Biological and Conference Opinion

I-40 Pavement Rehabilitation and Preservation of Bridges 352, 356, 344, 347, 339, and 334 in Asheville, Buncombe County, North Carolina

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Table of Contents

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Consultation History

September 21-22, 2022:	The North Carolina Department of Transportation (NCDOT) Division 13 requests a U.S. Fish and Wildlife Service (Service) point of contact for I-5889B. Service notifies NCDOT about a point of contact.
September 30, 2022:	NCDOT sends the structure plans for the proposed project and requests an onsite meeting. The Service sends dates for a site visit.
October 3, 2022:	NCDOT Division 13 and the Service have a call to discuss the project and schedule the onsite meeting.
October 5, 2022:	The Service meets with several individuals from NCDOT Division 13 onsite to discuss the project.
October 6, 2022:	The Service sends notes from the site visit to NCDOT's Biological Surveys Group.
October 18, 2022:	NCDOT Division 13 requests that the NCDOT Environmental Analysis Unit - Biological Surveys Group coordinate section 7 responsibilities for the project.
November 17, 2022:	NCDOT Biological Surveys Group sends questions about consultation to the Service.
November 21-23, 2022:	NCDOT and the Service discuss how to proceed with consultation and what the effects of the action might be. The Service advises NCDOT to request consultation as a stand-alone project to expedite consultation. The Service and NCDOT discuss a timeline for a formal consultation.
January 3, 2023:	The Federal Highways Administration (FHWA) requests formal consultation for I-5889B.
January 11-12, 2023:	The Service sends questions on the biological assessment to NCDOT.
January 23, 2023:	NCDOT sends answers to the Service's questions on the biological assessment.
January 25-26, 2023:	The Service requests and attends a virtual meeting with NCDOT's Biological Surveys Group. NCDOT commits to a monitoring conservation measure.
January 27 – February 1, 2023:	Exchange of question and responses about the project between the Service and NCDOT.

1. Introduction

A biological and conference opinion is the document that states the opinion of the Service in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531-1543) (Act), as to whether a federal action is likely to jeopardize the continued existence of species listed as endangered or threatened; or result in the destruction or adverse modification of designated critical habitat.

Formal consultation was requested by the FHWA, who is the lead federal action agency for this project for section 7 purposes; NCDOT is the FHWA's nonfederal designated representative. This document transmits the Service's biological and conference opinion (Opinion) based on our review of the proposed pavement rehabilitation and bridge preservation project (I-5889B) in Asheville, Buncombe County, North Carolina, and its effects on the federally endangered gray bat, federally endangered northern long-eared bat (NLEB)(effective March 31, 2023), and the tricolored bat, a species proposed for federal listing in September 2022.

This Opinion is based on information provided in the January 3, 2023, biological assessment (BA) submitted to the Service by the FHWA, telephone conversations and email correspondence as noted above in the consultation history, field investigations on October 5, 2022, communications with experts on the affected species, and other sources of information. A complete administrative record of this consultation is on file at the Asheville Ecological Services Field Office.

2. Proposed Action

As defined in the Service's section 7 regulations (50 CFR 402.02), "*action*" means "*all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies in the United States or upon the high seas*." The "*action area*" is defined as "*all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action*." The effects of the action must be considered in conjunction with the effects of other past and present Federal, state, or private activities, as well as the cumulative effects of reasonably certain future state or private activities within the action area.

2.1 Action Area

The action area for I-5889B (Figure 1) is about 1,412 acres and includes 3.83 miles of I-40 between its intersection with I-26 (northbound) at exit 46A, just west of Hominy Creek, and just east of its overcrossing of Vanderbilt Road. The action area includes I-40 and a 0.25-mile noise buffer. The action area includes at least 16 bridges, 11 culverts, Hominy Creek, the French Broad River (FBR), and Ram Branch. The six bridges undergoing extensive preservation work occupy about two acres on one mile of road. Based on Landfire Landcover, about 50% of the action area (including the noise buffer) is composed of forested or aquatic habitats.

2.2 Project Description

NCDOT proposes to preserve six bridges (100352, 100356, 100344, 100347, 100339, and 100334) (hereto referred to using the last three digits), resurface the roadway, and replace guardrails along I-40 from mile marker 45.25 to mile marker 50 in Buncombe County. General bridge preservation activities include pavement rehabilitation, deck repair, repair of 26 joints, substructure and bent repair, guardrail replacement, and shoulder reconstruction (1.3 shoulder miles). Roadwork outside of these six bridges includes roadway resurfacing and guardrail replacement. NCDOT does not plan to complete any work on or in the other 10 bridges or 11 culverts within the action area. There will be very little land disturbance on the project. Some shoulder disturbance may occur during the roadway resurfacing work.

According to the BA, the Traffic Control Plans show that work at these six bridges will be restricted to six weekends or 18 days and nights over 24 months, any time of year (about 3 days per bridge). The entire interstate will be closed 7:00 PM Friday through 6:00 AM the following Monday during these closures. An offsite detour will direct traffic onto I-240 around the closure.

According to the Structure Plans and the BA, the scope of the preservation work at six bridges is as follows:

1) Remove asphalt wearing surface and partially remove top of bridge deck concrete by fine milling and hydro-demolition (9,299 square yards or 1.9 acres).
2) Overlay prepared top of bridge deck with latex modified concrete – very early strength (LMC-VES) (9,299 square yards).
3) Remove existing joint material and install 1,503 feet of foam joints.
    a) Sound existing concrete around joint to determine if there is any concrete that is deficient that needs to be removed and replaced.
    b) Mark limits of unsound concrete around joint and remove by means of concrete saws and small jack hammers. The area under the joint will be protected to prevent any material from getting on to the bridge caps or falling in the roadway or water. This joint protection will be a catch pan made of steel or a box constructed of plywood. Once unsound

concrete is removed, area is cleaned thoroughly via water blasting and sand blasting. Once area is cleaned, joint opening is formed, and repair concrete is placed in joint.

c) Remove old joint by mechanical means, or if concrete repairs are needed, form a new joint opening. In either case, the joint that is being replaced is now sawed to the correct opening and cleaned via water blasting and sand blasting in preparation to install the 1,503 linear feet of new foam joint. Once cleaned, adhesive is applied to both the joint and the freshly cleaned concrete surface and the joint is installed.

4) Groove LMC-VES bridge deck.
5) Remove 5,040 linear feet (0.95 miles) and replace 4,920 linear feet of existing 20-inch tubular triple corrugated steel beam bridge guardrail.
6) Remove and replace or maintain existing steel beam guardrails (1,354 feet) and guardrail anchor units.
7) Mill and repave asphalt approach roadways.
8) Remove debris from top of existing end bent and bent caps and apply epoxy coating.
9) Inject epoxy resin on concrete cracks.
10) Remove unsound concrete and properly prepare existing end bent and bent areas for shotcrete and concrete repairs.

Concrete work will occur at night. Pours of concrete are required during hot weather to achieve the proper cure. These pours may include bridge elements including bent caps, end bents, and barrier rail wall. Pneumatic jack hammers, saws, pumps, compressors, generators, guardrail installation equipment, and grading and paving equipment will be used for the work. This equipment is vibratory and percussive in nature. Generators and air hammers will be used during bridge bent repair and may be in proximity to the FBR. Bridge bent work will likely occur during daytime hours. Plans show shotcrete repair at or below the water level of the FBR. NCDOT plans to do these repairs during low water periods when the necessary repairs are above water levels so that dewatering devices are not required. Bridgework may take place from a lift on the bridge, on the ground (riverbanks included), or from boats in the river.

There will be no in-water work associated with the project and erosion control measures will be in place. Fifteen temporary river traffic warning signs will be placed near the FBR during construction. The project will not increase stormwater run-off to streams within the action area. No trees will be removed as part of this project. Some tree limb trimming may be needed if they block lift access to the bridge bents.

Traffic shifts will be necessary during bridge rehabilitation. Because the shifts will start at night and be in place day and night over the weekend, they will require temporary night lighting at various locations throughout the action area. Temporary lighting will also be used to light up construction areas which include numerous parts of the bridges: top, bottom, and bents near the river. Temporary lights could be of various types, colors, and brightness, depending on the activity and the equipment used by the construction contractor. The project will not add new permanent lighting.

2.3 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. We consider the beneficial effects of conservation measures in making our determination of whether the project will jeopardize the species.

CM 1. NCDOT will commit to restrict the construction contractor to no more than 18 total days and nights of work, with no more than three consecutive days, which minimizes noise and light impacts to foraging and commuting bats.

CM 2. In active work areas closest to the FBR and Hominy Creek, NCDOT will limit all construction-related lighting to the minimum necessary to maintain safety.

CM 3. Construction-related lighting will not project into adjacent forested areas and will be directed at the bridge deck and roadway surfaces.

CM 4 NCDOT will contact the Service if new information from other sources (such as the North Carolina Wildlife Resources Commission (NCWRC) or other surveyors) about listed species is discovered, as it relates to the project to coordinate next conservation steps.

CM 5. NCDOT Division 13 environmental staff (or their contractors) will be onsite for any expansion joint work that will occur on the bridges to observe, identify, and ensure avoidance of injury/mortality of any federally protected bats present in the joints. To properly complete this task, the individual will need to have access to be able to see into the expansion joints and be knowledgeable in species level bat identification. This individual would also be responsible for monitoring the level of take to ensure NCDOT does not exceed the allowable level as outlined in the incidental take statement. If bats are detected by the monitor, work will briefly pause while the monitor counts and identifies the species of bat. Once complete, the monitor will work with the construction crews to minimize the likelihood of death or injury of bats that have not left the crevice on their own.

