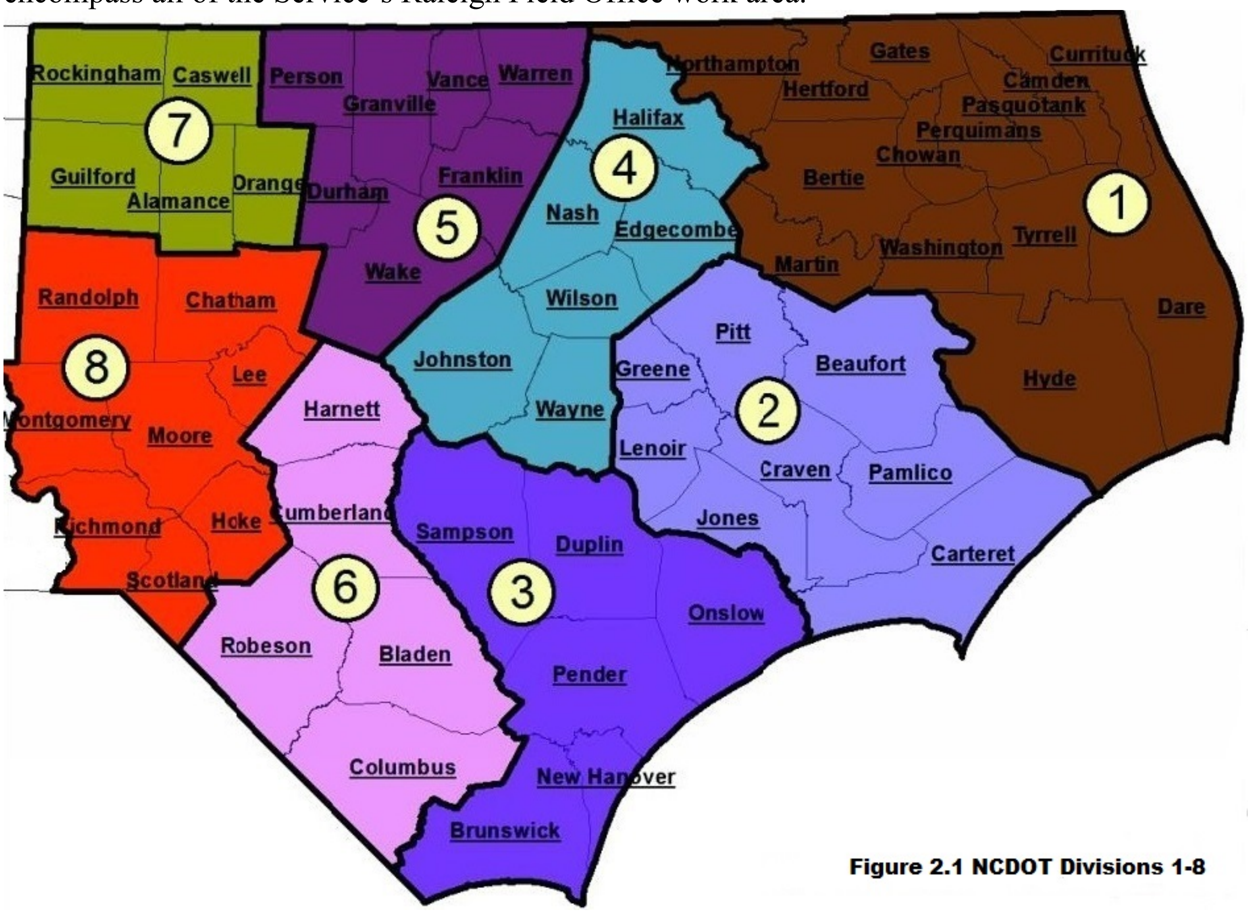


Figure 2.1 NCDOT Divisions 1-8

2.2. In-Water Work

Most bridge replacements take less than nine months to complete, but the smallest bridges can be completed in as little as three to six months. Culvert replacements are typically even shorter in duration. Installation of new bridges may require the installation of an on-site detour bridge when the new bridge is to be constructed on the same alignment as the existing bridge. However, off-site detours are generally utilized when practical. Some replacement bridges are built adjacent to the existing bridge while traffic is maintained on the old bridge. Occasionally, half of the new bridge is constructed adjacent to the old bridge and acts as the detour bridge while the original bridge is removed.

Foundations are required elements of every bridge construction. Bridge foundations consist of three general types: 1) drilled shafts, 2) columns on spread footings, and 3) driven piles with pile-supported caps or walls. Driven piles can be used to support temporary structures such as detour bridges and work bridges and can be used to provide additional support to spread footings.

In-water work may take place during many activities associated with bridge construction, including superstructure construction when a temporary in-stream work pad may be necessary to stage a crane to set girders or other parts of the superstructure. Best Management Practices (BMPs) are used to protect water quality during in-water work (NCDOT 2003, NCDOT 2014a, NCDOT 2015).

Bridge and culvert construction can include the following in-water activities:

- barge use - anchor spud installation, mooring, operation, stage equipment
- temporary work trestle/platform/temporary culvert crossing/detour bridge/causeway construction and removal
    - impact/vibratory pile driving
    - deck installation
    - removal of piles (vibratory hammer, direct pull, etc.)
    - placement and removal of riprap
    - drilled shaft installation
- bridge/culvert demolition and removal
    - work area isolation (cofferdam installation, impact/vibratory pile driving, dewatering via installation of jersey barriers, clean stone with impervious fabric, sand bags, etc.)
    - remove piles, footings, piers, bridge decking, rail bed, etc. (vibratory pile driver, clamshell bucket, containment boom)
    - wire saw concrete cutting, crane use
    - hoe ram use, debris containment, excavation
- substructure construction (piers, shafts, shaft caps, footings, abutments, foundations)
    - work area isolation (cofferdam installation, impact/vibratory pile driving, dewatering via installation of jersey barriers, clean stone with impervious fabric, sand bags, etc.)
    - drilled shaft construction (auger drills hole within casing) or impact pile driving
    - install casing, rebar
    - pour concrete
    - spread footing construction
    - riprap installation
    - bank stabilization
- culvert construction or placement
    - work area isolation (cofferdam installation, impact/vibratory pile driving, dewatering via installation of jersey barriers, clean stone with impervious fabric, sand bags, etc.)
    - stream diversion (excavated temporary channel, diversion pipe, temporary culvert, or through another barrel of the culvert)

- channel excavation or reshaping
- placement of pre-fabricated structure
- construction in-place (including headwalls and wingwalls)
- bank stabilization
- armoring channel
- restoring flow

2.3. Land-Based Work

Although some of the activities associated with the removal of an old bridge and construction of a new bridge may require in-water work, some activities such as the excavation and removal of abutments and land-based bents and the construction of new abutments and land-based bents may be completed entirely on land. For existing bridges with no bents in the water, all of the replacement activities will usually be completed entirely on land. In areas where excavation of old bridge components has occurred, riprap is typically placed to stabilize the stream banks or other areas at risk of scour.

All of the activities described below are typically associated with site preparation and/or staging areas. Staging areas are places where equipment, a temporary field office, and materials are temporarily stored or located in preparation for their use during construction. These areas are typically located within or adjacent to the construction site.

<u>Tree Clearing and Grubbing</u>
Clearing of trees and other vegetation will be performed to prepare the project area for construction activities. Clearing generally takes place within pre-marked areas necessary for construction purposes. Clearing consists of cutting and removing above-ground vegetation such as brush and trees; removing downed timber and other vegetative debris; and salvaging marketable timber. Grubbing will follow clearing operations to remove any remaining surface vegetation, roots, and buried debris.

Trees, stumps, and large roots will be removed from excavation areas to a depth sufficient to prevent such undesirable material from becoming mixed with the material being incorporated in the embankment. All extraneous matter will be removed and disposed of in fill or designated waste areas on or off-site by chipping, burying, or other methods of disposal, including burning. Various methods and equipment will be used for this work.

Clearing and grubbing takes place within right-of-way (ROW) limits, but may also occur in utility easements and in temporary construction easements used to store construction vehicles and supplies (erosion control materials, steel rebar and mesh, small diameter culverts, traffic signs and posts, office trailers, etc.).

<u>Earthwork</u>
Earthwork is all earth moving activities that occur for bridge or culvert removal and construction, including associated activities such as preparation of staging areas, bridge approaches, alignments, embankments, fills, backfills, foundations, toe trenches, waste areas, borrow areas, temporary access road construction, utility relocation, stormwater treatment, ditch

construction and stabilization, streambank stabilization, landscaping, and mitigation. Specific earthwork practices can include excavating (cutting), filling, ditching, backfilling, grading, embankment construction, augering, disking, ripping, grading, leveling, and borrowing and wasting of materials. Typical earthmoving equipment used includes haul trucks, dozers, excavators, scrapers, backhoes, and tractors.

Installation of Erosion and Sediment Control BMPs

This work includes the installation of erosion control devices such as silt fences, check dams, sediment basins, coir fiber matting, and temporary seeding (NCDOT 2003, NCDOT 2014a, NCDOT 2015).

2.4. Post-Construction Activities

In addition to temporary BMPs used during construction, NCDOT implements a post-construction stormwater program in accordance with their National Pollutant Discharge Elimination System (NPDES) permit. Post-construction structural BMPs are permanent controls that treat stormwater runoff from stabilized drainage areas to protect water quality, reduce pollutant loading, and minimize post-construction impacts to water quality (NCDOT 2014b). Because post-construction BMPs are permanent, they require a long-term maintenance commitment to function as designed.

Other post-construction activities include the following sub-activities:

- temporary BMP removal (silt fencing, check dams, sediment basin)
- fence installation (if required)
- landscaping/beautification/site stabilization
- reforestation

2.5. Conservation Measures

An in-lieu fee program has been developed for this programmatic consultation/conference (see Section 2.7). For individual bridge or culvert projects that may affect, and are likely to adversely affect (MA-LAA) one or more listed mussel species, the NCDOT will remit $25,000 for each bridge project and $10,000 for each culvert (including pipe structures $\geq$72 inches) project to the N.C. Nongame Aquatic Species Fund. Pipe structures <72 inches do not require payment into the Fund.

For all individual projects covered in this PBO that may affect (both MA-NLAA and MA-LAA) federally listed/proposed mussel species, Design Standards in Sensitive Watersheds [15A NCAC 04B.0124 (b) – (e)] will be incorporated into the plans. Design Standards in Sensitive Watersheds are erosion control measures that exceed the standard BMPs (e.g. measures are designed to provide protection from runoff of 25-year storm event). *Environmentally Sensitive Areas* shall also be designated and defined as a 50-foot buffer zone within the right-of-way (and any easements required for construction) on both sides of the stream measured from top of streambank. Within *Environmentally Sensitive Areas* the following shall apply:

- The contractor may perform clearing operations but not grubbing operations until immediately prior to beginning grading operations.

- Once grading operations begin in identified *Environmentally Sensitive Areas*, work shall progress in a continuous manner until complete.
- Erosion control devices shall be installed immediately following the clearing operation.
- Seeding and mulching shall be performed on the areas disturbed by construction immediately following final grade establishment.
- Seeding and mulching shall be done in stages on cut and fill slopes that are greater than 20 feet in height measured along the slope or greater than two acres in area, whichever is less.

The following commitments will apply to all bridge and culvert projects covered in this PBO which may affect (both MA-NLAA and MA-LAA) federally listed/proposed mussels:

- Offsite detours will be utilized to the maximum extent practicable.
- No heavy equipment will be placed in the streams.
- BMPs for bridge demolition and removal will be implemented (NCDOT 2003, NCDOT 2014a, NCDOT 2015, or newer).
- Bridges will be removed from the top down, first removing the asphalt with containment measures in place to prevent asphalt from dropping into the stream. The method of containment will be proposed by the contractor and approved by the project engineer. This will be followed by removal of the decking, girders, and finally the piles/shafts/columns.
- No new bents will be placed in the channel (unless justification is provided and then accepted by the Service).
- Existing abutments will be completely removed unless removal would result in destabilization of banks or increase adverse effects to listed/proposed mussels.
- Deck drains will not be allowed to discharge directly into the stream.
- Special sediment control fence (NCDOT Standard No. 1606.01) or a combination of special sediment control fence and standard silt fence will be installed between the top of the stream bank and bridge embankment. Once the disturbed areas of the project draining to these areas have been stabilized, the special sediment control fence and/or silt fence and all built up sediment adjacent to these devices will be removed to natural ground and stabilized with a native grass mix.
- All appropriate sedimentation and erosion control measures, throughout the project limits, will be maintained to ensure proper function following NCDOT Erosion and Sediment Control Design and Construction Manual and NCDOT Best Management Practices for Construction and Maintenance Activities.
- Coir fiber matting or clean riprap (underlain with geotextile) will be installed on the footprint of unclassified structure excavation near the streambanks.
- Embankment construction and grading shall be managed in such a manner as to prevent surface runoff/drainage from discharging untreated into the riparian buffer. All interim surfaces will be graded to drain to temporary erosion control devices. Temporary berms, ditches, etc. will be incorporated, as necessary, to treat runoff before discharging into the riparian buffer (as specified in NCDOT BMP manuals).

All sedimentation and erosion control measures will be appropriately maintained following NCDOT standards to ensure proper function of the measures. The NCDOT adheres to the permit conditions of General Permit NCG 010000 to Discharge Stormwater under the National Pollutant

Discharge Elimination System for Construction Activities. NCDOT is required to "select, install, implement and maintain best management practices (BMPs) and control measures that minimize pollutants in the discharge to meet the requirements of this permit." Among other conditions, the permit requires: 1) all erosion and sedimentation control measures must be inspected at least once every seven calendar days and 2) within 24 hours after any storm event of greater than 1.0 inch of rain per 24 hour period. It is understood that these requirements and implementation of other appropriate BMPs are monitored through multiple layers of oversight. At a minimum, the following personnel monitor erosion control measures:

- Contractor project manager
- NCDOT Division Environmental Officers and Environmental Specialists
- NCDOT Roadside Environmental Field Operations staff

2.6. Interrelated and Interdependent Actions

For purposes of consultation/conference under ESA Section 7, the effects of a federal action on listed/proposed species or critical habitat include the direct and indirect effects of the action, plus the effects of interrelated or interdependent actions. "Indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration" (50 CFR §402.02).

Utility Relocation
Utility relocation necessitated by a bridge or culvert project may involve both above and below-ground work, including tree clearing, mowing, and horizontal (directional) boring of a stream. In very rare circumstances (e.g. when a rock formation precludes directional boring), open trenching may occur.

Offsite Use Areas
Waste and borrow areas are used to dispose of and obtain materials for earthwork. Such sites are also subject to clearing and grubbing. As per NCDOT policy, each contractor is responsible for addressing federally listed/proposed threatened and endangered species issues at waste and borrow areas that occur offsite from the construction site.

2.7. Programmatic Methodology

The Action evaluated in this PBO includes the replacement of existing bridges, the repair and/or rehabilitation of existing bridges, the replacement or extension of existing culverts/pipes, and the bridge and culvert portions of highway widening projects within NCDOT Divisions 1-8 for a period of ten years (beginning in May 2018). For purposes of this PBO, pipes are considered as culverts. Projects that involve replacing an existing bridge with a culvert in areas which are likely to adversely affect federally listed/proposed mussel species are excluded from this consultation/conference (see Appendix B3). Furthermore, bridge replacements on streams that cannot be spanned with up to a single 120-foot permanent span will require additional review and may require a separate consultation/conference. Widening projects that run closely parallel to streams occupied by listed/proposed mussel species may not qualify to use this PBO. If questions arise as to the applicability of the PBO for a specific project, NCDOT will request guidance from the Service as to the project's eligibility. The Service will respond to such requests within 30 days. Also, road widening projects with bridge/culvert components that also include a new location road component are excluded from this PBO unless the new location portion does not cross any streams which may affect listed/proposed mussels.

