United States Department of the Interior

FISH AND WILDLIFE SERVICE
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March 25, 2015

John F. Sullivan III, PE
Federal Highway Administration
North Carolina Division
310 New Bern Avenue, Suite 410
Raleigh, North Carolina 27601

Scott McLendon
US Army Corps of Engineers
Wilmington District
69 Darlington Avenue
Wilmington, North Carolina 28403

Dear Mr. Sullivan and Mr. McLendon:

This document transmits the U.S. Fish and Wildlife Service's (Service) Conference Opinion based on our programmatic review of North Carolina Department of Transportation (NCDOT) activities in eastern North Carolina (Divisions 1-8) and their effects on the northern long-eared bat (NLEB, *Myotis septentrionalis*), a species federally proposed for listing under the Endangered Species Act of 1973 (ESA). This Conference Opinion is provided in accordance with Section 7(a)(4) of the ESA, as amended (16 U.S.C. 1531 *et seq*.). Your January 13, 2015 request for formal conference and accompanying Programmatic Biological Assessment (dated January 9, 2015) were received on January 16, 2015.

The Federal Highway Administration (NC Division) and the U.S. Army Corps of Engineers (Wilmington District) have determined that, collectively, federally funded and federally permitted activities implemented by NCDOT in eastern North Carolina (Divisions 1-8) may affect and are likely to adversely affect the NLEB. Therefore, this programmatic Section 7 conference will consider all NCDOT activities with a federal nexus in NCDOT Divisions 1-8 as a single action. It is understood that the Federal Highway Administration will be the lead federal action agency when individual projects are federally funded, whereas the U.S. Army Corps of Engineers will typically be the lead federal action agency when there is no federal funding for a project and a Clean Water Act Section 404 permit is required.

This Programmatic Conference Opinion only addresses the NLEB and should not, by itself, be necessarily construed as completing Section 7 consultation for any specific project. Any individual project which may affect any other federally threatened or endangered species must undergo its own Section 7 consultation on a project-by-project basis. If you have any questions concerning this Programmatic Conference Opinion, please contact me at (919) 856-4520 (Ext. 11).

Sincerely,

Pete Benjamin
Field Supervisor

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The following Programmatic Conference Opinion (PCO) is based on information provided in the *Programmatic Biological Assessment: Northern Long-Eared Bat (Myotis septentrionalis) in Eastern North Carolina* (PBA), scientific literature, meetings, emails, and other sources of published and unpublished information. A complete administrative record of this conference is on file at this office.

CONFERENCE HISTORY

March 24, 2014 – Staff from the Service, Federal Highway Administration (FHWA), and North Carolina Department of Transportation (NCDOT) met to discuss the need for a formal Section 7 conference for the proposed listed NLEB.

May 28, 2014 – Staff from the Service, FHWA, NCDOT, and U.S. Army Corps of Engineers (USACE) met to discuss the development of a programmatic formal Section 7 conference.

June 3, 2014 – Staff from the Service, FHWA, NCDOT, and USACE met to discuss the development of a programmatic formal Section 7 conference.

June 11, 2014 – Staff from the Service, FHWA, NCDOT, and USACE met to discuss the development of a programmatic formal Section 7 conference.

June 26, 2014 – Staff from the Service, FHWA, NCDOT, and USACE met to discuss the development of a programmatic formal Section 7 conference.

July 14, 2014 – Staff from the Service, FHWA, NCDOT, and USACE met to discuss the development of a programmatic formal Section 7 conference.

August 4, 2014 – Staff from the Service, FHWA, NCDOT, USACE, and North Carolina Wildlife Resources Commission (NCWRC) met to discuss the development of a programmatic formal Section 7 conference.

August 25, 2014 – The Service provided comments on an early rough draft PBA.

August 25, 2014 – Staff from the Service, FHWA, NCDOT, USACE, and NCWRC met to discuss the development of the PBA.

September 18, 2014 – Staff from the Service, FHWA, NCDOT, USACE, and NCWRC met to discuss the development of the PBA.

October 7, 2014 – Staff from the Service, FHWA, NCDOT, USACE, and NCWRC met to discuss the development of the PBA.

October 30, 2014 – Staff from the Service, FHWA, NCDOT, USACE, and NCWRC met to discuss the development of the PBA.

November 17, 2014 – Staff from the Service, FHWA, NCDOT, USACE, and NCWRC met to discuss the development of the PBA.

October – December 2014 – The Service provided comments on multiple drafts of the PBA.

January 16, 2015 – The Service received a letter from the FHWA and USACE, dated January 13, 2015 with the attached PBA, requesting a formal conference for potential effects to the NLEB that could result from the implementation of NCDOT activities in Divisions 1-8.

January 22, 2015 – The Service sent a letter to the FHWA and USACE stating that all information required for initiation of conferencing was either included with their January 13, 2015 letter or was otherwise available.

March 2, 2015 – The Service provided the FHWA, USACE, and NCDOT with a draft PCO.

PROGRAMMATIC CONFERENCE OPINION

I. DESCRIPTION OF PROPOSED ACTION

NCDOT Program Overview

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 one of the two largest state-owned and maintained highway systems in the country (USDOT 2013). 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 1) with brief descriptions adapted from the STIP (NCDOT 2015).

Table 1. 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.

Prefix	Project Type	Description
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 and/or gateway or interruptive markers intended for scenic beautification
EE	Mitigation	Wetland and stream mitigation in the form of enhancement, restoration, or preservation is conducted to offset losses due to project construction
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 or replantings 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

For the purposes of this programmatic consultation, NCDOT projects (STIP and Division) have been grouped and categorized as follows:

1. New Construction
2. Safety and Mobility
3. Maintenance and Preservation
4. Disaster Response, Bank Stabilization, and Sinkhole Repair
5. Transportation Enhancements

The proposed action evaluated in this PCO includes all of the NCDOT activities in NCDOT Divisions 1-8 (eastern North Carolina) with a federal nexus.

NCDOT Program Details

In order to conduct a thorough effects analysis of the NCDOT activities on the NLEB, each of the above categories of projects was broken down into a list of potential activities and sub-activities and are described below.

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. Vehicle and 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. Often, existing road surfaces or parking areas can be utilized. However, if heavy equipment staging is necessary in vegetated areas, temporary impacts to sensitive habitats can occur.

The NCDOT anticipates there will be approximately 1,436 projects within this category over the next five years within the action area.

Staging areas/site prep (activity)

Staging areas/project site prep covers preparations at the project site itself 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 (subactivity under staging areas/site prep)

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 (subactivities under staging areas/site prep)
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 grasses, 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 (subactivity under staging areas/site prep)
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 (subactivity under staging areas/site prep)
Blasting may be required on a 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 (subactivity under staging areas/site prep)
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) (subactivity under staging areas/site prep)
This work includes the installation of silt fences, check dams, sediment basins, coir blankets and temporary seeding.

Structure demolition (subactivity under staging areas/site prep)
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 (subactivity under staging areas/site prep)
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 (subactivity under staging areas/site prep)
Utility relocation or placement can involve both above and below-ground work, including tree clearing, mowing, trenching, and horizontal or directional bore. 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 right of way, the utility company will be responsible for obtaining their own permits. In this rare instance, tree clearing would not be accounted for by NCDOT.

Other project site prep subactivities
- portable fence installation/removal
- temporary access road construction, which requires installation of geofabric 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. This activity may include the following sub-activities:

- 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)
This activity includes the following subactivities:

- 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 of NCDOT's 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 even 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. Best Management Practices (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. Carolina Coastal Area Management Act counties (NCDOT 2003).

Bridge and culvert construction include the following subactivities:

- 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

Post-construction activities

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. Subactivities include:

- 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.

The current tree clearing limit along federal primary highways is 380 feet for rural roads and 340 feet for roads within city limits. Statewide, there are an estimated 8,000 billboards. Up to 750 permits may be issued annually for vegetation removal statewide (Coleman 2012). In addition to tree clearing, billboards may also involve long-term lighting.

2. Safety and Mobility Improvement (category)

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

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 generally 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.

The NCDOT anticipates there will be approximately 601 projects within this category over the next five years within the action area.

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. This primarily involves the following subactivities: 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. Subactivities include:

- staging areas
- project site prep
- install drainage features
- utility lines
- pre-watering of roads and exposed areas in construction site for dust control or grading

Road surface, railroad bed preparation and construction (activity)
The preparation of and construction of road surfaces and railroad beds may involve the following subactivities:

- 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.

3. Maintenance and Preservation (category)
All activities under this category will require the use of vehicles. Many 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.

The NCDOT anticipates there will be approximately 392 projects within this category over the next five years within the action area.

Bridge painting (activity)
Steel bridges or bridges with steel sections require painting on an as-needed basis, approximately every 10 years. Bridge painting involves abrasive blasting to remove all corrosion, washing the bridge, and then applying a number of coats of paint. Bridge painting and rehabilitation both require human presence above and below bridges. Bridge painting involves the following subactivities:

- 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 that are 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 action 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.

Bridge rehabilitation subactivities include:

- 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. Culvert cleaning/repair includes the following subactivities:

- 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 and 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. Drainage improvement subactivities include:

- 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 to 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 off 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. Pavement rehab and resurfacing include the following subactivities:

- 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

Herbicidal 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. Subactivities at these facilities may include:

- 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):
Reconstructing existing rail includes the following subactivities:

- 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. This activity requires the presence of humans in close proximity to where bats may be roosting. Each bridge is inspected every 24 months on average, but a few older structures may be inspected every 12 months.

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. Vehicles, heavy equipment, and portable lighting may be used.

Since it is not possible to accurately predict or account for projects in this category, an estimated number of projects in this category cannot be determined. However, most NCDOT divisions report dealing with disaster situations once every 3-10 years. One exception to this is NCDOT Division 1 which incurs hurricane and other severe storm damage more frequently than other Divisions.

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. Disaster response includes the following subactivities:

- 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. Subactivities include:

- 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. Sinkhole repair subactivities include:

- excavate and/or flush loose material
- place non-concrete fill material
- place concrete fill
- compact fill
- restore roadway

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 consistent with new roadway construction; however, these are much smaller in scale with less vegetation removal, disturbance, etc. Minor tree clearing, grubbing, and earthwork may be required on some transportation enhancement projects. Portable lights, vehicles, and heavy equipment may also be used.

The NCDOT anticipates there will be approximately 154 projects within this category over the next five years within the action area.

Subactivities include:

- 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.)
- course aggregate application, concrete or asphalt application
- striping, pavement markers and signage
- guard rail installation
- sidewalk installation
- information kiosk construction
- post-construction work

Conservation Measures

Conservation measures represent actions, pledged in the project description, that the action agency will implement to minimize the effects of the proposed action and further the recovery of the species under review. Such measures should be closely related to the action and should be achievable within the authority of the action agency. Since conservation measures are part of the proposed action, their implementation is required under the terms of the consultation. The NCDOT has agreed to implement the following conservation measure:

NCDOT will conduct a five-year NLEB research study with four objectives. First, acoustic surveys will be conducted to determine the distribution of NLEB in eastern North Carolina. Second, results from acoustical surveys will be used to guide mist-netting surveys. Captured NLEB will be equipped with radio transmitters and tracked to aid in the characterization of summer and winter roosting habitat and activity. Third, NLEB will be checked for presence and severity of white nose syndrome. Finally, structures (bridges, culverts, and buildings) will be assessed to determine frequency and seasonality of NLEB use. See Appendix B for details of the research.

Action Area

The action area is the 59 eastern-most counties of North Carolina, which comprises NCDOT Divisions 1-8 (out of the 14 total Divisions). North Carolina counties within the action area are listed by NCDOT Division in Table 2 and shown in Figure 2 (Appendix A).

Table 2. NCDOT Divisions and Counties within Action Area

Division 1	Bertie, Camden, Chowan, Currituck, Dare, Gates, Hertford, Hyde, Martin, Northampton, Pasquotank, Perquimans, Tyrrell, Washington
Division 2	Beaufort, Carteret, Craven, Greene, Jones, Lenoir, Pamlico, Pitt
Division 3	Brunswick, Duplin, New Hanover, Onslow, Pender, Sampson
Division 4	Edgecombe, Halifax, Johnson, Nash, Wayne, Wilson
Division 5	Durham, Franklin, Granville, Person, Vance, Wake, Warren
Division 6	Bladen, Columbus, Cumberland, Harnett, Robeson
Division 7	Alamance, Caswell, Guilford, Orange, Rockingham
Division 8	Chatham, Hoke, Lee, Montgomery, Moore, Randolph, Richmond, Scotland

The action area is a mosaic of federal, state, and private lands. Using Level III EPA Ecoregions (USEPA 2013), the action area can be divided into the Middle Atlantic Coastal Plain, Southeastern Plains, and the Piedmont (see Figure 1 in Appendix A).