CM 6. The construction contractor or Division 13 environmental staff (or their contractors) will report any dead bats found to NCDOT and the Service (Lauren Wilson, lauren_wilson@fws.gov, 828-275-8525). See Section 7.3 *Terms and Conditions* for additional information.

CM 7. Division 13 environmental staff will provide instruction about endangered species commitments to the construction contractor to ensure compliance during construction and will invite the Service to the preconstruction meeting.

3. Range-Wide Status of the Species

3.1 Gray bat

Scientific Name: *Myotis grisescens*
Status: Endangered
Date Listed: April 28, 1976
Critical Habitat: None Designated

This section summarizes best available data about the life history, population size, distribution, and threats to the gray bat throughout its range that are relevant to formulating an opinion about the action.

3.1.1 Life History

Cave Roosting Behavior

Gray bats are one of the few species of bats in North America inhabiting caves year-round. The species occupies cold caves or mines in winter and warmer caves during summer (Tuttle 1976a, Harvey et al. 1981, Harvey 1994, Martin 2007). The species chooses hibernation sites where there are often multiple entrances, good air flow (Martin 2007), and where temperatures are approximately 1°-9° C, though 1°-4° C appears to be preferred (Tuttle and Kennedy 2005). Tuttle (1979) noted that an estimated 95% of the range-wide population was confined to only nine hibernacula.

Gray bats show strong philopatry to both summering and wintering sites (Tuttle 1976a, Tuttle 1979, Tuttle and Kennedy 2005, Martin 2007). Because of their highly specific roost and habitat requirements, only about 5% of available caves are suitable for occupancy by gray bats (Tuttle 1979, Harvey 1994). During all seasons, males and yearling females seem less restricted to specific cave and roost types (Tuttle 1976b). Bachelor males segregate in separate aggregations within a colony home range that usually includes several caves that may extend up to 70 kilometers along a particular river valley (Tuttle and Kennedy 2005).

Gray bat hibernacula are often comprised of individuals from large areas of summer range. Based on band recovery data, Hall and Wilson (1966) calculated that a gray bat hibernaculum in Edmonson County, Kentucky attracted individuals from an area encompassing 27,195 square kilometers in Kentucky, southern Illinois, and northern Tennessee (Hall and Wilson 1966). Gray bats are documented to regularly migrate from 17 to 437 kilometers between summer maternity sites and winter hibernacula (Tuttle 1976b, Hall and Wilson 1966), with some individuals moving as much as 689 and 775 kilometers (Tuttle 1976b, Tuttle and Kennedy 2005).

Other Roost Types

There are some exceptions to this cave-specific roosting strategy. Many bat species use bridges and culverts as roost sites (Keeley and Tuttle 1999) and the gray bat is no exception. Bridges provide a warm refuge for individuals either foraging far from their primary daytime roosts or can serve as primary roosts during summer months. Gray bats have been found roosting in bridges in North Carolina, Kentucky (Barbour and Davis 1969, Martin 2007), Virginia (Powers et al. 2016), and between concrete barriers on the sides of bridges in Arkansas (Sasse 2019). Maternity colonies have also turned up in more unusual places, such as a barn in Missouri (Gunier and Elder 1971) and the gate room of a large dam in Tennessee (Lamb 2000).

Gray bat bachelor colonies, maternity colonies, and/or winter roosts have been found in culverts in North Carolina, Arkansas (Harvey and McDaniel 1988, Timmerman and McDaniel 1992), Virginia (Powers et al. 2016), Tennessee (Powers et al. 2016), Georgia (L. Pattavina, personal communication, March 13, 2022), and Kansas (Decher and Choate 1988). Culvert conditions can mimic those found in natural caves in terms of high levels of humidity and clear running water. Weber et al. (2020) surveyed 31 culverts in the FBR Basin in North Carolina for the presence of gray bats. That study recorded gray bats in a concrete box culvert in Western North Carolina with a 4.3-ft (1.3 m) entrance height. The shortest culvert Weber et al. (2020, pg. 28) documented gray bats in measured 320 ft (97.8 m) long. Records show that culverts used by gray bats are generally concrete; however, Weber et al. (2020) found gray bats used circular concrete lined corrugated metal pipe culverts and culverts with metal pipe entrances that open into a larger concrete box culvert interior.

Summer bridge and culvert roosts have been identified in North Carolina within the French Broad River (FBR) Basin (FBR) (Weber et al. 2020). Though more have been discovered since, as of 2020, about 39 known gray bat roosts existed in the FBR Basin in western NC and eastern Tennessee in caves (2), bridges (24), buildings (3), trees (2)(Samoray et al. 2020, Wetzel and Samoray 2022), and culverts (8). Notably, gray bats had not previously been documented using trees as roost sites. While 14 of these roosts contained more than 10 gray bats (Table 6 in Weber 2020), more than 50% contained just one or two individuals. Copulation was observed in at least one culvert during the fall swarming period (mid-September 2022) in Buncombe County, North Carolina (Cheryl Knepp, personal communication). The knowledge of where gray bats roost, especially during summer months, continues to expand.

Diet and Foraging

Gray bats feed exclusively on insects, with flies (*Diptera*), beetles (*Coleoptera*), caddisflies (*Trichoptera*), moths (*Lepidoptera*), wasps (*Hymenoptera*), stoneflies (*Plecoptera*), leafhoppers (*Homoptera*), and mayflies (*Ephemeroptera*) being the most important orders of insect prey (Rabinowitz and Tuttle 1982, Clawson 1984, Brack 1985, Lacki et al. 1995, Best et al. 1997). Diet has been found to coincide most directly with the predominantly available prey species in the foraging area (Clawson 1984, Barclay and Bingham 1994), including both terrestrial and aquatic species (Clawson 1984). A study examining fecal remains conducted by Brack and LaVal (2006) indicates that gray bat diets fluctuate to a minor degree depending upon varying factors such as age, sex, and location.

Gray bat summer foraging is strongly correlated with open water of rivers, streams, lakes, or reservoirs, where insects are abundant (Tuttle 1976b, LaVal et al. 1977). Results of surveys conducted in Tennessee indicate that wetland depressions are also important foraging sites for gray bats (Lamb 2000). Although the species may travel up to 35 kilometers between prime feeding areas over lakes and rivers and occupied caves, (LaVal et al. 1977, Tuttle and Kennedy 2005, Moore et al. 2017), most maternity colonies are usually located between 1-4 kilometers from foraging locations (Tuttle 1976b). Newly volant gray bats travel 0.0 – 6.6 kilometers between roost caves and foraging areas (Tuttle 1976a, Tuttle 1976b). Joey Weber reported that two male gray bats captured and radio-tagged June 13, 2019, on the Davidson River, were found the next day at a bridge roost 18-19 miles [43 river miles] to the northeast. At foraging sites, Tuttle (1976b) estimated that gray bats forage within roughly three meters above the water's surface. Abbreviated instances of bad weather in early spring and late fall are generally the only times gray bats deviate from primarily feeding along local bodies of water, and then they are found foraging in forest canopies (LaVal et al. 1977, Stevenson and Tuttle 1981).

Gray bats are known to establish foraging territories as insect numbers drop after dusk. Territories are controlled by reproductive females, which annually return to preferred territories (Brady et al. 1982, Goebel 1996). Gray bats tend to have large home ranges. Thomas and Best (2000) reported non-reproductive gray bats (males and females) from one northern Alabama cave foraged over areas of approximately 97 square kilometers. Moore et al. (2017) found reproductive female gray bats in Arkansas had a larger home range than previously thought, with an average of 159 square kilometers, and they depend on water for foraging and traveling. The home range for reproductive females may change depending on reproductive status, but could also change based on colony size, insect abundance, habitat continuity, land use, or a combination of these factors (Moore et al. 2017). During times of limited food resources, males and pre-reproductive females may be excluded from foraging territories (Stevenson and Tuttle 1981).

Forested areas along the banks of streams and lakes serve as corridors for travel and as protective feeding cover for newly volant young (Tuttle 1979, Brady et al. 1982, Moore et al. 2017). Whenever possible, gray bats of all ages fly in the protection of forest canopy between roosts and feeding areas (Service 1982). Individuals may also fly overland from relatively land-locked roost sites to reach the main river channel or tributary systems that lead to open-water foraging sites (Thomas 1994, Best and Hudson 1996). Gray bats do not feed in areas along rivers or reservoirs where the forest has been cleared (LaVal et al. 1977). Weber et al. (2020) found that gray bats moving between the FBR Basin near Asheville, North Carolina, and caves they use in Tennessee commuted along the FBR, but several overland flyways are evident from the GIS data.

Reproduction and Life Span

Gray bats are reproductively mature at two years of age (Miller 1939, Tuttle 1976a) and mate between September and October. Copulation typically occurs upon arrival at hibernating caves, whereupon females immediately enter hibernation. Mating males may take a few weeks to replenish fat stores but are typically in hibernation by early November (Tuttle 1976b, Tuttle and Stevenson 1978). Adult females store sperm throughout hibernation, a strategy known as delayed fertilization, and pregnancy begins following their spring emergence (Krulin and Sealander 1972). After a gestation period of 60 to 70 days (Saugey 1978), females give birth to one pup between late May and early June. Pups become volant 21-33 days after birth (Tuttle 1976a, Harvey 1994, Tuttle and Kennedy 2005). In summer, female gray bats form maternity colonies of a few hundred to many thousands of individuals.