This programmatic methodology assumes suitable habitat is present. If no suitable habitat is present, the appropriate biological conclusion is "no effect" and no further evaluation is needed. This programmatic process is an optional process and does not preclude individual project review if that is in the interest of the FHWA and USACE.

If the above criteria are met, the project may be evaluated using one of the three protocols described below. These protocols are intended to flow in a step-by-step manner as depicted by the flowcharts in Appendices B1-B3. Integral to these protocols are the following terms:

IPaC – The Service's Information for Planning and Consultation project planning tool found at https://ecos.fws.gov/ipac/. IPaC uses a 10 digit Hydrological Unit Code (HUC).

Identified Stream Reach – The North Carolina Natural Heritage Program maintains a list of Element Occurrences for all federally listed/proposed mussel species with GIS layers depicting the list. This information has been modified by the Service to provide shapefiles depicting the distribution of these species. These shapefiles have been provided to NCDOT. As updates occur, the revisions will also be provided to NCDOT.

In-Lieu Fee (ILF) Program – a compensatory mitigation program where monetary payments are remitted to a fund for conservation. All ILF payments will go to and be administered by the N.C. Nongame Aquatic Species Fund. These funds will be used for the conservation and recovery of federally listed mussel species (see Section 4.3.4 for examples and benefits of the ILF program). A multi-agency/organization group of mussel species experts will determine how to expend the funds. For individual bridge or culvert projects that may affect, and are likely to adversely affect (MA-LAA) one or more listed mussel species, the NCDOT will remit $25,000 for each bridge and $10,000 for each culvert (including pipe structures ≥ 72 inches in diameter). Pipe structures < 72 inches in diameter do not require payment, but other conservation measures apply.

For purposes of this PBO, the procedure for NCDOT will be to go to the IPaC webpage (https://ecos.fws.gov/ipac/) and upload a shapefile of the footprint of the project (or draw the area on the map). A list of federally listed/proposed mussel species for that area will be returned. If one or more of the mussel species addressed in this PBO is identified as potentially being present, then NCDOT will review the **identified stream reaches** for the mussel species. A direct comparison between those **identified stream reaches** should be made with the footprint of the proposed project to determine if the project will intersect an **identified stream reach** or a tributary within 0.25 mile of such. Individual projects will be evaluated using one of the following protocols.

Protocols

Bridge Replacement with Bridge/Repair/Rehabilitation (Appendix B1)

If the project has a federal nexus (federal funding, federal permit, or federal land), then Section 7 applies. If IPaC does not identify listed/proposed mussel species as potentially being present, then there is **No Effect**. If IPaC does identify listed/proposed mussel species as potentially being present, but no in-channel work or no earthwork will occur within 100 feet of the stream bank, then the biological conclusion is **MA-NLAA** (May Affect-Not Likely to Adversely Affect). If there will be in-channel or earthwork within 100 feet of the stream bank and the project intersects an **identified stream reach** or a tributary within 0.25 mile of such, or if the project occurs within designated/proposed critical habitat, then assume presence and **MA-LAA** (May Affect-Likely to Adversely Affect). If the project does not intersect an **identified stream reach** nor is it within designated/proposed critical habitat, then surveys may be conducted or presence assumed. If there is no survey conducted, then presence is assumed and a **MA-LAA** conclusion made. If a survey is conducted, note if listed/proposed species are observed. If so, then the biological conclusion is **MA-LAA**. If listed/proposed species were not observed, then the biological conclusion is **MA-NLAA**. In all cases where a **MA-LAA** biological conclusion is reached, an ILF payment will be paid. In all cases where a **MA-NLAA** biological conclusion is reached, concurrence with that conclusion is automatically provided by the Service (see Section 3).

Culvert Replacement or Extension (Appendix B2)

If the project has a federal nexus (federal funding, federal permit or federal land), then Section 7 applies. If IPaC does not identify listed/proposed mussel species as potentially being present, then there is **No Effect**. If IPaC does identify listed/proposed mussel species as potentially being present and intersects an **identified stream reach** or a tributary within 0.25 mile of such, or if the project occurs within designated/proposed critical habitat, then presence is assumed and a **MA-LAA** biological conclusion is made. If the project does not intersect an **identified stream** reach or is not within designated/proposed critical habitat, then the biological conclusion is **MA-NLAA**. When a **MA-LAA** biological conclusion is reached, an ILF payment will be paid. When a **MA-NLAA** biological conclusion is reached, concurrence with that conclusion is automatically provided by the Service (see Section 3).

Bridge to Culvert Replacement (Appendix B3)

If the project has a federal nexus (federal funding, federal permit, or federal land), then Section 7 applies. If IPaC does not identify listed/proposed mussel species as potentially being present, then there is **No Effect**. If IPaC does identify listed/proposed mussel species as potentially being present and intersects an **identified stream reach** or a tributary within 0.25 mile of such, or if the project occurs within designated/proposed critical habitat, then the programmatic process cannot be used and the Service should be contacted. If the project does not intersect an **identified stream reach** or is not within designated/proposed critical habitat, then a survey is needed. If listed/proposed species are observed, then the programmatic process cannot be used and the Service should be contacted. If no listed/proposed species were observed, then the biological conclusion is **MA-NLAA** and concurrence with that conclusion is automatically provided by the Service (see Section 3).

The aforementioned protocols were negotiated with the NCDOT, FHWA, and USACE. The NCDOT has affirmed its support of the protocols and regards the option to assume presence of mussel species as “a valuable tool to the Department by providing an avenue for the Section 7 Consultation to be taken off the critical path for project delivery” (Philip Harris, NCDOT Environmental Analysis Unit Head, personal email communication, May 11, 2018).

3. CONCURRENCE

In addition to individual projects programmatically addressed in this PBO, the programmatic scope of the Action also includes individual projects which may affect, but are not likely to adversely affect (MA-NLAA) the Dwarf Wedgemussel, Tar River Spinymussel, Yellow Lance, and Atlantic Pigtoe. This PBO provides advance Service concurrence with MA-NLAA conclusions that are consistent with the protocols defined in Section 2.7 and graphically depicted as flowcharts in Appendices B1-B3. The NCDOT, FHWA, and USACE are not required to provide any notification to the Service for such projects with the exception that NCDOT will annually report the number of projects utilizing this automatic advance concurrence (see Section 9.4). Except for exceeding the amount or extent of incidental take, the circumstances described in Section 11 of this PBO that require reinitiating consultation for the Action also apply.

4. DWARF WEDGEMUSSEL

4.1. Status of Dwarf Wedgemussel

This section summarizes the best available data about the biology and current condition of the Dwarf Wedgemussel (DWM, *Alasmidonta heterodon*) throughout its range that are relevant to formulating an opinion about the Action. The Service published its decision to list DWM as endangered on March 14, 1990 (55 FR 9447- 9451).

4.1.1. Description of DWM

The DWM is a small bivalve, rarely exceeding 45 mm in length. Clean young shells are usually greenish-brown with green rays. As it ages, the shell color becomes obscured by diatoms or mineral deposits and appears black or brown. The shell is thin but does thicken somewhat with age, especially toward the anterior end. The anterior end is rounded while the posterior end is angular forming a point near the posterio-ventral margin (USFWS 2017a).

4.1.2. Life History of DWM

The DWM occurs in small creeks to deep rivers in stable habitat with substrates ranging from mixed sand, pebble and gravel, to clay and silty sand. In the southern portion of its range, it is often found buried under logs or root mats in shallow water (USFWS 1993); whereas in the northern portion of its range, it may be found in firm substrates of mixed sand, gravel or cobble, or embedded in clay banks in water depths of a few inches to greater than 20 feet (Fichtel and Smith 1995, Gabriel 1995 and 1996, Nedeau and Werle 2003, Nedeau 2004a and 2004b, Nedeau 2006).

The DWM's reproductive cycle is typical of other freshwater mussels, requiring a host fish on which its larvae (glochidia) parasitize and metamorphose into juvenile mussels. The following species have been confirmed as host fish for the DWM: Tessellated Darter (*Etheostoma olmstedi*), Johnny Darter (*E. nigrum*), Fantail Darter (*E. flabellare*), Chainback Darter (*Percina nevisense*), Roanoke Darter (*P. roanoka*), Mottled Sculpin (*Cottus bairdi*), Slimy Sculpin (*C. cognatus*), Atlantic Salmon (*Salmo salar*), Pirate Perch (*Aphredoderus sayanus*), Redbreast Sunfish (*Lepomis auritus*), Green Sunfish (*L. cyanellus*), Bluegill (*L. macrochirus*), Bluehead Chub (*Nocomis leptocephalus*), Highfin Shiner (*Notropis altipinnis*), Swallowtail Shiner (*Notropis procne*), White Shiner (*Luxilus albeolus*), and Pinewoods Shiner (*Lythrurus matutinus*) (Michaelson and Neves 1995, White 2007, Levine *et al*. 2011). The DWM is not a long-lived species as compared to other freshwater mussels; life expectancy is estimated at 10 to 12 years (Michaelson and Neves 1995).

4.1.3. Numbers, Reproduction, and Distribution of DWM

The DWM is found in Atlantic Coast drainage streams and rivers of various sizes and moderate current. It currently ranges from New Hampshire to North Carolina. Historically, the DWM range extended north to New Brunswick, Canada. North Carolina's Neuse River Basin tributaries have apparently always represented the southern extent of the range of the species. The DWM has been documented in 16 major drainages (Table 4.1.3), comprising approximately 70 sites. However, at least 45 of these sites are based on less than five individuals or solely on relic shells (USFWS 2007, USFWS 2013).

Viable populations (i.e. containing a sufficient number of reproducing adults to maintain genetic variability and in which annual recruitment is adequate to sustain a stable population, USFWS 1993) in the northeastern United States include the Ashuelot River in New Hampshire and the Flat Brook in New Jersey. The Connecticut River in New Hampshire and Vermont, the Farmington River in Connecticut, Paulins Kill in New Jersey, and the Neversink River in New York may harbor viable populations, but more survey work is needed (USFWS 2013). Because of the qualitative survey methods used to assess the populations, it is not possible to estimate the number of individuals in these populations at this time. However, recent surveys indicate that DWM numbers may be declining at some locations in the Connecticut River and Ashuelot River (Biodrawversity LLC 2013, Biodrawversity LLC et al. 2014).

Although remaining populations from New Jersey south to North Carolina are much smaller, the Upper Tar River and Upper Fishing Creek in North Carolina are thought to harbor viable populations. Other populations in North Carolina, Virginia, and Maryland appear to be declining as evidenced by low densities, lack of reproduction, or inability to relocate any DWM in follow-up surveys (USFWS 2013). The DWM population in Swift Creek appears viable (Three Oaks 2016) but with a high risk of local extirpation due to low population abundance and lack of dispersal (Smith et al. 2015).

Table 4.1.3 DWM major drainages.

State	Major Drainage	County
NH	Upper Connecticut River	Coos, Grafton, Sullivan, Cheshire
VT	Upper Connecticut River	Essex, Orange, Windsor, Windham
MA	Middle Connecticut River	Hampshire, Hampden
CT	Lower Connecticut River	Hartford
NY	Housatonic River	Dutchess
NY	Middle Delaware	Orange, Sullivan, Delaware
NJ	Middle Delaware	Warren, Sussex
PA	Upper Delaware River	Wayne
MD	Choptank River	Queen Anne's, Caroline
MD	Lower Potomac River	St. Mary's, Charles
MD	Upper Chesapeake Bay	Queen Anne's
VA	Middle Potomac River	Stafford
VA	York River	Louisa, Spotsylvania
VA	Chowan River	Sussex, Nottoway, Lunenburg
NC	Upper Tar River	Granville, Vance, Franklin, Nash
NC	Upper Fishing Creek	Warren, Franklin, Nash, Halifax
NC	Upper Contentnea Creek	Wilson, Nash, Johnston
NC	Upper Neuse River (including Swift Creek)	Johnston, Wake, Orange

* The 16 major drainages identified in Table 4.1.3 do not necessarily correspond to the original drainages identified in the Recovery Plan (USFWS 1993), although there is considerable overlap.

4.1.4. Conservation Needs of and Threats to DWM

Human activity has significantly degraded DWM habitat causing a general decline in populations and a reduction in distribution of the species. Some factors responsible for the decline of the DWM include: 1) impoundment of river systems, 2) pollution, 3) alteration of riverbanks, 4) siltation, and 5) extreme weather events (e.g. floods and drought) (USFWS 1993, USFWS 2013).

Damming and channelization of rivers throughout the DWM's range have resulted in the elimination or alteration of much mussel habitat (Watters 2001). Domestic and industrial pollution was the primary cause for mussel extirpation at many historical sites. Mussels are known to be sensitive to a variety of heavy metals, inorganic salts, and ammonia (Wang et al. 2017). Mussel die-offs have been attributed to chemical spills, agricultural waste run-off, and low dissolved oxygen levels.

Because freshwater mussels are relatively sedentary and cannot move quickly or for long distances, they cannot easily escape when silt is deposited over their habitat. Siltation has been documented to be extremely detrimental to mussel populations by degrading substrate and water quality, increasing exposure to other pollutants, and by direct smothering of mussels (Ellis 1936, Marking and Bills 1980). In Massachusetts, a bridge construction project decimated a population of DWM by accelerated sedimentation and erosion (Smith 1981).

Extreme weather events like flooding and drought have had an impact on DWM. Surveys in 2006 indicated that the DWM population in the Neversink River (formerly one of the most robust populations of DWM) was adversely affected by flood events, and it remains to be seen if this population can rebound. Drought also appears to have adverse effects on DWM populations. This is evident in the upper Tar River watershed in North Carolina, where severe population declines followed a substantial drought in 2007 (USFWS 2013).

Most DWM populations are small and geographically isolated from each other. This isolation restricts exchange of genetic material among populations and reduces genetic variability within populations (USFWS 1993). Recent studies investigating the range-wide phylogeographic structure of DWM indicate that the low degree (or absence) of gene flow between and within drainages suggests that individual host fish do not move between drainages, nor do they exhibit effective movement (resulting in gene flow) within drainages (USFWS 2013).

