Programmatic Biological Opinion - Revised

NCDOT Program Effects on the Northern Long-eared Bat in Divisions 1-8

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CONSULTATION HISTORY

This section lists key events and correspondence during the course of this consultation. A complete administrative record of this consultation is on file at the Service's Raleigh Field Office.

2020-02-20 – The Service met with the North Carolina Department of Transportation (NCDOT) and Federal Highway Administration (FHWA) to discuss a revised programmatic consultation agreement for the northern long-eared bat.

2020-03-12 – The FHWA and U.S. Army Corps of Engineers (USACE) reinitiated formal consultation in order to request an extension of the existing programmatic agreement.

2020-03-17 – The Service granted an extension to the existing programmatic agreement until December 31, 2020.

2020-06-00 – Extensive email and telephone discussions among the Service, NCDOT, FHWA, and USACE began regarding the development of a revised Programmatic Biological Assessment (PBA).

2020-08-13 – The Service received a draft PBA from NCDOT.

2020-08-19 – The Service provided comments on the draft PBA.

2020-09-02 – The Service received a revised draft PBA and provided additional comments.

2020-09-20 – The Service received the final PBA (dated 2020-09-00) and a letter (dated 2020-09-18) from the FHWA and USACE requesting formal Section 7 consultation.

2020-10-06 – The Service provided a letter to FHWA and USACE stating that all information required for initiation of formal consultation was either included with their 2020-09-18 letter or was otherwise available.

2020-10-07 – The Service provided the FHWA, USACE, and NCDOT with a draft Programmatic Biological Opinion (PBO).

2020-11-06 – The Service issued a final PBO.

2022-03-23 – The Service proposed to reclassify the northern long-eared bat as endangered.

2022-04-04 – Email and telephone discussions among the Service, NCDOT, FHWA, and USACE began regarding re-initiation of formal Section 7 consultation.

2022-11-08 – The Service provided the FHWA, USACE, and NCDOT with a draft revised PBO.

2022-11-30 – The Service issued a final rule to reclassify the northern long-eared bat as endangered.

2022-12-08 – The Service received an addendum to the PBA and a letter (dated 2022-12-06) from the FHWA and USACE requesting re-initiation of formal Section 7 consultation.

PROGRAMMATIC BIOLOGICAL OPINION

1. INTRODUCTION

A Biological Opinion (BO) is the document that states the findings of the U.S. Fish and Wildlife Service (Service) required under Section 7 of 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 Programmatic Biological 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 all North Carolina Department of Transportation (NCDOT) activities within NCDOT Divisions 1-8 (eastern North Carolina) with a federal nexus for a 10-year time frame from January 1, 2021 to December 31, 2030. For individual projects that are federally funded, the Federal Highway Administration (FHWA) serves as the lead federal action agency. For individual 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. This PBO considers the effects of the northern long-eared bat (NLEB) only. All other species must be evaluated independently. The Action does not affect designated critical habitat; therefore, this PBO does not address critical habitat.

PBO Analytical Framework

A PBO that concludes a proposed federal action is *not* likely to *jeopardize the continued existence* of listed species and is *not* likely to result in the *destruction or adverse modification* of critical habitat fulfills the federal agency's responsibilities under §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 critical habitat as a whole for the conservation of a listed species" (50 CFR §402.02).

The Service determines in a PBO whether we expect an action to satisfy these definitions using the best available relevant data in the following analytical framework (see 50 CFR §402.02 for the regulatory definitions of *action, action area, environmental baseline, effects of the action*, and *cumulative effects*).

a. *Proposed Action*. Review the proposed federal action and describe the environmental changes its implementation would cause, which defines the action area.
b. *Status*. Review and describe the current range-wide status of the species or critical habitat.
c. *Environmental Baseline*. Describe the condition of the species or critical habitat in the action area, without the consequences to the listed species caused by the proposed action.

The environmental baseline includes the past and present impacts of all federal, state, or private actions and other human activities in the action area, the anticipated impacts of all proposed federal projects in the action area that have already undergone formal or early consultation, and the impacts of state or private actions which are contemporaneous with the consultation.

d. *Effects of the Action*. Predict all consequences to species or critical habitat caused by the proposed action, including the consequences of other activities caused by the proposed action, which are reasonably certain to occur. Activities caused by the proposed action would not occur but for the proposed action. Effects of the action may occur later in time and may include consequences that occur outside the action area.
e. *Cumulative Effects*. Predict all consequences to listed species or critical habitat caused by future non-federal activities that are reasonably certain to occur within the action area.
f. *Conclusion*. Add the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the species, formulate the Service's opinion as to whether the action is likely to jeopardize species or adversely modify critical habitat.

2. PROPOSED ACTION

North Carolina is one of only a few states that have no county highway departments. With about 80,000 miles of state-owned and maintained highways, NCDOT has the second largest state-owned and maintained highway system in the country (FHWA 2021). NCDOT constructs and maintains a wide variety of transportation infrastructure across the state, including aviation, bicycle, pedestrian, ferry, highway, public transportation, and railroad projects. NCDOT has divided the state into 14 geographical divisions. Typically larger projects are planned as part of the Statewide Transportation Improvement Program (STIP), while smaller projects are planned within the local Division Office. Most state transportation projects eventually become the responsibility of the local NCDOT Division Offices to maintain.

NCDOT projects are tracked by project type and a unique number. NCDOT STIP and Division project types, including commonly used prefixes, are listed below (Table 2) with brief descriptions adapted from the STIP (NCDOT 2022).

Table 2. NCDOT STIP and Division Project Types and Descriptions

Prefix	Project Type	Description
B	Bridge Replacement in STIP	Existing bridges are replaced. These projects are generally larger or more complicated than the next two categories.
BD	Bridge Replacement in Division	Existing bridges are replaced. Generally these are two lane bridges.
BP	Bridge Preservation in Division	Existing bridges are preserved by supplementing or replacing compromising elements.
C	Congestion Mitigation	Addition of lanes, sidewalks, greenways, trails, intersections, and associated crosswalks and signage for improved movement
E	Enhancement	Installation of interactive signage, visitor’s exhibits, gateway and/or interruptive markers intended for scenic beautification
EE	Mitigation	Wetland and stream mitigation as enhancement, restoration, or preservation conducted to offset losses due to project construction

Prefix	Project Type	Description
EB, ER	Bike Route and Pedestrian Enhancement	New or additional lanes for bike or pedestrian traffic
EL	Enhancements – Multi-use Path	Ramp, parking lot, or visitor center improvements, preservation, or maintenance
F	Ferry	Dock, ramp, engine, ferry, parking lot, or visitor center improvements, preservation, or maintenance
FS	Feasibility Study	Conducted to determine the degree to which the project is justified (economically, environmentally, socially, financially)
I	Interstate	Pavement preservation or maintenance, access improvement, widening, upgrading intersections, bridge preservation and/or adding lanes along interstates
K	Rest Area	Existing or new rest area ramp, parking, sewer, fixtures and finishes installation or preservation
L	Landscape	Plantings along NCDOT projects
P	Passenger Rail	Rail grade separations, track realignment, track improvement, track and station right of way acquisition, and track bypass installation
R, A, M	Rural	Improvements to existing and new locations, road widening, intersection or interchange improvements, traffic circles, and weigh stations improvements
S, SB	Scenic Byway	Waysides, overlooks, interpretive signs, land conservation to implement resource protection and heritage tourism development to enhance and preserve scenic vistas and tourism corridors
SF, SI, W	Highway Safety and Hazard	Realign curves, install median barriers, install shoulders or turn lanes to improve safety
SR	Safe Routes to School	Improve safety and/or reduce traffic, fuel consumption, and air pollution in vicinity of schools; also includes education, training, and other non-infrastructure needs
U	Urban	Roadway improvements including new lanes, new location extensions, bridge replacements, grade separations, interchange and intersection conversion
X	Special Projects	New location and new structures
Y, Z	Railroad-Highway Crossings	Grade separation and crossing safety improvements

The proposed programmatic action evaluated in this PBO includes all NCDOT activities in NCDOT Divisions 1-8 (Figures 1 and 2) with a federal nexus for a 10-year time frame from January 1, 2021 to December 31, 2030.

2.1. Programmatic Activities

For the purposes of this programmatic consultation, NCDOT projects (STIP and Division) are grouped into the following categories: 1) new construction, 2) safety and mobility improvement, 3) maintenance and preservation, 4) disaster response, bank stabilization, and sinkhole repair, 5) transportation enhancements, and 6) stream and wetland mitigation. Each of the above categories of projects is further divided into a list of potential activities and sub-activities. Any individual project may involve a combination of one or more activities or sub-activities.

2.1.1. New Construction (category)

New construction includes activities for roadway and railway construction and improvements, bridge and culvert construction and replacement, and the development of construction staging areas. Heavy equipment use are involved in all aspects of new construction. New construction projects typically reduce and modify habitat, increase impervious surface area, and increase disturbance. Many of these projects affect undeveloped or undisturbed property, require the acquisition of additional right-of-way (ROW), and involve impacts to native vegetation. Contractors may need to establish project equipment staging areas and parking areas, but existing road surfaces or parking areas can often be utilized.

Staging areas/site prep (activity)
This activity covers preparations at the project site and 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 closely adjacent to the construction site.

- Lighting - The use of lighting to illuminate project work involves installing permanent highway illumination and traffic signals. Lighting may also be used temporarily in order to conduct construction activities during the evening and nighttime hours.
- Tree clearing and grubbing - Tree clearing and clearing of other vegetation is performed to prepare the project area for construction activities. Clearing generally takes place within pre-marked areas in the project area necessary for construction purposes. The initial access into work areas for clearing activities will be via existing public roads, but clearing for temporary access roads may also be needed. Clearing consists of cutting and removing above-ground vegetation such as grass, 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 and buried debris. Clearing and grubbing are required prior to earthwork in order to remove vegetative and other debris from work areas so that design specifications (e.g. for compaction) can be met. Trees, stumps, and large roots will be removed from excavation areas to a depth sufficient to prevent such objectionable material from becoming mixed with the material being incorporated in the embankment. All extraneous matter will be removed and disposed of in 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 construction limits, but may also occur in temporary construction easements used to assemble and store the construction vehicles that are too large to travel on the highway in one piece (e.g. haul trucks, earthmovers, large dozers, large excavators, hoes, etc.). These areas are also used to store supplies (erosion control materials, steel rebar and mesh, small diameter culverts, traffic signs and posts, office trailers, etc.).
- Earthwork - Earthwork is all earth moving activities that will occur for road and interchange construction, access road construction/relocation, utility placement and

relocation, construction of drainage structures, and preparation of staging, maintenance, waste, and borrow areas. Earthmoving activities will include excavating (cutting), filling, ditching, backfilling, grading, embankment construction, auguring, disking, ripping, grading, leveling, borrowing and wasting of materials, and any other earth-moving work required in the construction of the project. Earthmoving equipment to be used includes haul trucks, dozers, excavators, scrapers, and backhoes. Earthwork may be conducted as part of the preparation of staging areas, bridge approaches, alignments, embankments, fills, backfills, foundations, toe trenches, road grades, utility relocation, stormwater treatment, ditch construction, bank stabilization, landscaping, restoration, and mitigation.

- Blasting - Blasting may be required on a very limited number of projects. Timing and duration of the blasting will vary on a project-by-project basis. Blasting consists of excavating in rock to achieve smooth, unfractured backslopes. It can also involve blasting to facilitate excavation. Bridgework may require blasting during the construction or removal of bridge abutments. Debris or rock disposal may be required after blasting.
- Dust control - Performing earthwork activities may necessitate the use of dust control measures. This work consists of applying water for the alleviation or prevention of dust nuisance originating from earthwork construction operation from within the project construction limits.
- Install erosion and sediment control best management practices (BMPs) - This work includes the installation of silt fences, check dams, sediment basins, coir blankets and temporary seeding.
- Structure demolition - Structures within the project ROW will be purchased and either demolished or moved (intact) off-site prior to the commencement of construction work. Structures include commercial, residential, and public buildings and facilities. After demolition, structure debris is hauled off-site for disposal.
- Installation of drainage features - This work may include work area isolation, stream diversion, dewatering, excavation for pipe trenches, ditch creation and stream relocation, culvert jacking or drilling, laying and covering pipe, constructing headwalls on the outlet side of flow diversion, installing armoring, and restoring flow.
- Utility relocation - Utility relocation or placement can involve both above and below-ground work, including tree clearing, mowing, trenching, and horizontal or directional boring. When water, sewer, electric, or gas lines need to be relocated, these impacts are typically accounted for during project planning and permitting. In the rare event that utility lines would need to be relocated outside a project ROW, the utility company will be responsible for obtaining their own permits.
- Portable fence installation/removal
- Temporary access road construction – requires installation of geo-fabric and rock
- Gravel workspace

Offsite use areas (activity)
Waste and borrow areas that are used to dispose of and obtain materials for earthwork are also subject to clearing and grubbing, but the contractor is responsible for addressing federally listed threatened and endangered species issues per NCDOT standard specifications. Most borrow and waste areas are sited in areas of previously disturbed habitat where tree removal is minimal.