Middle Atlantic Coastal Plain (Ecoregion 63)

Ecoregion 63 is found primarily in the Carolinas and other states to the north. It consists of low elevation, flat plains, with many swamps, marshes, and estuaries. Forest cover in the region, once dominated by longleaf pine, is now mostly loblolly and some shortleaf pine, with patches of oak, gum, and cypress near major streams. Its low terraces, marshes, dunes, barrier islands, and beaches are underlain by unconsolidated sediments. Poorly drained soils are common, and the region has a mix of coarse and finer textured soils. Ecoregion 63 is typically lower, flatter, more poorly drained, and marshier than Ecoregion 65 (see below). Pine plantations for pulpwood and lumber are typical, with some areas of cropland (USEPA 2002).

Southeastern Plains (Ecoregion 65)
These irregular plains with broad inter-stream areas have a mosaic of cropland, pasture, woodland, and forest. Natural vegetation was historically predominantly longleaf pine, with smaller areas of oak-hickory-pine. On some moist sites, southern mixed forest occurred with beech, sweetgum, southern magnolia, laurel and live oaks, and various pines. The Cretaceous or Tertiary sands, silts, and clays of the region contrast geologically with the metamorphic and igneous rocks of the Piedmont (see below). Streams in this area are relatively low-gradient and sandy-bottomed (USEPA 2002).

North Carolina Piedmont (Ecoregion 45)
Considered the non-mountainous portion of the Appalachians Highland by physiographers, the northeast-southwest trending Piedmont ecoregion comprises a transitional area between the mostly mountainous ecoregions of the Appalachians to the northwest and the relatively flat coastal plain to the southeast. It is a complex mosaic of Precambrian and Paleozoic metamorphic and igneous rocks with moderately dissected irregular plains and some hills. Once largely cultivated, much of this region is in planted pine or has reverted to successional pine and hardwood woodlands. The historic oak-hickory-pine forest was dominated by white oak, southern red oak, post oak, and hickory, with shortleaf pine, loblolly pine, and to the north and west, Virginia pine. The soils tend to be finer-textured than in coastal plain regions (USEPA 2002).

II. STATUS OF THE SPECIES

A. Species/critical habitat description

The northern long-eared bat (NLEB) is a medium-sized bat species, with an average adult body weight of 5 to 8 grams, with females tending to be slightly larger than males (Caceres and Pybus 1997). Average body length ranges from 77 to 95 mm and wingspan between 228 and 258 mm (Barbour and Davis 1969, Caceres and Barclay 2000). Pelage (fur) colors include medium to dark brown on its back, dark brown ears and wing membranes, and tawny to pale-brown fur on the ventral side (Nagorsen and Brigham 1993, Whitaker and Mumford 2008). As indicated by its common name, the NLEB is distinguished from other *Myotis* species by its long ears (average 17 mm, Whitaker and Mumford 2008) that, when laid forward, extend beyond the nose but less than 5 mm beyond the muzzle (Caceres and Barclay 2000). The tragus (projection of skin in front of the external ear) is long (average 9 mm), pointed, and symmetrical (Nagorsen and Brigham 1993, Whitaker and Mumford 2008).

The NLEB was once considered a subspecies of Keen's long-eared Myotis (*Myotis keenii)* (Fitch and Schump 1979), but was later recognized as a distinct species by van Zyll de Jong (1979) based on geographic separation and difference in morphology (Nagorsen and Brigham 1993, Caceres and Pybus 1997, Whitaker and Hamilton 1998, Caceres and Barclay 2000, Simmons

2005, Whitaker and Mumford 2008). No subspecies have been described for this species (van Zyll de Jong 1985, Nagorsen and Brigham 1993, Whitaker and Mumford 2008).

The range of the NLEB includes much of the eastern and north-central United States, and portions of all Canadian provinces from the Atlantic Ocean west to the southern Yukon Territory and eastern British Columbia. Within the United States, this area includes all or portions of the following 39 States: Alabama, Arkansas, Connecticut, Delaware, the District of Columbia, Florida, 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 2014a). However, throughout the majority of the species' range it is patchily distributed and historically was less common in the southern and western portions of the range than in the northern portion of the range (Amelon and Burhans 2006).

The Service proposed to list the NLEB as an endangered species on October 2, 2013 (USFWS 2013). On June 30, 2014, the Service reopened the comment period and announced a six-month extension for making a final listing determination for the NLEB, extending the due date until April 2, 2015 (USFWS 2014c). The Service subsequently proposed listing the NLEB with a rule under Section 4(d) of the ESA on January 16, 2015 (USFWS 2015). No critical habitat for the species has been proposed at this time.

B. Life history

NLEBs predominantly overwinter in hibernacula that include caves and abandoned mines. Hibernacula used by NLEBs are typically large, with large passages and entrances (Raesly and Gates 1987), relatively constant and cooler temperatures (32° to 48° F) (Raesly and Gates 1987, Caceres and Pybus 1997, Brack 2007), and with high humidity and no air currents (Fitch and Shump 1979, van Zyll de Jong 1985, Raesly and Gates 1987, Caceres and Pybus 1997). NLEBs are typically found roosting in small crevices or cracks in cave or mine walls or ceilings, often with only the nose and ears visible, thus are easily overlooked during surveys (Griffin 1940, Barbour and Davis 1969, Caire *et al.* 1979, van Zyll de Jong 1985, Caceres and Pybus 1997, Whitaker and Mumford 2008). Caire *et al.* (1979) and Whitaker and Mumford (2008) commonly observed individuals exiting caves with mud and clay on their fur, also suggesting the bats were roosting in tighter recesses of hibernacula. They are also found hanging in the open, although not as frequently as in cracks and crevices (Barbour and Davis 1969, Whitaker and Mumford 2008).

To a lesser extent, NLEBs have been found overwintering in other types of habitat that resemble cave or mine hibernacula, including abandoned railroad tunnels. Also, in 1952 three NLEBs were found hibernating near the entrance of a storm sewer in central Minnesota (Goehring 1954). Kurta and Teramino (1994) found NLEBs hibernating in a hydro-electric dam facility in

Michigan. In Massachusetts, NLEBs have been found hibernating in the Sudbury Aqueduct (French 2012). Griffin (1945) found NLEBs in December in Massachusetts in a dry well.

During the summer, NLEBs typically roost singly or in colonies underneath bark or in cavities or crevices of both live trees and snags (Sasse and Perkins 1996, Foster and Kurta 1999, Owen *et al.* 2002, Carter and Feldhamer 2005, Perry and Thill 2007, Timpone *et al.* 2010). Males and non-reproductive females' summer roost sites may also include cooler locations, including caves and mines (Barbour and Davis 1969, Amelon and Burhans 2006). NLEBs have also been observed roosting in colonies in manmade structures such as buildings, barns, a park pavilion, sheds, cabins, under eaves of buildings, behind window shutters, and in bat houses (Mumford and Cope 1964; Barbour and Davis 1969; Cope and Humphrey 1972; Amelon and Burhans 2006; Whitaker and Mumford 2008; Timpone *et al.* 2010; Joe Kath 2013, pers. comm. cited in USFWS 2013).

The NLEB appears to be opportunistic in tree roost selection, selecting varying roost tree species and types of roosts throughout its range, including tree species such as black oak (*Quercus velutina*), northern red oak (*Quercus rubra*), silver maple (*Acer saccharinum*), black locust (*Robinia pseudoacacia*), American beech (*Fagus grandifolia*), sugar maple (*Acer saccharum*), sourwood (*Oxydendrum arboreum*), and shortleaf pine (*Pinus echinata*) (Mumford and Cope 1964, Clark *et al.* 1987, 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). NLEBs most likely are not dependent on certain species of trees for roosts throughout their range; rather, certain tree species will form suitable cavities or retain bark and the bats will use them opportunistically (Foster and Kurta 1999). Carter and Felhamer (2005) speculated that structural complexity of habitat or available roosting resources are more important factors than the actual tree species.

Many studies have documented the NLEB's selection of live trees and snags, with a range of 10 to 53% selection of live roosts found (Sasse and Perkins 1996, Foster and Kurta 1999, Lacki and Schwierjohann 2001, Menzel *et al.* 2002, Carter and Feldhamer 2005, Perry and Thill 2007, Timpone *et al.* 2010). Foster and Kurta (1999) found 53% of roosts in Michigan were in living trees, whereas in New Hampshire, 34% of roosts were in snags (Sasse and Pekins 1996). The use of live trees versus snags may reflect the availability of such structures in study areas (Perry and Thill 2007) and the flexibility in roost selection when there is a sympatric bat species present (*e.g.,* Indiana bat, *Myotis sodalis*) (Timpone *et al.* 2010). In tree roosts, NLEBs are typically found beneath loose bark or within cavities and have been found to use both exfoliating bark and crevices to a similar degree for summer roosting habitat (Foster and Kurta 1999, Lacki and Schwierjohann 2001, Menzel *et al.* 2002, Owen *et al.* 2002, Perry and Thill 2007, Timpone *et al.* 2010).

Canopy coverage at NLEB roosts has ranged from 56% in Missouri (Timone *et al.* 2010), 66% in Arkansas (Perry and Thill 2007), greater than 75% in New Hampshire (Sasse and Pekins 1996), to greater than 84% in Kentucky (Lacki and Schwierjohann 2001). Studies in New Hampshire and British Columbia have found that canopy coverage around roosts is lower than in available stands (Sasse and Pekins 1996, Caceres 1998). Females tend to roost in more open areas than males, likely due to the increased solar radiation, which aids pup development (Perry and Thill 2007). Fewer trees surrounding maternity roosts may also benefit juvenile bats that are learning to fly (Perry and Thill 2007). However, in southern Illinois, NLEBs were observed roosting in areas with greater canopy cover than in random plots (Carter and Feldhamer 2005). Roosts are also largely selected below the canopy, which could be due to the species' ability to exploit roosts in cluttered environments; their gleaning behavior suggests an ability to easily maneuver around obstacles (Foster and Kurta 1999, Menzel *et al.* 2002).

Female NLEBs typically roost in tall, large-diameter trees (Sasse and Pekins 1996). Studies have found that the diameter-at-breast height (dbh) of NLEB roost trees was greater than random trees (Lacki and Schwierjohann 2001), and others have found both dbh and height of selected roost trees to be greater than random trees (Sasse and Pekins 1996, 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). Lacki and Schwierjohann (2001) have also found that NLEBs roost more often on upper and middle slopes than lower slopes, which suggests a preference for higher elevations due to increased solar heating.

NLEBs hibernate during the winter months to conserve energy from increased thermoregulatory demands and reduced food resources. 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). However, hibernation may begin as early as August (Whitaker and Rissler 1992a). In Copperhead Cave in west-central Indiana, the majority of bats enter hibernation during October, and spring emergence occurs mainly from about the second week of March to mid-April (Whitaker and Mumford 2008). In Indiana, NLEBs become more active and start feeding outside the hibernaculum in mid-March, evidenced by stomach and intestine contents. In northern latitudes, such as in upper Michigan's copper-mining district, hibernation for NLEBs may begin as early as late August and may last for 8 to 9 months (Stones and Fritz 1969, Fitch and Shump 1979). NLEBs have shown a high degree of philopatry (using the same site multiple years) for a hibernaculum (Pearson 1962), although they may not return to the same hibernaculum in successive seasons (Caceres and Barclay 2000).

Contrary to the species' documented behavior in the rest of its range, Grider (2014) found NLEBs to be active during the winter at a location in coastal North Carolina, an area which is devoid of known hibernacula and of any caves/mines which could potentially serve has hibernacula. The relatively mild winter temperatures of coastal North Carolina appear to allow some level of insect activity, thus providing winter foraging opportunities for NLEBs.