4.2. Environmental Baseline for DWM

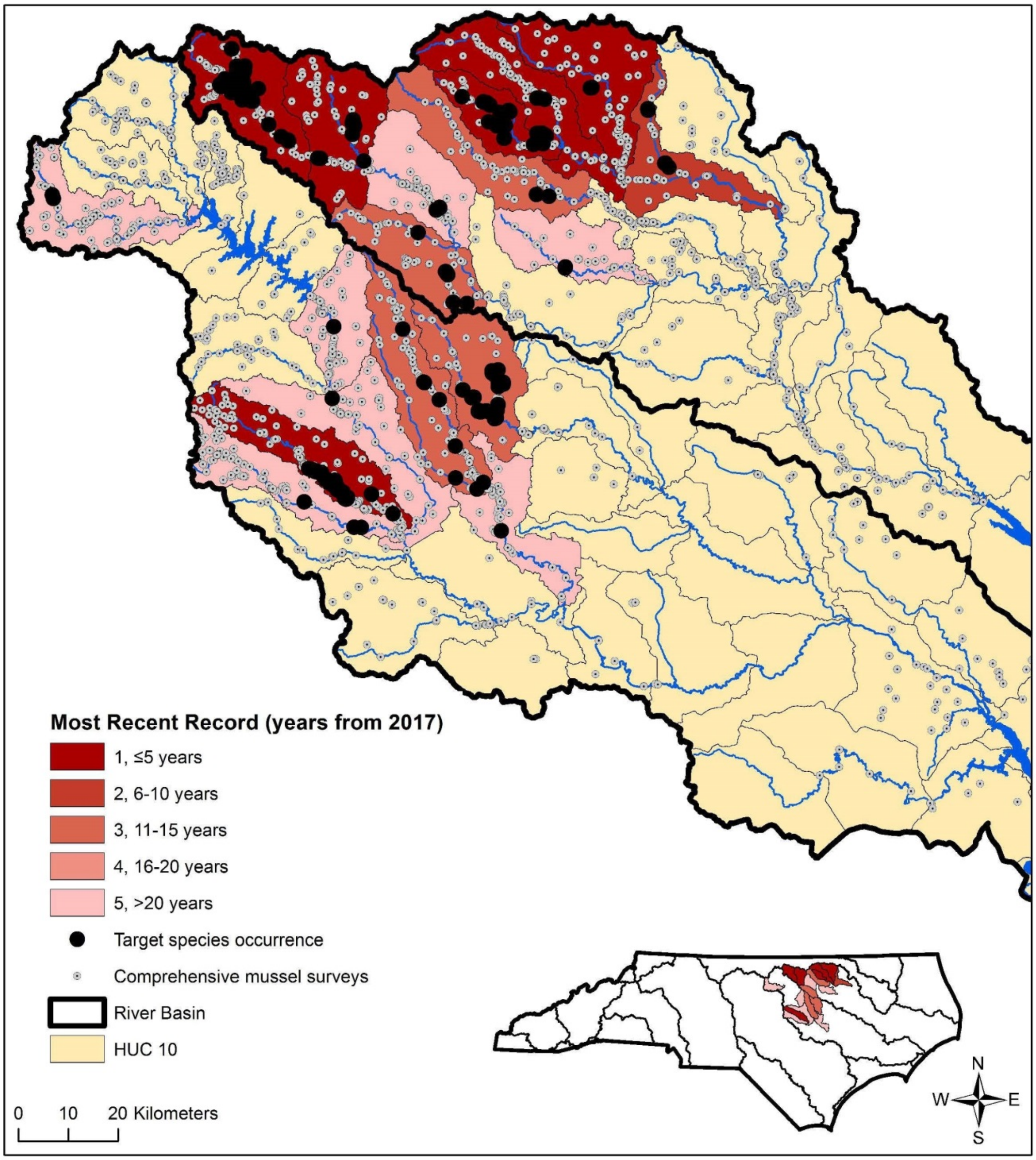
This section is an analysis of the effects of past and ongoing human and natural factors leading to the current status of the DWM, its habitat, and ecosystem within the Programmatic Action Area. The environmental baseline is a "snapshot" of the species' condition in the Programmatic Action Area at the time of the consultation, and does not include the effects of the Action under review.

4.2.1. Action Area Numbers, Reproduction, and Distribution of DWM

Populations of DWM exist in the Tar River Basin and the Neuse River Basin (Figure 4.2.1). The population in the Upper Tar River system is considered to be viable based on recent recruitment, regular occurrence of individuals, and connectivity of occupied tributaries (USFWS 2013). The species has been found in the main-stem of the Tar River as recently as July 2013, in Cub Creek as recently as July 2015, and in Shelton Creek as recently as July 2014. The Fishing Creek drainage within the Tar River Basin supports a viable DWM population with evidence of recruitment and connectivity of tributaries. In Shocco Creek, 18 live individuals and two shells were found between 2009 and 2014 and one live individual was found in 2017. Over 40 live individuals were found in Little Shocco Creek in 2017 (Tyler Black, NCWRC, personal communication, January 2018). Little Shocco Creek is currently considered to be the best population in North Carolina. The species has been observed in Maple Branch since 1997, including one live individual and three shells in 2017 (NCWRC 2018). Two live individuals were discovered at a new location in Ben's Creek in October 2017 (Tom Dickinson, Three Oaks Engineering, personal email communication, October 2017).

Within the Neuse River Basin, DWM is believed to have been extirpated from the Neuse River mainstem. While the species has been documented from several streams (Swift Creek, Middle Creek, Little River, Moccasin Creek, Turkey Creek, Little Creek, White Oak Creek, and Buffalo Creek), Swift Creek is the only stream where DWM have been documented within the last 10 years (Three Oaks 2016). Surveys indicate that the stream miles of occupied habitat have decreased since peak occupancy in Swift Creek. The DWM population in Swift Creek appears viable (Three Oaks 2016) but with a high risk of local extirpation due to low population abundance and lack of dispersal (Smith et al. 2015).

Occurrences by HUC 10 Watershed of the Dwarf Wedgemussel (*Alasmidonta heterodon*) and Survey Locations



Map created by: Tyler Black, Ph.D., 9/5/2017
Data sources: NC Wildlife Resources Commission

Figure 4.2.1

4.2.2. Action Area Conservation Needs of and Threats to DWM

Smith et al. (2015) determined that the most commonly identified factors limiting DWM population growth in the Tar River Basin were beaver-altered habitat coupled with unsuitable flow, unsuitable physical habitat, and Allee effect (high risk of demographic extirpation due to low population abundance and lack of dispersal). In the Neuse River Basin, the most commonly identified factors limiting DWM population growth were unsuitable physical habitat, Allee effect, and contaminants.

North American beaver (*Castor canadensis*) modify lotic habitats and aquatic ecosystem processes through the removal of riparian vegetation and dam building activities (Collen and Gibson 2001). Beaver dams adversely affect mussel survival and may threaten remaining populations of federally endangered mussels in North Carolina (Hoch 2012). Beaver dam activity is prevalent throughout the Programmatic Action Area.

Unsuitable physical habitat within the Programmatic Action Area can arise from several sources including alterations in stream flow, impoundments, urbanization, channel instability, loss of riparian buffers, siltation from land clearing, and even degradation from all-terrain vehicle use within the channel (USFWS 1993, Three Oaks 2016). Periods of drought also lower stream water levels and thus adversely affect mussel habitat (USFWS 2013, Three Oaks 2016). Urbanization and resulting increases in impervious surface are of particular concern in the Swift Creek Watershed of the Neuse River Basin (Three Oaks 2016).

The North Carolina DWM Work Group concluded that population augmentation through captive propagation is an essential component of management strategies to ensure DWM persistence in North Carolina (Smith et al. 2015). This is especially true in streams with small and isolated DWM populations where the Allee effect is one of the major limiting factors of population viability. Though a cooperative program between the North Carolina Wildlife Resources Commission (NCWRC) and North Carolina State University is actively propagating some imperiled mussel species, the current capacity is insufficient to meet the needs.

4.3. Effects of the Action on DWM

This section analyzes the direct and indirect effects of the Action on the DWM, which includes the direct and indirect effects of interrelated and interdependent actions. Direct effects are caused by the Action and occur at the same time and place. Indirect effects are caused by the Action, but are later in time and reasonably certain to occur. Our analyses are organized according to the description of the Action in Section 2 of this PBO. This PBO analyses the potential effects of an estimated 330 individual projects over 10 years collectively addressed as the Action.

4.3.1. Effects of In-Water Work on DWM

The following categories provide a range of potential effects to DWM. Since the estimated 330 individual projects collectively addressed as the Action vary in size, design, and setting, each of the following may or may not apply to any specific project. It is anticipated that most adverse effects will be temporary and non-lethal in nature. However, when viewed programmatically, some lethal effects are expected across the Programmatic Action Area. All potential effects described in this section could affect all life stages of DWM (larval glochidia, juveniles, and adults).

Extraction of Existing In-Water Bridge Bents
Extracting existing in-water bridge bents may disturb silt which can be redeposited downstream into DWM habitat. Siltation can harm mussels by degrading substrate and water quality, by increasing exposure to pollutants, and by direct smothering of mussels (Ellis 1936, Marking and Bills 1980). Furthermore, suspended sediment can interfere with respiration, feeding, or spawning of DWM and their host fish.

Causeways
For larger bridges, the use of one or more causeways (usually constructed of riprap) is sometimes necessary to remove in-water bridge bents or to construct new in-water bents. The placement of the rock can crush mussels or host fish with attached glochidia. Causeway construction may strand DWM or host fish in areas that are dewatered, or congregate them into ponded areas where temperature and dissolved oxygen levels may affect their survival. Host fish may also be disturbed by noise associated with causeway placement, or may have their movements restricted by the presence of the causeway. The removal of causeways may disturb silt which can be redeposited downstream into DWM habitat and potentially harm individual DWM and/or their host fish.

Demolition
Although NCDOT will take measures to contain bridge debris during demolition, there is always the chance that some bridge debris could inadvertently fall into the stream and degrade DWM habitat.

Construction in Channel
The placement of drilled shafts, footings, and piles for permanent bridges, temporary detour bridges, and work bridges could crush mussels. The noise and/or vibrations from the installation of such structures could disturb or alter the movements of DWM host fish. The placement of bridge foundations may disturb silt. However, work areas around in-water bents are isolated from the water column by the use of sheet piling, coffer dams, or other methods, thus greatly minimizing siltation.

Alterations in Flow
The removal of existing bridge bents from the channel may cause minor changes in the stream's flow pattern and velocity, which could be adverse or beneficial. Likewise, the replacement of a smaller culvert with a larger culvert may cause minor changes in the stream's flow pattern and velocity.

Bank Stabilization
In order to protect bridge foundations or reshaped banks at culverts, sometimes a small amount of bank stabilization is required. This is generally accomplished through placement of riprap along the stream banks, which may extend down into the edge of the water. Any DWM present along the water's edge could be crushed.

Culvert Placement or Construction
The removal and construction/placement of culverts requires excavation within the channel, thus producing a potential source of downstream sedimentation. However, work areas around culverts are isolated from the water column by temporarily diverting the flow around the work site, thus greatly minimizing siltation. If culverts are not properly placed or constructed, they can serve as impediments to DWM host fish movements upstream. Additionally, improperly constructed culverts can create stream instability, thus producing a source of long-term siltation. However, NCDOT implements BMPs to minimize such potential effects (NCDOT 2003).

Beneficial Effects
In general, existing bridges with in-water bents are replaced with bridges that completely span the stream channel, or at least reduce the number of bents within the channel. Given that in-water bents can trap debris during high flows and can change stream hydraulics in the immediate vicinity of the structure (causing scour and sediment deposition), the elimination or reduction of in-water bents is expected to reduce bridge effects on stream flow patterns. Also, given that large debris piles must often be removed from in-water bents (creating additional channel disturbance and downstream siltation), the elimination or reduction of in-water bents will thus eliminate or reduce future disturbance from debris removal. Additionally, new bridges are generally longer than the bridges they replace, thus allowing the removal of some fill material within the floodplain. This allows the stream to access more of its floodplain, potentially reducing downstream bank scouring and siltation effects on DWM.

4.3.2. Effects of Land-Based Work on DWM

The greatest construction related concern is prolonged erosion and sediment runoff from construction areas during or after clearing/grubbing, excavation of abutments, and earth moving activities. A major storm event could erode soil from within these disturbed areas and wash it into streams, causing harm by interfering with respiration, feeding, or spawning and otherwise degrading habitat for DWM and their host fish. However, to avoid or minimize potential siltation effects, NCDOT has developed stringent erosion control measures (see Section 2.5) which greatly minimize sediment entering the streams. Assuming the proper installation and maintenance of these erosion control measures and full implementation of all conservation measures, the probability of effects from siltation leading to mortality is low. Except in the most extreme and rare circumstances, it is the Service's experience that the modern erosion control methods employed by NCDOT are effective at minimizing sediment entering a stream. Only in a catastrophic failure of erosion control measures would effects be expected to be lethal. However, given the small size and cryptic nature of DWM, any effects would be difficult to detect and measure. It would not be possible to determine the number of individuals affected, especially for juveniles and glochidia.

Although NCDOT employs BMPs to avoid contaminants from entering streams, there is always the chance of an accidental spill of petrochemicals, uncured concrete, or other toxic substances into a stream. Although such events are rare, they can cause significant harm to mussels (USFWS 2017b).

4.3.3. Effects of Post-Construction Activities on DWM

Since most post-construction activities described in this Action are related to permanent BMPs that are designed to protect water quality and/or to stabilize a construction site, their effects on DWM are expected to be beneficial.

4.3.4. Effects of Conservation Measures on DWM

While most of the conservation measures described in Section 2.5 and 2.7 are designed to minimize adverse effects to federally listed mussels, the ILF program is a substantial and proactive measure that would not only partially offset adverse effects to listed mussels within the Programmatic Action Area, but would be a significant tool in furthering the recovery of the species. All ILF payments will be remitted to the N.C. Nongame Aquatic Species Fund. The pooling of funding will allow the Service and its partners to carry out a more effective and holistic approach to the conservation and recovery of federally listed mussel species. A multi-agency/organization group of mussel species experts will determine how to expend the funds. Potential projects include, but are not limited to, habitat preservation or restoration, mussel propagation to support augmentation (addressing a major conservation need for DWM; Smith et al. 2015) or restoration, survey/monitoring, and research.

4.3.5. Effects of Interrelated and Interdependent Actions on DWM

Utility relocations necessitated by bridge and culvert replacements could provide a potential source of additional, but likely minor (assuming directional boring of stream), sediment input into a stream. However, the use of proper sediment and erosion control measures would greatly minimize this potential. In the rare event that open trenching is utilized, downstream siltation could potentially harm mussels. Offsite use areas such as waste and borrow areas are unlikely to be located adjacent to a stream with federally listed mussel species. However, should a contractor opt to pursue such a location, additional coordination would be required.

4.4. Cumulative Effects on DWM

For purposes of consultation under ESA Section 7, cumulative effects are those caused by future state, tribal, local, or private actions that are reasonably certain to occur in the Action Area. Future federal actions that are unrelated to the proposed action are not considered, because they require separate consultation under Section 7 of the ESA.

We are not aware of any non-federal actions in the Programmatic Action Area that may affect DWM. Therefore, cumulative effects are not relevant to formulating our opinion for the Action.

4.5. Conclusion for DWM

In this section, we summarize and interpret the findings of the previous sections for the DWM (status, baseline, effects, and cumulative effects) relative to the purpose of a PBO under Section 7(a)(2) of the ESA, which is to determine whether a federal action is likely to:

a) jeopardize the continued existence of species listed as endangered or threatened; or

b) result in the destruction or adverse modification of designated critical habitat.

"Jeopardize the continued existence" means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR §402.02).

Relatively larger populations of DWM occur in portions of the northeastern United States. Other populations from New Jersey south to North Carolina are smaller and appear to be declining. Within the Programmatic Action Area, DWM populations exist in the Tar River Basin and the Neuse River Basin (Figure 4.2.1). The population in the Upper Tar River system is considered to be viable based on recent recruitment, regular occurrence of individuals, and connectivity of occupied tributaries (USFWS 2013). The population in the Fishing Creek Sub-basin also appears to currently support a viable population. Within the Neuse River Basin, Swift Creek is the only stream where DWM have been documented within the last 10 years. The DWM population in Swift Creek appears viable (Three Oaks 2016) but with a high risk of local extirpation due to low population abundance and lack of dispersal (Smith et al. 2015).

This PBO collectively analyses the potential effects of an estimated 330 individual bridge and culvert projects referred to as the Action. Each individual project has the potential to adversely affect juvenile or adult DWM by one or more of the following ways: crushing, burying, direct siltation effects on individuals, siltation effects on habitat, or accidental spills of toxic substances. Also, DWM host fish with attached glochidia may be adversely affected in the same ways, but with the additional potential to be disturbed or have their movements restricted. The probability of any one individual project having lethal effects on DWM is low; however, when considered programmatically, lethal effects are expected. Most adverse effects are expected to be temporary and non-lethal in nature. To minimize adverse effects to DWM, NCDOT will implement BMPs and other substantial conservation measures. This includes stringent erosion control measures to minimize sediment entering streams. The ILF program developed for this consultation will provide substantial funding for a more effective and holistic approach to the conservation and recovery of federally listed mussel species within the Programmatic Action Area.

After reviewing the current status of the species, the environmental baseline for the Programmatic Action Area, the effects of the Action and the cumulative effects, it is the Service's biological opinion that the Action is not likely to jeopardize the continued existence of the DWM.

5. TAR RIVER SPINYMUSSEL

5.1. Status of Tar River Spinymussel

This section summarizes the best available data about the biology and current condition of Tar River Spinymussel (TRSM, *Parvaspina steinstansana*) throughout its range that are relevant to formulating an opinion about the Action. The Service published its decision to list TRSM as endangered on July 29, 1985.