Young, non-volant gray bats experience healthy growth rates because their energy expenditure for thermoregulation is reduced by the roosting colony (Herreid 1963, 1967). Hunting is primarily learned by young on their own after learning to fly (Stevenson and Tuttle 1981), though lactating females will continue to nurse their offspring for a short time after they become volant. Survival and growth of volant young is inversely proportional to the distance traveled for shelter and food (Tuttle 1976a). Roosts are cool during this period of lactation and females are often required to feed continuously to sustain the high body temperatures required to nurse (Tuttle and Stevenson 1977). Distance traveled to feeding areas may also be correlated with adult mortality (Martin 2007).

Gray bats have been recorded as living up to 17 years (Harvey 1992, Tuttle and Kennedy 2005), with a mean annual survival rate of 70 percent in males and 73 percent in females (Gunier and Elder 1971). While survivorship among juveniles is relatively high (Saugey 1978), only 50 percent of gray bats reach maturity (Service 1980). Mortality rates are higher during the spring migration when fat stores have been expended and food resources can be scarce (Tuttle and Stevenson 1977).

3.1.2 Population Size

In the late 1970s, Tuttle (1979) estimated the total population of gray bats to be approximately 2.25 million. There was a net increase in population size of 11 percent between the 1970's and 2003, and an increase of 67 percent from the smallest population estimate. In 2007, a study was conducted examining gray bat hibernacula and maternity roosts across the established range to ascertain the effectiveness of current conservation steps. At that time, it was observed that populations had increased nearly 104 percent since 1982 (Martin 2007). More recently it has been reported that their populations appear to have remained stable within Tennessee (Bernard et al. 2017) and Virginia (Powers et al. 2015). In 2017, winter surveys of all Priority 1 hibernacula (as designated in the Gray Bat Recovery Plan) were conducted, including the largest hibernaculum, Fern Cave in Alabama. This coordinated, range-wide effort provided the best opportunity in decades to estimate the gray bat population, now estimated at approximately 4,358,263 (Service 2019). Summer emergence counts conducted by ISU at known roosts in Western North Carolina from 2018-2019 suggest there are at least 2,820 gray bats in the FBR basin (Weber 2020).

3.1.3 Distribution

The gray bat is known to occur in fourteen southeastern and midwestern states including Alabama, Arkansas, Florida, Georgia, Illinois, Indiana, Kansas, Kentucky, Missouri, North Carolina, Oklahoma, South Carolina, Tennessee, and Virginia. There is little variation between summer and winter ranges (NatureServe 2018) and population densities are highest in the limestone karst region (Hall and Wilson 1966, Barbour and Davis 1969, Tuttle 1976a, Harvey et al. 1981, Mitchell 1998).

North Carolina Natural Heritage Program (NCNHP) records (2022) confirm presence in thirteen western North Carolina counties: Ashe, Avery, Buncombe, Cherokee, Clay, Haywood, Henderson, Madison, McDowell, Surry, Swain, Transylvania, and Yancey. Records in North Carolina represent mist-net captures, North Carolina State Laboratory of Public Health records, and summer roost locations.

Gray bats were first discovered roosting in bridges in the FBR Basin (which includes the Pigeon River Basin) by NCWRC in 2016. There are four known gray bat primary roosts, all of which occur near the FBR, and numerous secondary roosts in the Asheville area (Weber et al. 2020). There are no known gray bat hibernacula located in North Carolina. The closest hibernaculum is a cave located near Newport, Tennessee, 0.2 miles from the Pigeon River (Weber et al. 2018).

3.1.4 Threats

The primary cause of gray bat population decline is human disturbance of their natural habitat (Barbour and Davis 1969, Mohr 1972, Harvey 1975, Tuttle 1979, Service 1982, Service 2009), with wintering sites and maternity roosts especially susceptible to disruption. Commercialization of caves, spelunking, and looting for archaeological artifacts are activities that most commonly result in disturbance to roosting bats (Service 1982, Service 2009). Disturbance in the hibernacula occurs when a human enters the cave and bats wake from hibernation, using vital energy stores that cannot be recovered before emerging in the spring (Tuttle 1976b). In addition, Stevenson and Tuttle (1981) found that banded gray bats tended to avoid roosts where researchers had handled them.

Humans are also impacting the environment in other ways that can negatively impact bats. Deforestation close to cave entrances, at foraging sites, and along commuting routes is likely to have negative effects due to the removal of prey abundance and reduced cover from natural predators (Tuttle 1979).

Insecticide use historically had a detrimental impact on gray bat populations (Clark et al. 1978, Clark et al. 1988), though many of the toxic substances are now banned from the market. While modern pesticides (e.g., organophosphates, neonicotinoids, pyrethroids, carbonates) are not expected to bioaccumulate in tissues, they are still a concern, are highly toxic, and may kill bats from direct exposure (Shapiro and Hohmann 2005). The presence of other contaminants of concern that can bioaccumulate (e.g., pharmaceuticals, flame retardants) has been documented in bats (Secord et al. 2015), though additional research is needed to understand impacts. Additionally, pesticides and other pollutants could indirectly impact bats by reducing insect populations.

Siltation and nutrient loading of waterways where bats forage and drink may negatively affect the species. As previously stated, a large portion of the gray bat diet is comprised of adult aquatic insects such as mayflies, stoneflies, and caddisflies. These groups of aquatic insects are especially susceptible to degraded water quality. Any substantial declines in the populations of these insects may have a detrimental effect on gray bat populations as well (Service 1982). Tuttle (1979) presented a correlation between a decline in gray bat numbers and an increase in sedimentation in several Alabama and Tennessee waterways.

Gray bat populations could also be impacted by temperature and precipitation changes due to climate change. Climate change will likely affect the distribution of suitable hibernacula for bats (Humphries et al. 2002). Since gray bats are a cave-obligate species requiring highly specific hibernacula and maternity caves, they are acutely at risk from fluctuating climate conditions.

Another potential threat to gray bat populations is the fungal disease white-nose syndrome (WNS). The disease is caused by the fungus *Pseudogymnoascus destructans*, which grows on the wings, ears, and muzzle of hibernating bats (Cryan et al. 2013). Since its discovery in New York in 2006, WNS has had an overwhelmingly negative effect on North American hibernating bats, eradicating millions of individuals. In 2012, the Service confirmed the first instance of WNS in gray bats (Service 2012). The full impact of WNS on overall gray bat populations is still being determined. As of spring 2017, the species has yet to experience any WNS-related declines and their populations appear to have remained stable within Tennessee (Bernard et al. 2017) and Virginia (Powers et al. 2016).

Finally, potential threats from development-related factors include roads, lighting, noise, and vibration (Rowse et al. 2016, Ramalho and Aguiar 2020). Lighting is increasingly being associated with negative outcomes for many species, including bats (Rowse et al. 2016), and has been “acknowledged as a threat to biodiversity”(Rowse et al. 2016 citing Hölker et al. 2010).

Studies have consistently shown that bat species richness decreases with the presence of artificial lighting in foraging and roosting areas, with *Myotis* species particularly vulnerable (Spoelstra et al. 2017, Stone et al. 2012, Downs 2003, Linley 2017). Lighting may exacerbate the barrier effect of roads, since those species reluctant to cross open spaces are also those most likely to avoid light. There are no data specific to gray bat for the use or avoidance of lighted areas that may occur along roadways. Research by Rydell and Baagøe (1996) indicates that bats in the genera *Eptesicus* (big brown bats, *Eptesicus fuscus*) and *Lasiurus* (red and hoary bats, *Lasiurus borealis* and *L. cinereus,* respectively) are the species typically noted foraging around artificial lights. In contrast, they noted that bats in the genus *Myotis* seem to avoid open spaces, preferring to feed in woodlands or low over water. Additional studies (for example, Rydell 1992, Blake et al. 1994, Stone et al. 2009, 2012) have shown that road lighting deters many bat species, notably slow-flying, woodland-adapted species such as members of the genera *Rhinolophus, Myotis,* and *Plecotus*, from approaching the road.

Exposure to lighting during emergence from roosts can cause roost abundance to decrease or bats to abandon the roost completely. While these effects have not been observed for gray bat, declines in roost abundance were observed for *Myotis* sp. and *Eptesicus fuscus* (Boldogh et al. 2007, Laidlaw and Fenton 1971). Exposure to lighting may also change how bats use a roost and the predation dynamics at the roost. For instance, bats may choose to use a different roost exit or entrance enabling predators' easier access to the bats. Predation may also be more successful if bats are illuminated, as predators would be able to see them more easily (Stone, Harris, and Jones 2015). Other studies have documented "reduced juvenile growth rates" at *Myotis* sp. roosts (Boldogh et al. 2007). Light may discourage bats from using the area during foraging or commuting activities (Stone, Harris, and Jones 2015) as well and affect insect assemblages, abundance, and distribution (Eisenbei 2006, van Langevelde et al. 2011, Davies et al. 2012, further summarized in Stone, Harris, and Jones 2015).

As described, lighting is problematic for bats in many ways, however, population-level studies that link such effects to a reduction in fitness or survival are rare. Even Boldogh et al. (2007), while documenting lower growth rates did not link this effect to lower survivorship (Rowse et al. 2016) or reproductive affects.