Typically, NLEBs are not abundant and compose a small proportion of the total number of bats hibernating in a hibernaculum (Barbour and Davis 1969, Mills 1971, Caire *et al.* 1979, Caceres and Barclay 2000). Although usually found in small numbers, the species typically inhabits the same hibernacula with large numbers of other bat species, and occasionally are found in clusters with these other bat species. Other species that commonly occupy the same habitat include:

little brown bat (*Myotis lucifugus*), big brown bat (*Eptesicus fuscus*), eastern small-footed bat (*Myotis leibii*), tri-colored bat (*Perimyotis subflavus*), and Indiana bat (Swanson and Evans 1936, Griffin 1940, Hitchcock 1949, Stones and Fritz 1969, Fitch and Shump 1979). Barbour and Davis (1969) found that the species is never abundant and rarely recorded in concentrations of over 100 in a single hibernaculum.

NLEBs often move between hibernacula throughout the winter, which may further decrease population estimates (Griffin 1940, Whitaker and Rissler 1992b, Caceres and Barclay 2000). Whitaker and Mumford (2008) found that this species flies in and out of some of the mines and caves in southern Indiana throughout the winter. In particular, the bats were active at Copperhead Cave periodically all winter, with NLEBs being more active than other species hibernating in the cave. Though NLEBs fly outside of the hibernacula during the winter, they do not feed; hence the function of this behavior is not well understood (Whitaker and Hamilton 1998). However, it has been suggested that bat activity during winter could be due in part to disturbance by researchers (Whitaker and Mumford 2008).

NLEBs exhibited significant weight loss during hibernation. In southern Illinois, weight loss during hibernation was observed in male NLEBs, with individuals weighing an average of 6.6 grams prior to January 10, and those collected after that date weighing an average of 5.3 grams (Pearson 1962). Whitaker and Hamilton (1998) reported a weight loss of 41–43% over the hibernation period for NLEBs in Indiana. In eastern Missouri, male NLEBs lost an average of 3.0 grams during the hibernation period (late October through March), and females lost an average of 2.7 grams (Caire *et al.* 1979).

While the NLEB is not considered a long-distance migratory species, short migratory movements between summer roost and winter hibernacula between 35 miles and 55 miles have been documented (Griffith 1945, Nagorsen and Brigham 1993). However, movements from hibernacula to summer colonies may range from 5 to 168 miles (Griffin 1945). Several studies show a strong homing ability of NLEBs in terms of return rates to a specific hibernaculum, although bats may not return to the same hibernaculum in successive winters (Caceres and Barclay 2000). Individuals have been known to travel between 35 and 60 miles between caves during the spring (Griffin 1945, Caire *et al.* 1979).

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 Missouri, the longest time spent roosting in one tree was 3 nights; however, up to 11 nights spent roosting in a manmade structure has been documented (Timpone *et al.* 2010). Similarly, Carter and Feldhamer (2005) found that the longest a NLEB used the same tree was 3 days; in West Virginia, the average time spent at one roost was 5.3 days (Menzel *et al.* 2002). Bats switch roosts for a variety of reasons, including temperature, precipitation, predation, parasitism, and ephemeral roost sites (Carter and Feldhamer 2005). In Missouri, Timpone *et al.* (2010) radio-tracked 13 NLEBs to 39 roosts and found the mean distance between the location where captured and roost tree was 1.1 miles (range 0.04–3.0 miles), and the mean distance traveled between roost trees was 0.42 mile (range 0.03–2.4 miles). In Michigan, the longest distance the same bat moved between roosts was 1.2 miles and the shortest was 20 feet (Foster and Kurta 1999). In New Hampshire, the mean distance between foraging areas and roost trees was 1975 feet (Sasse and Pekins 1996). In the Ouachita Mountains of Arkansas, Perry and Thill (2007) found that individuals moved among snags that were within less than 5 acres.

Some studies have found tree roost selection to differ slightly between male and female NLEBs. Male NLEBs have been found to more readily use smaller diameter trees for roosting than females, suggesting males are more flexible in roost selection than females (Lacki and Schwierjohann 2001, Broders and Forbes 2004, Perry and Thill 2007). In the Ouachita Mountains of Arkansas, both sexes primarily roosted in snags, although females roosted in snags surrounded by fewer midstory trees than did males (Perry and Thill 2007). In New Brunswick, Canada, Broders and Forbes (2004) found that there was spatial segregation between male and female roosts, with female maternity colonies typically occupying more mature, shade-tolerant deciduous tree stands and males occupying more conifer-dominated stands. In northeastern Kentucky, males do not use colony roosting sites and are typically found occupying cavities in live hardwood trees, while females form colonies more often in both hardwood and softwood snags (Lacki and Schwierjohann 2001).

NLEB breeding occurs from 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 2008). Copulation occasionally occurs again in the spring (Racey 1982). 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, resulting in a single embryo (Cope and Humphrey 1972, Caceres and Pybus 1997, Caceres and Barclay 2000). Gestation is approximately 50-60 days (Ollendorff 2002).

Maternity colonies, consisting of females and young, are generally small, numbering from about 30 (Whitaker and Mumford 2008) to 60 individuals (Caceres and Barclay 2000); however, one group of 100 adult females was observed in Vermilion County, Indiana (Whitaker and Mumford 2008). In West Virginia, maternity colonies in two studies had a range of 7–88 individuals (Owen *et al.* 2002) and 11–65 individuals, with a mean size of 31 (Menzel *et al.* 2002). Lacki and Schwierjohann (2001) found that the population size of colony roosts declined as the summer progressed with pregnant females using the largest colonies (mean=26) and postlactating females using the smallest colonies (mean=4), with the largest overall reported colony size of 65 bats. Other studies have also found that the number of individuals within a maternity colony typically decreases from pregnancy to post-lactation (Foster and Kurta 1999, Lacki and Schwierjohann 2001, Perry and Thill 2007, Garroway and Broders 2008, Johnson *et al.* 2012). Female roost site selection, in terms of canopy cover and tree height, changes depending on reproductive stage; relative to pre- and post-lactation periods, lactating NLEBs have been shown to roost higher in tall trees situated in areas of relatively less canopy cover and tree density (Garroway and Broders 2008).

Adult females give birth to a single pup (Barbour and Davis 1969). Birthing within the colony tends to be synchronous, with the majority of births occurring around the same time (Krochmal and Sparks 2007). Parturition likely occurs in late May or early June (Easterla 1968, Caire *et al.* 1979, Whitaker and Mumford 2008), but may occur as late as July (Whitaker and Mumford 2008). Broders *et al.* (2006) estimated a parturition date of July 20 in New Brunswick. Lactating and post-lactating females were observed in mid-June in Missouri (Caire *et al.* 1979), July in New Hampshire and Indiana (Sasse and Pekins 1996, Whitaker and Mumford 2008), and August in Nebraska (Benedict 2004). Juvenile volancy occurs by 21 days after parturition and as early as 18 days after parturition (Kunz 1971, Krochmal and Sparks 2007). Subadults were captured in late June in Missouri (Caire *et al.* 1979), early July in Iowa (Sasse and Pekins 1996), and early August in Ohio (Mills 1971).

Adult longevity is estimated to be up to 18.5 years (Hall 1957), with the greatest recorded age of 19 years (Kurta 1995). Most mortality for NLEBs and many other species of bats occurs during the juvenile stage (Caceres and Pybus 1997).

The NLEB has a diverse diet including moths, flies, leafhoppers, caddisflies, and beetles (Griffith and Gates 1985, Nagorsen and Brigham 1993, Brack and Whitaker 2001), with diet composition differing geographically and seasonally (Brack and Whitaker 2001). The most common insects found in the diets of NLEBs are lepidopterans (moths) and coleopterans (beetles), with arachnids (spiders) also being a common prey item (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. NLEBs have the highest frequency call of any bat species in the Great Lakes area (Kurta 1995). Gleaning allows this species to gain a foraging advantage for preying upon moths because moths are less able to detect these high frequency echolocation calls (Faure *et al.* 1993). Emerging at dusk, most hunting occurs above the understory, 3-10 feet above the ground, but under the canopy (Nagorsen and Brigham 1993) on forested hillsides and ridges, rather than along riparian areas (LaVal *et al.* 1977, Brack and Whitaker 2001). This coincides with data indicating that mature forests are an important habitat type for foraging NLEBs (Caceres and Pybus 1997). Occasional foraging also takes place over forest clearings and water, and along roads (van Zyll de Jong 1985).

Female home range size may range from 47–425 acres (Lacki *et al.* 2009). Owen *et al.* (2003) estimated average maternal home range size to be 161 acres. Home range size of NLEBs in this study site was small relative to other bat species, but this may be due to the study's timing (during the maternity period) and the small body size of NLEBs (Owen *et al.* 2003). The mean distance between roost trees and foraging areas of radio-tagged individuals in New Hampshire was 2034 feet (Sasse and Pekins 1996).

C. Population dynamics

Although they are typically found in low numbers in inconspicuous roosts, most records of NLEBs are from winter hibernacula surveys (Caceres and Pybus 1997). More than 780 hibernacula have been identified throughout the species' range in the United States, although many hibernacula contain only a few (1-3) individuals (Whitaker and Hamilton 1998). Known hibernacula include: Arkansas (n=20), Connecticut (n=5), Georgia (n=1), Illinois (n=36), Indiana (n=25), Kentucky (n=90), Maine (n=3), Maryland (n=11), Massachusetts (n=7), Michigan (n=94), Minnesota (n=11), Missouri (n=>111), Nebraska (n=2), New Hampshire (n=9), New Jersey (n=8), New York (n=58), North Carolina (n=20), Oklahoma (n=4), Ohio (n=3), Pennsylvania (n=112), South Carolina (n=2), South Dakota (n=7), Tennessee (n=11), Vermont (n=13), Virginia (n=8), West Virginia (n=104), and Wisconsin (n=45). 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). NLEBs have been consistently caught during summer mist net surveys and detected during acoustic surveys in eastern populations. Large numbers of NLEBs have been found in larger hibernacula in Pennsylvania (*e.g.* an estimated 881 individuals in a mine in Bucks County in 2004). Fall swarm trapping conducted in September–October 1988–1989, 1990–1991, and 1999–2000 at two hibernacula with large historical numbers of NLEBs had total captures ranging from 6 to 30 bats per hour, which indicated that the species was abundant at these hibernacula (Pennsylvania Game Commission 2012).

The NLEB is commonly encountered in summer mist-net surveys throughout the majority of the Midwest and is considered fairly common throughout much of the region. However, the species is often found infrequently and in small numbers in hibernacula surveys throughout most of the Midwest. Historically, the NLEB was considered quite common throughout much of Indiana, and was the fourth or fifth most abundant bat species in the State in 2009 (Whitaker and Mumford 2008).

The NLEB is less common in the southern portion of its range than in the northern portion of the range (Amelon and Burhans 2006). In the South, it is considered more common in states such as Kentucky and Tennessee, and rarer in the southern extremes of the range (*e.g.* Alabama, Georgia, and South Carolina).

The NLEB is generally less common in the western portion of its range than in the northern portion of the range (Amelon and Burhans 2006). It is considered common in only 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 Pybus 1997). However, the scarcity of records in the western parts of Canada may be due to more limited survey efforts. It has been estimated that approximately 40% of the NLEB's global range is in Canada (COSEWIC 2014).

D. Status and distribution

On October 2, 2013, the Service proposed to list the NLEB as an endangered species throughout its range under the ESA (USFWS 2013). The Service subsequently proposed listing the NLEB with a rule under Section 4(d) of the ESA on January 16, 2015 (USFWS 2015). No critical habitat has been proposed at this time.

The primary threat to and the reason for the proposed listing of the NLEB is white-nose syndrome (WNS), a disease caused by the fungus *Pseudogymnoascus destructans* (formerly known as *Geomyces destructans*) that is known to kill 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 cure. The species would likely not be imperiled were it not for this disease (USFWS 2013).

White-nose syndrome is an emerging infectious disease responsible for unprecedented mortality in some hibernating insectivorous bats of the northeastern United States (Blehert *et al.* 2009) and poses a considerable threat to several hibernating bat species throughout North America (USFWS 2011). The first evidence of WNS was documented in Howes Cavern, 32 miles west of Albany, New York in February 2006 (Blehert *et al.* 2009). Since that first documented appearance, WNS has spread rapidly throughout the Northeast and is expanding through the Midwest. As of August 2014, WNS had been confirmed in 25 states (Alabama, Arkansas, Connecticut, Delaware, Georgia, Illinois, Indiana, Kentucky, Maine, Maryland, Massachusetts, Michigan, Missouri, New Hampshire, New Jersey, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Vermont, Virginia, West Virginia, and Wisconsin) and 5 Canadian provinces (New Brunswick, Nova Scotia, Ontario, Prince Edward Island, and Quebec). The fungus that causes WNS has been confirmed in three additional states – Iowa, Minnesota, and Mississippi. WNS has killed more than 5.5 million bats in the northeast United States and Canada (USFWS 2014b).