5.1.1. Description of TRSM

The TRSM is one of only three freshwater mussels with spines in the world. The brownish shell is rhomboid-shaped, up to 2.4 inches (6 cm) long, with 0-6 spines on each valve. The shell is rather smooth and shiny, with concentric rings, and ends in a blunt point. Younger individuals are orange-brown with greenish rays streaking outward from the hinge area. Adults are darker with less distinct rays. One to three small thin ridges run on the interior surface of the shell from the beak cavity to the lower ventral area of the shell. The anterior half of the shell's inner surface is salmon-colored, while the posterior half is iridescent blue. Juveniles may have up to 12 spines, but adults tend to lose their spines as they mature (USFWS 2017c).

5.1.2. Life History of TRSM

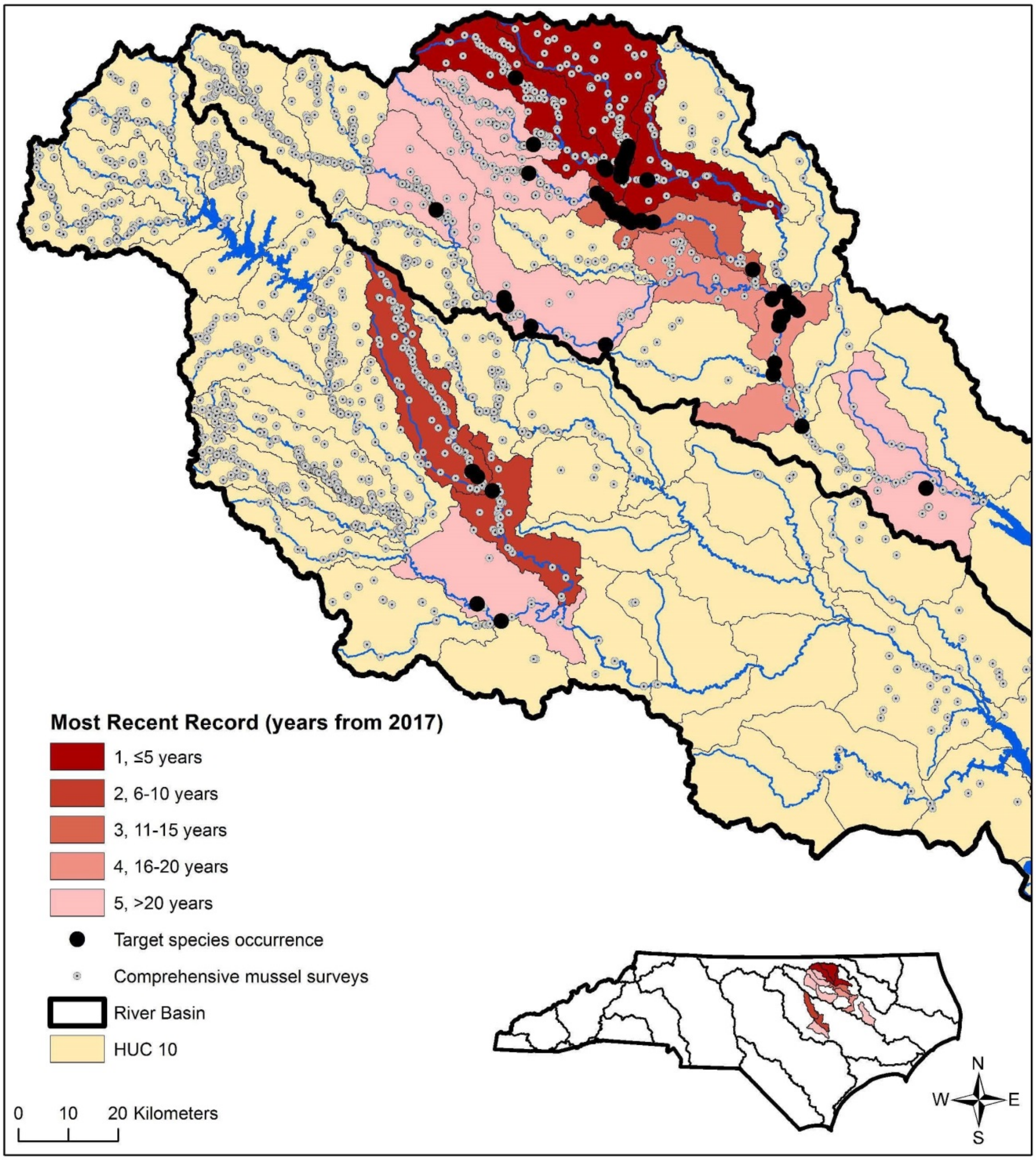
The TRSM lives in relatively silt-free unconsolidated beds of coarse sand and gravel in relatively fast-flowing, well oxygenated stream reaches. It is found in association with other mussels but is never very numerous. Like other mussels, it feeds by siphoning and filtering small food particles that are suspended in the water. Their method of reproduction is similar to other freshwater mussel species. Males release sperm into the water column, and the sperm are taken in by the females through their siphons as they respire. The eggs are fertilized and develop within the females' gills into larvae (glochidia). The females release the glochidia that must then attach to the gills or fins of specific fish species. The glochida transform into juvenile mussels and drop off the fish onto the stream bottom (USFWS 2017c). The following fish have been identified as suitable hosts: White Shiner (*Luxilus albeolus*), Pinewoods Shiner (*Lythrurus matutinus*), Bluehead Chub (*Nocomis leptocephalus*), and Satinfin Shiner (*Cyprinella analostana*) (Eads et al. 2008).

5.1.3. Numbers, Reproduction, and Distribution of TRSM

The TRSM is endemic to the Tar River and Neuse River basins in North Carolina (Figure 5.1.3). In the Tar River system, the species has been documented in the mainstem of the Tar River, Shocco Creek, Fishing Creek, Little Fishing Creek, Swift Creek, and Sandy Creek. In the Neuse River system, the species has been documented from the Little River and mainstem of the Neuse River. Based on the most recent survey data, the species may be extirpated from the mainstem of the Tar River (last observation of live individuals in 2001; no live or shells were found during surveys in 2002, 2007, or 2013) and Shocco Creek (last and only record was a shell found in 1993). The species may also be extirpated from the mainstem of the Neuse River. Surviving populations of TRSM are small in number, restricted in range, declining, and appear isolated from other populations where they continue to be highly vulnerable to extirpation from stochastic and chronic events (e.g., drought, toxic spills, runoff, problems associated with wastewater discharges) (USFWS 2014).

Surveys in Sandy Creek and Swift Creek (Tar River Basin) from 1987-2005 found a total of 355 TRSM (live individuals plus shells). Only one individual was found during surveys in Swift Creek in 2005 and no individuals have been found since. A total of 73 live individuals and shells have been observed in Little Fishing Creek during surveys from 1993-2016, and 10 (live

Occurrences by HUC 10 Watershed of the Tar River Spinymussel (*Parvaspina steinstansana*) and Survey Locations



Map created by: Tyler Black, Ph.D., 9/5/2017
Data sources: NC Wildlife Resources Commission

Figure 5.1.3

individuals plus shells) were found from 1999-2016 in Fishing Creek. Only four TRSM have been recorded from the Little River (Neuse River Basin), and repeated surveys have not found any more individuals (NCWRC 2018). Additional surveys are needed to determine the status of the TRSM in the mainstem of the Tar River, Shocco Creek, and the mainstem of the Neuse River.

Although a very low level of successful reproduction may be occurring in the Little Fishing/Fishing Creek and Little River populations, all the surviving populations appear to be well below self-maintenance levels. Multiple augmentation efforts from December 2014 through April 2017 have occurred in Little Fishing Creek and Fishing Creek. A total of 11,577 captively propagated TRSM were released at locations in the two streams (Tyler Black, NCWRC, personal email communication, February 2018).

5.1.4. Conservation Needs of and Threats to TRSM

All surviving populations of the TRSM are small in size, highly fragmented, and are in decline. The primary factors affecting the species and its habitat appear to be stream impacts (sedimentation, bank instability, loss of instream habitat) associated with the loss of forested riparian buffers, poorly controlled stormwater runoff of silt and other pollutants from forestry and agricultural activities, development activities, and road construction (USFWS 2019a). Pesticides were implicated in the largest known mortality event for Tar River spinymussel (Fleming et al. 1995). Point source discharges also continue to threaten habitat quality in both the Tar and Neuse River watersheds. The genetic viability of the surviving populations is a significant concern. All of the remaining populations of TRSM appear to be effectively isolated from one another by impoundments and long reaches of highly degraded habitat (USFWS 2019a).

5.2. Environmental Baseline for TRSM

This section is an analysis of the effects of past and ongoing human and natural factors leading to the current status of the TRSM, its habitat, and ecosystem within the Programmatic Action Area. The environmental baseline is a "snapshot" of the species' health in the Programmatic Action Area at the time of the consultation, and does not include the effects of the Action under review. Since the Programmatic Action Area encompasses the full range of TRSM, the range-wide Status of the Species is the Environmental Baseline.

5.3. Effects of the Action on TRSM

This section analyzes the direct and indirect effects of the Action on the TRSM, which includes the direct and indirect effects of interrelated and interdependent actions. Direct effects are caused by the Action and occur at the same time and place. Indirect effects are caused by the Action, but are later in time and reasonably certain to occur. Our analyses are organized according to the description of the Action in Section 2 of this PBO.

5.3.1. Effects of In-Water Work on TRSM

The effects of in-water work of the Action on TRSM are very similar to those of the DWM described in Section 4.3.1.

5.3.2. Effects of Land-Based Work on TRSM

The effects of land-based work of the Action on TRSM are very similar to those of the DWM described in Section 4.3.2.

5.3.3. Effects of Post-Construction Activities on TRSM

The effects of post-construction activities of the Action on TRSM are very similar to those of the DWM described in Section 4.3.3.

5.3.4. Effects of Conservation Measures on TRSM

The effects of conservations measures of the Action on TRSM are very similar to those of the DWM described in Section 4.3.4.

5.3.5. Effects of Interrelated and Interdependent Actions on TRSM

The effects of interrelated and interdependent actions on TRSM are very similar to those of the DWM described in Section 4.3.5.

5.4. Cumulative Effects on TRSM

For purposes of consultation under ESA Section 7, cumulative effects are those caused by future state, tribal, local, or private actions that are reasonably certain to occur in the Action Area. Future federal actions that are unrelated to the proposed action are not considered, because they require separate consultation under Section 7 of the ESA.

We are not aware of any non-federal actions in the Programmatic Action Area that may affect TRSM. Therefore, cumulative effects are not relevant to formulating our opinion for the Action.

5.5. Conclusion for TRSM

In this section, we summarize and interpret the findings of the previous sections for the TRSM (status, baseline, effects, and cumulative effects) relative to the purpose of a PBO under Section 7(a)(2) of the ESA, which is to determine whether a federal action is likely to:

c) jeopardize the continued existence of species listed as endangered or threatened; or
d) result in the destruction or adverse modification of designated critical habitat.

"Jeopardize the continued existence" means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR §402.02).

The TRSM is endemic to the Tar River and Neuse River basins in North Carolina. Populations of TRSM are small in number, restricted in range, declining, and appear isolated from other populations where they continue to be highly vulnerable to extirpation from stochastic and chronic events. Recent augmentation efforts have resulted in the release of 11,577 captively propagated TRSM into two streams within the Tar River basin.

The conclusion regarding effects on TRSM is very similar to that of the DWM described in Section 4.5. After reviewing the current status of the species, the environmental baseline for the Programmatic Action Area, the effects of the Action and the cumulative effects, it is the Service's biological opinion that the Action is not likely to jeopardize the continued existence of the TRSM.

6. YELLOW LANCE

6.1. Status of Yellow Lance

This section summarizes the best available data about the biology and current condition of Yellow Lance (YL, *Elliptio lanceolata*) throughout its range that are relevant to formulating an opinion about the Action. The Service published its decision to list YL as threatened on April 3, 2018 (83 FR 14189-14198). The Service also recently completed a Species Status Assessment Report for the YL (USFWS 2017d), and much of the information contained in that document is incorporated by reference into this PBO.

6.1.1. Description of YL

The YL is a bright yellow mussel with a shell more than twice as long as it is tall, usually not more than 86mm (3.4 inches) in length. Its shell is composed of two hinged valves which are joined by a ligament. The outermost layer of the shell has a waxy appearance with brownish ridges known as "growth rests" that formed during an intermediate stage of growth when the ridge area was the edge of the shell. The lustrous inner layer is usually an iridescent blue color, and sometimes has white or salmon color on the shorter end of the shell from where the foot extends (the anterior). The longer end of the shell from where the siphons extend (the posterior) is distinctly rounded. YL has interlocking hinge "teeth" on the inside of the shell to help keep the two valves in proper alignment (USFWS 2019b)

6.1.2. Life History of YL

The YL is a sand-associated species often found buried deep in clean, coarse to medium sand, although it can sometimes be found in gravel substrates. The YL often are moved with shifting sand and eventually settle in sand at the downstream end of stable sand and gravel bars. This species depends on clean, moderate flowing water with high dissolved oxygen and is found in medium-sized rivers to smaller streams.

The life cycle of the YL, like most freshwater mussels, is complex, relying on host fish for successful reproduction. Their eggs develop into microscopic larvae (glochidia) within the gills of the female mussel. The female expels glochidia into the water where they must attach to gills or fins of a fish to continue developing. Each mussel species has specific host fish species that are needed by the glochidia to keep growing and transform into juveniles. After a few weeks, they drop off and land on the river bottom where they grow into adults.

Like many freshwater mussels, the YL grows rapidly during the first few years of life and slows down with age. In the laboratory, the YL reaches sexual maturity around three years old. Once the YL reaches maturity, the females release stringy clumps of glochidia in mucous. The clumps are likely eaten by minnows so the glochidia can attach to the minnow's gills and fin scales. At least two species of minnow are confirmed to host YL development in a laboratory setting, the White Shiner (*Luxilus albeolus*) and Pinewoods Shiner (*Lythrurus matuntinus*). Biologists have developed ways to propagate YL under controlled laboratory conditions.

Like other freshwater mussels, YL are suspension feeders that eat algae and other tiny particles, such as leaf debris, that they filter out of the water. Juveniles likely pedal-feed in the sediment, whereas adults filter-feed from the water column. For more detailed information on the life history of YL, see USFWS (2017d).

6.1.3. Numbers, Reproduction, and Distribution of YL

The YL has a historical range from the Patuxent River Basin in Maryland to the Neuse River Basin in North Carolina. For the current range, the YL Species Status Assessment Report (USFWS 2017d) delineates populations by using the eight river basins that YL has historically occupied. This includes the Patuxent, Potomac, Rappahannock, York, James, Chowan, Tar, and Neuse River basins in Maryland, Virginia, and North Carolina. Because the river basin level is at a very coarse scale, populations were further delineated using management units (MUs). MUs were defined as one or more HUC10 watersheds that species experts identified as most appropriate for assessing population-level resiliency. Of eight historical populations, seven are known to have had a YL occurrence in the last 12 years, though the majority of those occurrences were limited to a single location within the river basin.

<u>Patuxent River Basin in Maryland</u> – This population contains one MU, the Patuxent MU. Five YL were collected prior to 1965, one individual was collected in 2015, and one relic shell was collected in 2016. In 2018, 23 individuals were found over 6+ kilometers of the Hawlings River.

<u>Potomac River Basin in Maryland/Virginia</u> – This population contains one MU, the Potomac MU. One specimen has been documented from a pre-1970 survey.

<u>Rappahannock River Basin in Virginia</u> – This population contains one MU, the Rappahannock River Subbasin MU. Many surveys have documented the presence of YL in this MU, with an occasional observation of upwards of 50 individuals. The species was first seen in the late 1980s, and it has been observed most recently in 2011 in the Rappahannock River, although very few (3) individuals were seen during that survey.