Road surface preparation and construction (activity)
The activity of road surface preparation and construction also includes the construction of bicycle and pedestrian facilities.

- Construct stormwater facilities
- Final grading and road/trail bed preparation
- Construct barrier wall and retaining wall (mechanically stabilized earth, soil nail, sheet pile, soldier pile, etc.)
- Application of course aggregate, concrete, or asphalt
- Striping, pavement markers, and signage
- Guard rail installation
- Noise wall construction
- Sidewalk installation

New rail track construction (activity)

- Subgrade installation (building up ballast/rail bed)
- Laying track

Bridge/culvert construction (activity)
Work included in this activity includes bridge construction and replacement, construction and replacement of culverts over three feet in diameter, and widening of existing bridges and culverts. Many traditional bridge replacement projects take as little as 9 months, and low-impact bridges can be completed in as little as 3-6 months. Culvert replacements are typically shorter in duration. Installation of new bridges may require the installation of an on-site detour 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 and replaced.

Geotechnical investigations (drilling) are necessary for any type of construction work that requires a level of underground stability. They are normally needed to determine appropriate designs for bridge foundations. Foundations are required elements of every bridge construction and replacement project. Bridge foundations consist of three general types: 1) drilled shafts, 2) columns on spread footings, and 3) driven piles and pile-supported caps or walls. Driven piles are normally used to support temporary structures such as detour bridges and work bridges. However, driven piles are also used to provide additional support to spread footings.

In-water work may take place during many activities associated with bridge construction, excluding superstructure construction. BMPs are used to protect water quality during in-water work, and special BMPs apply in High Quality Waters, Outstanding Resource Waters, and in N.C. Coastal Area Management Act counties (NCDOT 2003, 2014, 2015).

- Barge use - anchor spud installation, mooring, operation
- Temporary work trestle/platform/detour bridge/causeway construction and removal
    - impact/vibratory pile driving
    - deck installation
    - pile removal (vibratory hammer, direct pull, etc.)
- Bridge demolition (for replacement)
    - work area isolation (cofferdam installation, impact/vibratory pile driving, dewatering)

    - 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)
    - drilled shaft construction (auger drills hole within casing) or impact pile driving
    - install casing and rebar
    - pour concrete
    - spread footing construction
    - riprap installation
- Superstructure construction
    - pier tables, cantilevers, decking, pre-cast concrete or steel girders, crane use

Wildlife Passage Facilities (activity)
The construction of wildlife crossings (including culverts, bridge underpasses, bridge overpasses) involves some level of vegetation alteration and earth work.

- Prepare project site
- Install drainage features
- Construct crossing – culvert or bridge construction
    - retaining walls
    - final grading
    - post construction work

Post-construction (activity)
In addition to temporary BMPs used during construction, NCDOT implements a post-construction stormwater program in accordance with its 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. Because post-construction BMPs are permanent, they require a long-term maintenance commitment to function as designed.

- Temporary BMP removal (silt fencing, check dams, sediment basin)
- Fence installation
- Landscaping, beautification, site stabilization

Billboards (activity)
NCDOT has entered into an agreement with the FHWA regarding the control of outdoor advertising in areas adjacent to any highway which is or becomes a part of the National Highway System. No person shall erect and/or maintain any outdoor advertising within 660 feet of the highway ROW without first obtaining a permit from NCDOT. Constructing or maintaining a billboard may involve tree removal along highways. Vegetation cutting, thinning, pruning, or removal by billboard owners cannot be conducted without a permit by NCDOT. Billboards may also involve long-term lighting.

2.1.2. Safety and Mobility Improvement (category)

Safety and mobility improvement projects include many of the same activities and sub-activities described under the New Construction category such as tree clearing and grubbing. Heavy equipment use will be required for all projects, and portable lighting may be used for some.

Safety projects are designed to improve the safety of the highway system and not to add capacity. These include signal and illumination improvements, sign installation, installation of sidewalks, tree removal from the clear zone, guard rail installation, railroad grade separation, and alignment modifications. Alignment modifications may include adding auxiliary lanes (e.g. truck climbing and acceleration lanes), channelization (turn lanes), on and off ramp extensions, or realigning an intersection to improve the sight distance.

Mobility improvement projects are designed to improve traffic operations and/or capacity on existing roadways. Typical projects include construction of high occupancy vehicle (HOV) lanes in urban areas; reconstructing existing interchanges; construction of new interchanges; adding additional lanes; and sidewalk, curb and shoulder construction. Overpass, bridge, and culvert replacement and widening may occur as part of a mobility improvement project. Most mobility improvement projects occur in heavily developed urban areas. Many of these projects affect very little undeveloped or undisturbed property, and many occur in the existing ROW in heavily urbanized areas.

Intelligent transportation systems (activity)
Intelligent transportation systems are advanced applications that strive to provide innovative services relating to different modes of transport and traffic management and enable various users to be better informed and make safer, more coordinated, and smarter use of transport networks. This includes all modes of transport and incorporates current and evolving computer and communication technologies with the goal of improving traffic conditions, minimizing delays, and increasing safety for all commuters. Sub-activities include sign and camera installations.

Railroad protective device installation (activity)
This activity involves the installation of signals and other safety features where railroads intersect at grade or where railroads intersect roads at grade.

Railroad grade separation (activity)
Railroad grade separation involves the alignment of two or more surfaces, associated with similar or dissimilar transport types of differing elevations. This typically consists of the creation of an overpass or underpass to allow for continued flow of activity at the axis/intersection of the transport facilities.

- Staging areas
- Project site prep
- Install drainage features
- Utility lines
- Pre-watering of roads and exposed areas at construction site for dust control or grading

Road surface, railroad bed preparation and construction (activity)

- Construct stormwater facilities
- Final grading and road/rail bed preparation
- Retaining wall construction
- Course aggregate application, concrete or asphalt application
- Striping, pavement markers and signage
- Railroad crossing gate installation
- Guard rail installation
- Sidewalk, curb, and shoulder construction

Signal system improvements (activity)
Signal system improvements involve changes or upgrades to signaling system.

2.1.3. Maintenance and Preservation (category)

Many activities under this category will require the use of heavy equipment and portable lighting. Minor tree clearing and grubbing may be required on some maintenance, preservation, and facilities preservation projects.

Bridge painting (activity)
Steel bridges or bridges with steel sections require painting on an as-needed basis, approximately every 10 years.

- Construct scaffolding
- Install full containment (includes vacuum system for capturing wash water)
- Pressure wash bridge
- Sandblast bridge
- Prime/paint bridge
- Remove containment and scaffolding

Bridge rehabilitation (activity)
Bridge deck repairs occur regularly while bridge deck replacement is infrequent. Bridge decks made of concrete are partially removed and replaced. Removal may involve jackhammers, concrete saws, and hydro milling (high-pressure water). Longer bridges have expansion joints that must be repaired and replaced as needed. Bridge repair, painting, and retrofit projects may involve hanging scaffolding and containment devices under and around the bridges.

Bridge repair and maintenance activities include washing, sandblasting, patching, bonding, and filling voids in concrete with epoxy. Similar washing, sandblasting, and patching may be implemented for maintenance of guardrails and other infrastructure. In addition, this activity may occasionally include minor replacement and repair of bridge structural elements, such as individual trusses, stringers, and girders. Generally, this work requires the use of light equipment, primarily handheld power tools. However, replacement or repair of bridge structure elements, such as individual trusses, stringers, and girders may require the use of heavy equipment. In-water work similar to that previously described under bridge/culvert construction may take place during many activities associated with bridge rehabilitation projects.

- Install scaffolding and containment

- Replace rivets, degraded steel, bridge railing, joint seals, bearing work
- Seal cracks (Shotcrete)
- Repair concrete spalling
- Repair bridge approaches
- Repair/replace electrical system
- Bridge deck replacement
- Bridge demolition
    - install scaffolding and containment
    - mill, break up, or use hydro-demolition to remove existing deck
    - use vacuum truck or sweeper to remove debris
    - repair/replace finger joints
    - pour new deck
    - remove containment and scaffolding

Culvert cleaning/repair (activity)
This activity includes regular removal of debris, vegetation, and sediment.
- Divert flow, dewater as previously described
- Clean culvert
- Install culvert liner (complete or invert)
- Patch repair (metal or concrete, coat and seal)
- Headwall or outfall repair (concrete work or riprap installation)
- Repair joints (band installation, inject grout)
- Line with Shotcrete or Gunnite
- Sandblast/repaint/recoat

Drainage improvements (activity)
This activity includes all work necessary to maintain roadside ditches and channels, cross culverts, catch basins and inlets, and detention/retention basins. Slope and ditch repair involves re-grading ditches and slopes to the appropriate contour and filling in or repairing sides of the ditches where necessary. Regular maintenance of roadside ditches is required to remove built up sediments, debris or blockages, re-slope the sides, and maintain capacity. Removal of newly constructed beaver dams is often necessary when the dams affect the effectiveness of storm drainage facilities. Each construction project has an associated staging area which contains the construction company job site headquarters, parking, equipment, materials storage, refueling tanks, etc.

Catch basins, inlets and retention facilities are part of the storm drain system of the highway. These are designed to trap sediments and liquids and require regular cleaning. Material is removed by manual clearing methods or by using a vacuum truck. Solids are stored on NCDOT property, tested, and then disposed of at an approved disposal facility or recycled as fill material if suitable. Regular cleaning improves water quality and minimizes sediments that enter the natural stream systems.
- Clean and reshape ditches (remove vegetation, sediment, debris)
- Culvert repair work
- Clean catch basins/inlets (manually or vacuum truck)
- Remove beaver dams from culvert ends

- Remove sediment from retention/detention facilities
- Dispose of debris and vegetation

Guardrail replacement (activity)
Guardrail replacement includes the following subactivities:
- remove damaged guardrail
- install posts with post driver
- install steel beam

Pavement rehab and resurfacing (activity)
This activity involves patching, repairing, and replacing of roadway surfaces and pavements. Each section of highway paved with asphalt or concrete must be repaved every 10 – 14 years. If the pavement is in good shape, it may be overlaid with a new layer of asphalt, but badly deteriorated pavement requires the replacement of the foundation material. Typically, the existing asphalt pavement is ground off and replaced or simply overlaid with new asphalt. Ground-up pavement is normally recycled and used to make new asphalt pavement.

Since paving may result in a slightly higher road surface, manholes, drainage inlets, valves, guardrails, and survey monuments may require raising. Ditches and slopes may be repaired, and culverts may be cleaned. Culverts may also require extension as part of pavement rehab and resurfacing projects.
- Seal cracks with liquid asphalt
- Blanket application of liquid asphalt
- Apply aggregate
- Finish with power roller
- Grind (mill) existing pavement
- Collect and dispose of pavement grindings/slurry
- Dowel bar placement (if concrete)
- Apply new pavement

Herbicide spraying within ROW (activity)
This activity involves treating roadside vegetation using chemical control treatment methods that are applied by hand or by vehicle-mounted sprayers. Herbicide is used to control vegetation where manual or mechanical means would be cost-prohibitive or result in excessive soil disturbance or other resource damage. All herbicides are used according to manufacturer's label direction for rates, concentrations, exposure times, and application methods. Only formulations approved for aquatic-use will be applied in or adjacent to wetlands, lakes, and streams. The use of spot herbicide applications is periodically used to control tree limb growth.

Mowing (activity)
Mowing occurs regularly along roadside shoulders during the growing season and extends less frequently to the back of roadside ditches.

Mechanical branch removal along ROW (activity)
This is regular maintenance targeted at woody vegetation that occurs along the edges of existing transportation corridors. The NCDOT maintains a safety recovery zone of 40 feet from the edge

of the travel lane to allow errant vehicles to recover. The use of A-boom mowers has been the routine method of limb removal along the tree line. NCDOT also contracts the use of machinery equipped with a series of high speed rotary saws on a heavy-duty skidder apparatus which cuts the limbs smoothly as it moves along the ROW. There is no set schedule for addressing limb removal, and trimming limbs may wait until there is a complaint or problem. NCDOT also periodically contracts for the removal of a swath of roadside trees to set the woods line back to the original desired safety recovery distance when it has become overgrown over the course of several years. This generally requires the removal of 10 to 20 feet of wooded buffer area.

Hazard tree removal (activity)
This occurs along the edges of existing transportation corridors and involves the removal of individual trees with the potential to fall or drop branches in areas that may cause safety issues.

Repair ROW fence (activity)

Facility rehabilitation (activity)
This activity includes the preservation, maintenance, and construction of new weigh stations, rest areas, rail stations, and maintenance facilities. Rehabilitation of historic buildings and other historic structures may also occur.

- Paving
- Expansion of buildings and parking areas
- Septic upgrades
- Minor vegetation alteration and removal (including trees)
- Installation of erosion and sediment control
- Overlay, paving
- Excavation
- Herbicide application
- Painting/striping/signing
- Rehab historic rail buildings and other non-bridge structures

Reconstruct existing rail (activity):

- Install new rail, concrete ties, and resurface stone ballast
- Pavement resurfacing at crossings and approaches
- Upgrade signals and warning systems

Snow removal/deicers (activity)
Snow removal and deicing is conducted sporadically in eastern North Carolina. Stormwater pollution prevention plans are developed for NCDOT maintenance facilities where deicers are stored and loaded, and where equipment repair is conducted.