The pattern of spread has generally followed predictable trajectories along recognized migratory pathways and overlapping summer ranges of hibernating bat species. Therefore, Kunz and Reichard (2010) assert that WNS is spread mainly through bat-to-bat contact. However, evidence suggests that fungal spores can be transmitted by humans (Sleeman 2011). Seven North American hibernating bat species are confirmed with WNS (USFWS 2014b).

White-nose syndrome is caused by the recently described psychrophilic (cold-loving) fungus, currently known as *Pseudogymnoascus destructans*. *P. destructans* may be nonnative to North America and only recently arrived on the continent (Puechmaille *et al.* 2011, Minnis and Lindner

2013). The fungus grows on and within exposed tissues of hibernating bats (Gargas *et al.* 2009, Lorch *et al.* 2011), and the diagnostic feature is the white fungal growth on muzzles, ears, or wing membranes of affected bats, along with epidermal erosions that are filled with fungal hyphae (Blehert *et al.* 2009, Meteyer 2009). *P. destructans* 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 *P. destructans* 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 *P. destructans*.

In addition to the presence of the white fungus, observations show that bats affected by WNS are characterized by some or all of the following: (1) depleted fat reserves by mid-winter; (2) general unresponsiveness to human disturbance; (3) apparent lack of immune response during hibernation; (4) ulcerated, necrotic, and scarred wing membranes; and (5) aberrant behaviors, including shifts of large numbers of bats in hibernacula to roosts near the entrances or unusually cold areas, large numbers of bats dispersing during the day from hibernacula during midwinter, and large numbers of fatalities, either inside the hibernacula, near the entrance, or in the immediate vicinity of the entrance (WNS Science Strategy Group 2008, USFWS 2011).

Although the exact process by which WNS leads to death remains undetermined, it is likely that the immune function during torpor compromises the ability of hibernating bats to combat the infection (Bouma *et al.* 2010, Moore *et al.* 2011). A current hypothesis suggests that bats arrive at hibernacula unaffected and enter hibernation with sufficient fat stores, but then become affected and use fat stores too quickly as a result of disruption to hibernation physiology (WNS Science Strategy Group 2008). Recent observations suggest that bats are arriving at hibernacula with sufficient or only slightly lower fat stores (Courtin *et al.* 2010).

Boyles and Willis (2010) hypothesized that infection by *P. destructans* alters the normal arousal cycles of hibernating bats, particularly by increasing arousal frequency and/or duration. In fact, Reeder *et al.* (2012) and Warnecke *et al.* (2012) observed a progressive increase in arousal frequency in laboratory studies of hibernating bats infected with *P. destructans.* A disruption of this torpor-arousal cycle could easily cause bats to metabolize fat reserves too quickly, thereby leading to starvation. For example, skin irritation from the fungus might cause bats to remain out of torpor for longer than normal to groom, thereby exhausting their fat reserves prematurely (Boyles and Willis 2010). In the early stages of WNS infection, Verant *et al.* (2014) found that hibernating WNS-infected little brown bats utilized energy twice as fast as non-infected bats. However, this greater energy use by infected bats was not associated with an increased rate or duration of arousals from torpor during the early stages of infection. This implies that infected bats have an elevated metabolism prior to the onset of the increased arousal patterns characteristic of late-stage infections.

Cryan *et al.* (2010) suggested that mortality may be caused by catastrophic disruption of wing-dependent physiological functions. The wings of winter-collected WNS-affected bats often reveal signs of infection, whereby the degree of damage observed suggests functional impairment. Emaciation is a common finding in bats that have died from WNS. The authors hypothesized that wing damage caused by *P. destructans* infections could sufficiently disrupt water balance to trigger frequent thirst-associated arousals with excessive winter flight, and subsequent premature depletion of fat stores. In related research, Cryan *et al.* (2013) found that electrolytes (sodium and chloride) tended to decrease as wing damage increased in severity. Proper concentrations of electrolytes are necessary for maintaining physiologic homeostasis, and any imbalance could be life-threatening. Additionally, Verant *et al.* (2014) found that bats with early-stage WNS developed severe, chronic respiratory acidosis and hyperkalemia (high potassium concentrations in the blood). Although the exact mechanism by which WNS affects bats is still in question, the effect it has on many hibernating bat species is well documented, as well as the high levels of mortality it causes in some susceptible bat species.

The NLEB is known to be highly susceptible to WNS, and mortalities due to the disease have been confirmed. From 2007 to mid-2013, the USGS National Wildlife Health Center in Madison, Wisconsin tested 65 NLEB submissions. Twenty-eight of the 65 NLEBs tested were confirmed as positive for WNS by histopathology and another 10 were suspect (Ballmann 2013, personal communication cited in USFWS 2013). The New York Department of Environmental Conservation has confirmed at least 29 NLEBs submitted with signs of WNS since 2007 in New York but there were still bat carcasses not yet analyzed (Okonieski 2012, personal communication cited in USFWS 2013).

Due to WNS, the NLEB has experienced a sharp decline in the northeastern part of its range, as evidenced in hibernacula surveys. The northeastern United States is very close to saturation (i.e. WNS found in majority of hibernacula) for the disease, with the NLEB being one of the species most severely affected by the disease (Herzog and Reynolds 2013). Turner *et al.* (2011) compared the most recent pre-WNS count to the most recent post-WNS count for 6 cave bat species; they reported a 98% decline between pre- and post-WNS in the number of hibernating NLEBs at 30 hibernacula in New York, Pennsylvania, Vermont, Virginia, and West Virginia. In addition to the Turner *et al.* (2011) data, the Service conducted an additional analysis that included data from Connecticut (n=3), Massachusetts (n=4), and New Hampshire (n=4), and added one additional site to the previous Vermont data. Using a protocol similar to Turner *et al.* (2011), the Service found that the combined overall rate of decline seen in hibernacula count data for the 8 states was approximately 99% (USFWS 2013). Similarly, during 2013 hibernacula surveys at 34 sites where NLEBs were also observed prior to WNS in Pennsylvania, researchers found a 99% decline (from 637 to 5 bats) (Turner 2013).

Long-term (including pre- and post-WNS) summer data for the NLEB are somewhat limited; however, the available data parallel the population decline exhibited in hibernacula surveys. Summer surveys from 2005–2011 near Surry Mountain Lake in New Hampshire showed a 99% decline in capture success of NLEBs post-WNS, which is similar to the hibernacula data for the state (a 95% decline) (Brunkhurst 2012). In Vermont, the species was the second most common bat species in the state pre-WNS; however, it is now one of the least likely to be encountered, with the change in effort to capture one bat increasing by nearly 13 times, and approximately a 94% overall reduction in captures in mist-net surveys (Darling and Smith 2011). In eastern New York, captures of NLEBs have declined approximately 93% from pre-WNS (Herzog 2012). In West Virginia, NLEB mist-net captures comprised 41% of all captures pre-WNS and 24% post-WNS (Francl *et al.* 2012). Nagel and Gates (2012) reported a 78% decrease in NLEB passes during acoustic surveys between 2010 and 2012 in western Maryland. At two swarm trapping sites in Pennsylvania, researchers in 2010-2011 saw a decline in capture rates of 95% at one site and 97% at the second site post-WNS, which corroborates documented interior hibernacula declines (Turner *et al.* 2011, Turner 2013).

The area currently affected by WNS constitutes the core of the NLEB's range, where the species was most common prior to WNS. Furthermore, the rate at which WNS has spread has been rapid. Since its first documented occurrence in New York in February 2006, WNS had spread to 25 states and 5 Canadian provinces by August 2014 (USFWS 2014b). WNS has already had a substantial effect on NLEBs in the core of its range and is likely to spread throughout the species' entire range within a short time; thus the Service considers it to be the predominant threat to the species range-wide. This threat is ongoing and is expected to increase in the future as it continues to extirpate NLEB populations (USFWS 2013).

Other threats to the NLEB include wind-energy development, winter habitat modification (i.e. effects on hibernacula), summer habitat loss/modification (i.e. tree clearing from timber harvest, development, natural resource extraction, etc.), 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.

E. Analysis of the species/critical habitat likely to be affected

The NLEB is presently in danger of extinction throughout its entire range due to the severity and immediacy of the threat posed by WNS. White-nose syndrome has currently spread to 25 of the 39 states where the NLEB is known to occur, but is expected to spread to the remaining states in the near future. Rates of decline at hibernacula have been as high as 99%. The proposed action, the implementation of the NCDOT activities in Divisions 1-8, is likely to adversely affect the NLEB.

Other species

This PCO only addresses the NLEB and should not, by itself, be necessarily construed as completing Section 7 consultation for any specific activity. Individually, each NCDOT activity may or may not have adverse effects on other federally threatened or endangered species. Therefore, independent of this programmatic conference, all NCDOT projects in Divisions 1-8 will be separately assessed for effects to other federally listed species.

III. ENVIRONMENTAL BASELINE

Under Section 7(a)(2) of the ESA, when considering the "effects of the action" on federally listed species, the Service is required to take into consideration the environmental baseline. The environmental baseline includes past and ongoing natural factors and the past and present impacts of all federal, state, or private actions and other activities in the action area (50 CFR 402.02), including federal actions in the area that have already undergone Section 7 consultation, and the impacts of state or private actions which are contemporaneous with the consultation in process.

A. Status of the species within the action area

Eastern North Carolina is on the periphery of the NLEB's range, and data indicating the presence or absence of the species within the action area is sparse. However, the available data do suggest that NLEBs occur in low numbers within the action area and that the species is absent from much of the action area. Currently, negative data (data which does not support the presence of the species at a specific location) far exceeds positive data.

NLEB capture records in the action area

Camden County: Six NLEBs were captured in 2012, and one NLEB was captured in 2013 (Grider 2014).

Currituck County: During bat surveys conducted at a U.S. Naval facility that spans Chesapeake, Virginia and Currituck County, North Carolina, a total of 16 NLEBs were captured during the summers of 2013 and 2014 (Michael Wright, US Navy, personal communication, October 29, 2014).

Washington County: Six NLEBs were captured in June/July of 2007, including five juveniles, suggesting a resident maternity colony was present (Morris *et al*. 2009). In 2012, two NLEBs were captured (Grider 2014).

Other records indicating NLEB presence in the action area

Lee County: A rabies lab record from June 2001 is preserved in the University of North Carolina Wilmington Natural History Collection (David Webster, associate dean, University of North Carolina Wilmington, personal communication, January 21, 2014).

New Hanover County: A rabies lab record from 1996 is preserved in the University of North Carolina Wilmington Natural History Collection (David Webster, associate dean, University of North Carolina Wilmington, personal communication, January 21, 2014).

Wake County: Two specimens collected in Raleigh from 1947 and 1981 are preserved in the University of North Carolina at Wilmington Natural History Collection (David Webster, associate dean, University of North Carolina Wilmington, personal communication, January 21, 2014).

Negative data for NLEBs in the action area

Below is a summary of all known mist net bat survey work in eastern North Carolina which did not lead to any evidence of the presence of NLEB.

Fort Bragg/Camp Mackall (Cumberland, Harnett, Hoke, Richmond, and Scotland Counties) – (Janice Patten, wildlife biologist, Fort Bragg Endangered Species Branch, personal communication, July 1, 2014).

- Mist-netting was conducted from 2004-2009 at 38 locations across Fort Bragg and Camp Mackall. In addition, buildings were inspected for potential roosts. No NLEBs were captured or observed.
- In the winter of 2013-2014, several known roost locations where checked for bats. Bats were found at two sites, but no NLEBs were observed.

Uwharrie National Forest (Montgomery and Randolph Counties)

- Three nights of netting occurred during the 2004 Southeastern Bat Diversity Network bat blitz in Anson, Montgomery, and Randolph counties at over 30 sites. Seventy-seven bats (representing five species) were captured, but no NLEBs were captured (Cameron *et al*. 2004).
- NCDOT staff conducted netting in 2007 at four sites in Montgomery County. No NLEBs were captured.
- Fifty-eight nights of mist-netting occurred at 14 sites in the Uwharrie National Forest in the summer of 2014; 179 bats were captured, but there were no NLEB captures (King and Kalcounis-Rueppell 2014).