York River Basin in Virginia – This population contains one MU, the York MU. Several surveys document the presence of YL in this MU – presumably first seen in 1973, and as recent as 2007 in the South Anna River, although only one individual was observed during that survey.

James River Basin in Virginia – This population contains one MU, the Johns Creek MU. YL was first seen in this MU in 1984, and in 2004, one effort observed 31 individuals. The Virginia Department of Transportation confirms YL occurrence in this basin as recent as 2009.

Chowan River Basin in Virginia – This population contains two MUs, the Nottoway River Subbasin MU and the Meherrin River MU. Several surveys in the Nottoway River Subbasin have noted the presence of YL (one with as many as 781 individuals, although the identity of some specimens is in question). The species has been seen as recently as 2011 in the Nottoway River, albeit in extremely low (5) numbers.

Tar River Basin in North Carolina – This population contains four MUs; the Upper/Middle Tar River MU, the Lower Tar River MU, the Sandy-Swift Creek MU, and the Fishing Creek Subbasin MU. Many survey efforts have documented the presence of YL over the years; the species was first seen in 1966 in the Tar River, and it has been documented as recently as 2017 in Shocco Creek (RK&K 2017). Surveys in the mainstem Tar in 1990 documented upwards of 100 live individuals; most other surveys have documented between 25 and 31 individuals, and the most seen in recent (2014) surveys has been 25 live individuals. Similarly, in the late 1980s and early 1990s, Swift Creek surveys documented hundreds (342 in one instance) of shells, and recent surveys in 2015 and 2016 documented 53 and 45 live individuals, respectively.

Neuse River Basin in North Carolina – This population contains one MU, the Middle Neuse Tributaries MU. The YL was first seen in 1991, and most recently one individual was seen in 2015. Most surveys report very low numbers observed (usually only one live individual or just shell material), although one effort in 1994 (Swift Creek) documented 18 live individuals. There have been recent (2014-2016) intensive surveys in the Swift Creek watershed, and only one YL has been observed.

For more detailed information regarding the current condition of YL populations across its range, see USFWS (2017d).

6.1.4. Conservation Needs of and Threats to YL

The conservation needs of and threats to YL are very similar to those of the DWM described in Section 4.1.4. However, for additional detailed information, see USFWS (2017d).

6.2. Environmental Baseline for YL

This section is an analysis of the effects of past and ongoing human and natural factors leading to the current status of the YL, its habitat, and ecosystem within the Programmatic Action Area. The environmental baseline is a "snapshot" of the species' health in the Programmatic Action Area at the time of the consultation, and does not include the effects of the Action under review.

6.2.1. Action Area Numbers, Reproduction, and Distribution of YL

The Programmatic Action Area encompasses four MUs from the Tar River Basin and one MU from the Neuse River Basin described in Section 6.1.3 (Figure 6.2.1). For more detailed information, see USFWS 2017d.

6.2.2. Action Area Conservation Needs of and Threats to YL

The Programmatic Action Area conservation needs of and threats to the YL are very similar to those of the DWM described in Section 4.2.2.

6.3. Effects of the Action on YL

This section analyzes the direct and indirect effects of the Action on the YL, which includes the direct and indirect effects of interrelated and interdependent actions. Direct effects are caused by the Action and occur at the same time and place. Indirect effects are caused by the Action, but are later in time and reasonably certain to occur. Our analyses are organized according to the description of the Action in Section 2 of this PBO.

6.3.1. Effects of In-Water Work on YL

The effects of in-water work of the Action on YL are very similar to those of the DWM described in Section 4.3.1.

6.3.2. Effects of Land-Based Work on YL

The effects of land-based work of the Action on YL are very similar to those of the DWM described in Section 4.3.2.

6.3.3. Effects of Post-Construction Activities on YL

The effects of post-construction activities of the Action on YL are very similar to those of the DWM described in Section 4.3.3.

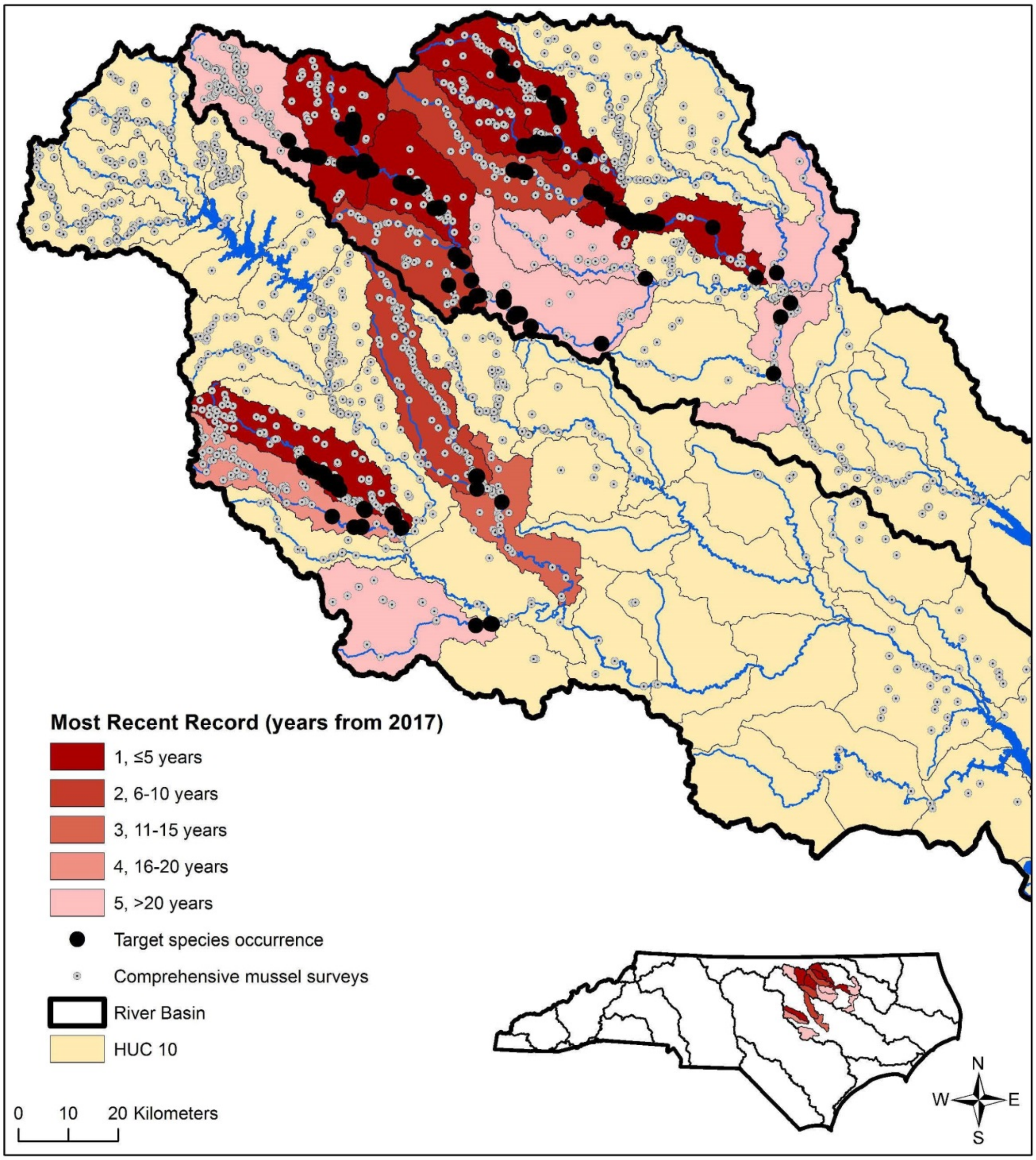
6.3.4. Effects of Conservation Measures on YL

The effects of conservations measures of the Action on YL are very similar to those of the DWM described in Section 4.3.4.

6.3.5. Effects of Interrelated and Interdependent Actions on YL

The effects of interrelated and interdependent actions on YL are very similar to those of the DWM described in Section 4.3.5.

Occurrences by HUC 10 Watershed of the Yellow Lance (*Elliptio lanceolata*) and Survey Locations



Map created by: Tyler Black, Ph.D., 9/5/2017
Data sources: NC Wildlife Resources Commission

Figure 6.2.1

6.4. Cumulative Effects on YL

For purposes of consultation under ESA Section 7, cumulative effects are those caused by future state, tribal, local, or private actions that are reasonably certain to occur in the Action Area. Future federal actions that are unrelated to the proposed action are not considered, because they require separate consultation under Section 7 of the ESA.

We are not aware of any non-federal actions in the Programmatic Action Area that may affect YL. Therefore, cumulative effects are not relevant to formulating our opinion for the Action.

6.5. Conclusion for YL

In this section, we summarize and interpret the findings of the previous sections for the YL (status, baseline, effects, and cumulative effects) relative to the purpose of a PBO under Section 7(a)(2) of the ESA, which is to determine whether a federal action is likely to:

e) jeopardize the continued existence of species listed as endangered or threatened; or
f) result in the destruction or adverse modification of designated critical habitat.

"Jeopardize the continued existence" means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR §402.02).

Of eight historical populations of YL occurring in Maryland, Virginia, and North Carolina, six are known to have had records in the last 12 years (USFWS 2017d). The Programmatic Action Area encompasses four MUs from the Tar River Basin and one MU from the Neuse River Basin described in Section 6.1.3.

The conclusion regarding effects on YL is very similar to that of the DWM described in Section 4.5. After reviewing the current status of the species, the environmental baseline for the Programmatic Action Area, the effects of the Action and the cumulative effects, it is the Service's biological opinion that the Action is not likely to jeopardize the continued existence of the YL.

7. ATLANTIC PIGTOE

7.1. Status of Atlantic Pigtoe

This section summarizes best available data about the biology and current condition of Atlantic Pigtoe (AP, *Fusconaia masoni*) throughout its range that are relevant to formulating an opinion about the Action. The Service published a proposed rule to list AP as threatened on October 11, 2018 (83 FR 51570-51609). The Service also recently completed a Species Status Assessment Report for the AP (USFWS 2017e), and much of the information contained in that document is incorporated by reference into this PBO.

7.1.1. Description of AP

The AP is a freshwater mussel with a chunky, rhombus shaped shell, similar in appearance to a pig's hoof/toe. There is a distinct posterior ridge. The outer surface of the shell is yellow to dark brown and parchment-like, while the inner layer is iridescent blue to salmon, white, or orange. Although larger specimens exist, the AP rarely exceeds two inches in length. Young individuals may have greenish rays across the entire shell surface. When collected fresh, the interior surface (nacre) in the shell tends to be salmon colored and sometimes iridescent. AP has interlocking hinge "teeth" on the inside of the shell to help keep the two valves in proper alignment (USFWS 2019c).

7.1.2. Life History of AP

The preferred habitat of the AP is coarse sand and gravel, and rarely in silt and detritus. Historically, the best populations existed in small creeks to larger rivers with excellent water quality, where flows were sufficient to maintain clean, silt-free substrates.

The life cycle of the AP, like most freshwater mussels, is complex, relying on host fish for successful reproduction. Male AP release their sperm into the water column where it is siphoned in by the females. Once fertilization has taken place in the gills of the female mussel, mature microscopic glochidia (larva) are released where they must attach themselves to the gills and/or fins of fish hosts to continue developing. AP are tachytictic (short term) breeders that usually release their larvae by July or August (USFWS 2019c).

AP have specific host fish that are needed by the glochidia to keep growing to ultimately transform into juveniles. After a few weeks of living as parasites, they drop off and land on the stream bottom where they grow into adults. Host fish for the AP include the Rosefin Shiner (*Lythrurus ardens*), Creek Chub (*Semotilus atromaculatus*), Longnose Dace (*Rhynichthys cataractae*), White Shiner (*Luxilus albeolus*), Satinfin Shiner (*Cyprinella analostana*), Bluehead Chub (*Nocomis leptocephalus*), Rosyside Dace (*Clinostomus funduloides*), Pinewoods Shiner (*Lythrurus matutinus*), Swallowtail Shiner (*Notropis procne*), and Mountain Redbelly Dace (*Chrosomus oreas*). The time period for glochidia to develop varies between 30 to-60 days and depends on the host fish (USFWS 2019c).

Like all freshwater mussels, AP are known as suspension feeders because they eat algae, bacteria, and other microscopic matter they filter out of the water. Juveniles likely pedal-feed in the sediment, whereas adults filter-feed from the water column (USFWS 2019c).

7.1.3. Numbers, Reproduction, and Distribution of AP

The AP's historical range included all major river basins in the Atlantic coastal drainages from the James River Basin in Virginia south to the Altamaha River Basin in Georgia. The AP has been documented from multiple physiographic provinces, from the foothills of the Appalachian Mountains through the Piedmont and into the Coastal Plain, in streams ranging in size from < 1 meter wide up to some of the largest Atlantic Slope rivers within the species' range.

For the current range, the AP Species Status Assessment Report (USFWS 2017e) delineates populations using the 12 river basins that AP has historically occupied. This includes the James, Chowan, Roanoke, Tar, Neuse, Cape Fear, Pee Dee, Catawba, Edisto, Savannah, Ogeechee, and Altamaha River basins. Of 12 historical populations, seven populations within Virginia and North Carolina have observations in the last 12 years, though the majority of occurrences were limited to a single location within the river basin. The AP is presumed extirpated from the southern portion of the range in South Carolina and Georgia. Most of the remaining populations are small and fragmented, only occupying a fraction of reaches that were historically occupied. This decrease in abundance and distribution has resulted in largely isolated contemporary populations.

Because the river basin level is at a very coarse scale, the seven extant populations were further delineated using management units (MUs). MUs were defined as one or more HUC10 watersheds that species experts identified as most appropriate for assessing population-level resiliency. For more detailed information regarding the status of each population and MU, see pages 13-26 and Table 3-2 of the AP Species Status Assessment Report (USFWS 2017e).

7.1.4. Conservation Needs and Threats to AP

The conservation needs of and threats to AP are very similar to those of the DWM described in Section 4.1.4. However, for additional detailed information, see USFWS 2017e.

7.2. Environmental Baseline for AP

This section is an analysis of the effects of past and ongoing human and natural factors leading to the current status of the AP, its habitat, and ecosystem within the Programmatic Action Area. The environmental baseline is a "snapshot" of the species' health in the Programmatic Action Area at the time of the consultation, and does not include the effects of the Action under review.