3.2 Northern long-eared bat

Scientific Name: *Myotis septentrionalis*
Status: Endangered
Date Listed as Threatened: May 4, 2015
Date Listed as Endangered: Final Rule Published November 29, 2022; Effective March 31, 2023
Critical Habitat: None Designated

This section summarizes best available data about the life history, population size, distribution, and threats to the NLEB throughout its range that are relevant to formulating an opinion about the action. The Service published a Species Status Assessment (SSA) on March 22, 2022 (Service 2022c).

3.2.1 Life History

NLEB typically overwinters in caves or mines and spends the remainder of the year in forested habitats. The bat active season for NLEBs in Western North Carolina is April 1 through October 15. While information is lacking, short regional migratory movements between seasonal habitats (summer roosts and winter hibernacula) of 35-55 miles have been documented (Griffin 1940, Caire et al. 1979, Nagorsen and Brigham 1993) and occur during the first part and last part of the active season outside of the maternity season. The maternity season is May 15 through August 15 in Western North Carolina (Susan Cameron, personal communication). Adult females give birth to a single pup. Parturition (birth) may occur as early as late May or early June (Easterla 1968, Caire et al. 1979, Whitaker and Mumford 2009) and may occur as late as mid-July (Whitaker and Mumford 2009). Juvenile volancy (flight) often occurs 21 days after birth (Kunz 1971; Krochmal and Sparks 2007).

NLEBs typically roost singly or in maternity colonies underneath bark or more often in cavities or crevices of both live trees and snags (Sasse and Pekins 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 switch tree roosts often (Sasse and Pekins 1996), typically every 2 to 3 days (Foster and Kurta 1999, Owen et al. 2002, Carter and Feldhamer 2005, Timpone et al. 2010). Suitable summer habitat is extensively defined in the *Range-wide Indiana Bat and NLEB Survey Guidelines*, which is updated annually (https://www.fws.gov/library/collections/range-wide-indiana-bat-and-northern-long-eared-bat-survey-guidelines).

Maternity colonies, consisting of females and young, are generally small, numbering from about 30 (Whitaker and Mumford 2009, p. 212) to 60 individuals (Caceres and Barclay 2000, p. 3); however, larger colonies of up to 100 adult females have been observed (Whitaker and Mumford 2009, p. 212). A maternity colony of 44 females is the median of published post-WNS maximum roost exit counts of reproductive females as cited in Thalken and Lacki (2018, p. 635).

Maternity roosting areas have been reported to vary from mean of 16.2 acres (range=10.1 – 22 acres, n=4, Hyzy et al. 2020) to 21 acres to 161 acres to 179 acres (Broders et al. 2006; Owen et al. 2003; Lacki et al. 2009, respectively) to a high of 425 acres (Lacki et al. 2009). Foraging areas are six or more times larger (Broders et al. 2006; Henderson and Broders 2008). The distance traveled between consecutive roosts varies widely from 20 ft (Foster and Kurta 1999) to 2.4 mi (Timpone et al. 2010). Likewise, the distance traveled between roost trees and foraging areas in telemetry studies varies widely, for example, a mean of 1,975 feet (Sasse and Perkins 1996) and a mean of 3,609 feet (Henderson and Broders 2008). Circles with a radius of these distances, that is an area where roosting and foraging may occur, have an area of 281 and 939 acres, respectively. A recent analysis completed for the Service's range-wide northern-long eared bat determination key assumes that the roosting area for northern-long eared bat colonies is 22.2 acres (9 ha), based on the median minimum roosting area for northern-long eared bat females found across seven studies conducted in a mix of fragmented and intact forested areas across the species' range (range, 0.3 - 88 ha, Broders et al. 2006, p. 1177; Henderson & Broders 2008, 956; Silvis et al. 2015b, p. 7; Swingen et al. 2018; Hyzy et al. 2020, p. 62; Kalen et al. 2022, p. 163; Gorman et al. 2022, p. 163)(Service, unpublished).

NLEBs are nocturnal foragers and use hawking (catching insects in flight) and gleaning (picking insects from surfaces) behaviors in conjunction with passive acoustic cues (Nagorsen and Brigham 1993, Ratcliffe and Dawson 2003). 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). Most foraging occurs above the understory, 1 to 3 m (3 to 10 ft) 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, White et al. 2017). Foraging also takes place over small forest clearings and water, and along roads (van Zyll de Jong 1985). NLEBs seem to prefer intact mixed-type forests with small gaps (that is, forest trails, small roads, or forest-covered creeks) in forests with sparse or medium vegetation for forage and travel rather than fragmented habitat or areas that have been clear cut (Service 2015).

Artificial Roosts

To a lesser extent, NLEBs have been observed roosting in colonies on human-made structures, such as buildings, barns, utility poles, window shutters, bridges, and bat houses (Mumford and Cope 1964, Barbour and Davis 1969, Cope and Humphrey 1972, Burke 1999, Sparks et al. 2004, Amelon and Burhans 2006, Whitaker and Mumford 2009, Timpone et al. 2010, Bohrman and Fecske 2013, Feldhamer et al. 2003, Sasse et al. 2014, Service 2015, Dowling and O'Dell 2018). It has been hypothesized that use of human-made structures may occur in areas with fewer suitable roost trees (Henderson and Broders 2008, Dowling and O'Dell 2018). In northcentral West Virginia, NLEBs were found to use artificial roosts more readily as distance from large forests (greater than 494 acres) increased, suggesting that artificial roosts are less likely to be selected when there is greater availability of suitable roost trees (De La Cruz et al. 2018).

Northern-long eared bats are known to roost in bridges in North Carolina and at least one of these bridges crosses a road (versus water). As of January 2023 in western North Carolina, NCWRC has records of 11 structure surveys in 4 bridges that detected NLEBs roosting during the active season (April 1 to October 15). The average roost size was 1.2 bats though 82% of the roost checks recorded just one NLEB. The max roost size was two NLEBs at one location (Susan Cameron, personal communication, January 12, 2023). The NCDOT's bridge inspection database contains records of bat surveys on 2,100 structures. NCWRC's database presumable contains all positive records of NLEBs from NCDOT's database.

The species has also been found in culverts in Missouria (Droppelman 2014, L. Droppelman, personal communication, February 24, 2022) and Louisiana (Nikki Anderson, unpublished data, March 23, 2022). The species has not been found in culverts in Georgia (Emily Ferrall, personal communication, April 7, 2022), North Carolina, or Mississippi (Katelin Cross, personal communication, March 23, 2022). Published culvert records are limited for this species.

3.2.2 Population Size

Prior to 2006 (that is, before WNS was first documented), NLEB was abundant and widespread throughout much of its range (despite having low winter detectability) with 737 occupied hibernacula and a maximum count of 38,181 individuals (Table 2; Service 2022c). According to the SSA (Service 2022c), in 2020, the NLEB was projected to be detected in 139 hibernacula, with a median winter abundance of 19,356 individuals (Table 2; Service 2022c).

Available evidence, including both winter and summer data, indicates NLEB abundance has and will continue to decline substantially over the next 10 years under current demographic conditions. Winter abundance (from known hibernacula) has declined range-wide (49%) and across most Representation Units (RPUs) (0–90%). In addition, the number of extant winter colonies declined range-wide (81%) and across all RPUs (40–88%). There has also been a noticeable shift towards smaller colony sizes, with a 96–100% decline in the number of large hibernacula (≥100 individuals). Declining trends in abundance and occurrence are also evident across much of NLEB's summer range. Range-wide summer occupancy declined by 80% from 2010–2019. Data collected from mobile acoustic transects found a 79% decline in range-wide relative abundance from 2009–2019 and summer mist-net captures declined by 43–77% compared to pre-WNS capture rates (Service 2022c).

Table 1. Numbers of NLEB Adapted from Service (2022c) Tables in Appendix 3 (Service 2022c page 124).

Year	Range	# States	Spatial Extent	# Hibernacula	Winter Abundance
Prior to 2006 (Historical Condition)	Range-wide	29	1.2 billion	737	38,131 (max)
2020 (Projected)	Range-	18	644 million	139	19,356 (median)

	wide				
Prior to 2006 (Historical Condition)	Southeast Unit			50	393 (max)
2020 (Projected)	Southeast Unit			1	Probability of population growth = 0

For the national effort to create conservation tools for the uplisting of the NLEB, the Asheville Ecological Services Field Office estimated that 22 NLEB maternity colonies may occur in Western North Carolina. This is based on 18 post-WNS capture/observation records and 4 post-WNS acoustic records. This estimate includes any site with NLEB captures or observations regardless of sex, age, or reproductive condition. Post-WNS dates were based on the national WNS map (Susan Cameron, personal communication, January 26, 2023).

3.2.3 Distribution

NLEBs occur over much of the eastern and north-central U.S., and all Canadian provinces west to the southern Yukon Territory and eastern British Columbia (Nagorsen and Brigham 1993, Caceres and Pybus 1997, Environment Yukon 2011). In the U.S., the species' range reaches from Maine west to Montana, south to eastern Kansas, eastern Oklahoma, Arkansas, and east to South Carolina (Whitaker and Hamilton 1998, Caceres and Barclay 2000, Simmons 2005, Amelon and Burhans 2006). The species' range includes all or portions of 37 states and the District of Columbia. The species' range extends into the mountains of Western North Carolina but does not include most of the Piedmont Ecoregion in the state. A population of NLEB was discovered in coastal North Carolina in 2007 and has since been documented to extend into at least 27 coastal North Carolina counties. The coastal and mountain populations in the state are not thought to be connected (Jordan 2020; Gary Jordan, personal communication, July 6, 2022; Service 2022c).