Bridge inspections (activity)
This activity involves a detailed review of each bridge's superstructure, deck, supports, railing, and pavement to check the functionality and safety of each bridge. Each bridge is inspected every 24 months on average, but a few older structures may be inspected every 12 months.

Endangered Plant Conservation (activity)
NCDOT periodically conserves habitat to offset effects to federally protected plants through conservation easement or purchase of property. This activity also includes habitat protection and restoration work such as thinning, burning, and non-native invasive species control. Herbicides may be used on non-natives, but only on a very limited basis. All herbicides are applied by hand.

2.1.4. Disaster Response, Bank Stabilization, and Sinkhole Repair (category)

There is no way to accurately predict all the activities that may occur within this category since they are entirely dependent on the extent and type of damage and level of repair that will be needed. Minor tree clearing and grubbing may be required on some disaster response, bank stabilization, and sinkhole repair projects in order to provide access for equipment. Heavy equipment and portable lighting may be used.

Disaster response (activity)
Disasters are usually weather-driven events from flooding, ice-storms, or hurricanes. Disaster response activities involve emergency work to repair and stabilize eroding banks or shoulders on sections of rivers, streams, and the ocean adjacent to existing highways. Emergency repairs to bridges and roadbeds may also be necessary. Temporary bridges may be constructed. High water flows during floods can cause erosion of the bank to the point that the adjacent highway is undermined. Other flood damage can include clogged culverts and deposition of debris along transportation corridors. Immediate repairs normally involve protection or reconstruction of the highway and associated infrastructure such as bridges, culverts, and utilities.

- Debris removal
- Construct temporary access road
- Vegetation removal/disposal
- Grading
- Install/remove temporary erosion control
- Barge use
- Riprap installation
- Road reconstruction (rebuild roadbed, add drainage structures, repave, paint)
- Fill newly created breaches
- Sandbag installation/replacement
- Water removal (pumping water from flooded areas)
- Culvert cleaning/repair

Bank stabilization/flood damage/scour repair - non-emergency (activity)
These activities stem from the result of natural changes in river or stream morphology over time. These activities normally involve protection of the highway and associated infrastructure such as culverts and utilities. Clogged culverts often require cleaning or may need upgraded to a larger size to prevent further flow restrictions. Other repairs involve river training techniques to redirect the thalweg away from the road. These techniques include placing riprap, barbs, drop structures, groins, or large woody debris in the waterway.

- Debris removal
- Construct temporary access road
- Vegetation removal/disposal

- Grading
- Barge use
- Riprap installation
- Willow staking
- In-stream structure installation (weirs, barbs, logjams, etc.)
- Road reconstruction (rebuild roadbed, add drainage structures, repave, paint)
- Retaining wall construction
- Landscaping/site stabilization
- Install/remove temporary erosion control

Sinkhole repair (activity)
Sinkhole repair will involve some level of earthwork and may rarely include tree clearing and grubbing, depending on the extent of damage.

- Excavate and/or flush loose material
- Place non-concrete fill material
- Place concrete fill
- Compact fill
- Restore roadway

2.1.5. Transportation Enhancements (category)

Transportation enhancements can include bicycle and pedestrian facility construction and historic bridge rehabilitation. Other activities include the construction of turnouts, overlooks, historic markers, and viewpoints. Such activities could be similar to new roadway construction; however, these are much smaller in scale with less vegetation removal and disturbance. Minor tree clearing, grubbing, and earthwork may be required on some transportation enhancement projects. Portable lights and heavy equipment may also be used.

- Permanent lighting installed
- Install/remove portable fence
- Prepare project site
- Install drainage features
- Utility lines
- Pre-watering of roads and exposed areas for dust control or grading
- Road and parking lot surface preparation and construction
- Construct stormwater facilities
- Final grading
- Construct retaining wall (mechanically stabilized earth, soil nail, sheet pile, soldier pile, etc.)
- Coarse aggregate application, concrete or asphalt application
- Striping, pavement markers and signage
- Guard rail installation
- Sidewalk installation
- Information kiosk construction
- Post-construction work

2.1.6. Stream and Wetland Mitigation (category)

Stream and wetland mitigation are construction activities that include restoration of the hydrology, soils, and vegetation to wetland systems; bank stabilization and in-channel habitat restoration of streams; and reforestation of riparian buffers. These combined mitigation actions include habitat enhancement, preservation, and replacement.

2.2. Conservation Measures

Conservation measures are actions which promote the recovery of listed species and are included as an integral part of the proposed action. These actions serve to minimize or compensate for project effects on the species under review.

1) No tree clearing will occur within 150 feet of a known maternity roost tree May 1 - June 30 in order to protect non-volant young. Winter roost trees are not considered maternity roost trees.
2) At individual project sites where a total of 1.0 acre or more of tree clearing will occur, no tree clearing will occur during the portion of the day that the air temperature is <40 degrees Fahrenheit in order to protect NLEBs that may be in torpor. This restriction is only subject to the known/potential range (30 coastal counties) that is shown in Figure 2.
3) NCDOT has agreed to conduct up to 10 years of NLEB monitoring and research study. The monitoring portion of this agreement will consist of six fixed locations (determined from the past 5-year study where NLEB were the most abundant). These locations will be monitored on a rotational basis, where only a portion of the locations are mist netted every year. Through the research portion of this study, NCDOT will fund up to $500,000 towards NLEB research during the 10 years of the PBO's duration. The details of the studies will be determined at a later date. The primary goal is to learn more about the NLEB in the coastal plain of North Carolina and how NCDOT can build projects with the least amount of impact to the species. A secondary goal is to better determine the occupied range of the species in eastern North Carolina.

2.3. Other Activities Caused by the Action

A PBO evaluates all consequences to species or critical habitat caused by the proposed federal action, including the consequences of other activities caused by the proposed action, that are reasonably certain to occur (see definition of "effects of the action" at 50 CFR §402.02). Additional regulations at 50 CFR §402.17(a) identify factors to consider when determining whether activities caused by the proposed action (but not part of the proposed action) are reasonably certain to occur. These factors include, but are not limited to:

(1) past experiences with activities that have resulted from actions that are similar in scope, nature, and magnitude to the proposed action;
(2) existing plans for the activity; and
(3) any remaining economic, administrative, and legal requirements necessary for the activity to go forward.

In its request for consultation, the FHWA and USACE did not describe, and the Service is not aware of, any additional activities caused by the Action that are not included in the previous description of the proposed Action. Therefore, this PBO does not address further the topic of "other activities" caused by the Action.

2.4. Programmatic Action Area

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). Delineating the action area is necessary for the federal action agency to obtain a list of species and critical habitats that may occur in that area, which necessarily precedes any subsequent analyses of the effects of the action to particular species or critical habitats.

It is practical to treat the action area for a proposed federal action as the spatial extent of its direct and indirect "modifications to the land, water, or air" (a key phrase from the definition of "action" at 50 CFR §402.02). Indirect modifications include those caused by other activities that would not occur but for the action under consultation. The action area determines any overlap with critical habitat and the physical and biological features therein that we defined as essential to the species' conservation in the designation final rule. For species, the action area establishes the bounds for an analysis of individuals' exposure to action-caused changes, but the subsequent consequences of such exposure to those individuals are not necessarily limited to the action area.

Since this PBO collectively evaluates a large number of individual projects, the action area for this PBO includes all the locations of individual NCDOT activities within NCDOT Divisions 1-8 (Figures 1 and 2) 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. The Programmatic Action Area includes the following three EPA Level III Ecoregions: Piedmont, Southeastern Plains, and Middle Atlantic Coastal Plain (Griffith et al. 2002).

3. SOURCES OF CUMULATIVE EFFECTS

A PBO must predict the consequences to species caused by future non-federal activities within the programmatic action area, *i.e.,* cumulative effects. "Cumulative effects are those effects of future state or private activities, not involving federal activities, that are reasonably certain to occur within the action area of the federal action subject to consultation" (50 CFR §402.02). Additional regulations at 50 CFR §402.17(a) identify factors to consider when determining whether activities are reasonably certain to occur. These factors include, but are not limited to: existing plans for the activity; and any remaining economic, administrative, and legal requirements necessary for the activity to go forward.

If reviewed individually, some NCDOT maintenance activities would not have a federal nexus and thus could qualify as cumulative effects. However, given the programmatic nature of this consultation, such maintenance activities are included in the overall project description and assessed on a program level.

Eastern North Carolina has a large timber industry, with approximately $707 million of timber being delivered to mills within the Programmatic Action Area in 2017 alone (Parajuli and Bardon 2019). Much of this timber harvest is part of sustainable management, with the remainder occurring due to development and land clearing for other purposes. From mid-2010 to mid-2018, the human population within the Programmatic Action Area increased by approximately 545,000 people (U.S. Census Bureau 2020). Increased population growth generally leads to increased land clearing. However, only about 2% of the population increase occurred within rural areas where the northern long-eared bat may be present (NCDOT 2019).

4. STATUS OF NORTHERN LONG-EARED BAT

This section summarizes best available data about the biology and condition of the northern long-eared bat (NLEB, *Myotis septentrionalis*) throughout its range that are relevant to formulating an opinion about the Action. The Service originally published a decision to list the NLEB as threatened on April 2, 2015 (80 FR 17974–18033) and a 4(d) rule on January 14, 2016 (81 FR 1900–1922). Subsequently, the Service published its decision to reclassify the NLEB as endangered on November 30, 2022 (87 FR 73488-73504).

4.1. Species Description

The NLEB is a small (~5-8 g) insectivorous bat with a head and body length <50 mm and overall length up to 95 mm (Caceres and Barclay 2000). The fur on the back is light/medium brown, while the fur on the belly is generally a pale grayish-brown. The NLEB can be distinguished from other species within its genus by a longer ear (>16 mm) and a longer, symmetrical, sharp-pointed tragus.

4.2. Life History

The NLEB is generally considered to be a forest interior species (Owen et al. 2003, Johnson et al. 2009). During the summer, NLEBs typically roost singly or in colonies in cavities, cracks/crevices, or underneath bark of both live trees and snags of a large variety of species (Sasse and Pekins 1996, Foster and Kurta 1999, Lacki and Schwierjohann 2001, Owen et al. 2002, Carter and Feldhamer 2005, Perry and Thill 2007, Timpone et al. 2010, Jordan 2020). NLEBs appear to not be dependent on certain species of trees for roosts, but rather search for suitable cavities, cracks/crevices, and exfoliating bark found in whatever tree species are available (Foster and Kurta 1999). NLEBs have also been observed roosting in manmade structures such as buildings, bat houses, and bridges (Barbour and Davis 1969, Cope and Humphrey 1972, Kiser et al. 2002, Feldhamer et al. 2003, Amelon and Burhans 2006, Whitaker and Mumford 2009, Timpone et al. 2010).

Female NLEBs are variable in their selection of tree sizes for maternity roosts. For example, Sasse and Pekins (1996) found that females typically roosted in large-diameter trees with a mean diameter-at-breast-height (dbh) of 41 cm. However, Jordan (2020) found that mean dbh of maternity roost trees was 20.6 cm, with some as small as 6.1 cm. Some studies have found that the dbh and/or height of NLEB roost trees was greater than random trees (Sasse and Pekins 1996, Lacki and Schwierjohann 2001, Owen et al. 2002). However, other studies have found that roost tree mean dbh and height did not differ from random trees (Menzel et al. 2002, Carter and Feldhamer 2005). NLEBs switch roosts often (Sasse and Perkins 1996), typically every 2–3 days (Foster and Kurta 1999, Owen et al. 2002, Carter and Feldhamer 2005, Timpone et al. 2010).

In most of their range, NLEBs overwinter in hibernacula that include caves and abandoned mines (Caire et al. 1979; Whitaker and Rissler 1992a, 1992b; Caceres and Barclay 2000). To a lesser extent, NLEBs have been found overwintering in other types of habitat that resemble caves or mines, such as a storm sewer in Minnesota (Goehring 1954) and a hydro-electric dam in Michigan (Kurta and Teramino 1994). NLEBs have also been documented hibernating within the crawl space of a house on Nantucket Island, Massachusetts (Dowling and O'Dell 2018). In coastal North Carolina, NLEBs utilize trees as day roosts during winter (Jordan 2020).

In most of their range, NLEBs hibernate during the winter months to conserve energy from increased thermoregulatory demands and reduced food resources (USFWS 2015). In general, NLEBs arrive at hibernacula in August or September, enter hibernation in October and November, and leave the hibernacula in March or April (Caire et al. 1979, Whitaker and Hamilton 1998, Amelon and Burhans 2006). In northern latitudes such as in upper Michigan, hibernation for NLEBs may begin as early as late August and may last for 8 to 9 months (Stones and Fritz 1969). While the NLEB is not considered a long-distance migratory species, short migratory movements between summer roosts and winter hibernacula between 35 miles and 55 miles have been documented (Griffin 1940, Caire et al. 1979).