Croatan National Forest (Carteret, Jones, and Onslow Counties)

- Fourteen nights of mist-netting were conducted for the US 17 project on the west side of Croatan National Forest (CNF) in Jones and Onslow Counties, but no NLEBs were captured (Ecological Engineering 2014).
- Six nights of mist-netting were conducted in CNF along the proposed Havelock bypass corridor in 2005 (NCDOT). No NLEBs were captured.
- Five nights of mist-netting were conducted adjacent to CNF at the NCDOT Croatan Mitigation Bank from 2007-2010 (NCDOT). No NLEBs were captured.
- One night of mist-netting was conducted in Carteret County at the southern edge of CNF in 2009 (NCDOT). No NLEBs were captured.

North Carolina Division of Parks and Recreation surveys

North Carolina Museum of Natural Sciences staff surveyed 12 state parks and natural areas in eastern North Carolina between 1999 and 2004 via mist-netting and roost checks (Lambiase *et al*. 2000 and subsequent 2005 addendum). More than 160 bats were observed in approximately 40 days/nights of surveys, but no NLEBs were observed during any of these surveys. Survey locations included Eno River State Park (Orange and Durham Counties), Goose Creek State Park (Beaufort County), Lake Waccamaw State Park (Columbus County), Lumber River State Park (Columbus, Robeson, and Scotland Counties), Merchant's Millpond State Park (Gates County), Pettigrew State Park (Washington and Tyrell Counties), Raven Rock State Park (Harnett County), Weymouth Woods State Park (Moore County), Jones Lake State Park (Bladen County), Singletary Lake State Park (Bladen County), Theodore Roosevelt State Natural Area (Carteret County), and William B. Umstead State Park (Wake County).

Bladen and Lenoir County mist-netting

During the summer of 2012 (May 14 to August 5) Grider (2014) did not capture any NLEBs at sites in Bladen and Lenoir Counties, although 168 bats from seven other species were captured. During the spring of 2013 (March 11 to April 12), Grider (2014) did not capture any NLEBs at his field site in Bladen County, although five bats from one other species were captured.

Bridge surveys

Although there is evidence of NLEBs using bridges and other structures for roosting in other parts of the species range, bridge surveys in eastern North Carolina have failed to find any NLEBs. Felts and Webster (2003) found 219 bats (representing three species) during bridge and culvert surveys in southeastern North Carolina (Bladen, Brunswick, Columbus, Duplin, New Hanover, Onslow, and Pender Counties), but none were NLEB. McDonnell (2001) examined 990 bridges and culverts in 25 counties in the North Carolina Coastal Plain. Eighty-one (81) bats were found, but no NLEBs were identified.

Acoustic bat surveys in the action area

At this time, the Raleigh Field Office is not considering acoustic data as official records of presence or absence, given the software's difficulties in distinguishing the Myotis species and pending further refinement of acoustic software and standardization of methodologies and analysis. However, acoustic efforts are noted below as current best available information.

- From March 25 to May 15, 2014 the Service conducted passive acoustic surveys for NLEBs at 23 sites in 14 counties within the action area. NLEBs were identified by two software packages at 4 of the 23 sites in Bertie, Chatham, Craven, and Jones Counties (Kathy Matthews, USFWS Raleigh Field Office, personal communication, February 23, 2015).
- Multiple Sonobat acoustic transects were conducted across Fort Bragg and Camp Mackall from 2004-2014. Eight bat species were detected, but none were NLEBs (Janice Patten, wildlife biologist, Fort Bragg Endangered Species Branch, personal communication, July 1, 2014).

- Pittaway and Kalcounis-Rueppell (2014) analyzed acoustic transects along 18 routes that were run in 2009, 2010 and 2012 in the Uwharrie National Forest. No NLEB calls were recorded.
- Three nights of acoustic driving transects in 2010 conducted on CNF by USFS staff (Pittaway and Kalcounis-Rueppell 2014). No NLEB calls were recorded.

Winter bat activity in the action area

Grider (2014) determined that multiple species of bats remain active during the winter in eastern North Carolina, especially within the coastal plain. Seven species, including NLEB in Camden County, were identified by acoustic surveys during the winters of 2012/2013 and 2013/2014. Additionally, one NLEB was captured in a mist net in Camden County on March 11, 2013 (Kalcounis-Rueppell and Grider 2013). Several other bats from three other species were also captured December 20-21, 2013 at the same location (Grider 2014). In the rest of the NLEB's range, the species would normally be hibernating in caves or other suitable hibernacula during winter. See Section B below for more related discussion.

B. Factors affecting species environment within the action area

A number of ongoing anthropogenic and natural factors may affect the NLEB. Some of these effects have not been evaluated with respect to biological impacts on the species. In addition, some are interrelated and the effects of one cannot be separated from others. Known or suspected factors affecting the NLEB are discussed below.

White-nose syndrome

WNS is not known to occur within the action area (Heffernan 2015). This may be due to the near absence of caves or other suitable hibernacula within the action area. However, much of the action area does occur within the WNS buffer zone described in USFWS (2015).

Lack of known hibernacula

No NLEB hibernacula are currently known to exist within the action area. This is likely due to the near absence of suitable caves in eastern North Carolina. Although suitable or potentially suitable caves do exist outside the action area in south-central Virginia (Virginia Speleological Survey 2007) and in western North Carolina, these caves are >125 miles from known NLEB capture sites in northeastern North Carolina. This distance is beyond the 35-55 mile range at which NLEBs are typically known to migrate (Griffith 1945, Nagorsen and Brigham 1993). However, a small number of underground mines located primarily in the western portion of the action area could conceivably provide hibernacula for NLEBs. Overall, the absence of known hibernacula within or near the action area makes the area distinctly different than most of the rest of the range of the species.

Winter activity of NLEB in eastern North Carolina

From Grider (2014) it appears that the climate in eastern North Carolina, especially along the coast, is sufficient for year-round or near year-round activity for NLEBs, thus possibly precluding the need for traditional hibernacula. Whitaker *et al.* (1997) similarly found that eastern red bats (*Lasiurus borealis*) were able to forage during winter in coastal North Carolina. Due to relatively mild winter temperatures in coastal North Carolina, it is believed that sufficient insect activity occurs to sustain bat activity during much of the winter. Taylor (1963) found that some cold-tolerant insects can maintain flight at temperatures as low as 8°C. Grider (2014) found that his coastal plain North Carolina study sites averaged nightly temperatures of 8°C or higher on 34.1% of winter nights. However, he also found some minimal level of bat activity as low as -3.4°C.

Loss/modification of roosting and foraging habitat

The action area has experienced and continues to experience loss and modification of NLEB roosting and foraging habitat through tree removal. Tree removal occurs primarily as a result of development, timber harvest, and land clearing for agriculture. From 1990 to 2011, total forest land in the Coastal Plain and Piedmont Regions of North Carolina declined by approximately 4%, but the decline appears to have stabilized in recent years (Brown and New 2013).

Public conservation lands

The 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 and subsequently developed. However, some management activities such as prescribed burning, timber stand improvement, and sustainable timber harvesting may have some level of adverse effects to the species.

Climate Change

Climate change in eastern North Carolina may result in additional sea level rise. Sea level rise would flood portions of coastal North Carolina, thus killing trees that NLEBs may use for foraging and roosting. Simultaneously, a warming climate could increase insect availability during winter and thus increase winter activity and perhaps alter behaviors.

IV. EFFECTS OF THE ACTION

Under Section 7(a)(2) of the ESA, "effects of the action" refers to the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action. The federal agency is responsible for analyzing these effects. The effects of the proposed action are added to the environmental baseline to determine the future baseline, which serves as the basis for the determination in this PCO. Should the effects of the federal action result in a situation that would jeopardize the continued existence of the species, we may propose reasonable and prudent alternatives that the federal agency can take to avoid a violation of Section 7(a)(2). The discussion that follows is our evaluation of the anticipated direct and indirect effects of the proposed project. Indirect effects are those caused by the proposed action that occur later in time but are still reasonably certain to occur (50 CFR 402.02).

A. Factors to be considered

Proximity of the action: The proposed action will occur within suitable roosting and foraging habitat throughout the action area. No known hibernaculum occur within the action area.

Distribution: The expected disturbance from the proposed action may directly affect roosting and foraging NLEBs at multiple locations throughout the action area.

Timing: Project construction will occur throughout the year and through all phases of the NLEB's life cycle, although the winter behavior of NLEBs within the action area is not yet fully understood.

Nature of the effect: Adverse effects to the NLEB in the action area are expected to occur primarily in the form of nonlethal harassment of roosting bats as roost trees are felled during land clearing operations or when structures (e.g. bridges) are demolished. However, some minimal level of lethal effects is expected when bats are unable to escape roost trees which are being felled or when structures are demolished (e.g. when female bats with non-volant pups are present). Due to seemingly low numbers of NLEBs in the action area, the generalist roosting habitat selection of the species, and the abundance of forested lands within the action area, it is assumed that removal of roosting and foraging habitat is, in and of itself, not an adverse effect if no NLEBs are present.

Duration/disturbance frequency: This PCO analyzes the effects of the proposed action for a period of five years, beginning in April 2015. Covered activities will be ongoing throughout the 5-year timeframe, but the duration of each covered activity will vary from weeks to years.

Disturbance intensity and severity: The intensity and severity of disturbance will vary depending on the scope of each covered activity.

B. Analysis for effects of the action

Beneficial effects:

The greatest beneficial effect of the action is the previously described 5-year research project to be conducted by NCDOT (see Conservation Measures section above and Appendix B).

Information is severely lacking for the NLEB in eastern North Carolina. Of special interest is the need for information on the winter behavior of NLEBs in the action area. The data obtained from the research will be essential for long-term NLEB conservation in eastern North Carolina by helping to target management and protection efforts.

To comply with Section 404 of the Clean Water Act, NCDOT is required to mitigate for impacts to wetlands and streams. NCDOT typically offsets unavoidable impacts at a 2:1 ratio through a combination of restoration, enhancement, and preservation activities. Since most wetland impacts are to forested wetlands, NCDOT is responsible for replacing much of the forested wetland acreage that is lost due to project construction. Additionally, most stream mitigation requires forested riparian buffers to be planted or restored. From 2003 to 2013, NCDOT restored approximately 4,000 acres of forest, preserved approximately 18,000 acres of forest, and planted over one million trees within NCDOT Divisions 1-8 (LeiLani Paugh, NCDOT, personal communication, February 2, 2015). These restored and preserved acres of forested habitat provide substantial long-term benefits to the NLEB.

Direct effects:

The amount of information on the occurrence, distribution, and population size of the NLEB in the action area is minimal. Little information exists on locations of maternity roosts or preferred foraging areas. Therefore, quantifying the direct effects to the species is difficult. However, because the available data do suggest that NLEBs occur in low numbers within the action area and that the species is absent from much of the action area, it is presumed that most of NCDOT's activities within the action area, if viewed individually, would not adversely affect the species. However, when assessed at the programmatic level, it is certain that adverse effects will occur.

1. Mortality from tree clearing or structure removal

During tree clearing activities, if a NLEB is present in a tree at the time it is felled, it is possible the bat may be killed if it does not quickly exit the tree. Non-volant pups would be especially vulnerable. Given the seeming low occurrence of the NLEB in the action area, and given the large amount of forested acreage in the action area, the probability that any specific project would cause mortality of the species is likely low. However, collectively, all NCDOT activities within the action area together as a program will likely result in some relatively small amount of mortality, although the precise amount of mortality would not be predictable or measureable.

Although there is currently no evidence of NLEBs using bridges, culverts, or buildings as roost sites in the action area, there has been a minimal amount of NLEB use of bridges as roost sites in the mountains of western North Carolina. Therefore, it is possible that NLEBs may use bridges, large box culverts, or buildings as roost sites in eastern North Carolina. During the demolition of these structures, it is possible that NLEBs could be killed if they are unable to quickly exit the structure.