3.2.4 Threats

Although there are countless stressors affecting northern long-eared bat, the primary factor influencing the viability of the species is WNS. Other primary factors that influence northern long-eared bat viability include wind energy mortality, effects from climate change, and habitat loss. Local concerns include lighting, noise and vibration. Lighting is increasingly being associated with negative outcomes for many species, including bats (Rowse et al. 2016), and has been "acknowledged as a threat to biodiversity" (Rowse et al. 2016 citing Hölker et al. 2010). These threats are further reviewed in Section 3.1.4 for the gray bat and are similar for NLEB.

3.3 Tricolored bat

Scientific Name: *Perimyotis subflavus*
Status: Proposed Endangered
Date of Proposed Listing: September 14, 2022
Critical Habitat: None designated

This section summarizes best available data about the life history, population size, distribution, and threats to the tricolored bat throughout its range that are relevant to formulating an opinion about the action. The Service received a petition to list the tricolored bat as threatened on June 16, 2016. On December 20, 2017, we found the petition presented substantial scientific or commercial information indicating that the petitioned action may be warranted. We commenced a review (known as a 12-month finding) to determine if listing of the tricolored bat was warranted and proposed to list the tricolored bat as endangered on September 14, 2022.

3.3.1 Life History

Inactive Season

Tricolored bats are an obligate hibernator with populations in subtropical regions hibernating even in the absence of severe winters (McNab 1974). Tricolored bats enter hibernation with an average beginning date of mid-October and an average ending date of mid-April (LaVal and LaVal 1980). In Western North Carolina, the winter inactive season is October 15 to April 1.

In addition to caves, tricolored bats use a wide variety of other hibernacula including mines (Whitaker and Stacy 1996, Brack 2007), storm sewers (Goehring 1954), culverts (Sandel et al. 2001, Lutsch et al. 2022, Katherine Etchison, personal communication, January 25, 2023), and surge tunnels at quarries (Slider and Kurta 2011). Recent evidence indicates that tricolored bats also hibernate in rock faces in Nebraska (Lemen et al. 2016) and suggests that the species may have a wider winter range than previously suspected. As of early 2023, there are about 80 tricolored bat hibernacula documented in Western North Carolina, including caves (50), mines (22), root cellars (4), and culverts (11). In a Winter 2021 culvert blitz in western North Carolina, tricolored bats were found in 3% of surveyed culverts (Katherine Etchison, personal communication, September 20, 2022).

Hibernating tricolored bats typically roost singly but will form small clusters and often select a roost on the walls as opposed to the ceiling of the hibernaculum (Brack 1979, Kurta 2008). Hibernacula in Western North Carolina are typically occupied by one or two tricolored bats though one recently discovered culvert supported 12 tricolored bats in torpor. Throughout most of the range, they select relatively warm, stable sites often located further from the hibernaculum entrance than other bat species (Brack 2007). Individuals in hibernation alternate between bouts of torpor that last, on average, about 15 and 25 days though may last longer (Brack and Twente 1985) and short periods of arousal (McNab 1982, Service 2022b).

As previously noted, there is little information about tricolored bat movements, including swarming sites and hibernacula, but the species is currently believed to be a short distance regional migrant (Fraser et al. 2012; Fujita and Kunz 1984). Species engaging in regional migration travel annually from hibernaculum to summer roosting sites, and then move among swarming locations in the autumn (Fenton 1969; Fraser et al. 2012; Hitchcock 1965). Recent research has led to speculations that some individuals migrate farther distances than previously suspected, and that migratory behavior may differ between males and females (Davis 1959; Fraser et al. 2012). Fraser et al. (2012) investigated tricolored bat migration by conducting stable hydrogen isotope analyses of 184 museum specimen fur samples and compared the results to published values of collection site growing season precipitation. Their results suggested that 33% of males and 16% of females collected during the postulated non-molt period were south of their location for fur growth. Fraser et al. (2012) also noted that if tricolored bats only engaged in regional migration, then evidence would be expected to show equal numbers of bats migrating north and south during the non-molt period. Respectively, Fraser et al. (2012) concluded that at least some tricolored bats, of both sexes, engage in latitudinal migration.

Summer Habitat Use

Tricolored bat roost trees may occur in a relatively small area. One study found that the average distance between roost trees was 86 meters (m) (range 5-482 m) and between capture locations and roost trees was 2.5 kilometers (km) (range 165 to 2,290 m) (Schaefer 2016). “Roosting range” was between 0.005 acres (ac) and 10.9 ac for seven individuals (average=1.95 acres) (Schaefer 2016, p. 49). “Roost habitat area” or “minimum roost area” was 0.25 to 5.7 ac for four individuals (Veilleux and Veilleux 2004b). In Indiana, Veilleux and Veilleux (2004b) radio-tracked four tricolored bats to their respective roost trees and found that the minimum and maximum distances between roosts trees was 13 m and 926 m. A study in Nova Scotia found that the “roost area” for five maternity colonies using more than five trees (12 to 31 trees) varied from 4 - 191 ac, with a mean of 67.5 ac (Table 4 in Poissant 2009). In summary, a tricolored bat maternity colony could have a roost area between 0.005 and 191 acres (Schaefer 2016, Veilleux and Veilleux 2004, Poissant 2009).

A study conducted in Arkansas radio-tagged 28 male and nine female tricolored bats and found that roost trees varied from 1-3 roost trees for males and 1-5 roost trees for females (Perry and Thill 2007b). Seven of 14 female roosts were colonies and based on exit counts and visible pups, the estimated number of bats (adults and pups) in colonies was 3-13, with an average of 6.9 (±1.5) (Perry and Thill 2007b). Other studies report maternity colony sizes of 3.7 individuals (Veillieux and Veillieux 2004b), 15 individuals (Whitaker and Hamilton 1998), and 18 individuals with an average of 10 individuals (Poissant 2009). Perry and Thill (2007b) found males roosting in forested habitats also occupied by females, but primarily in solitary roosts. One study found that individuals within a roosting area/colony did not switch or overlap other roost areas/colonies though all individuals from all colonies shared foraging space (Poissant 2009).

Maternity colonies are most likely to be found roosting in umbrella-shaped clusters of dead leaves, but may also be found in live leaf foliage, lichens, patches of pine needles caught in tree limbs, buildings, caves, bridges, culverts, and rock crevices (Humphrey 1975, Veilleux et al. 2003, Veilleux and Veilleux 2004a; b, Veilleux et al. 2004, Perry and Thill 2007, Newman et al. 2021). Perry and Thill (2007) suggest that tricolored bat's yellow-brown coloration allows them to blend in with brown, dead leaf clusters imparting protection from visual predators. Oak (genus *Quercus*) and maple (*Acer*) trees are preferred by maternity colonies of tricolored bats presumably because the ends of the branches tend to have many leaves (Veilleux et al. 2003; 2004, Perry and Thill 2007), and thus maternity colonies are more often associated with uplands than bottomland forest. O'Keefe (2009) found male tricolored bats primarily in hickories, maples, and birches and not oaks. Veilleux et al. (2003) found 27% of tricolored bat roosts in oak trees when oaks compromised only 3% of the available trees; others found at least 80% of tricolored bat roosts in oaks (Leput 2004, Perry and Thill 2007). Tricolored bats are known to forage near trees, as well as forest perimeters, and along waterways (Fujita and Kunz 1984).

In Indiana, female tricolored bat maternity roosts occurred mostly in upland habitats (9.4%) as opposed to riparian (0.8%) and bottomland (0.2%) habitats (Veilleux et al. 2003). Preferred upland habitat by this species could be related to the greater availability of preferred roost tree species: white oak (Quercus alba), bur oak (*Quercus macrocarpa*), and red oak (*Quercus rubra*) (Veilleux et al. 2003). O'Keefe (2009) found that non-reproductive tricolored bats in North Carolina only roosted in forest stands older than 72 years, and preferentially roosted at lower elevations, closer to non-linear openings, and closer to streams than expected by random chance. Other researchers have found that at the stand level or greater, tricolored bats seem to roost selectively in more mature forest within riparian buffers or corridors (Perry and Thill 2007, O'Keefe 2009), within a diversity of patch types, farther than expected from roads (Perry et al. 2008), and in unharvested pine or pine-hardwood stands greater than or equal to 50 years old (94% of female roosts and 52% of male roosts, Perry and Thill 2007b). One small study in the Nantahala National Forest in Macon County, North Carolina found male tricolored bat roosts were on average 136 m from roads or trails, and while the distance ranged from 4 to 285 m, 75% of the roads in the study area were gated grass-covered U.S. Forest Service roads with virtually no vehicular traffic (O'Keefe 2009). Other studies found tricolored bat roosts on average 70 m and 52 m from edges (Leput 2004, Veilleux et al. 2003, respectively).

Tricolored bats vary their roost position in the canopy and landscape depending on reproductive conditions. Reproductive female bats roost lower in the canopy and farther from forest edges than non-reproductive females. Veilleux and Veilleux (2004b) speculated that lower position in the canopy and greater distances from the forest edge may reduce wind exposure and allow for more stable temperatures. Gestation is typically 44 days (Wimsatt 1945), and females produce twin pups whose mass is approximately 44-54% of the size of the mother, a higher ratio than most Vespertilionid bats (Kurta and Kunz 1987). Young are volant at 3 weeks and act as adults around 4 weeks old (Hoying and Kunz 1998).