Contrary to the species' documented behavior in the rest of its range, Jordan (2020) documented that NLEBs in coastal North Carolina did not hibernate and were active throughout most of the winter. During late fall–winter 2015–2018, 43 NLEBs were tracked to 165 winter roost trees located mostly in or adjacent to swamps. Coastal North Carolina is an area devoid of known hibernacula and of caves/mines which could potentially serve has hibernacula. The relatively mild winter temperatures of the area allows some level of insect activity, thus providing winter foraging opportunities for NLEBs.

NLEB breeding begins in late July in northern regions to early October in southern regions and commences when males begin to swarm hibernacula and initiate copulation activity (Whitaker and Hamilton 1998, Caceres and Barclay 2000, Amelon and Burhans 2006, Whitaker and Mumford 2009). Hibernating females store sperm until spring, exhibiting a delayed fertilization strategy (Racey 1979, Caceres and Pybus 1997). Ovulation takes place at the time of emergence from the hibernaculum, followed by fertilization of a single egg (Cope and Humphrey 1972, Caceres and Pybus 1997, Caceres and Barclay 2000). Gestation is approximately 50-60 days (Ollendorff 2002).

Adult females give birth to a single pup (Barbour and Davis 1969). In the southern portion of its range, parturition generally occurs in late May or June (Easterla 1968, Caire et al. 1979, Whitaker and Mumford 2009). In more northern latitudes, parturition occurs later in July (Broders et al. 2006, 2013). However, parturition likely occurs earlier in early to mid-May in coastal South Carolina (Kindel 2019) and the southern coastal plain of North Carolina (Jordan 2020). Juvenile volancy occurs by 18-21 days after parturition (Krochmal and Sparks 2007). NLEB can live up to 18.5 years (Hall et al. 1957).

Maternity colonies, consisting of females and young, are generally small, numbering from about 30 (Whitaker and Mumford 2009) to 60 individuals (Caceres and Barclay 2000); however, one group of 100 adult females was observed in Indiana (Whitaker and Mumford 2009). Individual female home range sizes range from as small as 2.5 acres (Badin 2014) to as large as 425 acres (Lacki et al. 2009). Owen et al. (2003) estimated mean maternal home range size to be 161 acres. The roosting area of maternity colonies in contiguous forest have been reported between 3.2 and 144.1 acres (mean 94.0 acres) by Silvis et al. (2015).

The NLEB has a diverse diet including moths, beetles, flies, leafhoppers, caddisflies, and spiders with diet composition differing geographically and seasonally (Griffith and Gates 1985, Nagorsen and Brigham 1993, Brack and Whitaker 2001, Feldhamer et al. 2009). Foraging techniques include hawking (catching insects in flight) and gleaning in conjunction with passive acoustic cues (Nagorsen and Brigham 1993, Ratcliffe and Dawson 2003). Observations of NLEBs foraging on arachnids (Feldhamer et al. 2009), presence of green plant material in their feces (Griffith and Gates 1985), and non-flying prey in their stomach contents (Brack and Whitaker 2001) suggest considerable gleaning behavior.

4.3. Numbers, Reproduction, and Distribution

The range of the NLEB includes the following 37 states: Alabama, Arkansas, Connecticut, Delaware, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Hampshire, New Jersey, New York, North Carolina, North Dakota, Ohio, Oklahoma, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Vermont, Virginia, West Virginia, Wisconsin, and Wyoming (USFWS 2022a) and all Canadian provinces and territories except Nunavut (COSEWIC 2013).

Much of the available data on NLEBs are from winter surveys, although they are typically observed in low numbers because of their preference for inconspicuous roosts (Caceres and Pybus 1997). NLEBs are documented in hibernacula in 29 of the 37 states in the species' range (USFWS 2015). The number of known hibernacula per state includes: Alabama (2), Arkansas (41), Connecticut (8), Delaware (2), Georgia (3), Illinois (21), Indiana (25), Kentucky (119), Maine (3), Maryland (8), Massachusetts (7), Michigan (103), Minnesota (11), Missouri (>269), Nebraska (2), New Hampshire (11), New Jersey (7), New York (90), North Carolina (22), Oklahoma (9), Ohio (7), Pennsylvania (112), South Carolina (2), South Dakota (21), Tennessee (58), Vermont (16), Virginia (8), West Virginia (104), and Wisconsin (67). Other states within the species' range have no known hibernacula (due to no suitable hibernacula present or lack of survey effort).

Historically, the NLEB was most abundant in the eastern portion of its range (Caceres and Barclay 2000). Prior to white-nose syndrome (WNS, see below), NLEBs were consistently caught during summer mist net surveys in the Northeast and Midwest U.S. and were considered one of the more frequently encountered bat species (USFWS 2015). The NLEB is less common in the southern portion of its range (Amelon and Burhans 2006). Within the southern U.S., it was considered more common in Kentucky and Tennessee, and rarer in the southern extremes of the range (e.g. Alabama, Georgia, and South Carolina). The NLEB is generally much less common in the western portion of its range within the U.S. (Amelon and Burhans 2006). It was only considered locally common in small portions of the western part of its range (e.g. Black Hills of South Dakota) and uncommon or rare in the western extremes of the range (e.g. Wyoming, Kansas, Nebraska) (Caceres and Barclay 2000). The NLEB occurs throughout the majority of the forested regions of Canada, although it is found in higher abundance in eastern Canada than in western Canada, similar to in the United States (Caceres and Pybus 1997).

4.4. Conservation Needs and Threats

The predominant threat to and the reason for the listing of the NLEB as federally endangered is WNS, a disease caused by the psychrophilic (cold-adapted) fungus *Pseudogymnoascus destructans* (*Pd*) that is known to kill some species of hibernating bats. The Service has found that no other threat is as severe and immediate to the species persistence as WNS. There is currently no known practicable cure. The species would likely not be imperiled were it not for this lethal disease (USFWS 2015).

Since its discovery in 2006 in New York, WNS has killed millions of bats across much of the eastern U.S. and southeastern Canada, resulting in local to regional extirpation of once common bat species (Blehert et al. 2009, Frick et al. 2010, Blehert et al. 2011, USFWS 2022b). WNS impacts physiology, water balance, and arousal patterns of some species of hibernating bats in lethal ways (Cryan et al. 2010, Willis et al. 2011, Reeder et al. 2012). Since 2006, WNS has spread rapidly throughout most of the NLEB's range in the U.S. and a smaller, but significant, portion of its range in Canada (USFWS 2022c). The spread of WNS is correlated with the distribution of caves and climate (Maher et al. 2012).

Since its appearance, WNS has caused an estimated 97-100% decline in NLEB population across 79% of its range. Winter abundance (from known hibernacula) has declined rangewide by 49%, and the number of extant winter colonies declined rangewide by 81%. There has also been a shift towards smaller colony sizes, with a 96-100% decline in the number of large hibernacula (≥100 individuals). Declining trends in abundance and occurrence are also evident across much of NLEB's summer range. Rangewide summer occupancy declined by 80% from 2010–2019. Data collected from mobile acoustic transects found a 79% decline in rangewide relative abundance from 2009–2019, and summer mist-net captures declined by 43-77% compared to pre-WNS capture rates (USFWS 2022a).

Pd grows best at the cool temperatures at which many bats hibernate, with optimal fungal growth occurring at 54.5° to 60.4° F, and no growth above approximately 67° F (Verant et al. 2012). Temperatures in WNS-affected hibernacula seasonally range from 36° to 57° F, permitting year-round growth, and may act as a reservoir maintaining the fungus (Blehert et al. 2009). Langwig et al. (2014) documented that contact with *Pd* contaminated hibernacula in autumn initiated infection in bats, but transmission and infection intensity remained low until bats began to fully hibernate during the winter. In summer, despite high bat-to-bat contact rates, most bats cleared infections and prevalence dropped to zero, presumably due to the resumption of a body temperature higher than the upper growth limit of *Pd*.

Other threats to the NLEB include wind-energy development, modification to hibernacula, tree clearing (from timber harvest, development, and natural resource extraction), human disturbance of hibernating bats, predation, climate change, and contaminants (USFWS 2013). Although these threats (prior to WNS) have not individually or cumulatively had significant impacts at the species level, they may increase the overall impacts to the species when considered cumulatively with WNS. Since the decline in population size is due to WNS rather than habitat loss, it may be assumed that habitat availability is not a limiting factor for the species across most of its range, except in highly agricultural areas of the Midwest U.S. and the forest/prairie transition zone on the western periphery of its range. The limited proportion of most landscapes that are harvested in any given year makes it unlikely that loss of a small number of roost trees would cause negative population-level impacts (Silvis et al. 2016).

5. ENVIRONMENTAL BASELINE FOR NORTHERN LONG-EARED BAT

This section describes the best available data about the condition of the NLEB in the Programmatic Action Area without the consequences caused by the proposed Action.

5.1. Action Area Numbers, Reproduction, and Distribution

The NLEB was only recently discovered within the Programmatic Action Area. The species was first mist-netted and identification confirmed through DNA analysis in Washington County in 2007 (Morris et al. 2009). From 2007 to 2022, 200 unique NLEBs have been captured by mist-netting, with 182 captured since 2015 (Appendix B). Captures include 162 adults, 34 juveniles (indicating reproduction), and 4 of unknown age and occurred in all months of the year, with 36 captures in winter (December–February). Twenty-seven coastal counties within the Programmatic Action Area currently have records for the species; however, an additional three counties should be considered as potentially occupied counties due to proximity and similarity of habitat (Figure 2). Despite the number of recent captures, the numbers caught in mist nets are relatively low when compared to other parts of its range pre-WNS (e.g., Rojas et al. 2017). This low capture rate could be a result of coastal North Carolina being on the periphery of the species' overall range.

Occupancy rate (i.e. probability that a species occurs at a random site within suitable habitat) is difficult to calculate. However, the NLEB occupancy rate within the 30 counties of the known/potential range (Figure 2) of the Programmatic Action Area can be estimated as follows. From March 2015 to September 2022, Service staff and consultants surveyed approximately 299 sites within the aforementioned 30 counties (calculated from supplemental materials in Jordan 2020 and unpublished USFWS data). Most sites were surveyed multiple nights and in some cases over multiple years. Of the 299 sites, NLEBs were captured at 54 sites (18.1%). Robbins et al. (2008) calculated that mist netting is 89% effective at detecting presence of NLEBs when two net sets are used for two nights. However, the mist netting from Jordan (2020) and unpublished USFWS data typically utilized 4-6 net sets per night. Therefore, we will assume that if NLEBs were present at a site there was a 100% chance of capturing at least one. As such, we will assume an 18.1% occupancy rate for NLEBs within the 30 counties of the known/potential range.

Captures within the Programmatic Action Area have occurred in wetland forest (73.0%), upland forest (25.5%), and pine plantations (1.5%). However, upland forest and pine plantation capture sites were generally in close proximity (<0.5 km) to wetland forest. Captures have occurred almost exclusively within the Middle Atlantic Coastal Plain Ecoregion, with a single outlier occurring within the Southeastern Plains Ecoregion near the boundary with the Middle Atlantic Coastal Plain Ecoregion (Figure 1). Despite significant survey efforts, NLEBs have never been captured within the Piedmont Ecoregion. All captures have occurred ≤ 87 km from the Atlantic Ocean or one of its major sounds, with most occurring < 50 km (Jordan 2020, unpublished USFWS data).

Captures occurring in every month of the year confirms the presence of a year-round population of NLEBs in the Middle Atlantic Coastal Plain Ecoregion within North Carolina (Jordan 2020, unpublished USFWS data). However, it is unclear if the bats are an entirely resident population or if some individuals make seasonable movements. The lack of captures from recent and previous efforts within the Piedmont (including the portion outside the Programmatic Action Area) and from most of the Southeastern Plains Ecoregion strongly suggests geographically disjunct populations of NLEBs in North Carolina. A formerly robust population in the Blue Ridge Ecoregion of western North Carolina appears separated from the population in the Middle Atlantic Coastal Plain Ecoregion by a large unpopulated area in the middle of the state (Figure 1), despite the populations being genetically near identical (Morris et al. 2009). This separation is similar to the findings of the North American Bat Monitoring Program (Li and Kalcounis-Rueppell 2019).

NLEB within the Programmatic Action Area have been observed to be active throughout most of the winter and roosting in trees (Jordan 2020). The documentation of extensive NLEB winter activity in coastal North Carolina confirms a novel survival strategy as opposed to the hibernation strategy that the species is assumed to use in the rest of its range. This portion of the state is nearly devoid of caves or mines suitable for hibernacula, but experiences milder winters with insect activity. With higher nightly winter temperatures (Grider et al. 2016), the Coastal Plain appears to provide more opportunities for winter foraging than does the Piedmont.

During late fall/winter 2015–2018, 43 NLEBs were tracked to 165 winter roost trees located mostly in wetland forest (94.6%) within the Programmatic Action Area (Jordan 2020). At least 22 species of trees were utilized (mostly swamp species). Most trees were live (84.2%) and ranged in size from 1.6 to 43.7 inches diameter-at-breast-height (dbh). Utilizing temperature sensitive transmitters, some NLEBs were documented to be in sustained torpor during cold bouts. The longest sustained torpor bout for each radio-tagged bat averaged 6.8 days and the coldest recorded temperature for a normothermic bat was 37.4º F.