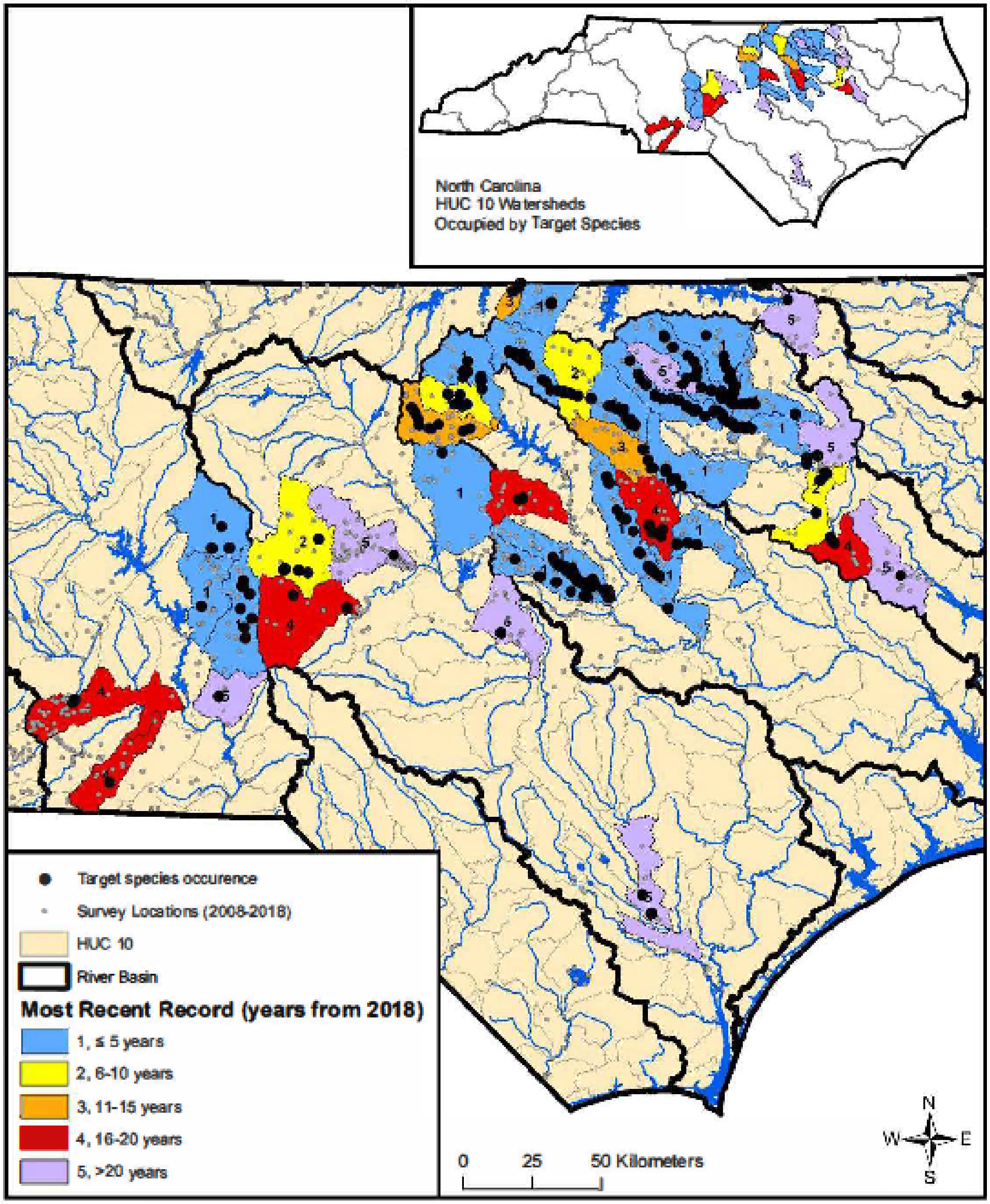
7.2.1. Action Area Numbers, Reproduction, and Distribution of AP

The Programmatic Action Area encompasses two MUs from the Roanoke River Basin, four MUs from the Tar River Basin, two MUs from the Neuse River Basin, four MUs from the Cape Fear River Basin, and one MU from the Pee Dee River Basin (two additional MUs occur in this basin but are outside the Programmatic Action Area). These MUs are described in detail in pages 17-21 of USFWS 2017e and depicted in Figure 7.2.1.

7.2.2. Action Area Conservation Needs of and Threats to AP

The Programmatic Action Area conservation needs of and threats to the AP are very similar to those of the DWM described in Section 4.2.2. However, for additional detailed information, see USFWS 2017e.

Occurrences by HUC 10 Watershed of the Atlantic Pigtoe (*Fusconaia masoni*) and Survey Locations



Map created by: Tyler Black, Ph.D., 3/28/2019
Data sources: NC Wildlife Resources Commission

Figure 7.2.1

7.3. Effects of the Action on AP

This section analyzes the direct and indirect effects of the Action on the AP, which includes the direct and indirect effects of interrelated and interdependent actions. Direct effects are caused by the Action and occur at the same time and place. Indirect effects are caused by the Action, but are later in time and reasonably certain to occur. Our analyses are organized according to the description of the Action in Section 2 of this PBO.

7.3.1. Effects of In-Water Work on AP

The effects of in-water work of the Action on AP are very similar to those of the DWM described in Section 4.3.1.

7.3.2. Effects of Land-Based Work on AP Effects of In-Water Work on AP

The effects of land-based work of the Action on AP are very similar to those of the DWM described in Section 4.3.2.

7.3.3. Effects of Post-Construction Activities on AP

The effects of post-construction activities of the Action on AP are very similar to those of the DWM described in Section 4.3.3.

7.3.4. Effects of Conservation Measures on AP

The effects of conservations measures of the Action on AP are very similar to those of the DWM described in Section 4.3.4.

7.3.5. Effects of Interrelated and Interdependent Actions on AP

The effects of interrelated and interdependent actions on AP are very similar to those of the DWM described in Section 4.3.5.

7.4. Cumulative Effects on AP Cumulative Effects on AP

For purposes of consultation under ESA Section 7, cumulative effects are those caused by future state, tribal, local, or private actions that are reasonably certain to occur in the Action Area. Future federal actions that are unrelated to the proposed action are not considered, because they require separate consultation under Section 7 of the ESA.

We are not aware of any non-federal actions in the Programmatic Action Area that may affect AP. Therefore, cumulative effects are not relevant to formulating our opinion for the Action.

7.5. Conclusion for AP

In this section, we summarize and interpret the findings of the previous sections for the AP (status, baseline, effects, and cumulative effects) relative to the purpose of a PBO under Section 7(a)(2) of the ESA, which is to determine whether a federal action is likely to:

g) jeopardize the continued existence of species listed as endangered or threatened; or
h) result in the destruction or adverse modification of designated critical habitat.

"Jeopardize the continued existence" means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR §402.02).

Of 12 historical populations, seven populations within Virginia and North Carolina have observations in the last 12 years. The Programmatic Action Area encompasses two MUs from the Roanoke River Basin, four MUs from the Tar River Basin, two MUs from the Neuse River Basin, four MUs from the Cape Fear River Basin, and one MU from the Pee Dee River Basin.

The conclusion regarding effects on AP is very similar to that of the DWM described in Section 4.5. After reviewing the current status of the species, the environmental baseline for the Programmatic Action Area, the effects of the Action and the cumulative effects, it is the Service's biological opinion that the Action is not likely to jeopardize the continued existence of the AP.

8. PROPOSED ATLANTIC PIGTOE CRITICAL HABITAT

8.1. Status of Atlantic Pigtoe Proposed Critical Habitat

This section summarizes best available data about the current condition of all proposed units of critical habitat for Atlantic Pigtoe (AP, *Fusconaia masoni*) that are relevant to formulating an opinion about the Action. The Service published its proposed rule to designate critical habitat for AP on October 11, 2018 (83 FR 51570-51609).

8.1.1. Description of AP Proposed Critical Habitat

Proposed critical habitat for AP is comprised of approximately 542 river miles in 16 units. All of the units are currently occupied by the species and contain all of the physical and biological features (PBFs) essential to the conservation of the species. See Table 3 of 83 FR 51570-51609 for more detailed information on individual units.

The proposed critical habitat provides the following PBFs essential to the conservation of the AP (83 FR 51570-51609).

1. Suitable substrates and connected instream habitats, characterized by geomorphically stable stream channels and banks (*i.e.,* channels that maintain lateral dimensions, longitudinal profiles, and sinuosity patterns over time without an aggrading or degrading bed elevation) with habitats that support a diversity of freshwater mussel and native fish

(such as stable riffle-run-pool habitats that provide flow refuges consisting of silt-free gravel and coarse sand substrates).

2. Adequate flows, or a hydrologic flow regime (which includes the severity, frequency, duration, and seasonality of discharge over time), necessary to maintain benthic habitats where the species is found and to maintain connectivity of streams with the floodplain, allowing the exchange of nutrients and sediment for maintenance of the mussel's and fish hosts' habitat, food availability, spawning habitat for native fishes, and the ability for newly transformed juveniles to settle and become established in their habitats.

3. Water and sediment quality (including, but not limited to, conductivity, hardness, turbidity, temperature, pH, ammonia, heavy metals, and chemical constituents) necessary to sustain natural physiological processes for normal behavior, growth, and viability of all life stages.

4. The presence and abundance of fish hosts necessary for recruitment of the AP.

8.1.2. Conservation Value of AP Proposed Critical Habitat

The current distribution of the AP is much reduced from its historical distribution. We anticipate that recovery will require continued protection of existing populations and habitat, as well as ensure there are adequate numbers of mussels in stable populations and that these populations occur over a wide geographic area. This strategy will help to ensure that catastrophic events, such as the effects of hurricanes (e.g. flooding that causes excessive sedimentation, nutrients, and debris to disrupt stream ecology), cannot simultaneously affect all known populations. Rangewide recovery considerations, such as maintaining existing genetic diversity and striving for representation of all major portions of the species' current range, were considered in formulating this proposed critical habitat. All of the units are currently occupied by the species and contain all of the PBFs essential to the conservation of the species (83 FR 51570-51609).

8.1.3. Conservation Needs for AP Proposed Critical Habitat

The features essential to the conservation of the AP may require special management considerations or protections to reduce the following threats: (1) urbanization of the landscape, including land conversion for urban and commercial use, infrastructure (roads, bridges, utilities), and urban water uses (water supply reservoirs, wastewater treatment, etc.); (2) nutrient pollution from agricultural activities that impact water quantity and quality; (3) significant alteration of water quality; (4) improper forest management or silviculture activities that remove large areas of forested wetlands and riparian systems; (5) culvert and pipe installation that creates barriers to movement; (6) impacts from invasive species; (7) changes and shifts in seasonal precipitation patterns as a result of climate change; and (8) other watershed and floodplain disturbances that release sediments or nutrients into the water. Management activities that could ameliorate these threats include: use of best management practices designed to reduce sedimentation, erosion, and bank side destruction; protection of riparian corridors and leaving sufficient canopy cover along banks; moderation of surface and ground water withdrawals to maintain natural flow regimes; increased use of stormwater management and reduction of stormwater flows into the systems;

and reduction of other watershed and floodplain disturbances that release sediments, pollutants, or nutrients into the water (83 FR 51570-51609).

8.2. Environmental Baseline for AP Proposed Critical Habitat

This section is an analysis of the effects of past and ongoing human and natural factors leading to the current status of proposed critical habitat for AP within the Programmatic Action Area. The environmental baseline is a "snapshot" of the condition of the PBFs that are essential to the conservation of the species within proposed critical habitat of the Programmatic Action Area at the time of the conference, and does not include the effects of the Action under review.

8.2.1. Programmatic Action Area Conservation Value of AP Proposed Critical Habitat

Of the total 542 river miles of critical habitat proposed for the AP, approximately 444 river miles are located within the Programmatic Action Area. This represents 11 of 16 proposed units (see Table 8.2.1 below). These units currently support all breeding, feeding, and sheltering needs of the species.

Table 8.2.1. Proposed Critical Habitat Units Within Programmatic Action Area

Unit	Streams in Unit	Counties in Unit
RR1	Dan River	Rockingham
RR2	Aarons Creek	Granville
TR1	Tar River, Bear Swamp Creek, Crooked Creek, Cub Creek, Shelton Creek	Granville, Vance, Franklin, Nash
TR2	Sandy/Swift Creek	Vance, Franklin, Nash, Warren
TR3	Fishing Creek, Little Fishing Creek, Shocco Creek, Maple Branch	Warren, Halifax, Franklin, Nash
TR4	Tar River, Fishing Creek	Edgecombe
NR1	Flat River, Little River, Eno River	Person, Durham, Orange
NR2	Swift Creek, Middle Creek, Little River, Contentnea Creek	Wake, Johnston, Wilson
CF1	New Hope Creek	Orange
CF2	Deep River, Richland Creek, Brush Creek	Randolph
YR1	Little River	Randolph, Montgomery

8.2.2. Programmatic Action Area Conservation Needs for AP Proposed Critical Habitat

See 83 FR 51570-51609 (specifically pages 51584-51585) for detailed information on the conservation needs of the 11 proposed critical habitat units within the Programmatic Action Area.

8.3. Effects of the Action on AP Proposed Critical Habitat

This section analyzes the direct and indirect effects of the Action on proposed critical habitat for AP, which includes the direct and indirect effects of interrelated and interdependent actions. Direct effects are caused by the Action and occur at the same time and place. Indirect effects are caused by the Action, but are later in time and reasonably certain to occur. Our analyses are organized according to the description of the Action in section 2 of this PBO.

8.3.1. Effects of In-Water Work on AP Proposed Critical Habitat

The primary potential effect of in-water work to proposed critical habitat is the resuspension of sediment when existing in-water structures are removed (i.e. bents and abutments). This resuspended sediment is transported downstream where it redeposits on the substrate. Although sediment transport is a normal process within a stream's flow regime (Poff et al. 1997), redeposited sediment could affect, at least temporarily, PBF numbers 1, 3, and 4 (see Section 8.1.1 above). However, NCDOT's use of BMPs (NCDOT 2003, NCDOT 2015) will greatly minimize these effects. As such, these effects to the PBFs are expected to be minor and temporary, and thus would not appreciably diminish the value of the PBFs.

Almost all existing NCDOT bridges are replaced with bridges that are longer and have either no bents in the water or with a reduced number of bents in the water. With increased bridge lengths, some existing fill in the floodplain for approach roads is often removed. This, along with removing or reducing the number of bents in the channel, generally has the effect of removing unnatural constriction points in the stream which often cause scouring of the banks or channel. Therefore, the replacement of bridges has the potential for long-term improvement of PBFs by reducing erosion and redeposition of sediment.

8.3.2. Effects of Land-Based Work on AP Proposed Critical Habitat

All bridge and culvert replacements involve some degree of earthwork along approach roads and adjacent stream banks. These disturbed areas create the potential to erode sediment into the stream and affect PBF numbers 1, 3, and 4. However, NCDOT has developed stringent erosion control measures (see Section 2.3) which greatly minimize sediment entering the stream. Assuming the proper installation and maintenance of these erosion control measures, such effects to the PBFs are expected to be minor and temporary, and thus would not appreciably diminish the value of the PBFs.

8.3.3. Effects of Post-Construction Activities on AP Proposed Critical Habitat

Since most post-construction activities described in this Action are related to permanent BMPs that are designed to protect water quality and/or to stabilize a construction site, their effects on AP proposed critical habitat are expected to be beneficial.

8.3.4. Effects of Conservation Measures on AP Proposed Critical Habitat

The Conservation Measures, in part, are designed to reduce sedimentation effects. Therefore, their effects on AP proposed critical habitat are expected to be beneficial.

8.3.5. Effects of Interrelated and Interdependent Actions on AP Proposed Critical Habitat

Utility relocations necessitated by bridge and culvert replacements could provide a potential source of additional, but likely minor (assuming directional boring of stream), sediment input into a stream. This sediment input into the stream could potentially affect PBF numbers 1, 3, and 4. However, the use of proper sediment and erosion control measures will greatly minimize this potential. Offsite use areas such as waste and borrow areas are unlikely to be located adjacent to a stream with designated/proposed critical habitat. However, should a contractor opt to pursue such a location, additional coordination would be required.

8.4. Cumulative Effects on AP Proposed Critical Habitat

For purposes of consultation under ESA §7, cumulative effects are those caused by future state, tribal, local, or private actions that are reasonably certain to occur in the Action Area. Future Federal actions that are unrelated to the proposed action are not considered, because they require separate consultation under §7 of the ESA.

We are not aware of any non-Federal actions in the Programmatic Action Area that may affect proposed critical habitat. Therefore, cumulative effects are not relevant to formulating our opinion for the Action.

8.5. Conclusion for AP Proposed Critical Habitat

In this section, we summarize and interpret the findings of the previous sections for AP proposed critical habitat (status, baseline, effects, and cumulative effects) relative to the purpose of a BO/CO under §7(a)(2) of the ESA, which is to determine whether a Federal action is likely to:

a) jeopardize the continued existence of species listed as endangered or threatened; or
b) result in the destruction or adverse modification of designated critical habitat.

"*Destruction or adverse modification*" means a direct or indirect alteration that appreciably diminishes the value of designated critical habitat for the conservation of a listed species. Such alterations may include, but are not limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features (50 CFR §402.02).