Post-natal growth rates slow during cold snaps because the mothers cannot eat, and available energy is used for thermoregulation (Hoying and Kunz 1998). As with other species of bats, some male tricolored bats remain at hibernacula year-round (Whitaker and Rissler 1992). Most males roost in the same types of leaf clusters used by female tricolored bats (Veilleux and Veilleux 2004a), although they return to the same roost for multiple days, with one individual in Arkansas roosting in the same cluster for 33 days (Perry and Thill 2007). Male bats also select roosts in the same species of trees, although males tend to use thinner and shorter trees (Veilleux and Veilleux 2004a). Males also tend to roost at lower heights than females; often 16.4 feet (ft) (5 m) from the ground (Perry and Thill 2007).

Structures

Katzenmeyer (2016), conducting winter surveys in Mississippi over five years, found tricolored bats in culverts as small as 2 ft tall and 30 ft long. Tricolored bats use culverts in Florida as small as 3 ft tall by 60 ft long though smaller culverts are not surveyed. Preliminary analysis did not find an effect of culvert height or length on tricolored bat presence in Florida (Smith, L. personal communication, March 9, 2022). The Louisiana Department of Wildlife and Fisheries has surveyed more than 1,000 culverts over three winters and found tricolored bats in 21% of them. Summer surveys of a much smaller number of culverts found the species in about 4% of surveyed culverts. The smallest culvert used by the species in Georgia is a 3 ft tall pipe culvert that is 388 ft long (Emily Ferrall, personal communication, April 7, 2022). There are numerous culvert records for this species across multiple states (Walker et al., 1996; Martin et al., 2005; Katzenmeyer, 2016, L. Smith, personal communication, 2022, Nikki Anderson, unpublished data, March 24, 2022).

As of January 2023, NCWRC had 16 records of tricolored bats using 12 bridges and 1 culvert in western NC during the active season (April 1 to October 15). One these 16 records was a maternity roost (1 female and 1 pup at a bridge between May 15 to Aug 15). The average roost size was 1.6 bats though 75% of the roost checks recorded just one tricolored bat. The maximum summer roost size detected in North Carolina is seven tricolored bats; the maximum winter roost size detected is 12 (Sue Cameron, personal communication, January 10, 2023). In North Carolina, tricolored bats have been found in culverts as small as 29 inches tall (36 inches with 7 inches of fill/water; winter record)(Katherine Etchison, personal communication, January 24, 2023) by 60 ft long (Cheryl Knepp, personal communication, September 8, 2021).

3.3.2 Population Size

White-nose syndrome (WNS) has recently decimated tricolored bat populations in several states. Before the onset of WNS, the tricolored bat was generally believed to be common and secure throughout most of its range in the eastern US, with some even considering the species to be rapidly increasing in population and range, especially in grassland areas (Benedict et al. 2000, Sparks and Choate 2000, Geluso et al. 2004). However, subsequent analysis of survey data suggests that even prior to WNS, the tricolored bat, along with several other WNS-affected species, was in a state of gradual decline in the eastern US (Ingersoll et al. 2013). Correcting for biases inherent in hibernacula counts, Ingersoll et al. (2013) found that from 1999-2011, (i.e., both pre- and post-WNS), the tricolored bat declined by 34% in a multi-state study area (New York, Pennsylvania, West Virginia, and Tennessee). Capture rates of tricolored bats in Pennsylvania declined by 56% between pre-WNS years (2001-2008) and 2013 (Butchkoski and Bearer 2016), which is similar to the 53.8% decline observed in Missouri hibernacula (Colatskie 2017). Cheng et al. (2021) estimates range-wide declines of 93% from 1995 to 2018 and a 59% overlap of species and WNS occurrence ranges.

The range-wide population of tricolored bats is estimated to be 67,898 individuals as of 2020 (Service 2022). The Service has split western NC into Northern and Southern Representation Units (Service 2022). The Service estimates that, since 2006, the Northern and Southern Representation Units have experienced a 17% and 27% decline in summer occupancy, respectively, and a 57% and 24% decline in the number of winter colonies, respectively. The projected median abundance in 2020 for the Northern Representation Unit was 41,448 tricolored bats. The projected median abundance in 2020 for the Southern Representation Unit was 24,559 tricolored bats (Service 2022).

3.3.3 Distribution

Tricolored bats are known from 39 States (from New Mexico north to Wyoming and all states to the east), Washington D.C., 4 Canadian Provinces (Ontario, Quebec, New Brunswick, Nova Scotia), and Guatemala, Honduras, Belize, Nicaragua, and Mexico. The species current distribution in New Mexico, Colorado, Wyoming, South Dakota, and Texas is the result of westward range expansion in recent decades (Geluso et al. 2005, Adams et al. 2018, Hanttula and Valdez 2021). They have also expanded into the Great Lakes Basin (Kurta et al. 2007; Slider and Kurta 2011). This expansion is largely attributed to increases in trees along rivers and increases in suitable winter roosting sites, such as abandoned mines and other human-made structures (Benedict et al. 2000, Geluso et al. 2005, Slider and Kurta 2011).

3.3.4 Threats

WNS is a threat to many bat species throughout North America. While WNS has been assumed to be the sole driver of bat population declines, new research indicates that many factors are likely acting synergistically (Ingersoll et al. 2016). Bats are subject to a suite of severe threats (Mickleburgh et al. 1992, Hutson et al. 2001, Pierson 1998), including disturbance and altered microclimates of critical hibernacula and day roosts (Tuttle 1979, Neilson and Fenton 1994, Thomas 1995), loss and modification of foraging areas (Pierson 1998, Hein 2012, Jones et al. 2009), toxicity and changed prey composition and abundances from pesticide use and other chemical compounds (Shore and Rattner 2001, Clark 1988), direct or indirect chemical exposure leading to lethal or sublethal effects that eventually lead to death or reduced reproduction (Clark et al. 1978, Clark et al. 1980, Clark et al. 1982, Eidels et al. 2016), climate change primarily because temperature is an essential feature of both hibernacula and maternity roosts (Frick et al. 2010, Rodenhouse et al. 2009), and in-flight collisions with vehicles, buildings, and wind turbines (Russell et al. 2009, Arnett et al. 2008, Kunz et al. 2007). Bats are often subject to more than one of these threats simultaneously; such co-occurring threats may result in synergistic or interacting effects, with impacts more severe than from any single threat in isolation (Crain et al. 2008, Kannan et al. 2010, Laurance and Useche 2009, Harvell et al. 2002). Finally, additional concerns relate to development and include roads, lighting, noise, and vibration (Rowse et al. 2016, Ramalho and Aguiar 2020). Lighting is increasingly being associated with negative outcomes for many species, including bats (Rowse et al. 2016), and has been "acknowledged as a threat to biodiversity"(Rowse et al. 2016 citing Hölker et al. 2010). These threats are further reviewed in Section 3.1.4 for the gray bat and are similar for tricolored bat.

4. Environmental Baseline in the Action Area

In accordance with 50 CFR 402.02, the environmental baseline "*refers to the condition of the listed species or its designated critical habitat in the action area, without the consequences to the listed species or designated critical habitat caused by the proposed action. The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process. The consequences to listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency's discretion to modify are part of the environmental baseline*."

This project is located in the Mountain Ecoregion in Western North Carolina, south of the city of Asheville. The project area is developed to the north of I-40 and undeveloped to the south of I-40 and is entirely in the FBR Basin (HUC# 06010105). There is existing permanent lighting along the I-40 corridor throughout the region. In the action area, there is existing permanent lighting at the NC 191 Brevard Road/I-40 Interchange (Exit 47).

Other nearby major highway and bridge construction projects (for example, the I-26 Connector, the Biltmore FBR Bridge and Pratt-Whitney Development, the I-26 Proposed Exit 35, and the I-26 Widening) have already undergone section 7 consultation within the area. The population of bats that occurs in the action area also occupy and use the action areas of these other projects. The local bat populations are therefore expected to incur long-term, cumulative effects from the construction and operation of these roadways and bridges which may include stress, disturbance, deterrence, adaptation, or a combination of these factors.

No caves or mines, which could be used by bats for roosting are present in the action area. Large rivers (FBR), large (Hominy Creek, two crossings) and small (Ram Branch) streams, and forested habitat, which could be used for roosting, foraging, commuting, or some combination, by gray bat, NLEB, and tricolored bat, are present in the action area. No presence/probable absence surveys consistent with the Service's *Indiana Bat and NLEB Survey Guideline*s were conducted; therefore, information on the presence of roost trees in the action area is not available.

The six bridges undergoing rehabilitation have 1,503 feet of expansion joints. Expansion joints that are sealed at the top and not filled with material are suitable roosting habitat for gray bats, NLEBs, and tricolored bats. Bridge expansion joints that are shallow, vertical, top-sealed crevices measuring ½ inch to 1 ¼ inch wide and 4 to 12 inches deep are present on at least Bridges 334, 339, 347, and 344 and may be present on Bridges 352 and 356. Past surveys of the six bridges did not detect evidence of bat use (Table 2). While many of the surveys appear to have been sufficient to detect any bats present (Table 2), all survey results are more than two years old, all emergence surveys are more than five years old, and emergence surveys were done outside the peak activity window for surveys (May 15 to August 15).

Table 2. Survey History and Size of the Action Area at Six Bridges in the I-5889B Action Area.