During spring/summer 2019, 21 pregnant or lactating NLEBs were tracked to 64 maternity roost trees located mostly in wetland forest (92.2%) within the Programmatic Action Area (Jordan 2020). At least 14 species of trees were utilized (mostly swamp species). Both live (59.4%) and dead (40.6%) trees were utilized and ranged in size from 2.4 to 20.9 inches dbh. The pup season for NLEBs was calculated to be approximately May 1 – June 30, which is earlier than that published in USFWS (2016) for the 4(d) rule.

Although NLEBs have occasionally been observed using bridges in other states (Civjan et al. 2017) and in western North Carolina (NCDOT 2021, unpublished data), bridge surveys in eastern North Carolina have failed to find any NLEBs. McDonnell (2001) surveyed 990 bridges and culverts in the coastal plain of North Carolina and did not observe any NLEBs. Felts and Webster (2003) surveyed 423 bridges and culverts in the southern coastal plain of North Carolina and did not observe any NLEBs. NCDOT (2020) surveyed 200 bridges in eastern North Carolina and did not observe any NLEBs. During the winters of 2019/2020, 2020/2021, and 2021/2022, members of the NC Bat Working Group searched 271 culverts within the Action Area and did not observe any NLEBs (North Carolina Wildlife Resources Commission, unpublished data). Overall, bat use for any species from the culvert surveys was low (6.3%).

5.2. Action Area Conservation Needs and Threats

Although *Pd* spores (but not WNS) have been detected in two counties on the western edge of the Programmatic Action Area (where no NLEBs are known to occur) within the Piedmont (USFWS 2022c), there is currently no evidence of WNS or *Pd* in the Southeastern Plains and Middle Atlantic Coastal Plain Ecoregions of North Carolina. This is likely due to the near absence of caves and subsurface mines and to milder winters permitting bats to be active during winter in these coastal areas. All NLEBs captured within the Programmatic Action Area have been healthy with no signs of WNS (Jordan 2020, unpublished USFWS data). During the winters of 2016/2017 and 2017/2018, swab samples taken from 198 bats of five species susceptible to WNS (including NLEB) from within the Middle Atlantic Coastal Plain were tested for presence of *Pd*. None of the samples were determined to be positive for *Pd* (Jordan 2020). Since WNS requires hibernating bats in *Pd* infected caves or mines, this non-hibernating coastal population of NLEB it is likely not susceptible to WNS-induced mortality. Although some small caves and subsurface mines occur within western portion of the Programmatic Action Area in the Piedmont (where NLEBs are not known to occur), no NLEB hibernacula are known to occur within the Programmatic Action Area.

The discovery of a population of NLEBs that foregoes long-term hibernation is particularly important from a conservation standpoint. NLEBs were recently discovered in coastal South Carolina (White et al. 2018), an area with similar conditions to coastal North Carolina and contiguous with the coastal North Carolina population of NLEBs. With the species in sharp decline elsewhere from WNS, coastal North Carolina and South Carolina could ultimately serve as a refugium for the species (Jordan 2020).

The Programmatic Action Area has experienced and continues to experience loss and modification of potential NLEB roosting and foraging habitat through tree removal. Tree removal occurs primarily as a result of timber harvest, development, and land clearing for agriculture. In 2017, approximately $707 million of timber was delivered to saw mills within the Programmatic Action Area (Parajuli and Bardon 2019). However, most of the NLEB captures and identified roost trees within the Programmatic Action Area have occurred on protected public lands and in or near swamps where timber harvest and development is more limited (Jordan 2020). The Programmatic Action Area contains significant amounts of forested conservation lands in the form of national wildlife refuges, national forests, state forests, state parks, state game lands, and other protected properties. Public ownership confers some conservation benefit to listed species by removing some threats that might otherwise be present if the properties were owned by private landowners. The distribution of NLEBs within the Programmatic Action Area is spotty, and much suitable habitat remains unoccupied. As such, availability of habitat is not currently a limiting factor.

Climate change may result in additional sea level rise. Sea level rise would flood portions of coastal North Carolina, thus killing some trees that NLEBs may potentially use for foraging and roosting. Simultaneously, a warming climate could increase insect availability during winter and thus increase winter activity and perhaps expand the winter range of the species. Additionally, a warming climate may further limit the spread of the psychrophilic *Pd* spores.

6. EFFECTS OF THE ACTION ON NORTHERN LONG-EARED BAT

In a PBO for a listed species, the effects of the proposed action are all reasonably certain consequences to the species caused by the action, including the consequences of other activities caused by the action. Activities caused by the action would not occur but for the action. Consequences to species may occur later in time and may occur outside the action area. We identified and described the activities included in the proposed Action in sections 2.1–2.2. Our analyses of the consequences caused by each of these activities follows.

While this PBO covers all individual NCDOT projects in Divisions 1-8, it only analyzes the potential effects of an estimated 322 individual projects that occur within the known/potential range of the NLEB (30 counties, Figure 2) within the Programmatic Action Area over a 10-year span from January 1, 2021 to December 31, 2030. Individual projects outside the known/potential range of NLEB (29 counties, Figure 2) are not expected to have an effect on the species. Project construction will occur throughout the year and through all phases of the NLEB's life cycle. No known NLEB hibernaculum occur within the Programmatic Action Area. The estimated 322 individual projects will vary in size, design, and setting, so each of the following effects may or may not apply to any specific individual project.

6.1. Programmatic Activities

Tree Clearing

By far, tree clearing from a variety of NCDOT activities is the most likely source of effects to NLEBs. Although an adult NLEB may be able to evacuate a tree that is being felled, non-volant juveniles may be killed (Belwood 2002). If tree clearing occurred during extremely low temperatures in winter, adults in short-term torpor could also be killed. Given the relatively low numbers (Jordan 2020, unpublished USFWS data) and the estimated occupancy rate of 18.1% (see Section 5.1), the probability that any individual project would cause mortality of the species is low. However, when considered collectively, some amount of mortality is likely. The precise amount of mortality would not be determinable since dead NLEBs would likely go unnoticed, and estimating such mortality is difficult since NLEB density data is not available. Although mortality could potentially occur at any time of the year, it is assumed that mortality would be higher during the maternity season if maternity roost trees were felled. Thus the following exercise will generate a "worst-case" rough estimate of mortality using some known maternity colony parameters.

Maternity colonies generally number from ~30 (Whitaker and Mumford 2009) to 60 females (Caceres and Barclay 2000). The midpoint of 45 females per colony will be assumed. Assuming a 1:1 sex ratio and one pup per female, a total of 135 NLEBs (females, males, young) are assumed present within the area utilized by a maternity colony. Silvis et al. (2015, 2016) estimated the average area utilized by a NLEB maternity colony in contiguous forest at 94.0 acres. NCDOT has estimated they will clear 1288 acres of forest over 10 years. Dividing 1288 by 94.0 yields 13.7 maternity colonies. Multiplying 13.7 maternity colonies by 135 NLEBs per colony yields 1849.5 bats. Finally, multiplying 1849.5 bats by 0.181 (occupancy rate) yields 335 NLEBs that could be adversely affected by tree clearing within the Programmatic Action Area over ten years. While most NLEBs would be expected to survive a roost tree being felled (Belwood 2002), the estimate of 335 bats would be considered the "worst-case" number of NLEBs killed in the unlikely event that all NLEBs present in felled trees died. A more likely scenario is that a small but unknown percentage of the 335 NLEBs would be killed while the rest would survive and be temporarily displaced.

A NLEB that is forced to evacuate a tree being felled will expend energy in finding another roost tree, but such energy expenditure is not likely to adversely affect the bat since NLEBs change roost trees frequently (Sasse and Perkins 1996). However, a bat relocating to a new roost tree during daytime could temporarily be exposed to increased predation pressure.

Habitat Removal

Due to the relatively low numbers of NLEBs in the Programmatic Action Area (Jordan 2020), their generalist habits in roost selection, and the abundance of unoccupied forest lands, it is assumed that removal of roosting and foraging habitat is not an adverse effect if no NLEBs are present. NCDOT estimates that 1288 acres of forest will be cleared within the known/potential range of the NLEB (Figure 2) over ten years. With approximately 6.3 million acres of forest land available within the 30-county known/potential range of the NLEB within the Programmatic Action Area (Parajuli and Bardon 2019), NCDOT's tree removal over ten years represents ~ 0.02% of the overall available habitat, most of which is currently unoccupied. Therefore, potential effects from habitat removal are insignificant.

Structure Demolition

Although an adult bat would likely be able to evacuate a bridge or other structure during demolition, it is possible that a NLEB could be crushed during such activity. However, repeated bridge and culvert surveys in eastern North Carolina have failed to detect NLEBs using such structures (McDonnell 2001; Felts and Webster 2003; NCDOT 2020; NC Bat Working Group 2020-2022, unpublished data). Therefore, potential effects from structure demolition are discountable.

Noise, Lighting, Vibrations, and Other Disturbances

NLEBs may be exposed to increased noise, lighting, vibrations and other disturbances from heavy equipment during clearing and road construction. Most such disturbances would occur during the day when the bats were not foraging. Generally, construction activities that occur during the night occur within congested urban areas where NLEBs are likely not present. Although the effect of such disturbances is unknown, they would be temporary. It is assumed that NLEBs could move away from such disturbances to other roost trees. Increased noise and lighting from traffic on new highways would be permanent. Data regarding the effects of traffic noise on bats is mixed. For example, Schaub et al. (2008) suggested that foraging habitat for greater mouse-eared bats (*Myotis myotis*) in Germany near noisy roads is degraded, while Zurcher et al. (2010) found that noise from vehicles had no discernable effect on Indiana bats (*Myotis sodalis*) crossing roads in Indiana. Without data specific to NLEBs, it is unknown what effect traffic noise will have on the species. However, since the NLEB is a forest interior species (Owen et al. 2003, Johnson et al. 2009), it is assumed NLEBs are less likely to occur along highways and such potential effects would be insignificant and/or discountable. Also, new highway construction over the next ten years in rural areas within the Programmatic Action Area where the NLEB is likely to occur is minimal (NCDOT 2022).

Decreased Water Quality

Although NCDOT implements various best management practices to avoid or minimize degrading water quality (NCDOT 2003, NCDOT 2014, NCDOT 2015), some NCDOT activities may inadvertently cause impacts in the form of temporary sedimentation or accidental spills of petrochemicals, uncured concrete, or herbicides. Degraded water quality could affect NLEB drinking water sources or affect the habitat of some of the NLEB's prey base (e.g. aquatic stage of caddisflies). However, since NLEBs should have little difficulty finding alternative drinking water sources or alternative prey and foraging areas, the effect on the species would likely be insignificant and/or discountable.

Mortality from Vehicle Traffic

A study conducted in coastal North Carolina which analyzed wildlife road-kills (Smith 2011) documented mortality of bats, although no dead NLEBs were observed. Since NLEBs typically forage 1-3 meters above the ground (Nagorsen and Brigham 1993), NLEBs could conceivably be struck and killed by vehicles on new roads. However, this is unlikely since NLEBs are generally forest interior species and would seldom be near highways. Also, new road construction in rural areas over the next ten years within the Programmatic Action Area is minimal (NCDOT 2022). Thus mortality from vehicle traffic on new roads is assumed to be discountable.

Habitat Fragmentation

Zurcher et al. (2010) and Bennett and Zurcher (2013) found that roads can act as a barrier to bats, and the volume of traffic increases the barrier effect. Without specific data on the relationship between NLEBs and current habitat connectivity levels in coastal North Carolina, only generalizations can be made about the effects of habitat fragmentation due to NCDOT activities. NCDOT projects may reduce NLEB habitat connectivity, but the effect cannot be quantified. Since new road construction in rural areas over the next ten years within the Programmatic Action Area is minimal (NCDOT 2022), it is assumed any effects from habitat fragmentation would be minimal. It is also assumed that the abundance of NLEB habitat will act to ameliorate any fragmentation effects of NCDOT activities.

Secondary Development

While bridge/culvert replacements, maintenance activities, and road widening do not increase new development, new-location road facilities do have the potential to induce secondary development. Secondary development may result in the loss of potential habitat for the NLEB.

Although no quantitative analysis is available for this programmatic consultation, in previous large scale transportation projects in eastern North Carolina, only a relatively small percentage of secondary development could be attributed to the road facility. Since new-location projects represent only a small portion of the overall NCDOT construction program over the next 10 years (NCDOT 2022), and given the fact that there is a large amount of unoccupied habitat available for the NLEB, it is assumed that potential effects due to habitat loss from secondary development are insignificant.