2. Overall habitat loss

Although the overall distribution of the NLEB is currently unknown for the action area, for the purposes of this programmatic conference, it is assumed that all forested land within the action area could serve as NLEB foraging and/or roosting habitat. NCDOT has determined that their activities from January 1, 2015 to December 31, 2019 will clear up to 10,223 acres of trees in Divisions 1-8. Based on U.S. Forest Service forest inventory data for North Carolina (New 2014), this amount of clearing represents 0.21% of the total forested acres in the action area. While there is no evidence to indicate that roosting or foraging habitat availability is a limiting factor for the NLEB in the action area, the acreage of tree clearing will serve as the surrogate to attempt to quantify the potential harm and/or harassment to the species from the removal of trees.

To put the potential amount of forested habitat loss into perspective, the following theoretical exercise is useful. Using an average maternal home range size of 161 acres from Owen *et al*. (2003), the theoretical maximum number of NLEB maternity colonies represented by 10,223 acres of trees to be cleared by NCDOT over five years is 63. However, this theoretical number of maternity colonies is a gross overestimate for multiple reasons. The 10,223 acres of tree clearing assumes that project ROWs are entirely cleared, which is generally not the case. Also, the available information regarding presence/absence of the species within the action area suggests that the occupancy rate of the forested acreage to be cleared is low. Only 3 of the 59 counties within the action area are conclusively known to currently support the NLEB. The proposed tree clearing within these three counties only represents a small fraction of the 10,223 acres that may be cleared within the action area over five years. Furthermore, there is only one STIP-level project planned within three miles of any known NLEB capture sight, and most of the trees within that project ROW have previously been cleared.

3. Harm or harassment from removing roost trees

Although there are few records of NLEB maternity or non-maternity roost areas from the action area, NCDOT activities at the programmatic level are likely to remove some unknown number of active roost trees. A NLEB present in a roost tree that is being felled will likely exit the tree and fly to another nearby tree. The NLEB’s flight to another tree will cause extra energy expenditure and may expose the bat to increased predation pressures. Pregnant females and females with pups would be the most vulnerable due to the increased energy demands of pregnancy and the rearing of young. Likewise, NLEBs that exit their roost sites in bridges or buildings being demolished could experience similar effects.

4. Harm or harassment from removing foraging habitat

An individual NLEB whose foraging area overlaps with a specific project area or whose foraging area will be significantly fragmented will have to expend an increased amount of energy to establish a new foraging area or new travel corridors between roosting and foraging areas. This may subject the bat to increased inter- or intra-specific competition or to increased predation pressures. It is anticipated that in most cases an individual NLEB would have little difficulty in establishing new foraging areas and that any adverse effects would be minimal and temporary.

5. Harm or harassment due to noise, vibrations, and other disturbances

In addition to habitat destruction in a project footprint, a decrease in the quality of remaining habitat adjacent to a project footprint may occur. Increased disturbance may occur during clearing and construction from the use of equipment and from blasting, although blasting is rarely used by NCDOT. NLEBs may be exposed to noise levels and vibrations that they may not have experienced in the past, depending on the proximity of their roost sites or foraging areas to NCDOT activities. The majority of these effects will be temporary and generated solely during construction activities, although noise generated from new roads will be permanent. It is difficult to predict the degree to which NLEBs would be disturbed by the noise and vibrations associated with construction activities, but it is reasonable to assume that any effect resulting from noise and vibrations could result in bats selecting roost trees or foraging areas further from the disturbance. However, there would be limited exposure of foraging NLEBs to construction-related noise and vibration since most construction work occurs during the daytime, and the nighttime work that does occur generally occurs within congested urban areas which would be less likely to have NLEBs present. The burning of woody debris at construction sites may also disturb roosting or foraging bats with smoke or heat.

6. Decreased water quality

Although NCDOT implements various measures to avoid or minimize degrading water quality, some NCDOT activities may 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, and since some insects with an aquatic life-stage (e.g. caddisflies) make up a portion of the diet of the NLEB, the degraded water quality could affect the prey base for NLEBs. 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.

7. Harassment from research project

During the five-year research project to be implemented by NCDOT, NLEBs could be adversely affected by mist-netting activities, such as becoming stressed or injured in the net. Roost surveys conducted during cold temperatures in winter could also arouse bats during periods of low insect activity, thus leading to the excess expenditure of energy reserves. Telemetry surveys could stress individual bats carrying transmitters. However, all of these potential effects are covered under ESA Section 10(a)(1)(A) permits for the researchers.

<u>Indirect effects</u>:

1. Mortality from vehicle traffic

Bats that fly across roads can be killed by vehicles (Lesinski 2007, Lesinski 2008, Russell *et al*. 2009, Gaisler *et al*. 2009). A study conducted in eastern North Carolina (in Tyrrell and Dare Counties) which analyzed wildlife road-kills documented bat mortality (Smith 2011). Since NLEBs typically forage 1 to 3 meters above the ground (Nagorsen and Brigham 1993), NLEBs could be struck and killed by vehicles on new roads constructed within the action area; however, such mortality would be expected to be minimal.

2. Habitat fragmentation from road traffic

Zurcher *et al*. (2010) 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 NLEB and current habitat connectivity levels in eastern North Carolina, only generalizations can be made about the effects of habitat fragmentation due to NCDOT activities. NCDOT projects may reduce NLEB habitat connectivity; therefore, NLEBs may need to expend extra energy to forage, find cover, or commute to roost sites as a result. No realistic estimate of the reduction in habitat connectivity can be made due to the limited NLEB data in the action area. It is assumed that the abundance of NLEB habitat will act to ameliorate the fragmentation effects of NCDOT activities.

3. Harm or harassment from removing maternity roost trees outside the maternity season

Activities that require the removal of primary maternity roost trees outside of the NLEB maternity season may result in adverse effects to maternity colony members and potential loss of a year's recruitment. If pregnant females are required to search for new roosting habitat in the spring, this effort may place additional stress on pregnant females at a critical time when fat reserves are low and they are already stressed from the energy demands of pregnancy. Adult male and non-reproductive female NLEBs would be less affected since they are not subject to the physiological demands of pregnancy and rearing young.

4. Road avoidance due to traffic noise

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 crossing roads in Indiana. Without data specific to NLEBs, it is unknown what effect traffic noise will have on the species.

5. Secondary development

There is potential for the NCDOT Program to induce additional development. While bridge replacements and maintenance activities do not increase development, new location and widening projects do have the potential to increase traffic capacity, which may induce secondary development, resulting in additional habitat loss. No quantitative analysis is practicable for the scope of the NCDOT Program.

Interrelated and interdependent effects:

Utility companies often locate utility lines (e.g. water, gas, electrical) along NCDOT roads within the ROW. In those situations, there would generally be no additional effects to the NLEB from tree clearing. However, occasionally, utility companies relocate utility lines outside the limits of the NCDOT ROW. In those situations, additional tree clearing may occur. Since that decision by the utility company generally does not occur until late in project planning or even after project construction has begun, and given the programmatic nature of this PCO, there is no accurate way to estimate the extent of additional tree clearing. However, based on the infrequent occurrence of this scenario, the additional adverse effect to NLEBs is expected to be minimal.

C. Species' response to proposed action

Numbers of individuals/populations in the action area affected: Comprehensive information regarding the population size of NLEBs in the action area is lacking. Total records of live captures within the action area comprise only about 20 individuals. These live captures are from only 3 of the 59 counties in the action area. A significant amount of negative data (i.e. surveys without evidence of NLEB) covering multiple counties suggests that the population of NLEB within the action area is low.

Sensitivity to change, resilience, and recovery rate: Due to the near absence of information on the population, distribution, and behavior of NLEBs in the action area, these factors are largely unknown.

V. CUMULATIVE EFFECTS

Cumulative effects include the effects of future state, local, or private actions that are reasonably certain to occur in the action area considered in this PCO. Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to Section 7 of the ESA.

Bridge maintenance

There will be NCDOT maintenance activities with no federal nexus such as bridge painting and repair work which could affect the NLEB. If NLEB are roosting in bridges in eastern North Carolina, maintenance activities could harass or kill individuals. However, current data suggest that bridge use by NLEB in North Carolina is very limited (McDonnell 2001, Felts and Webster 2003), so the overall effects of bridge maintenance on the species are expected to be minimal.

Tree trimming and hazard tree removal
Tree trimming and hazardous tree removal are activities that generally occur without a federal nexus. These activities occur along road ROWs to reduce safety hazards due to falling trees or limbs, or to improve line-of-sight issues. Potential effects to NLEB would be similar to the tree removal previously described in the direct effects section. Tree trimming and hazardous tree removal occurs on an as-needed basis, so quantifying the amount of habitat lost from this activity is not practicable.

Borrow areas
NCDOT contractors, independent of project planning and usually without a federal nexus, may select borrow areas to obtain material for earthwork and may require tree removal. Construction contractors are generally responsible for addressing federally threatened and endangered species issues for these sites per NCDOT standard specifications. However, most borrow areas are located in areas of previously disturbed habitat where tree removal is minimal.

Timber industry
Eastern North Carolina has a large timber industry, with approximately $551 million of timber being delivered to mills within the action area in 2012 alone (Jeuck and Bardon 2013). Much of this timber harvest is part of sustainable management, with the remainder occurring due to development and land clearing for other purposes. In addition to timber harvest, some unknown acreage of forested land is managed for optimal timber production and/or wildlife management. Both timber harvest and forest management involving tree clearing will continue to have adverse effects on the NLEB within the action area similar to the effects described above for the removal of roost trees and foraging habitat. However, these adverse effects would be very difficult to quantify.

Development
From 2010 to 2013, the U.S. Census Bureau estimated an annual 1.1% population growth rate in the action area (U.S. Census Bureau 2014). Most of this growth occured in urban areas, with the rural areas being nearly stable or declining in population. Increased population growth generally leads to increased land clearing. Tree clearing from development will continue to have adverse effects on the NLEB. However, given the size of the action area (59 counties) and the paucity of data on NLEBs within the action area, these effects would not be measureable.

VI. CONCLUSION

After reviewing the current status of the NLEB, the environmental baseline for the action area, the effects of the proposed action and cumulative effects, it is the Service’s conference opinion that NCDOT activities in eastern North Carolina (Divisions 1-8), as proposed, are not likely to jeopardize the continued existence of the NLEB. No critical habitat has been proposed or designated for the NLEB; therefore, none will be affected.

This non-jeopardy opinion is based on the following rationale:

1. Eastern North Carolina is on the periphery of the NLEB's range, and there are very few records of NLEBs in the action area.
2. Based on available data, NLEBs appear to occur in low numbers within the action area.
3. The NLEB appears to be absent from portions of the action area.
4. There are no known NLEB hibernacula and almost no caves in eastern North Carolina.
5. The loss of trees from NCDOT activities will not result in a shortage of available roosts or foraging opportunities for NLEB since forested habitat is abundant in eastern North Carolina and is not likely a factor limiting the numbers or reproduction of NLEB populations.
6. The likelihood of any individual NCDOT project having an adverse effect on the NLEB is likely low.
7. Most of the adverse effects that do occur will occur as non-lethal harassment. The probability of any individual project causing NLEB mortality is likely very low.
8. The greatest conservation need for NLEBs in eastern North Carolina is basic information on the distribution and behavior of the species. As part of the action, NCDOT has proposed to conduct an extensive and systematic research and data collection effort over five years. This information is needed to form conservation strategies for the species in the future.

INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and federal regulations pursuant to Section 4(d) of the ESA prohibit the taking of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns such as breeding, feeding or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of Section 7(b)(4) and Section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The prohibitions against taking the species found in Section 9 of the ESA do not apply until the NLEB is listed. However, the Service advises the action agencies to consider implementing the following reasonable and prudent measures. If this PCO is adopted as a Programmatic Biological Opinion following a listing, these measures, with their implementing terms and conditions, will be non-discretionary.

Amount or extent of take anticipated

The Service expects incidental take of NLEBs attributable to the proposed action will be difficult to detect and quantify for the following reasons: 1) most incidental take will occur as sub-lethal harassment, 2) sub-lethal effects are mostly undetectable, 3) dead bats are mostly undetectable, and 4) data on the presence, distribution, and behavior of NLEB in the action area is very limited. By far, the greatest amount of incidental take will be associated with tree clearing. Although other NCDOT activities have the potential to take NLEBs, these other activities are believed to be inconsequential when compared to tree clearing. Therefore, tree clearing acreage was determined to be the only meaningful surrogate to express the extent of incidental take. The NCDOT has determined that up to 10,223 acres of trees will be cleared by NCDOT activities within the action area over the next five years. This figure is conservatively estimated and is likely high since it assumes that all trees will be cleared within a project ROW, which is often not the case.