Bridge Number	Description	Survey Date(s)	Survey Type	Results
334	Hominy I-40 Bifurcated, west bound lane	9/7/2017 6/26/2019	Emergence (2017) Visual Only; Expansion joints not inspected (2019)	No bats or signs of bat use.
339	Hominy I-40 Bifurcated, east bound lane	9/7/2017 6/26/2019	Emergence (2017) Visual Only; Expansion joints inspected (2019)	No bats or signs of bat use.
352	FBR I-40, east bound lane	9/16/2017 6/27/2019	Emergence + Lift Truck (2017) Visual Only; Expansion joints inspected; Drain holes inaccessible (2019)	No bats or signs of bat use.
356	FBR I-40, west bound lane	9/16/2017	Emergence + Lift Truck	
347	Hominy I-40, west bound lane	9/7/2017	Emergence	No bats or signs of bat use.
344	Hominy I-40, east bound lane	9/7/2017		

4.1 Gray Bat in the Action Area

According to the North Carolina Natural Heritage Program (NCNHP) Biotics Database and the NCDOT Bat Structure Survey Databases, the closest known roosting occurrence of gray bat is in a culvert two miles north of the project. Additional known roosts occur north, south, and east of the action area. Foraging occurrences of gray bat, collected during ground telemetry surveys completed by Indiana State University (ISU) in 2018, are located throughout the I-40 corridor including at the crossing of the FBR within the action area (see Figure 2 in the BA). Radio telemetry tracking studies were conducted by the NCWRC in 2016 and 2017 and ISU in 2018 and 2019 on bats captured at roosts near the action area. The results of these studies indicate that gray bats flying in and through the action area are from these nearby roost sites (Weber 2020).

Extensive acoustic surveys for gray bat were conducted during the latter part of the summer of 2017 and the entire 2018 season, some of which overlaps with I-5889B action area. In addition, ISU deployed acoustic detectors across the FBR basin from 2018-2020. Results indicate that gray bats are present in the action area spring through fall, with a pattern of lower gray bat activity in the FBR basin from May to early July (Weber 2020).

Although gray bat have not been found roosting on the six bridges undergoing preservation, because recent acoustic and telemetry data results indicate the gray bat are present in the action area, structure surveys are more than two years old, and the bridges have suitable roosting habitat in the form of expansion joints that will be impacted by the project, the species is assumed to be roosting in the six bridges undergoing preservation during the active season (March 15 to November 15).

Though more have been discovered since, as of 2020, ISU research documented 37 known gray bat roosts in the FBR Basin in Western North Carolina in bridges (24), buildings (3), trees (2), and culverts (8)(Weber 2020). While 12 of these roosts contained more than 10 gray bats, more than 50% contained just one or two individuals. Based on the typical number of gray bats found in roosts in Western North Carolina, we estimate that up to two gray bats could occupy each of the six bridges to be preserved (6 bridges x 2 bats each = 12 bats). Many more bats may be present foraging, commuting, or roosting in other parts of the action area.

4.2 Northern Long-Eared Bat in the Action Area

NLEBs are known to roost in NCDOT bridges (NCDOT 2021a) and suitable roost trees. According to the NCNHP Biotics Database and the NCDOT Bat Structure Survey Databases, the closest known roosting occurrence of NLEB is in a cave approximately 19.5 miles southeast of the project. The closest known foraging occurrence of NLEB is a 2018 mist net capture located 6.5 miles southwest of the project.

Suitable habitat for NLEB occurs within the action area, however, current structure or presence/probable absence surveys have not been conducted and available acoustic data has not been analyzed for the species. Therefore, the species is assumed to be present during the active season (April 1 to October 15) within the action area. It is difficult to estimate the number of NLEB that could be in the action area given: (1) the rapid decline of the population since the introduction of white-nose-syndrome and (2) the SSA's (Service 2022b) use of winter data to estimate population levels when no NLEB have been detected hibernating in Western North Carolina since the arrival of white-nose syndrome, and (3) a lack of active season population-level estimates. Based on information in *Section 3.2 Status of the Species* and given the low number of bridges found to be occupied by NLEB in Western North Carolina, we estimate less than 20% occupancy of the six bridges, and a roost size of one, which yields one NLEB roosting on the bridges to be preserved. Additional bats may be present foraging, commuting, migrating, or tree-roosting in the action area.

4.3 Tricolored bat in the Action Area

Tricolored bats are known to roost in NCDOT structures, both bridges (NCDOT 2021a) and culverts (NCDOT 2021b) and suitable roost trees. According to the NCNHP Biotics Database and the NCDOT

Bat Structure Survey Databases, the closest known roosting occurrence of tricolored bat is in a cave approximately 14.8 miles west of the project. The closest foraging occurrence of tricolored bat is a 2015 mist net capture located 6.4 miles southwest of the action area. As of early 2023, there are about 86 tricolored bat hibernacula documented in Western North Carolina, however, none occur in Buncombe County (NCWRC email comm. November 17, 2022).

While suitable habitat for tricolored bat occurs within the action area, current structure or presence/probable absence surveys have not been conducted and available acoustic data has not been analyzed for the species. Therefore, the species is assumed to be present, potentially year-round, within the action area. The project is located in the Northern Representation Unit (Service 2022), which had a 2020 projected median abundance of 41,448 tricolored bats (Service 2022).

We estimate that one tricolored bat could be roosting in the six bridges to be preserved. This is based on information provided in Section 3.3.1 *Life History - Structures*, including the limited number of known occupied bridges despite thousands of bridge surveys. We assume less than 20% occupancy of the six bridges (=one bridge) and a roost size of one (1 bridge x 1 bat = 1 tricolored bat). Additional bats may be present foraging, commuting, migrating, or tree-roosting in the action area.

5. Effects of the Action

In accordance with 50 CFR 402.02, the definition of "effects of the action" is "*all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action*." This section analyzes the effects or consequences of the action on the gray bat, NLEB, and the tricolored bat. The effects of the action are added to the environmental baseline and, after taking into consideration the status of the species, serve as the basis for the determination in this Opinion (50 CFR 402.14(g)(4)).

5.1 Stressors

Bridge preservation activities will create noise day and night, increase lighting at night temporarily, and expose bridge expansion joints that provide roosting habitat for bats. These stressors are expected to adversely affect the gray bat, NLEB, and tricolored bat (Table 3).

Bridge Preservation

Listed bat species are likely to experience adverse effects to their bridge roosts due to impacts from bridge preservation work. Effects include the potential for direct human disturbance to roosting bats if they occupy expansion joints during 18 days and nights of work at six bridges (about 3 days per bridge). Bats may temporarily or permanently abandon specific expansion joint roosts or the entire bridge roost. As some work will occur during the maternity season (May 15 to August 15), adults and volant and nonvolant pups may be affected as could reproductive activities like nursing. Disturbance could cause the abandonment of pups. While adults are less likely to be killed or injured than pups, the potential exists given the description of the action. These effects will be minimized by conservation measures, principally CM 5, which provides environmental supervision of all joint work and allows environmental staff to work with construction crews to minimize death and injury of bats that do not flush on their own.

Activities occurring between May 15 and August 15 are especially important, since during this period, females give birth and raise their pups until they are volant. This is a critical time in the life cycle of bats, when females need to obtain sufficient nutrition to raise healthy pups, and both adult females and juveniles are most susceptible to disturbance. A conservation measure, *CM 1*, which proposes to limit work to 18 days or three days per bridge, will limit the amount of time effects are experienced by roosting bats during this vulnerable life stage. Also, gray bat activity decreases during May and June, which will reduce the number of gray bats potentially effected during the maternity season.

Listed bat species may experience indirect effects to their roosting behavior in the form of habitat loss within the cracks and joints of the existing bridges. As part of project I-5889B, cracks and joints will be repaired and filled. If bats are using the joints or cracks as roosting habitat, there would be a loss of roosting habitat due to repair work. These potential effects are expected to be insignificant due to the abundance of bridges in the surrounding landscape.

Lighting

Listed bat species may experience effects to their foraging or commuting behavior, roost emergence behavior, nighttime roosting behavior, or some combination of these behaviors due to impacts from temporary nighttime construction lighting. Effects include bat's avoidance of lit areas, delayed or early emergence, changes in the timing of roost use, or some combination. These effects may cause bats to use different areas for their routine behaviors possibly impacting individual bat fitness due to longer flight distances, curtail foraging timeframes, modify rest periods, or change threats from predation or vehicle traffic especially along new flight routes. These potential effects may be minimized by implementation of conservation measures (CM 2 and CM 3) and are expected to be discountable due to the presence of forested habitat along the streams and rivers crossed by the six bridges, the height of the bridges, width of the streams, limited duration of the construction activities (CM 1), and availability of alternate bridge and tree roosts in the area.

Noise

Listed bat species may also experience direct effects to their roosting, foraging, or commuting behaviors, or a combination of these behaviors, due to impacts from construction noise day and night. Per the BA, existing baseline background noise levels on the I-40 freeway and urban landscape in the action area are 65-75 A-weighted decibels (dBA). Pneumatic jack hammers, saws, pumps, compressors, generators, guardrail installation equipment, and grading and paving equipment will be used in the preparation of repair areas. This equipment is vibratory and percussive. The maximum noise level for activities that will occur as part of this project is 101-110 dBA, attributed to pneumatic tool usage (CalTrans 2016). The only natural background sounds that occur in this range are thunder and thunderclaps (110 – 120 dBA)(CalTrans 2016). Construction-related noise of 110 dBA would be expected to attenuate to background levels (75 dBA) at 1260 feet (0.24 miles)(CalTrans 2016). Effects from disturbance by pneumatic jackhammers and similar equipment during any time of day or night may include a change in emergence times from bridge or tree roosts, may cause bats to move away from the sound, may cause bats to flush from their bridge or tree roost, temporarily or permanently abandon a roost, auditory damage, or some combination of these effects. These effects will be minimized by some conservation measures, specifically CM 1 which minimizes the length of the construction period. Additionally, an adaptation to high background noise levels which bats, choosing to roost under or near busy freeways, may experience, could reduce the significance of the noise effects to individual bats.