6.2. Conservation Measures

NCDOT has agreed to implement a monitoring program and to contribute up to $500,000 towards additional NLEB research. The information gained from these measures will be utilized to inform and improve conservation efforts for the species in the future. NCDOT has agreed to avoid tree clearing within 150 feet of known maternity roost trees during the time frame of May 1 – June 30, thus reducing the probability of killing non-volant young. NCDOT has also agreed to avoid tree clearing when air temperatures are <40º F at individual project sites where a total of 1.0 acre or more of tree clearing will occur, thus reducing the probability of killing a NLEB which may be in short-term torpor.

6.3. Summary of Effects

Of all the potential sources of adverse effects, tree clearing is the only source reasonably certain to cause adverse effects. Other potential sources are likely insignificant and/or discountable. Due to the low occupancy rate of 18.1% and relatively low numbers of NLEBs within the Programmatic Action Area, many individual projects will likely have no effect on the species. For those individual projects that do have effects, it is anticipated that most effects will be temporary and non-lethal in nature. However, when viewed programmatically, some lethal effects are expected across the Programmatic Action Area. It is estimated that the Action will take up to 335 NLEBs by tree clearing. However, only a small percentage of the take will be in the form of mortality, with the remainder being temporarily displaced from their roosts.

7. CUMULATIVE EFFECTS ON NORTHERN LONG-EARED BAT

In Section 3, we identified activities that satisfy the regulatory criteria for sources of cumulative effects. Although it is certain that tree clearing for the timber industry, development, and for other purposes will occur within the Programmatic Action Area over the next 10 years, it is not possible to know the extent of the effects to NLEBs. In lieu of specific data, only generalizations can be made. Much of the sustainable timber industry in eastern North Carolina involves short-rotation loblolly pine (*Pinus taeda*) plantations where NLEBs are unlikely to be found. Jordan (2020) found that 94.6% of the winter roosts and 92.2% of the maternity roosts in coastal North Carolina occurred in wetland forests that would be difficult to harvest for timber or to clear for development. These roosts were also mostly located in large tracts of forest on protected public lands. Based on where most NLEBs have been observed to roost, and given an estimated 18.1% occupancy rate, it can be assumed that relatively little tree clearing will occur in occupied NLEB habitat. In the relatively few NLEB-occupied areas where tree clearing does occur, most NLEBs present in roost trees being felled would be expected to survive (Belwood 2002). Some amount of mortality is likely to occur, but it is assumed to be minimal. Surviving NLEBs will temporarily be displaced, but it is unlikely that the loss of a small number of roost trees would cause negative population-level impacts (Silvis et al 2016). Habitat appears to not currently be a limiting factor for the species in coastal North Carolina.

8. CONCLUSION FOR NORTHERN LONG-EARED BAT

In this section, we summarize and interpret the findings of the previous sections (status, baseline, effects, and cumulative effects) relative to the purpose of the PBO for the NLEB, which is to determine whether the Action is likely to jeopardize its continued existence.

The range of the NLEB includes 37 states and 12 Canadian provinces and territories. Although once common in the eastern portion of its range, the species has experienced a precipitous decline in numbers due to WNS. Numbers have declined 90–100% in some portions of the species' range affected by WNS. No other threat is as severe and immediate to the species persistence as WNS, and it would likely not be imperiled were it not for this lethal disease. The fungus that causes WNS thrives in the cool temperatures found in caves and mines where NLEBs hibernate and generally kills the bats during their hibernation. Habitat availability is not considered a limiting factor for the species across most of its range, except in some highly agricultural areas of the Midwest U.S. and the forest/prairie transition zone on the western periphery of its range.

The NLEB is known to occur in 27 counties within the Programmatic Action Area, but is considered to potentially occur within three more counties. The counties occur in the eastern portion of the Programmatic Action Area near the coast. Since being discovered in coastal North Carolina in 2007, 200 unique NLEBs have been captured, with 182 captured since 2015. Occurring on the periphery of the species' range, this coastal population appears to be geographically disjunct from the more interior population of NLEBs and is behaviorally very different. Unlike NLEBs in most of the rest of their range, these coastal NLEBs occur in an area with virtually no caves or mines suitable for hibernacula and do not hibernate during the winter. Tracking studies have verified that NLEBs along the coast are active most of the winter and roost in trees during the winter. Unlike NLEBs found in the interior portion of their range, these NLEBs primarily occur in swamps. Since the population of NLEBs in the Programmatic Action Area do not hibernate and do not utilize caves or mines, they are likely not susceptible to WNS. No NLEBs captured in coastal North Carolina have shown any signs of WNS and *Pd* spores have not been detected within the coastal plain of North Carolina. The NLEB is estimated to have an 18.1% occupancy rate within the 30 counties where it is known or thought to potentially occur.

Tree clearing from a variety of NCDOT activities is the only significant source of effects to NLEBs from the Action. While most NLEBs are expected to evacuate trees being felled, some non-volant juveniles can be killed during the maternity season, and some adults may be killed during extremely low temperatures while in short-term torpor. Given the relatively low numbers and the estimated occupancy rate of 18.1%, the probability that any individual project would affect the species is low. Of those affected, the probability of mortality is low. However, when considered collectively, some amount of mortality is likely. It is estimated that up to 335 NLEBs could be adversely affected by tree clearing over ten years within the Programmatic Action Area. It is likely most of these NLEBs will survive, but some unknown small percentage will likely die. NCDOT has committed to conservation measures which will reduce the likelihood of killing non-volant young NLEBs during the maternity season and adult NLEBS during winter which may be in short-term torpor.

Due to the relatively low numbers of NLEBs in the Programmatic Action Area, their generalist habits in roost selection, and the abundance of unoccupied forest lands, it is assumed that removal of roosting and foraging habitat is not an adverse effect if no NLEBs are present. NCDOT estimates that 1288 acres of forest will be cleared within the known/potential range of the NLEB over ten years. With approximately 6.3 million acres of forest available within the 30-county known/potential range of the NLEB within the Programmatic Action Area, NCDOT's tree removal over ten years represents ~ 0.02% of the overall available habitat, most of which is currently unoccupied. Therefore, potential effects from habitat removal are insignificant. All other potential sources of effects are also considered insignificant and/or discountable. Although some cumulative effects from tree clearing from the timber industry and other sources are likely to occur, they are considered to be relatively minor since most such clearing will occur in areas less likely to be occupied by NLEBs.

The mostly non-lethal take of 335 NLEBs is not considered to be biologically meaningful at the range-wide scale. The small subset of the take which is lethal will not reduce appreciably the likelihood of the survival and recovery of the species. After reviewing the 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 Programmatic Biological Opinion that the Action is not likely to jeopardize the continued existence of the NLEB.

9. INCIDENTAL TAKE STATEMENT

ESA §9(a)(1) and regulations issued under §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 §3(19)). In regulations, the Service further defines:

- "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;" (50 CFR §17.3) and
- "incidental take" as "takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or applicant" (50 CFR §402.02).

Under the terms of ESA §7(b)(4) and §7(o)(2), taking that is incidental to a federal agency action that would not violate ESA §7(a)(2) is not considered prohibited, provided that such taking is in compliance with the terms and conditions of an incidental take statement (ITS).

For the exemption in ESA §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 §7(o)(2) may lapse if the FHWA or 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.

9.1. Amount or Extent of Take

This section specifies the amount or extent of take of listed wildlife species that the Action is reasonably certain to cause, which we estimated in the "Effects of the Action" section of this PBO. We estimate take of NLEBs of up to 335 individuals; however, only a small subset of this number would be expected to be of a lethal nature.

9.2. Reasonable and Prudent Measures

The Service believes that no reasonable and prudent measures are necessary or appropriate to minimize the amount or extent of incidental take of NLEB caused by the Action. NCDOT previously agreed to conservation measures which would minimize take (See Section 2.2). Minor changes that do not alter the basic design, location, scope, duration, or timing of the Action would not reduce incidental take below the amount or extent anticipated for the Action as proposed. Therefore, this ITS does not provide reasonable and prudent measures for this species.

9.3. Terms and Conditions

No reasonable and prudent measures to minimize the impacts of incidental take caused by the Action are provided in this ITS; therefore, no terms and conditions for carrying out such measures are necessary.

9.4. Monitoring and Reporting Requirements

In order to monitor the impacts of incidental take, the NCDOT must report the progress of the Action and its impact on the species to the Service as specified in the ITS (50 CFR §402.14(i)(3)). This section provides the specific instructions for such monitoring and reporting (M&R), including procedures for handling and disposing of any individuals of a species actually killed or injured. These M&R requirements are mandatory.

As necessary and appropriate to fulfill this responsibility, the FHWA and/or USACE must require any permittee, contractor, or grantee to accomplish the M&R through enforceable terms that the FHWA and/or USACE includes in 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. Disposition of Dead NLEBs

If dead bats suspected of being NLEB are observed during clearing, demolition, or construction activities of the Action, such bats should be collected and preserved for identification. Gary Jordan of the Service's Raleigh Field Office should be contacted at gary_jordan@fws.gov to arrange a transfer of the bats. Dead bats should be placed in a freezer until they can be transferred.

M&R2. 10-Year Monitoring

NCDOT previously agreed to 10 years of systematic monitoring at six fixed locations (i.e. properties), with two sites per location. Half of the locations are to be monitored each year. Monitoring activities have already occurred in 2021 (NV5 2021) and 2022 (Three Oaks Engineering 2022). NCDOT must continue to replicate these monitoring activities through 2030.

M&R3. Bat Habitat Assessment SOP

NCDOT staff and/or consultants must follow the NCDOT Bat Habitat Assessment SOP by filling out Bat Habitat Assessment Forms for projects that affect bridges and culverts. These forms will be submitted to the NCDOT Biological Surveys Group and entered into its database even if no bat presence is detected. If NLEBs are detected at a bridge or culvert, the Service will be notified.

10. CONSERVATION RECOMMENDATIONS

§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.

NCDOT has already agreed to certain recommendations which will benefit the NLEB. Most notably, the NCDOT will contribute up to $500,000 towards NLEB research. The Service does not have any addition recommendations.

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.

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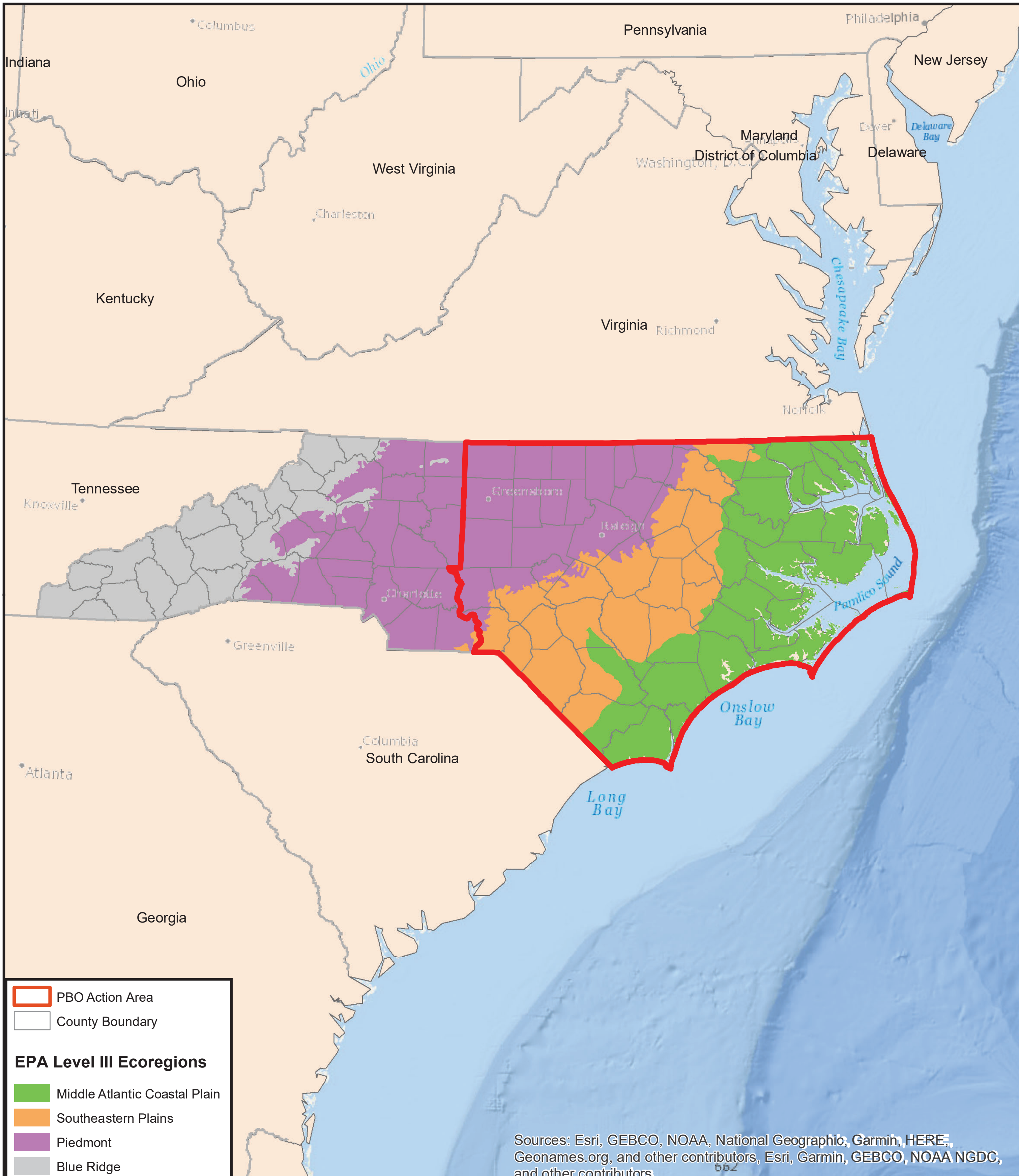
Appendix A