Of the total 542 river miles of proposed critical habitat for the AP, approximately 444 (82%) occurs with the Programmatic Action Area. The 11 proposed units with the Programmatic Action Area are all considered occupied by the species. Some adverse effects to critical habitat may occur from movement of sediment within the stream or from input of sediment into the stream, thus potentially affecting PBF numbers 1, 3, and 4. However, implementation of conservation measures as part of the Action will greatly minimize these effects. All such effects are expected to minor and temporary, and thus will not appreciably diminish the value of the PBFs.

After reviewing the current status of the proposed critical habitat, the environmental baseline for the Programmatic Action Area, the effects of the Action, and the cumulative effects, it is the Service's conference opinion that the Action is not likely to destroy or adversely modify proposed critical habitat for AP.

9. INCIDENTAL TAKE STATEMENT

ESA Section 9(a)(1) and regulations issued under Section 4(d) prohibit the take of endangered and threatened fish and wildlife species without special exemption. The term "take" in the ESA means "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct" (ESA Section 3). In regulations at 50 CFR §17.3, the Service further defines:

- "harass" as "an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering;"
- "harm" as "an act which actually kills or injures wildlife. Such act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering;" and
- "incidental take" as "any taking otherwise prohibited, if such taking is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity."

Under the terms of ESA Section 7(b)(4) and Section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered prohibited, provided that such taking is in compliance with the terms and conditions of an incidental take statement (ITS).

The prohibitions against taking an endangered animal species found in ESA §9, and against taking a threatened animal species adopted by regulations under §4(d), do not apply until a species is listed. The preceding Programmatic Conference Opinion evaluated effects of the Action on the AP and proposed critical habitat, which are not listed under the ESA. The Service advises the FHWA and USACE to consider implementing the reasonable and prudent measures provided below, which are intended to reduce the anticipated amount or extent of take of this species. Voluntary implementation of these measures according to the accompanying terms and conditions, and voluntary monitoring and reporting of taking as specified below, will facilitate adoption of the Conference Opinion as a Biological Opinion following listing of this species as endangered or threatened. Following such adoption, the reasonable and prudent measures, terms and conditions, and monitoring and reporting requirements provided below will become non-discretionary.

For the exemption in ESA Section 7(o)(2) to apply to the Action considered in this PBO, the FHWA and USACE must undertake the non-discretionary measures described in this ITS, and these measures must become binding conditions of any permit, contract, or grant issued for implementing the Action. The FHWA and USACE have a continuing duty to regulate the activity covered by this ITS. The protective coverage of Section 7(o)(2) may lapse if the FHWA and USACE fails to:

- assume and implement the terms and conditions; or
- require a permittee, contractor, or grantee to adhere to the terms and conditions of the ITS through enforceable terms that are added to the permit, contract, or grant document.

In order to monitor the impact of incidental take, the FHWA and USACE must report the progress of the Action and its impact on the species to the Service as specified in this ITS.

9.1. Amount or Extent of Take

This section specifies the amount or extent of take of listed/proposed wildlife species that the Action is reasonably certain to cause, which we estimated in the "Effects of the Action" section(s) of this PBO. We reference, but do not repeat, these analyses here.

9.1.1. DWM

The Service anticipates that the Action is reasonably certain to cause incidental take of individual DWM consistent with the definition of harm resulting from in-water work and land-based work (see Sections 4.3.1 and 4.3.2). However, we believe that incidental take for this species is difficult to determine. Incidental take that occurs due to sub-lethal levels of siltation or water quality degradation which temporarily disrupt movement, breeding, feeding, or sheltering of adult and juvenile DWM or larval glochidia are likely not detectable or measureable. Incidental take that results in injury or death from larger amounts of siltation or water quality degradation would be difficult to determine. Actual habitat degradation may be detectable, but knowing whether a specific degradation actually affected the species would be difficult to determine. Spent shells may be collected, but attributing the cause of mortality would be very difficult. Incidental take of DWM due to effects to host fish would likely not be detectable or measureable.

This PBO analyzes the adverse effects of an estimated 330 individual bridge and culvert projects over ten years across the entire Programmatic Action Area. However, DWM are not present at all of these estimated 330 individual project locations. Due to revisions in the STIP every two years and uncertainty in the number of individual projects at the Division level (see Section 2), and considering the programmatic nature of this consultation, the precise number of individual projects which are likely to cause incidental take cannot be known with certainty. Therefore, the following rationale is used to conservatively estimate the maximum level of incidental take.

Data extracted from the NCWRC Aquatics Database over 20 years (1999-2018) indicate that 3013 mussel surveys were conducted in the potential range of the DWM within the Programmatic Action Area. From these surveys, a total of 677 DWM were observed. Using a detection probability of 0.42 (Pandolfo et al. 2016), the number of 677 observed DWM is divided by 0.42 to obtain an estimated total number of 1612 present within the surveyed reaches. Although the NCWRC Aquatics Database does not indicate the length of each survey, an assumed distance of 0.31 mile (500 meters) is used. This assumption is supported by the fact that most surveys in the database are from ESA investigations, of which the Service generally requires to be 500 meters in length. Multiplying 0.31 mile by 3013 surveys yields 934 miles surveyed. Then dividing 1612 estimated DWM present by 934 miles yields an estimated density of 1.73 DWM/mile. Under normal circumstances, a downstream distance of 400 meters (0.25 mile) is generally considered to be the extent of detectable sedimentation effects. Multiplying this 0.25 mile distance by the 330 estimated number of projects equals approximately 82.5 stream miles affected. With an estimated density of 1.73 DWM/mile, we conservatively estimate the maximum amount of take of DWM in the Programmatic Action Area to be 143 individuals. It is anticipated that most of this take would be in the form of temporary non-lethal effects.

9.1.2. TRSM

The Service anticipates that the Action is reasonably certain to cause incidental take of individual TRSM consistent with the definition of harm resulting from in-water work and land-based work (see Sections 5.3.1 and 5.3.2). However, we believe that incidental take for this species is difficult to determine. Incidental take that occurs due to sub-lethal levels of siltation or water quality degradation which temporarily disrupt movement, breeding, feeding, or sheltering of adult and juvenile TRSM or larval glochidia are likely not detectable or measureable. Incidental take that results in injury or death from larger amounts of siltation or water quality degradation would be difficult to determine. Actual habitat degradation may be detectable, but knowing whether a specific degradation actually affected the species would be difficult to determine. Spent shells may be collected, but attributing the cause of mortality would be very difficult. Incidental take of TRSM due to effects to host fish would likely not be detectable or measureable.

This PBO analyzes the adverse effects of an estimated 330 individual bridge and culvert projects over ten years across the entire Programmatic Action Area. However, TRSM are not present at all of these estimated 330 individual project locations. Due to revisions in the STIP every two years and uncertainty in the number of individual projects at the Division level (see Section 2), and considering the programmatic nature of this consultation, the precise number of individual projects which are likely to cause incidental take cannot be known with certainty. Therefore, the following rationale is used to conservatively estimate the maximum level of incidental take.

Data extracted from the NCWRC Aquatics Database over 20 years (1999-2018) indicate that 2391 mussel surveys were conducted in the potential range of the TRSM within the Programmatic Action Area. From these surveys, a total of 64 TRSM were observed. Using a detection probability of 0.42 (Pandolfo et al. 2016), the number of 64 observed TRSM is divided by 0.42 to obtain an estimated total number of 152 present within the surveyed reaches. Although the NCWRC Aquatics Database does not indicate the length of each survey, an assumed distance of 0.31 mile (500 meters) is used. This assumption is supported by the fact that most surveys in the database are from ESA investigations, of which the Service generally requires to be 500 meters in length. Multiplying 0.31 mile by 2391 surveys yields 741 miles surveyed. Then dividing 152 estimated TRSM present by 741 miles yields an estimated density of 0.21 TRSM/mile. Under normal circumstances, a downstream distance of 400 meters (0.25 mile) is generally considered to be the extent of detectable sedimentation effects. Multiplying this 0.25 mile distance by the 330 estimated number of projects equals approximately 82.5 stream miles affected. With an estimated density of 0.21 TRSM/mile, we conservatively estimate the maximum amount of take of TRSM in the Programmatic Action Area to be 17 individuals. It is anticipated that most of this take would be in the form of temporary non-lethal effects.

9.1.3. YL

The Service anticipates that the Action is reasonably certain to cause incidental take of individual YL consistent with the definition of harm resulting from in-water work and land-based work (see Sections 6.3.1 and 6.3.2). However, we believe that incidental take for this species is difficult to determine. Incidental take that occurs due to sub-lethal levels of siltation or water quality degradation which temporarily disrupt movement, breeding, feeding, or sheltering of adult and juvenile YL or larval glochidia are likely not detectable or measureable. Incidental take that results in injury or death from larger amounts of siltation or water quality degradation would be difficult to determine. Actual habitat degradation may be detectable, but knowing whether a specific degradation actually affected the species would be difficult to determine. Spent shells may be collected, but attributing the cause of mortality would be very difficult. Incidental take of YL due to effects to host fish would likely not be detectable or measureable.

This PBO analyzes the adverse effects of an estimated 330 individual bridge and culvert projects over ten years across the entire Programmatic Action Area. However, YL are not present at all of these estimated 330 individual project locations. Due to revisions in the STIP every two years and uncertainty in the number of individual projects at the Division level (see Section 2), and considering the programmatic nature of this consultation, the precise number of individual projects which are likely to cause incidental take cannot be known with certainty. Therefore, the following rationale is used to conservatively estimate the maximum level of incidental take.

Data extracted from the NCWRC Aquatics Database over 20 years (1999-2018) indicate that 2876 mussel surveys were conducted in the potential range of the YL within the Programmatic Action Area. From these surveys, a total of 645 YL were observed. Using a detection probability of 0.42 (Pandolfo et al. 2016), the number of 645 observed YL is divided by 0.42 to obtain an estimated total number of 1536 present within the surveyed reaches. Although the NCWRC Aquatics Database does not indicate the length of each survey, an assumed distance of 0.31 mile (500 meters) is used. This assumption is supported by the fact that most surveys in the database are from ESA investigations, of which the Service generally requires to be 500 meters in length. Multiplying 0.31 mile by 2876 surveys yields 892 miles surveyed. Then dividing 1536 estimated YL present by 892 miles yields an estimated density of 1.72 YL/mile. Under normal circumstances, a downstream distance of 400 meters (0.25 mile) is generally considered to be the extent of detectable sedimentation effects. Multiplying this 0.25 mile distance by the 330 estimated number of projects equals approximately 82.5 stream miles affected. With an estimated density of 1.72 YL/mile, we conservatively estimate the maximum amount of take of YL in the Programmatic Action Area to be 142 individuals. It is anticipated that most of this take would be in the form of temporary non-lethal effects.

9.1.4. AP

The Service anticipates that the Action is reasonably certain to cause incidental take of individual AP consistent with the definition of harm resulting from in-water work and land-based work (see Sections 7.3.1 and 7.3.2). However, we believe that incidental take for this species is difficult to determine. Incidental take that occurs due to sub-lethal levels of siltation or water quality degradation which temporarily disrupt movement, breeding, feeding, or sheltering of adult and juvenile AP or larval glochidia are likely not detectable or measureable. Incidental take that results in injury or death from larger amounts of siltation or water quality degradation would be difficult to determine. Actual habitat degradation may be detectable, but knowing whether a specific degradation actually affected the species would be difficult to determine. Spent shells may be collected, but attributing the cause of mortality would be very difficult. Incidental take of AP due to effects to host fish would likely not be detectable or measureable.

This PBO analyzes the adverse effects of an estimated 330 individual bridge and culvert projects over ten years across the entire Programmatic Action Area. However, AP are not present at all of these estimated 330 individual project locations. Due to revisions in the STIP every two years and uncertainty in the number of individual projects at the Division level (see Section 2), and considering the programmatic nature of this consultation, the precise number of individual projects which are likely to cause incidental take cannot be known with certainty. Therefore, the following rationale is used to conservatively estimate the maximum level of incidental take.

Data extracted from the NCWRC Aquatics Database over 20 years (1999-2018) indicate that 4978 mussel surveys were conducted in the potential range of the AP within the Programmatic Action Area. From these surveys, a total of 1578 AP were observed. Using a detection probability of 0.42 (Pandolfo et al. 2016), the number of 1578 observed AP is divided by 0.42 to obtain an estimated total number of 3757 present within the surveyed reaches. Although the NCWRC Aquatics Database does not indicate the length of each survey, an assumed distance of 0.31 mile (500 meters) is used. This assumption is supported by the fact that most surveys in the database are from ESA investigations, of which the Service generally requires to be 500 meters in length. Multiplying 0.31 mile by 4978 surveys yields 1543 miles surveyed. Then dividing 3757 estimated AP present by 1543 miles yields an estimated density of 2.43 AP/mile. Under normal circumstances, a downstream distance of 400 meters (0.25 mile) is generally considered to be the extent of detectable sedimentation effects. Multiplying this 0.25 mile distance by the 330 estimated number of projects equals approximately 82.5 stream miles affected. With an estimated density of 2.43 AP/mile, we conservatively estimate the maximum amount of take of AP in the Programmatic Action Area to be 200 individuals. It is anticipated that most of this take would be in the form of temporary non-lethal effects.

9.2. Reasonable and Prudent Measures

The Service believes the following reasonable and prudent measures (RPMs) are necessary or appropriate to minimize the impact of incidental take caused by the Action on DWM, TRSM, YL, and AP.

RPM 1. Schedule for ILF Payments. The ILF payments detailed in Section 2.7 will be remitted on a quarterly basis.

RPM 2. Utility Relocations. Utility relocations necessitated by bridge or culvert replacements must minimize sedimentation effects to mussels and their habitat.

9.3. Terms and Conditions

In order for the exemption from the take prohibitions of Section 9(a)(1) and of regulations issued under Section 4(d) of the ESA to apply to the Action, the FWHA and USACE must comply with the terms and conditions (T&Cs) of this statement, provided below, which carry out the RPMs described in the previous section. These T&Cs are mandatory. As necessary and appropriate to fulfill this responsibility, the FHWA and USACE must require any permittee, contractor, or grantee to implement these T&Cs through enforceable terms that are added to the permit, contract, or grant document.

T&C 1. Funding Agreement (RPM1). Within 90 days of the issuance of this PBO, NCDOT must complete a funding agreement in order to remit ILF payments to the N.C. Nongame Aquatic Species Fund on a quarterly basis as per the terms of the funding agreement. A copy of the funding agreement must be provided to the Service.

T&C 2. Directional Boring (RPM 2). Unless technically unfeasible, NCDOT must require utility relocations through streams to utilize directional (horizontal) boring instead of open trench cutting.

9.4. Monitoring and Reporting Requirements

In order to monitor the impacts of incidental take, the FHWA and USACE must report the progress of the Action and its impact on the species to the Service as specified in the incidental take statement (50 CFR §402.14(i)(3)). This section provides the specific instructions for such monitoring and reporting (M&R). As necessary and appropriate to fulfill this responsibility, the FHWA and USACE must require any permittee, contractor, or grantee to accomplish the monitoring and reporting through enforceable terms that are added to the permit, contract, or grant document. Such enforceable terms must include a requirement to immediately notify the FHWA, USACE, and the Service if the amount or extent of incidental take specified in this ITS is exceeded during Action implementation.