Effect of the take

In the accompanying PCO, the Service has determined that this level of anticipated take is not likely to result in jeopardy to the NLEB, or destruction or adverse modification of designated or proposed critical habitat.

Duration of the take

This level of incidental take is authorized from the effective date of a final listing determination through April 30, 2020.

Reasonable and Prudent Measures

The Service believes the following reasonable and prudent measures are necessary and appropriate within NCDOT Divisions 1-8 to minimize take of the NLEB. These nondiscretionary measures include, but are not limited to, the terms and conditions outlined in this PCO.

1. Include visual bat surveys for structures and mines when developing environmental documentation during project planning.

2. Report annual tree clearing acreage to the Service.

3. Avoid disturbing any known NLEB maternity roosts during pupping season.

4. As research findings become available, coordinate with the Service to develop future conservation measures.

Terms and Conditions

In order to be exempt from the prohibitions of Section 9 of the ESA, the NCDOT must comply with the following terms and conditions, which implement the reasonable and prudent measures described previously. These terms and conditions are nondiscretionary.

1. Develop a policy to conduct bat presence surveys at bridges, within vacant buildings, and within suitable underground mines within project study areas when developing Natural Resource Technical Reports and National Environmental Policy Act documents during project planning. These bat presence surveys will be limited to visual surveys only. With regard to underground mines, there is no expectation that investigators will survey any mine with unsafe conditions. If NLEBs are observed, the information must be reported to the Raleigh Field Office. (RPM 1)

2. NCDOT must track and report annually to the Service the total tree clearing acreage for all activities covered by this programmatic conference/consultation (i.e. projects with a federal nexus only). A cumulative tree clearing acreage for the years 2015-2019 must be provided by April 2020. (RPM 2)

3. If NCDOT or other researchers identify NLEB maternity roosts, do not remove occupied maternity roost trees or clear-cut within 0.25 mile of an occupied maternity roost tree during the summer pupping season. The pupping season for NLEBs in eastern NC is not yet precisely known, but the dates of May 15 – August 15 will be used until more data are available. (RPM 3)

4. During the research related semi-annual meetings specified in the conservation measures, discuss and consider any future conservation measures which the research findings may suggest would benefit the NLEB. (RPM 4)

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. The following conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or proposed critical habitat, to help implement recovery plans, or to develop information.

1. NCDOT and/or FHWA could contribute funding to purchase additional acoustic bat survey equipment and software for natural resource agencies.

2. NCDOT and/or FHWA could provide for bat acoustic survey techniques training for staff from the Service, WRC, and other natural resource agencies.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, we request notification of the implementation of any conservation recommendations.

REINITIATION/CLOSING STATEMENT

This concludes the conference for the action outlined in your January 13, 2015 request for formal conference. You may ask the Service to confirm the PCO as a Programmatic Biological Opinion issued through formal consultation if the NLEB is listed. The request must be in writing. If the Service reviews the proposed action and finds that there have been no significant changes in the action as planned or in the information used during the conference, the Service will confirm the PCO as the Programmatic Biological Opinion on the action and no further Section 7 consultation will be necessary.

After listing of the NLEB as endangered or threatened and any subsequent adoption of this PCO, the FHWA (NC Division) and USACE (Wilmington District) shall request reinitiation of consultation if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action.

The Incidental Take Statement provided in this PCO does not become effective until the NLEB is listed and the PCO is adopted as the Programmatic Biological Opinion issued through formal consultation.

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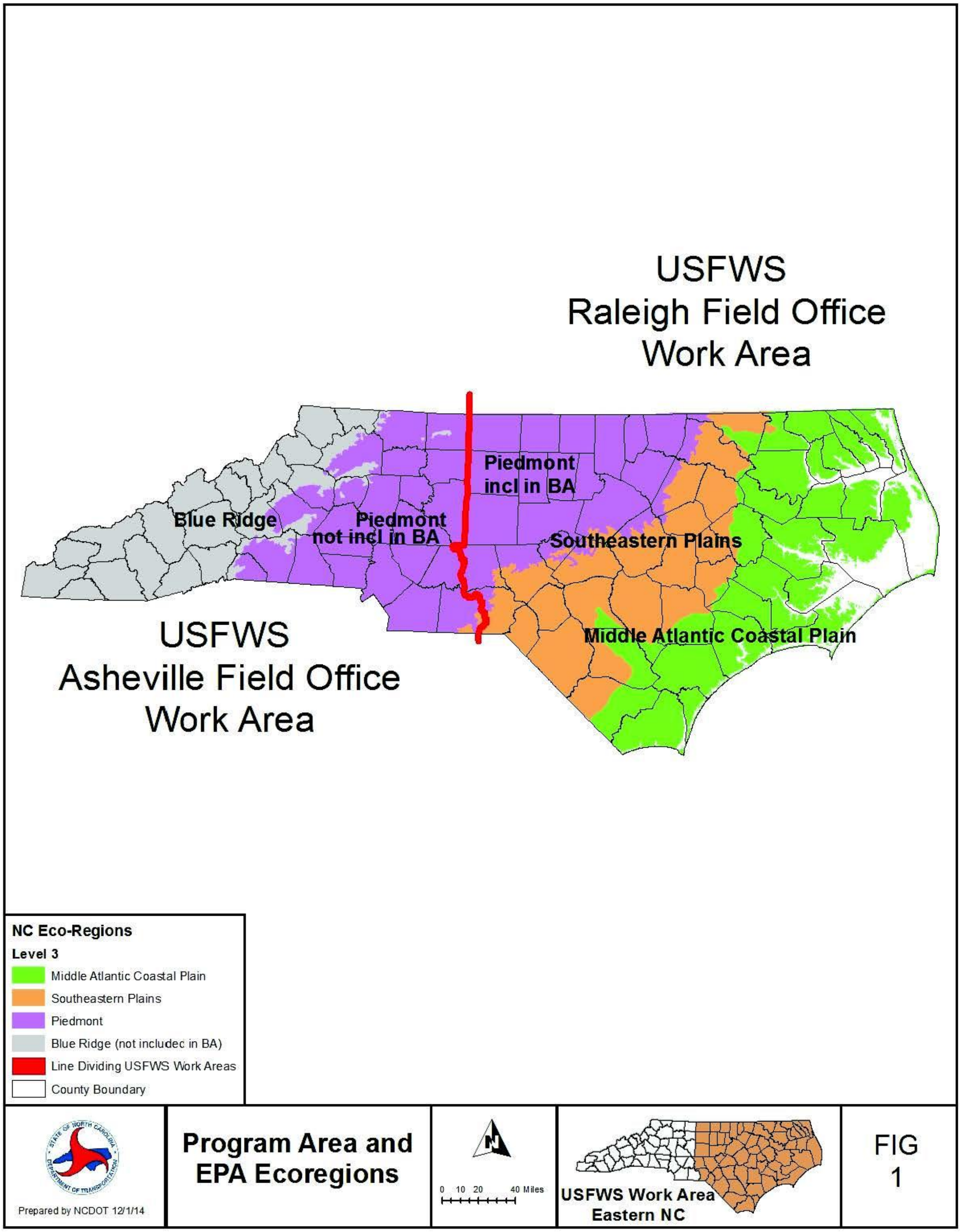
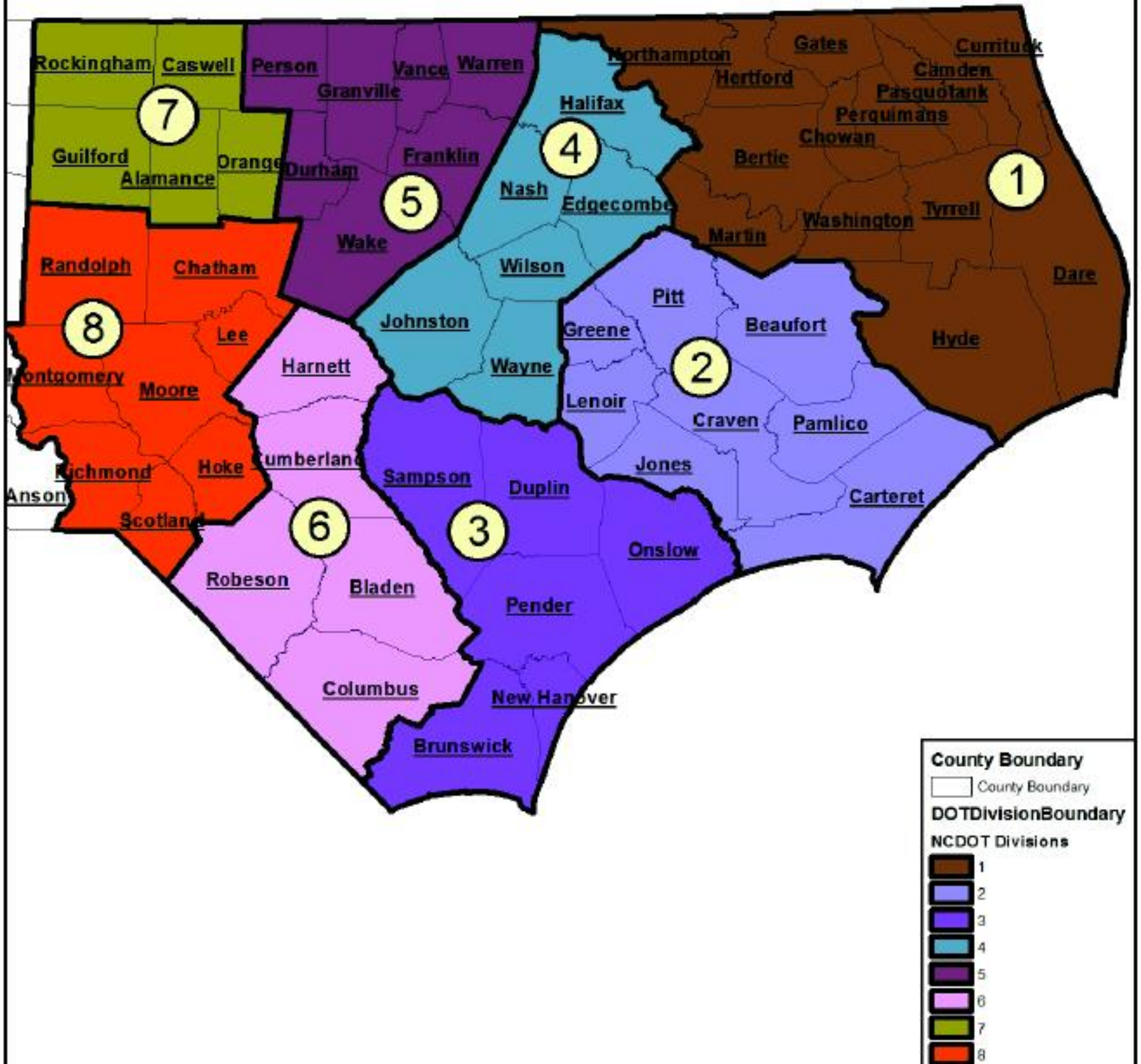
APPENDIX A

FIGURES



Program Area and EPA Ecoregions



Prepared by NCDOT 10/27/14

Action Area

Eastern NC Counties
& Eastern NCDOT Divisions

0 5 10 20 Miles

FIG 2

APPENDIX B

RESEARCH

NORTHERN LONG-EARED BAT RESEARCH STUDY
FOR EASTERN NORTH CAROLINA
NCDOT, 2015-2019

Objectives
1. Use acoustic monitoring to determine the distribution of Northern Long-eared Bat (NLEB) in eastern North Carolina, determine where presence is year-round and where it is limited to the maternity season, and develop basic understanding of northern long-eared bat habitat and temporal (year-round) activity patterns.
2. Use the results of the acoustic surveys to conduct mist-netting/telemetry on NLEBs to locate and characterize day roosts, especially winter roosts (if NLEB are present in eastern NC over the winter).
3. Swab bats in winter to determine presence/absence of *Pseudogymnoascus destructans*, the fungus that causes white nose syndrome (WNS).
4. Conduct structure, bridge and culvert checks to determine degree of use, seasons of use and type of structure preferences.