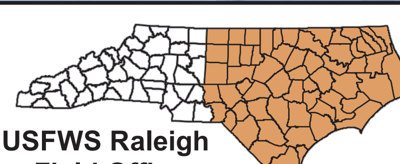
Figures



Prepared by NCDOT 9/1/2020

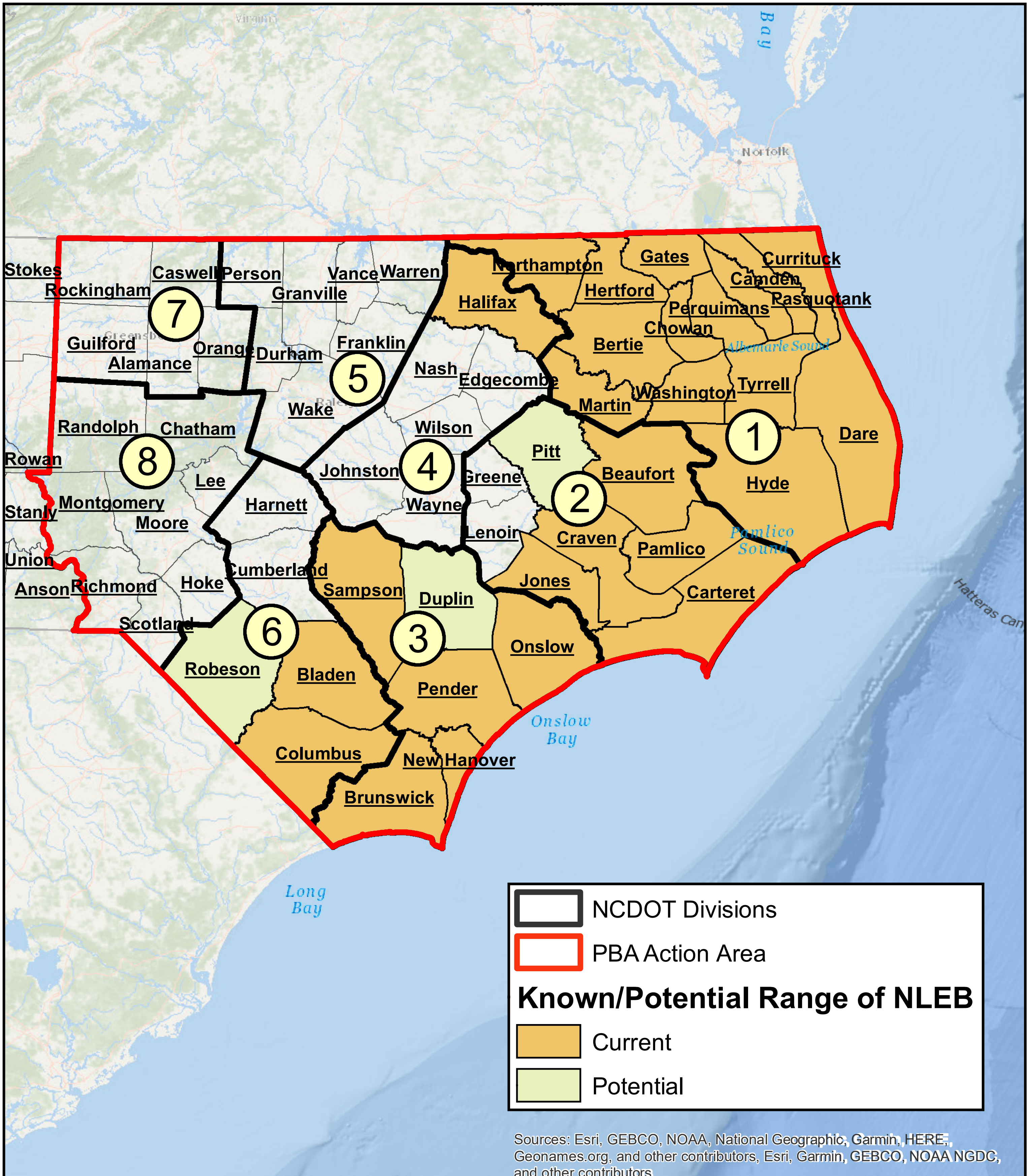
EPA Ecoregions and PBO Action Area

0 10 20 40 Miles



USFWS Raleigh Field Office

FIG 1



Prepared by NCDOT 10/13/2022

PBA Action Area

Eastern NC Counties
& Eastern NCDOT Divisions

0 5 10 20 Miles

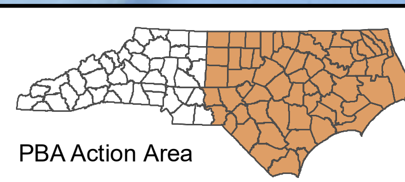


FIG 2

Appendix B

Eastern North Carolina Capture Data

From Jordan (2020) and unpublished USFWS data

All MYSE Captures in Eastern North Carolina						
Date	County	Location	Sex	Age	Forest Type	Source
20070611	Washington	~35.8288, -76.67537	M	A	Wetland Forest	Morris et al. 2009
20070618	Washington	~35.8288, -76.67537	F	J	Wetland Forest	Morris et al. 2009
20070618	Washington	~35.8288, -76.67537	F	J	Wetland Forest	Morris et al. 2009
20070625	Washington	~35.8288, -76.67537	F	J	Wetland Forest	Morris et al. 2009
20070625	Washington	~35.8288, -76.67537	M	J	Wetland Forest	Morris et al. 2009
20070702	Washington	~35.8288, -76.67537	F	J	Wetland Forest	Morris et al. 2009
20120517	Camden	36.276833, -76.00275	F	A	Wetland Forest	Grider et al. 2016
20120517	Camden	36.276833, -76.00275	M	A	Wetland Forest	Grider et al. 2016
20120607	Washington	35.830967, -76.68590	F	A	Pine Plantation	Grider et al. 2016
20120609	Washington	35.830967, -76.68590	M	A	Pine Plantation	Grider et al. 2016
20120620	Camden	36.276833, -76.00275	M	A	Wetland Forest	Grider et al. 2016
20120621	Camden	36.276833, -76.00275	F	J	Wetland Forest	Grider et al. 2016
20120624	Camden	36.272567, -76.01890	F	J	Wetland Forest	Grider et al. 2016
20120722	Camden	36.272567, -76.01890	M	A	Wetland Forest	Grider et al. 2016
20130311	Camden	36.276833, -76.00275	M	A	Wetland Forest	Grider et al. 2016
20140810	Currituck	36.54218, -76.27234	F	A	Upland Forest	Tetra Tech 2015
20140810	Currituck	36.54218, -76.27234	M	A	Upland Forest	Tetra Tech 2015
20140812	Currituck	36.54403, -76.26367	F	A	Pine Plantation	Tetra Tech 2015
20150603	Currituck	36.54175, -76.27239	F	A	Upland Forest	Tetra Tech 2016
20150603	Currituck	36.54175, -76.27239	U	U	Upland Forest	Tetra Tech 2016
20151116	Currituck	36.3835, -76.00794	M	A	Upland Forest	Ecological Engineering 2016
20151117	Currituck	36.3835, -76.00794	F	A	Upland Forest	Ecological Engineering 2016
20151126	Currituck	36.3835, -76.00794	F	A	Upland Forest	Ecological Engineering 2016
20151126	Currituck	36.3835, -76.00794	M	A	Upland Forest	Ecological Engineering 2016
20151212	Gates	36.51211, -76.52334	F	A	Wetland Forest	Ecological Engineering 2016
20151212	Gates	36.51211, -76.52334	M	A	Wetland Forest	Ecological Engineering 2016
20151212	Gates	36.51211, -76.52334	M	A	Wetland Forest	Ecological Engineering 2016
20160229	Currituck	36.3835, -76.00794	F	A	Upland Forest	Ecological Engineering 2016
20160309	Dare	35.82943, -75.90243	F	A	Wetland Forest	USFWS, Raleigh, NC
20160309	Dare	35.82943, -75.90243	F	A	Wetland Forest	USFWS, Raleigh, NC
20160316	Bertie	35.97118, -77.14224	F	A	Wetland Forest	USFWS, Raleigh, NC
20160316	Bertie	35.97118, -77.14224	M	A	Wetland Forest	USFWS, Raleigh, NC

20160518	Gates	36.431409, -76.700728	M	A	Wetland Forest	NCWRC, Asheville, NC
20160628	Martin	35.884044, -77.144931	M	J	Upland Forest	Three Oaks Engineering 2016
20160720	Bladen	34.71071, -78.52111	M	A	Wetland Forest	Calyx Engineers 2017a
20161116	Bladen	34.710711, -78.520655	F	A	Wetland Forest	Copperhead Consulting 2017
20161201	Bladen	34.710711, -78.520655	F	A	Wetland Forest	Copperhead Consulting 2017
20170113	Tyrrell	35.737660, -76.07271	M	A	Wetland Forest	Copperhead Consulting 2017
20170222	Bertie	35.970717, -77.139417	M	A	Wetland Forest	Copperhead Consulting 2017
20170222	Bertie	35.970717, -77.139417	M	A	Wetland Forest	Copperhead Consulting 2017
20170225	Bertie	35.960100, -77.148580	F	A	Wetland Forest	Copperhead Consulting 2017
20170225	Bertie	35.965060, -77.149620	M	A	Wetland Forest	Copperhead Consulting 2017
20170227	Tyrrell	35.886960, -76.133650	F	A	Wetland Forest	Copperhead Consulting 2017
20170227	Tyrrell	35.886960, -76.133650	M	A	Wetland Forest	Copperhead Consulting 2017
20170227	Tyrrell	35.875100, -76.131110	M	A	Wetland Forest	Copperhead Consulting 2017
20170517	Craven	35.02727, -77.04653	M	A	Wetland Forest	NCWRC, Asheville, NC
20170614	Pender	34.463982, -78.171258	M	A	Wetland Forest	Calyx Engineers 2017b
20170626	Hyde	35.365876, -76.159534	F	A	Wetland Forest	Three Oaks Engineering 2017
20170718	Pasquotank	36.46076, -76.45768	M	A	Wetland Forest	USFWS, Raleigh, NC
20170905	Beaufort	35.70053, -76.81015	M	A	Wetland Forest	USFWS, Raleigh, NC
20170905	Beaufort	35.70053, -76.81015	F	A	Wetland Forest	USFWS, Raleigh, NC
20171115	Dare	35.827897, -75.903003	F	A	Wetland Forest	Copperhead Consulting 2018
20171115	Dare	35.827897, -75.903003	M	A	Wetland Forest	Copperhead Consulting 2018
20171115	Dare	35.83055, -75.90145	M	A	Wetland Forest	Copperhead Consulting 2018
20171116	Gates	36.431409, -76.700728	M	A	Wetland Forest	Calyx Engineers 2018a
20171116	Gates	36.431409, -76.700728	M	A	Wetland Forest	Calyx Engineers 2018a
20171118	Dare	35.80357, -75.88571	M	A	Wetland Forest	Copperhead Consulting 2018
20171118	Dare	35.827897, -75.903003	F	A	Wetland Forest	Copperhead Consulting 2018
20171121	Dare	35.831415, -75.904015	M	A	Wetland Forest	Copperhead Consulting 2018
20171121	Dare	35.827897, -75.903003	M	A	Wetland Forest	Copperhead Consulting 2018
20171128	Camden	36.27222, -75.98704	M	A	Wetland Forest	Calyx Engineers 2018a
20171202	Gates	36.436850, -76.692960	M	A	Wetland Forest	Calyx Engineers 2018a
20171202	Craven	35.00707, -77.07463	M	A	Wetland Forest	Ecological Engineering 2018
20171218	Craven	35.02727, -77.046536	M	A	Wetland Forest	Ecological Engineering 2018
20180120	Camden	36.27516, -75.98873	M	A	Wetland Forest	Calyx Engineers 2018a
20180123	Camden	36.53743, -76.37275	F	A	Upland Forest	Calyx Engineers 2018a