M&R1. Project Submittal Form. NCDOT must develop a “Project Submittal Form” which includes the following information for bridge and culvert projects addressed through this formal consultation:

1. county
2. stream
3. 10-digit HUC
4. structure #
5. WBS # and STIP # (if applicable)
6. road #
7. bridge or culvert?
8. replacement or repair or rehabilitation or extension?
9. Is bridge or culvert work part of road widening project?
10. estimated let date
11. mussel species adversely affected
12. amount of ILF payment - $25,000 or $10,000
13. person(s) who made biological conclusion of MA-LAA

The Project Submittal Form should be a standardized fill-in form in a .pdf or similar format. The project reviewer must fill in the form for each bridge or culvert project that has a biological conclusion of MA-LAA arrived at through the Programmatic Methodology (see Section 2.7 and Appendices B1 and B2). Project Submittal Forms are not required for projects that receive automatic concurrence with a MA-NLAA biological conclusion that are consistent with the protocols defined in Section 2.7 and graphically depicted as flowcharts in Appendices B1-B3; however, documentation of MA-NLAA biological conclusions will be included in permit application files to the USACE. The completed Project Submittal Form will be emailed to the Service at the Raleigh Field Office. The NCDOT must designate staff in the Environmental Analysis Unit (or equivalent if organizational changes occur) that will submit the Project Submittal Forms and track all projects covered by this PBO. The expectation is that both Division level and Central Office managed projects will be submitted and tracked by the Environmental Analysis Unit to ensure consistency. If more than 330 bridge and culvert projects with a biological conclusion of MA-LAA are implemented between May 2018 and May 2028, then incidental take has been exceeded and reinitiation of formal consultation is required.

M&R 2. Report Number of Automatic Concurrences. Although Project Submittal Forms are not required for MA-NLAA conclusions, NCDOT must annually, via email, provide a total number of projects (cumulatively) with such conclusions that utilize the automatic advance concurrence for one or more of the species addressed in this BO/CO as described in Section 3.

M&R 3. Erosion Control Measures Failure. In the event of any visible sediment loss from any individual project site, a review of turbidity levels will be made upstream and downstream 400 meters (0.25 mile) to determine if sedimentation effects are occurring beyond 400 meters downstream. If visual observation of turbidity levels downstream appear to be elevated beyond upstream observations, the project inspector will contact the Division Environmental Officer. If determined that project-related sedimentation is occurring beyond 400 meters, the Service must be contacted immediately to discuss potential remediation.

10. CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs federal agencies to use their authorities to further the purposes of the ESA by conducting conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary activities that an action agency may undertake to avoid or minimize the adverse effects of a proposed action, implement recovery plans, or develop information that is useful for the conservation of listed species. The Service offers the following recommendations that are relevant to the listed species addressed in this PBO and that we believe are consistent with the authorities of the FHWA and USACE.

1. Provide additional training to NCDOT Division-level staff to further their understanding of mussel ecology and conservation. The Service is willing to assist NCDOT Central Office staff biologists with this training.

11. REINITIATION NOTICE

Formal consultation for the Action considered in this PBO is concluded. Reinitiating consultation is required if the FHWA and USACE retain discretionary involvement or control over the Action (or is authorized by law) when:

a. the amount or extent of incidental take is exceeded;
b. new information reveals that the Action may affect listed species or designated critical habitat in a manner or to an extent not considered in this PBO;
c. the Action is modified in a manner that causes effects to listed species or designated critical habitat not considered in this PBO; or
d. a new species is listed or critical habitat designated that the Action may affect.

In instances where the amount or extent of incidental take is exceeded, the FHWA and USACE are required to immediately request a reinitiation of formal consultation.

Formal conference for the Action considered in this Conference Opinion is concluded. The FHWA and USACE may submit a written request to the Service to confirm the Conference Opinion as a Biological Opinion issued through formal consultation if the FHWA and USACE retain discretionary involvement or control over the Action when species addressed in the Conference Opinion are listed, or when proposed critical habitats addressed in the Conference Opinion are designated. This request should advise the Service of any new information about the Action or its effects on such species or critical habitats that is relevant to adopting the Conference Opinion as a Biological Opinion, including the amount or extent of any taking of species that the Action has caused before the effective date of a listing decision.

The incidental take statement provided for non-listed species in a Conference Opinion does not become effective until such species are listed and the Conference Opinion is adopted as a Biological Opinion. At that time, the Service will review the Action to determine whether modifying the opinion and incidental take statement to reflect new information is appropriate. If the Service finds no significant changes in the Action as proposed or in the information used during the conference, the Service will confirm the Conference Opinion as a Biological Opinion for the Action, which shall conclude formal consultation. Thereafter, the FHWA and USACE shall request to reinitiate formal consultation under the same four circumstances listed above.

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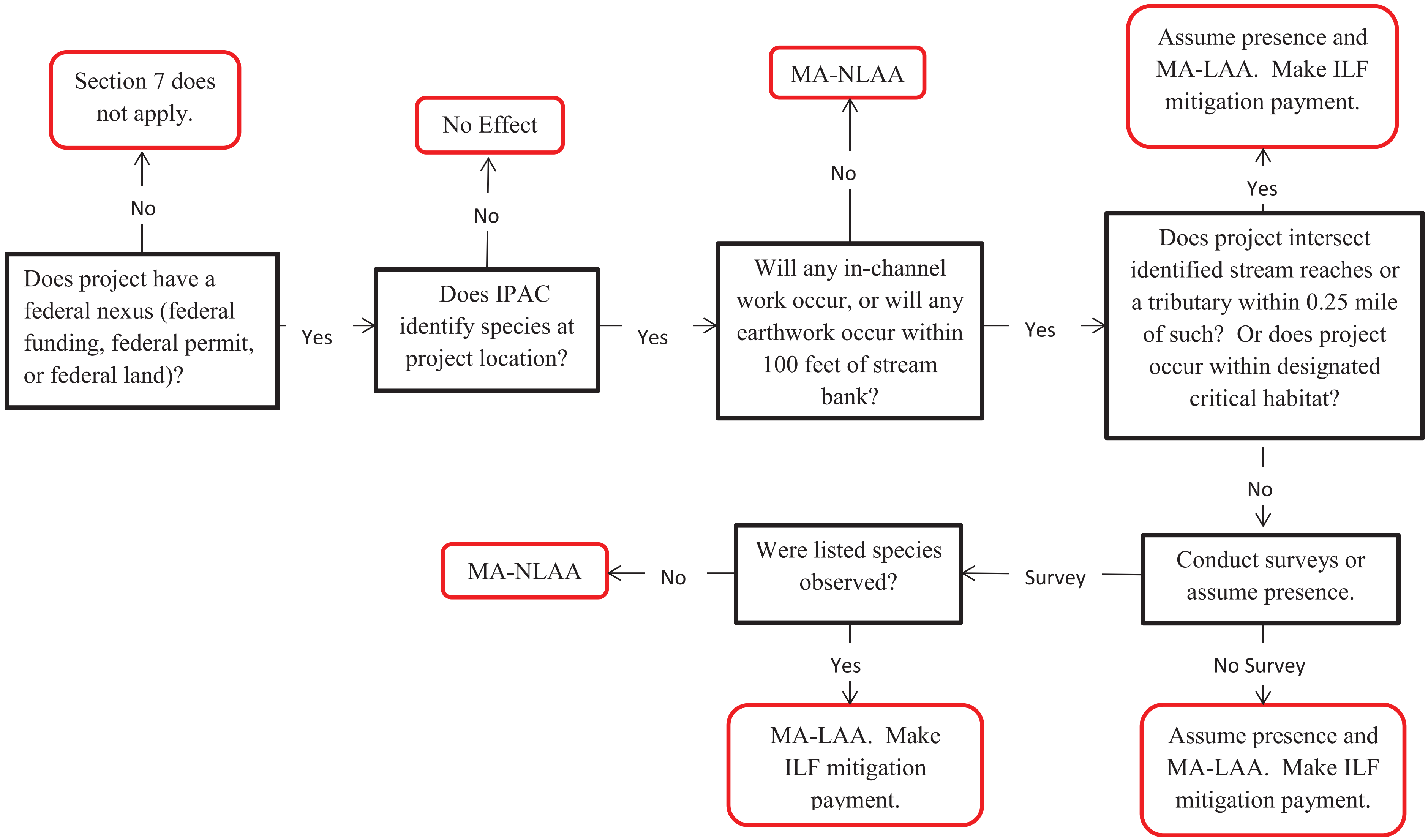
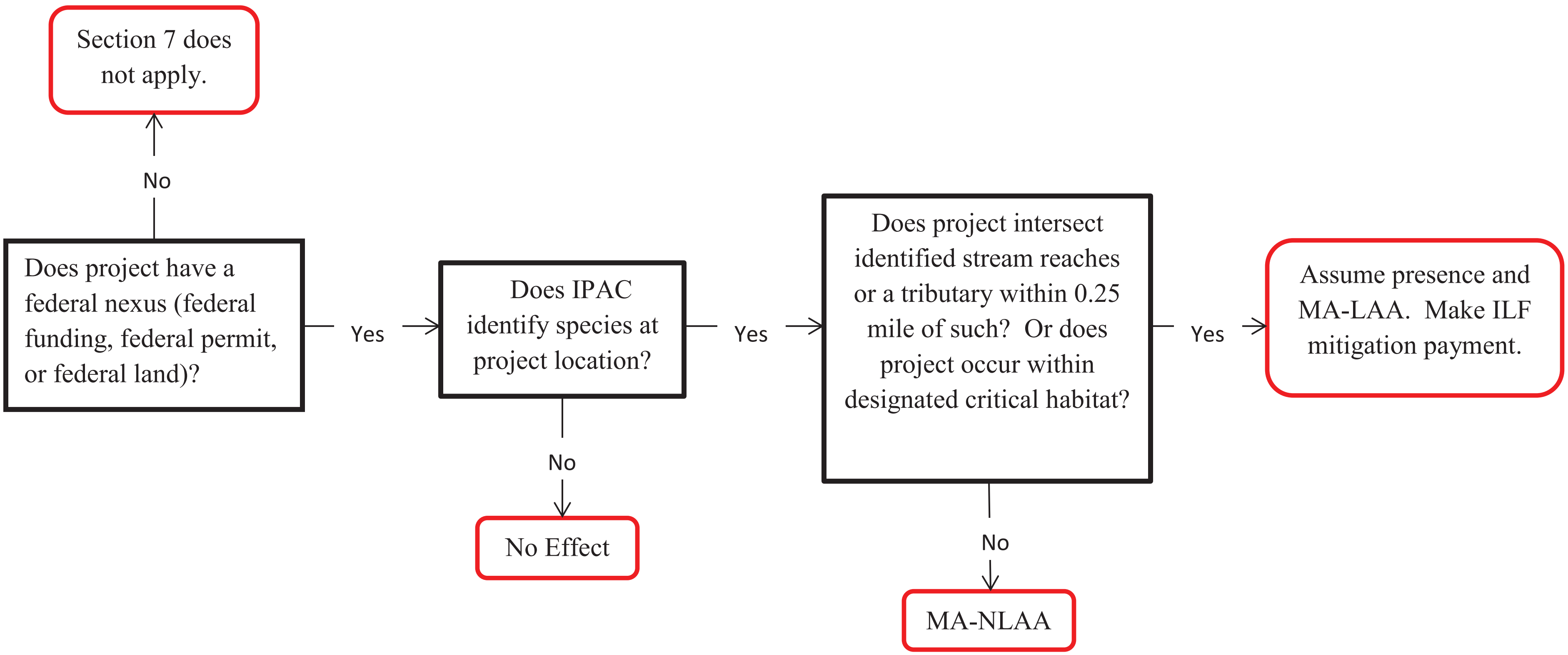
Appendix B1. Section 7 Mussel Programmatic Process – Bridge Replacement with Bridge/Repair/Rehabilitation Divisions 1-8 for Dwarf Wedgemussel, Tar River Spinymussel, Yellow Lance, and Atlantic Pigtoe



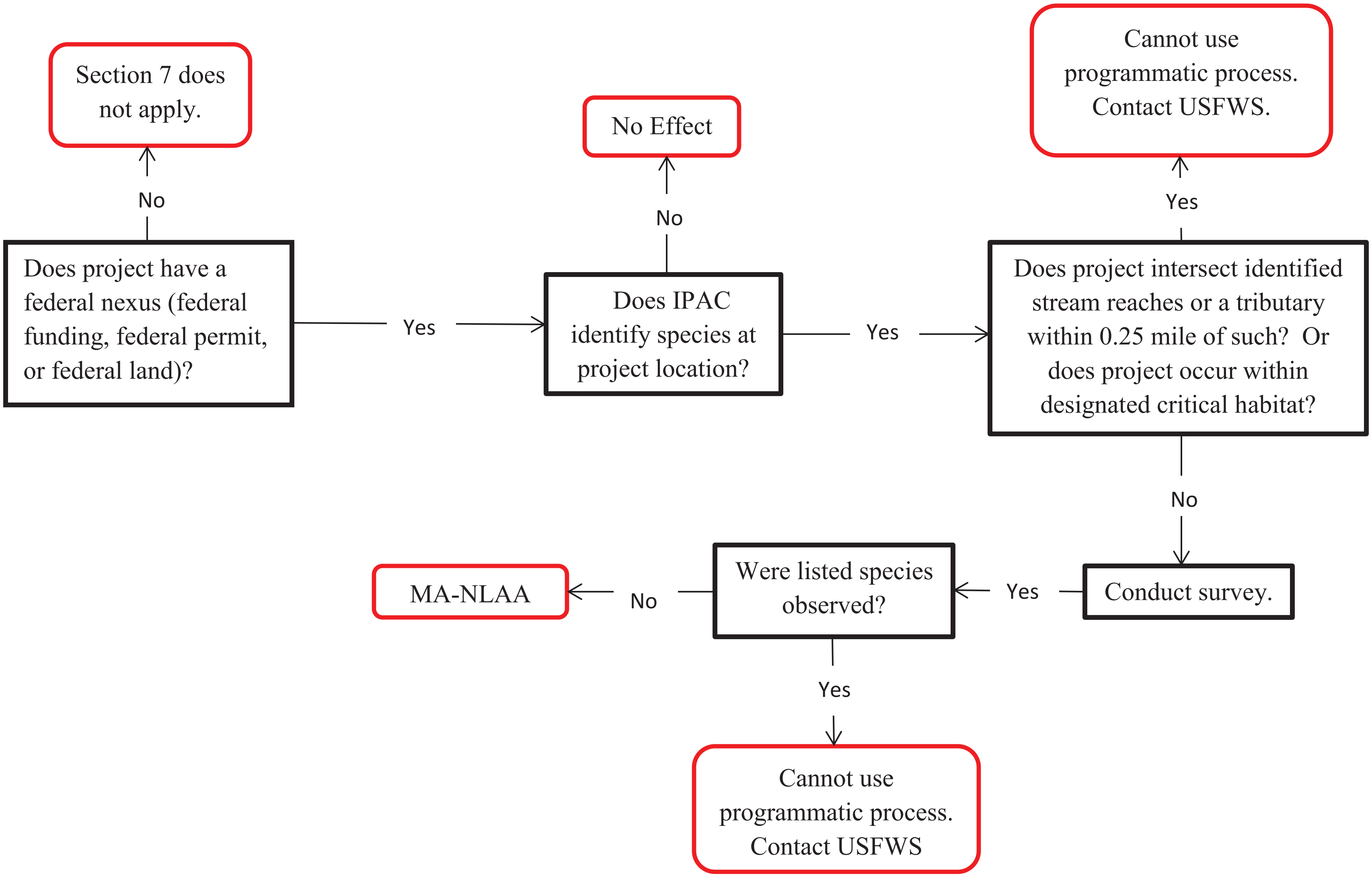
*This programmatic process assumes that all normal BMPs and on-site conservation measures regarding design, construction, and erosion control are implemented.

Appendix B2. Section 7 Mussel Programmatic Process – Culvert Replacement or Extension Divisions 1-8 for Dwarf Wedgemussel, Tar River Spinymussel, Yellow Lance, and Atlantic Pigtoe



*This programmatic process assumes that all normal BMPs and on-site conservation measures regarding design, construction, and erosion control are implemented.

Appendix B3. Section 7 Mussel Programmatic Process – Bridge to Culvert Replacement Divisions 1-8 for Dwarf Wedgemussel, Tar River Spinymussel, Yellow Lance, and Atlantic Pigtoe



*This programmatic process assumes that all normal BMPs and on-site conservation measures regarding design, construction, and erosion control are implemented.