1. Acoustic Monitoring
For research in eastern NC, select 30 locations for conducting acoustic work, covering 10 locations/year for 3 years. At each location, sample 4 times/year (early and mid-summer, fall and winter) with 4 bat detectors for 3 nights/sampling period. This will result in 480 detector nights/year. Sampling for three years will result in a minimum of 1440 detector nights, which will be the minimum amount of acoustic work to be conducted through the 5-year research program. Additional work may be needed to fill information gaps; this will be determined as work progresses. If ten locations are sampled a year for five years, a maximum of 2400 detector nights will be the result. Using multiple bat detectors will allow four sites within a location to be sampled so that habitat preferences can be determined. Monitoring multiple times a year will ensure that the species' presence is detected if some areas are only inhabited on a seasonal basis. Sampling may be discontinued at locations with little or no bat activity, at which point a new location will be selected.

Thirty locations spaced out over eastern NC will provide information about the species' distribution. Counties with NLEB capture records, counties with reliable acoustic-only records (no captures), and counties near recent NLEB captures in Washington, Currituck and Camden counties will be prioritized for initial monitoring. Sampling locations will be coordinated with advisors from state and federal resource agencies and from academia to avoid duplicating efforts.

In addition to the methods listed below, all survey efforts will follow the NLEB Interim Conference and Planning Guidance (US Fish and Wildlife Service, 2014) to the extent practicable.

Methods:
- Use Anabat SD2 detectors or SM2 Songmeters encased in weather-proof housing. Ensure that the latest firmware is included. All detectors will have been tested within the last year for sensitivity.
- Use sensitivity setting of 7 (Anabat).
- Detectors will be placed in a variety of habitats and stand conditions.
- Bat echolocation passes will be identified using two automated systems such as EchoClass II and BCID (Bat Call ID) as well as supervised visual examination.
- Habitat will be scored as as pine/hardwood/mixed; the landscape setting as upland/bottomland; the timber as managed (thinned, burned, or pine plantation) or unmanaged, mature or cutover; and the condition as more open or more forested, following Ford et al. (2006). To score human disturbance, habitat will also be classed as natural, rural (scattered agricultural land or buildings visible), suburban (regular houses/buildings) or mixed (patches of natural and other land use).

- Natural communities will be typed according to Schafale (2012) to give an indication of which tree species are present.
- Assess forest basal area (m2/ha) using a 10- factor prism and canopy cover using a sighting tube at 10 random locations within a 0.05-ha circular plot around each survey site (Cook et al. 1995, Ford et al. 2006). This will give an indication of forest structure and how cluttered the surrounding habitat is.

Rationale for locations for acoustic work:

- Virginia lists records for NLEB in the Dismal Swamp in VA. The swamp lies in Gates, Pasquotank, and Camden Counties in NC. Navy biologists captured NLEB in Currituck County, NC and adjacent Chesapeake County, VA.
- Washington, Camden, Currituck and surrounding counties were selected to gather more information about presence/seasonal activity of NLEBs in the area.
- No NLEB records occur in the Piedmont or coastal plain of South Carolina; all records are from the mountains.
- There are records of NLEB in Wake County and the US Fish and Wildlife Service (USFWS) lists Lee County as a recent occurrence, so those counties and some of the surrounding counties will be targeted for work.
- New Hanover and Brunswick counties will be targeted due to a New Hanover record.
- UNC-Greensboro has identified one NLEB call in Bladen County, so it was selected.
- UNCG researchers felt that the swath of counties between New Hanover and Washington would be good to survey, so counties such as Duplin, Onslow, Pitt and Beaufort will be targeted.
- The following areas were avoided based on negative data: Uwharrie National Forest and Fort Bragg.

Proposed Acoustic Locations for 2015 (rational for selection is indicated below each county)

1. Bladen – Bladen Lakes State Forest
   One county acoustic record from UNCG
2. Currituck – North River Gameland
   Proximity to known NLEB capture sites
3. Gates (or Camden/Pasquotank) - Great Dismal Swamp National Wildlife Refuge
   Proximity to known NLEB capture sites
4. Hertford – Chowan Swamp Gameland (some of the gameland may fall in an NABat priority site)
   Proximity to known NLEB capture sites
5. Lee (or Chatham) – CP&L Gameland (selecting Chatham will hit part of an NABat priority site)
   NLEB capture record for Lee County
6. New Hanover – NCDOT Murrayville Mitigation Site
   NLEB rabies record for New Hanover County
7. Tyrell – Palmetto-Peartree Reserve (some of which falls in an NABat priority site)
   Proximity to known NLEB capture sites
8. Wake – Swift Creek Bluffs, Triangle Land Conservancy
   Historic NLEB record for Wake County
9. Washington - Pocosin Lakes National Wildlife Refuge
   Proximity to known NLEB capture site
10. Wayne – Waynesborough State Park (on Neuse River)
    Lack of data from this area of the state; proposed NCDOT Goldsboro bypass project

Locations will be further refined based on a variety of good habitat types. Locations at state parks, national wildlife refuges, and large NCDOT mitigation properties will be prioritized for sampling, as they should be amenable to repeated monitoring and, if NLEBs are determined to be present, can help provide species conservation measures. Locations will be selected to provide a wide array of vegetative communities and management/disturbance regimes. Because of logistical constraints associated with intensive mist-netting and day-roost research, these efforts will be concentrated initially in and around Camden, Washington and Currituck counties, where NLEB are known to occur.

The North American Bat Monitoring Program (NABat; https://www.fort.usgs.gov/science-tasks/2457) sampling design and protocols will be followed to the extent possible. The NABat sampling frame consists of a GIS-generated sampling grid across North America of 10x10 km grid cells. Two to four stationary sampling sites are established within each cell and are sampled two times/summer within the same week. Following repeatable protocols in a nationally standardized context will allow comparison within and between states and regions and can reveal trends across broad landscape scales. NABat will establish population baselines from which anticipated declines from white-nose syndrome and other threats can be documented and will provide information about bat populations within NC.

Acoustic monitoring results will be used to determine where mist-netting should be targeted. Acoustic data collected as a result of NCDOT research could be used to develop northern long-eared bat predictive habitat models. Modeling will not be conducted by NCDOT, but NCDOT will cooperate with other agencies wishing to use our data to develop models.

2. Mist-netting/telemetry
NLEBs will be netted over water, forest edges, and forested roads and outfitted with radio-transmitters. The bats will be radio-tracked to day-roosts to describe roost and site characteristics following the methods of Perry and Thill, (2007). Mist netting/telemetry in the northeastern part of the state (around Camden, Currituck and Washington counties) can begin concurrently with acoustic work in early 2015 and can expand to other areas of eastern NC over time, depending on the acoustic results. If mist-netting is not as productive as we anticipate (few NLEB captures), resources can be reallocated for more acoustic work. The initial assumption is that there will be positive acoustic results to justify mist-netting at least 15 locations in the eastern half of NC. This 15-location estimate is based on known occurrences and negative survey results, while anticipating that ideally, mist-netting should occur in enough locations to provide data from all regions of eastern NC. The target season for most netting will be in the fall, with the intent of tracking bats to their winter roosts. Some summer netting may be conducted as well if requested by USFWS, which would allow data to be collected on reproductive status and summer roosts.

Assume at least five locations will be surveyed with mist-nets each year for three years, with 8 nights of surveying per location, for a minimum of 120 survey nights. If 25 locations are netted eight nights each (67 nights of mist-netting a year over a three-year period), two hundred survey nights will be conducted. Mist-netting will be coordinated with UNCG researchers, who will be conducting NLEB work around Camden and Washington counties in 2015.

Telemetry will be used to collect information about roost types and locations. For telemetry, assume that up to 100 NLEBS will be captured and transmittered throughout the five year programmatic duration, for a minimum of 8400 hours of telemetry (100 bats x 4 hours a day x 21 days), assuming sufficient numbers of bats are captured.

Allowing for the possibility that up to 50 NLEB roost sites will be found, each roost will be inspected at least four times a year for two years to determine summer/winter usage. Emergence counts may be conducted instead of physically entering roosts. Collecting data on winter presence and roosting habitat will prioritized over collecting summer data (e.g. 2/3 effort on winter data, 1/3 effort on summer data). If 100 NLEB roosts are found, a total of 800 roost inspections/emergence counts will be conducted.

Methods:

- Nets will remain open at least five hours a night (pre-dawn netting can count towards the five hours).
- There will be a 46 degree cut-off for mist-netting, based on insect activity results from Taylor (1963).
- Each bat will be tracked for at least 4 hours a day for 3 weeks, (unless the transmitter falls off or stops working prior to that point).
- Each roost will be inspected (or an emergence count will be conducted) at least four time a year: twice in summer and twice in winter.
- The following data will be collected at each roost: tree species, diameter at breast height (dbh), roost height, cavity description, total tree height, tree condition (live vs snag), and tree location. If the roost is in a site other than a tree, the site will be described.
- The natural community surrounding each roost tree will be typed according to Schafale (2012).
- Habitat surrounding each roost will be characterized in a 17.8-m radius (0.1-ha) plot centered on the roost tree with a tally of all woody stems >1 m tall and <5 cm dbh. Woody stems (including snags) >1 m tall and >5 cm dbh will be recorded by dbh and species. Canopy cover will be measured at four locations along the outer edge of each plot using a spherical densitometer (Perry and Thill, 2007).
- To determine site characteristics that may have affected roost selection, data will also be collected at random sites and compared with roost plots.

It should be noted that in addition to the above mist-netting and acoustic work, NCDOT may also conduct NLEB surveys for one or two new location projects in eastern North Carolina in early 2015.

3. White-nose Syndrome Data Collection

Data collection to determine the presence/extent of WNS will be coordinated with the North Carolina Wildlife Resources Commission (NCWRC) so as not to duplicate efforts. If winter roosts are located and the bats can be accessed safely, they will be swabbed in winter for *Pseudogymnoascus destructans*. Some winter/early spring mist-netting may be conducted at the request of USFWS in order to collect data on WNS occurrence. In the unlikely event fungal growth is observed on bats during the summer, photographs and wing punches will be collected. The Reichard Wing Damage Index should be recorded for all bats regardless of season, and bats with score of 2 or 3 will be photographed per North Carolina's White-nose Syndrome Surveillance and Response Plan (2013). Swabs and wing punches will be sent to the Southeast Cooperative Wildlife Disease Study lab for analysis.

4. Bridge and Structure Surveys

Bridge and structure surveys will be conducted to determine if NLEB use them for roosting in eastern NC, and if so, how often, what types of structures are used, and for which seasons. These surveys will focus initially around Camden and Washington counties, expanding into other counties as acoustic surveys dictate. A variety of bridge types will be selected for surveying: concrete slab, cast-in-place, steel deck, concrete beam, wooden, etc. Large culverts will also be surveyed.

Data will be collected from 200 bridges/culverts throughout the 5 year duration. Some bridge data may be compiled from existing NCDOT records. Bridge surveys will be conducted primarily in summer, but some surveys may also be conducted in winter to look for potential winter roosts. If a bridge has evidence of significant bat use, that structure will be checked again to collect data on seasonal use. Buildings capable of housing bats (abandoned houses, barns, sheds, etc.) will be surveyed opportunistically.

5. Reporting and Decision-making Process

NCDOT will develop monitoring methods and locations with technical advice from advisors from state and federal resource agencies and from academia. Their recommendations will be considered by the research group. The group will consist of staff from the NCDOT Biological Surveys Group, and representatives from USFWS, NCWRC and FHWA. The US Army Corps of Engineers (USACE) will remain informed as the research progresses, but has chosen to be silent member of the group. NCDOT will provide quarterly reports to USFWS, FHWA, NCWRC and USACE throughout the duration of the five year research study, and meetings will be held at least twice a year to provide results, to plan for future efforts, and to maintain coordination between agencies. Work will begin in 2015 and will be completed by the end of 2019. Final reports will be due by April 2020.

Products

Levels of effort for the various objectives may vary somewhat as the work progresses, if the research group determines it is appropriate. For example, if mist-netting proves to be rather unproductive, less effort will be needed for telemetry, freeing up more resources for acoustic surveys.

Initial mist-netting and acoustic planning/installation
Year-round acoustic surveys
Acoustic data interpretation and analysis
Northern long-eared netting and tracking
Roost data collection
WNS swabbing results
Quarterly reports
Preparation and submittal of final acoustical activity report
Preparation and submittal of final tracking/roost report
Final report

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