20180207	Dare	35.827897, -75.903003	M	A	Wetland Forest	Copperhead Consulting 2018
20180211	Gates	36.433850, -76.703669	M	A	Upland Forest	Calyx Engineers 2018a
20180211	Gates	36.431001, -76.697484	M	A	Wetland Forest	Calyx Engineers 2018a
20180211	Gates	36.431001, -76.697484	M	A	Wetland Forest	Calyx Engineers 2018a
20180211	Gates	36.431001, -76.697484	M	A	Wetland Forest	Calyx Engineers 2018a
20180215	Dare	35.831415, -75.904015	M	A	Wetland Forest	Copperhead Consulting 2018
20180216	Craven	34.80819, -77.07938	M	A	Wetland Forest	Ecological Engineering 2018
20180219	Dare	35.80357, -75.88571	M	A	Wetland Forest	Copperhead Consulting 2018
20180219	Dare	35.79123, -75.87230	M	A	Wetland Forest	Copperhead Consulting 2018
20180219	Dare	35.79755, -75.85710	M	A	Wetland Forest	Copperhead Consulting 2018
20180220	Dare	35.83192, -75.90908	F	A	Wetland Forest	Copperhead Consulting 2018
20180220	Carteret	34.77828, -76.96162	M	A	Wetland Forest	Ecological Engineering 2018
20180221	Dare	35.80268, -75.93410	F	A	Wetland Forest	Copperhead Consulting 2018
20180221	Dare	35.80268, -75.93410	F	A	Wetland Forest	Copperhead Consulting 2018
20180222	Dare	35.79123, -75.87230	M	A	Wetland Forest	Copperhead Consulting 2018
20180222	Dare	35.80268, -75.93410	F	A	Wetland Forest	Copperhead Consulting 2018
20180228	Craven	34.80819, -77.07938	M	A	Wetland Forest	Ecological Engineering 2018
20181023	Currituck	36.38193, -76.00694	M	A	Upland Forest	USFWS, Raleigh, NC
20190411	Columbus	34.159504, -78.468713	M	A	Upland Forest	USFWS, Raleigh, NC
20190422	Gates	36.42562, -76.70287	M	A	Wetland Forest	Calyx Engineers 2019
20190424	Dare	35.82789, -75.90300	M	A	Wetland Forest	Copperhead Consulting 2019
20190425	Dare	35.83192, -75.90908	F	A	Wetland Forest	Copperhead Consulting 2019
20190425	Camden	36.27141, -75.98923	F	A	Wetland Forest	VHB 2019
20190425	Camden	36.27141, -75.98923	F	A	Wetland Forest	VHB 2019
20190427	Camden	36.27141, -75.98923	F	A	Wetland Forest	VHB 2019
20190427	Camden	36.27141, -75.98923	M	A	Wetland Forest	VHB 2019
20190507	Currituck	36.38350, -76.00794	F	A	Upland Forest	VHB 2019
20190507	Currituck	36.38350, -76.00794	F	A	Upland Forest	VHB 2019
20190507	Currituck	36.38350, -76.00794	F	A	Upland Forest	VHB 2019
20190507	Currituck	36.38350, -76.00794	M	A	Upland Forest	VHB 2019
20190507	Currituck	36.38350, -76.00794	U	U	Upland Forest	VHB 2019
20190508	Gates	36.42462, -76.70330	M	A	Wetland Forest	Calyx Engineers 2019
20190509	Currituck	36.36849, -75.99693	F	A	Wetland Forest	VHB 2019
20190509	Currituck	36.36849, -75.99693	F	A	Wetland Forest	VHB 2019

20190509	Currituck	36.36849, -75.99693	F	A	Wetland Forest	VHB 2019
20190509	Currituck	36.36849, -75.99693	M	A	Wetland Forest	VHB 2019
20190511	Dare	35.82789, -75.90300	F	A	Wetland Forest	Copperhead Consulting 2019
20190513	Gates	36.42462, -76.70330	M	A	Wetland Forest	Calyx Engineers 2019
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20190518	Gates	36.42694, -76.70490	M	A	Wetland Forest	Calyx Engineers 2019
20190518	Currituck	36.38350, -76.00794	F	A	Upland Forest	VHB 2019
20190518	Currituck	36.38350, -76.00794	F	A	Upland Forest	VHB 2019
20190518	Currituck	36.38350, -76.00794	F	A	Upland Forest	VHB 2019
20190518	Currituck	36.38350, -76.00794	F	A	Upland Forest	VHB 2019
20190518	Currituck	36.38350, -76.00794	F	A	Upland Forest	VHB 2019
20190518	Currituck	36.38350, -76.00794	F	A	Upland Forest	VHB 2019
20190518	Currituck	36.38350, -76.00794	M	A	Upland Forest	VHB 2019
20190518	Currituck	36.38350, -76.00794	M	A	Upland Forest	VHB 2019
20190518	Currituck	36.38350, -76.00794	M	A	Upland Forest	VHB 2019
20190521	Gates	36.43065, -76.69732	M	A	Wetland Forest	Calyx Engineers 2019
20190522	Gates	36.44766, -76.68147	F	A	Wetland Forest	Calyx Engineers 2019
20190601	Camden	36.28535, -75.98419	F	A	Wetland Forest	VHB 2019
20190603	Dare	35.83141, -75.90401	F	A	Wetland Forest	Copperhead Consulting 2019
20190604	Camden	36.28543, -75.99110	M	A	Wetland Forest	VHB 2019
20190604	Camden	36.28543, -75.99110	M	A	Wetland Forest	VHB 2019
20190604	Camden	36.28543, -75.99110	M	A	Wetland Forest	VHB 2019
20190605	Dare	35.7612, -75.9584	M	A	Wetland Forest	Three Oaks Engineering 2019
20190608	Camden	36.27193, -76.02613	M	A	Wetland Forest	VHB 2019
20190608	Camden	36.27193, -76.02613	F	A	Wetland Forest	VHB 2019
20190611	Gates	36.43500, -76.67627	F	A	Upland Forest	Calyx Engineers 2019
20190611	Gates	36.43500, -76.67627	M	A	Upland Forest	Calyx Engineers 2019
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20190614	Gates	36.44098, -76.67928	F	A	Upland Forest	Calyx Engineers 2019
20190616	Camden	36.27338, -75.98689	F	A	Wetland Forest	VHB 2019
20190616	Camden	36.27338, -75.98689	M	A	Wetland Forest	VHB 2019
20190616	Camden	36.27338, -75.98689	F	J	Wetland Forest	VHB 2019
20190616	Camden	36.27338, -75.98689	F	J	Wetland Forest	VHB 2019
20190617	Currituck	36.38263, -76.00726	M	J	Upland Forest	De La Cruz et al. 2020

20190617	Currituck	36.38263, -76.00726	F	A	Upland Forest	De La Cruz et al. 2020
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20190617	Currituck	36.36849, -75.99693	F	A	Wetland Forest	VHB 2019
20190617	Currituck	36.36849, -75.99693	F	J	Wetland Forest	VHB 2019
20190617	Currituck	36.36849, -75.99693	M	J	Wetland Forest	VHB 2019
20190618	Currituck	36.38263, -76.00726	F	A	Upland Forest	De La Cruz et al. 2020
20190618	Currituck	36.38263, -76.00726	F	A	Upland Forest	De La Cruz et al. 2020
20190620	Currituck	36.38263, -76.00726	F	A	Upland Forest	De La Cruz et al. 2020
20190622	Dare	35.82789, -75.90300	F	A	Wetland Forest	Copperhead Consulting 2019
20190622	Dare	35.82789, -75.90300	M	J	Wetland Forest	Copperhead Consulting 2019
20190622	Dare	35.82789, -75.90300	M	J	Wetland Forest	Copperhead Consulting 2019
20190622	Dare	35.82789, -75.90300	M	J	Wetland Forest	Copperhead Consulting 2019
20190622	Dare	35.82789, -75.90300	F	J	Wetland Forest	Copperhead Consulting 2019
20190622	Dare	35.82789, -75.90300	F	J	Wetland Forest	Copperhead Consulting 2019
20190622	Dare	35.83141, -75.90401	M	J	Wetland Forest	Copperhead Consulting 2019
20190622	Camden	36.27885, -75.99007	F	J	Wetland Forest	VHB 2019
20190622	Camden	36.27885, -75.99007	M	J	Wetland Forest	VHB 2019
20190623	Dare	35.83192, -75.90908	F	J	Wetland Forest	Copperhead Consulting 2019
20190624	Dare	35.83192, -75.90908	F	J	Wetland Forest	Copperhead Consulting 2019
20190624	Currituck	36.38263, -76.00726	F	A	Upland Forest	De La Cruz et al. 2020
20190625	Currituck	36.38263, -76.00726	F	J	Upland Forest	De La Cruz et al. 2020
20190625	Currituck	36.38263, -76.00726	M	A	Upland Forest	De La Cruz et al. 2020
20190625	Currituck	36.38263, -76.00726	M	J	Upland Forest	De La Cruz et al. 2020
20190625	Currituck	36.38263, -76.00726	F	A	Upland Forest	De La Cruz et al. 2020
20190625	Currituck	36.38263, -76.00726	F	A	Upland Forest	De La Cruz et al. 2020
20190625	Gates	36.43685, -76.69296	F	J	Wetland Forest	Calyx Engineers 2019
20190625	Gates	36.43685, -76.69296	M	J	Wetland Forest	Calyx Engineers 2019
20190627	Gates	36.44766, -76.68147	F	A	Wetland Forest	Calyx Engineers 2019
20190702	Gates	36.42462, -76.70330	M	A	Wetland Forest	Calyx Engineers 2019
20190705	Gates	36.44898, -76.66532	F	A	Upland Forest	Calyx Engineers 2019
20190707	Dare	35.82789, -75.90300	M	J	Wetland Forest	Copperhead Consulting 2019
20190707	Gates	36.43685, -76.69296	F	J	Wetland Forest	Calyx Engineers 2019

20190709	Dare	35.83141, -75.90401	M	A	Wetland Forest	Copperhead Consulting 2019
20190710	Dare	35.79123, -75.87230	M	A	Wetland Forest	Copperhead Consulting 2019
20190710	Dare	35.79123, -75.87230	M	A	Wetland Forest	Copperhead Consulting 2019
20190710	Dare	35.76099, -75.95855	M	A	Wetland Forest	Copperhead Consulting 2019
20190711	Dare	35.79123, -75.87230	M	J	Wetland Forest	Copperhead Consulting 2019
20190712	Dare	35.79123, -75.87230	M	A	Wetland Forest	Copperhead Consulting 2019
20190713	Dare	35.76099, -75.95855	F	J	Wetland Forest	Copperhead Consulting 2019
20190715	Dare	35.82789, -75.90300	F	A	Wetland Forest	Copperhead Consulting 2019
20190715	Dare	35.82789, -75.90300	F	A	Wetland Forest	Copperhead Consulting 2019
20190715	Dare	35.83192, -75.90908	F	A	Wetland Forest	Copperhead Consulting 2019
20190715	Dare	35.83192, -75.90908	F	J	Wetland Forest	Copperhead Consulting 2019
20190715	Dare	35.76099, -75.95855	M	A	Wetland Forest	Copperhead Consulting 2019
20200319	Perquimans	36.36194, -76.51689	F	A	Wetland Forest	USFWS, Raleigh, NC
20210406	Brunswick	34.12343, -78.40169	F	A	Wetland Forest	USFWS, Raleigh, NC
20210505	Pamlico	35.24654, -76.62469	F	A	Wetland Forest	USFWS, Raleigh, NC
20210506	Dare	35.79142, -75.87251	M	A	Upland Forest	NV5 2021
20210508	Dare	35.83015, -75.90282	F	A	Upland Forest	NV5 2021
20210621	Gates	36.42966, -76.69737	M	A	Wetland Forest	NV5 2021
20210630	Hertford	36.32808, -76.75757	M	A	Wetland Forest	USFWS, Raleigh, NC
20220222	Sampson	34.56120, -78.25217	M	A	Upland Forest	USFWS, Raleigh, NC
20220322	Chowan	36.29078, -76.66247	M	A	Wetland Forest	USFWS, Raleigh, NC
20220425	Currituck	36.38218, -76.00685	M	A	Upland Forest	Three Oaks Engineering 2022
20220428	Camden	36.27229, -75.98697	F	A	Wetland Forest	Three Oaks Engineering 2022
20220607	Halifax	36.11448, -77.26251	F	A	Wetland Forest	USFWS, Raleigh, NC
20220623	Currituck	36.36850, -75.99574	U	U	Wetland Forest	Three Oaks Engineering 2022
20220623	Currituck	36.36850, -75.99574	M	A	Wetland Forest	Three Oaks Engineering 2022
20220626	Craven	35.02749, -77.04608	M	A	Upland Forest	Three Oaks Engineering 2022
20220626	Craven	35.02749, -77.04608	F	J	Upland Forest	Three Oaks Engineering 2022
20220629	Camden	36.27286, -75.98693	M	J	Wetland Forest	Three Oaks Engineering 2022
20220629	Camden	36.27408, -75.98696	M	A	Wetland Forest	Three Oaks Engineering 2022
20220629	Northampton	36.21231, -77.37028	M	A	Wetland Forest	USFWS, Raleigh, NC
20220705	Onslow	34.85260, -77.21236	M	A	Wetland Forest	USFWS, Raleigh, NC

*Excludes recaptures from same site

** In addition to mist net capture records, there is one additional record each for Jones and New Hanover Counties.
On 20180219, a MYSE captured in Craven County was tracked to a winter roost tree in Jones County.
In 1996, a MYSE from New Hanover County was submitted to the state rabies lab for testing.