5.2 Cumulative Effects

Cumulative effects include the "*effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation*" (50 CFR 402.02). 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 Act. Federal projects such as the I-26 Connector (I-2513, Service Log# 02-252), I-26 Widening (I-4400/4700, Service Log #01-206), Project Ranger (Service Log #19-328), and I-26 Proposed Exit 35 (HE-0001, Service Log #21-330) are included in the environmental baseline as section 7 consultation is already completed for these actions.

NCDOT did not identify any cumulative effects as reasonably certain to occur within the action area. The work is confined to the existing NCDOT right-of-way which generally limits private and State activities as do the nature of freeways themselves.

5.3 Summary of Effects

In summary, construction activities are expected to adversely affect the gray bat, NLEB, and tricolored bat if they are roosting on the six bridges where preservation activities are proposed. If bats are roosting in the bridge at the time of the joint repair activities, bats may flush from the joints when they are exposed during the day or bats may be otherwise encouraged to move to avoid direct injury or death. (Table 3).

Table 3. Summary of Effects

Project Activity / Stressor	Duration	Where/Activity	Effect Determination
Bridge Preservation	18 days and nights over 24 months (year-round)	Unknown Bridge Roosts	LAA; Minimized by CM 1, CM 5, and CM 7.
		Unknown Tree Roosts Foraging and Commuting Activity	NLAA
Night Lighting		Unknown Bridge Roosts	LAA; Minimized by CM 1, CM 2, CM 3, and CM 7.
		Unknown Tree Roosts Foraging and Commuting Activity	NLAA
Noise and Vibration		Unknown Bridge Roosts	LAA; Minimized by CM 1.
		Unknown Tree Roosts Foraging and Commuting Activity	NLAA

6. Conclusion

After reviewing the current status of the gray bat, NLEB, and tricolored bat, the environmental baseline for the action area, the effects of the proposed I-5889B project and the cumulative effects, it is the Service's biological and conference opinion that the I-5889B project, as proposed, is not likely to jeopardize the continued existence of the gray bat, NLEB, or tricolored bat.

Gray Bat:

1. Although some activities associated with the proposed action are expected to result in adverse effects to the gray bat, we have determined that the species' reproduction, numbers, and distribution will not be appreciably reduced because of the proposed action. If the FBR Basin gray bat population is estimated at 2,820 individuals (Weber 2020), then this project would adversely affect less than 0.43% (= 12 / 2,820) of the FBR Basin population. *Section 4.1 Environmental Baseline* describes how we estimated 12 bats.
2. Effects of the action reach only a small number (6) of the potential bridge and culvert roosts (635) in Buncombe County.

NLEB:

3. Although some activities associated with the proposed action are expected to result in adverse effects to the NLEB, we have determined that the species' reproduction, numbers, and distribution will not be appreciably reduced because of the proposed action. Given the wide distribution of NLEB colonies

across the landscape and the one individual assumed roosting on the brides to be preserved by the project, I-5889B will not affect the species at the population level.

Tricolored Bat:

4. Although some activities associated with the proposed action are expected to result in adverse effects to the tricolored bat, we have determined that the species' reproduction, numbers, and distribution will not be appreciably reduced because of the proposed action. If the Northern Representation Unit population of tricolored bat is 41,448 individuals (Weber 2020), then this project would adversely affect 0.005% (= 2 / 41,448) of the regional population. *Section 4.3 Environmental Baseline* describes how we estimated two bats.
5. Effects of the action reach only a small number (6) of potential bridge and culvert roosts (635) in Buncombe County and tricolored bats typically roost more in trees than bridges.

No critical habitat has been designated for these species; therefore, none will be affected.

7. Incidental Take Statement

Section 9 of the Act and Federal regulations pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take "*means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct*" (16 U.S.C §1532). Harm is further defined by the Service as "*an act which actually kills or injures wildlife. Such act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering*" (50 CFR 17.3). Incidental taking "*means any taking otherwise prohibited, if such taking is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity*" (50 CFR 17.3). Harass is defined by the Service as "*an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering*" (50 CFR 17.3). 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 under the Act, provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are non-discretionary and must be undertaken by the FHWA and NCDOT so that they become binding conditions of any grant or permit issued to the construction contractor, as appropriate, for the exemption in section 7(o)(2) to apply. The FHWA and NCDOT have a continuing duty to regulate the activity covered by this incidental take statement. If the FHWA or NCDOT (1) fails to assume and implement the terms and conditions or (2) fails to require the construction contractor to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the FHWA and NCDOT must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [50 CFR §402.14(i)(3)].

7.1 Amount or Extent of Take

Incidental take of gray bat, NLEB, and tricolored bat is anticipated to occur as a result of the preservation of six bridges on I-40 (I-5889B). Effects to the assumed bridge roosts of gray bat, NLEB, and tricolored bat within the action area are expected to occur due to roost disturbance, lighting, and noise.

The Service anticipates that 12 gray bats, one tricolored bat, and one NLEB roosting on the six bridges could be taken as a result of the proposed action. The incidental take of bats is expected to be in the form of harass, harm, wound, kill, trap, capture, or some combination. The take resulting from the proposed action is not expected to cause mortality of individuals in a majority of cases but could reduce fitness and reproductive success of bats adversely affected. In this Opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to these species.

7.2 Reasonable and Prudent Measures

The Service believes the following reasonable and prudent measure(s) are necessary and appropriate to minimize take of **gray bat** and **NLEB**. These non-discretionary measures reduce the level of take associated with project activities, include only actions that occur within the action area, and involve only minor changes to the project.

1. Ensure that the contractor understands and follows the measures listed in the "Conservation Measures," "Reasonable and Prudent Measures," and "Terms and Conditions" sections of this Opinion.
2. Reduce take, mortality, and injury of bats to the maximum extent practicable.
3. Monitor and document the amount of take and report it to the Service.

The prohibitions against taking **tricolored bat** found in section 9 of the Act do not apply until the species is listed. However, the Service advises the FHWA and NCDOT to consider implementing the above reasonable and prudent measures. If this conference opinion is adopted as a biological opinion following a listing or designation, the above reasonable and prudent measures, with their implementing terms and conditions, will be nondiscretionary.

7.3 Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act for **gray bat** and **NLEB,** the FHWA and NCDOT must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting and monitoring requirements. When incidental take is anticipated, the terms and conditions must include provisions for monitoring project activities to determine the actual project effects on listed fish or wildlife species (50 CFR §402.14(i)(3)). These terms and conditions are nondiscretionary.

1. Ensure that the procedures listed in the "Conservation Measures," "Reasonable and Prudent Measures", and "Terms and Conditions" sections of this Opinion are being implemented.
2. <u>Training</u>. A biologist with knowledge of bat biology and this Opinion shall conduct on-site training with all individuals involved in bridge preservation activities. The biologist shall discuss the requirements of this Opinion, how to identify bats, and how and when (immediately) to report any wildlife observations.
3. <u>Joint Protection Coordination</u>. If NCDOT uses something other than a steel or plywood box catch pan for joint protection, they shall coordinate the change with the Service to ensure its design does not trap, capture or otherwise injure bats that may need to leave the joints during construction.
4. <u>Reporting</u>. Once the project is complete, provide a short report by the end of the calendar or fiscal year in which the contractor completes the project, whichever is more distant, that 1) indicates the actual level of incidental take in comparison to that granted and analyzed in this Opinion (12 gray bats, one tricolored bat, one NLEB), 2) provides results/feedback/lessons-learned on the effectiveness of conservation measures, reasonable and prudent measures, and terms and conditions, 3) documents the dates of the six weekends of work at the six bridges, and 4) provides a summary of any surveys (positive and negative) and bat observations made during the project.
5. <u>Discovery of Injured or Dead Individuals</u>. Upon locating a dead, injured, or sick individual of an endangered or threatened species, the FHWA or NCDOT must notify the Service at

Susan_Cameron@fws.gov and Lauren_Wilson@fws.gov within 24 hours. Bats should only be handled by people who have current vaccinations and immunity records for rabies. Care should be taken in handling sick or injured individuals and in the preservation of specimens in the best possible state for later analysis of cause of death or injury [50 CFR 402.14(i)(1)(v)].

In order to be exempt from the prohibitions of section 9 of the Act once the proposed species, **tricolored bat,** is listed, the FHWA and NCDOT must comply with the above terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting and monitoring requirements. If this conference opinion is adopted as a biological opinion following a listing or designation, these terms and conditions will be non-discretionary.

The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The FHWA and NCDOT must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

8. Conservation Recommendations

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

1. Produce a report on NLEB and tricolored bat activity in the FBR Basin using the existing acoustic data collected from 2017 – 2020. Information will be useful for future section 7 consultations as well as the environmental baseline.

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

9. Reinitiation Notice

This concludes formal consultation for I-5889B. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and 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. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

You may ask the Service to confirm this conference opinion as a biological opinion issued through formal consultation if the tricolored bat is listed or critical habitat is designated. 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 this conference opinion as the biological opinion on the project and no further section 7 consultation will be necessary. Reinitiation of the subsequent, confirmed biological opinion would be required for the same four reasons listed above.

10. Literature Cited

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10.2 Citations for *Section 3. Range-Wide Status of the Species*

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Appendix A Figures

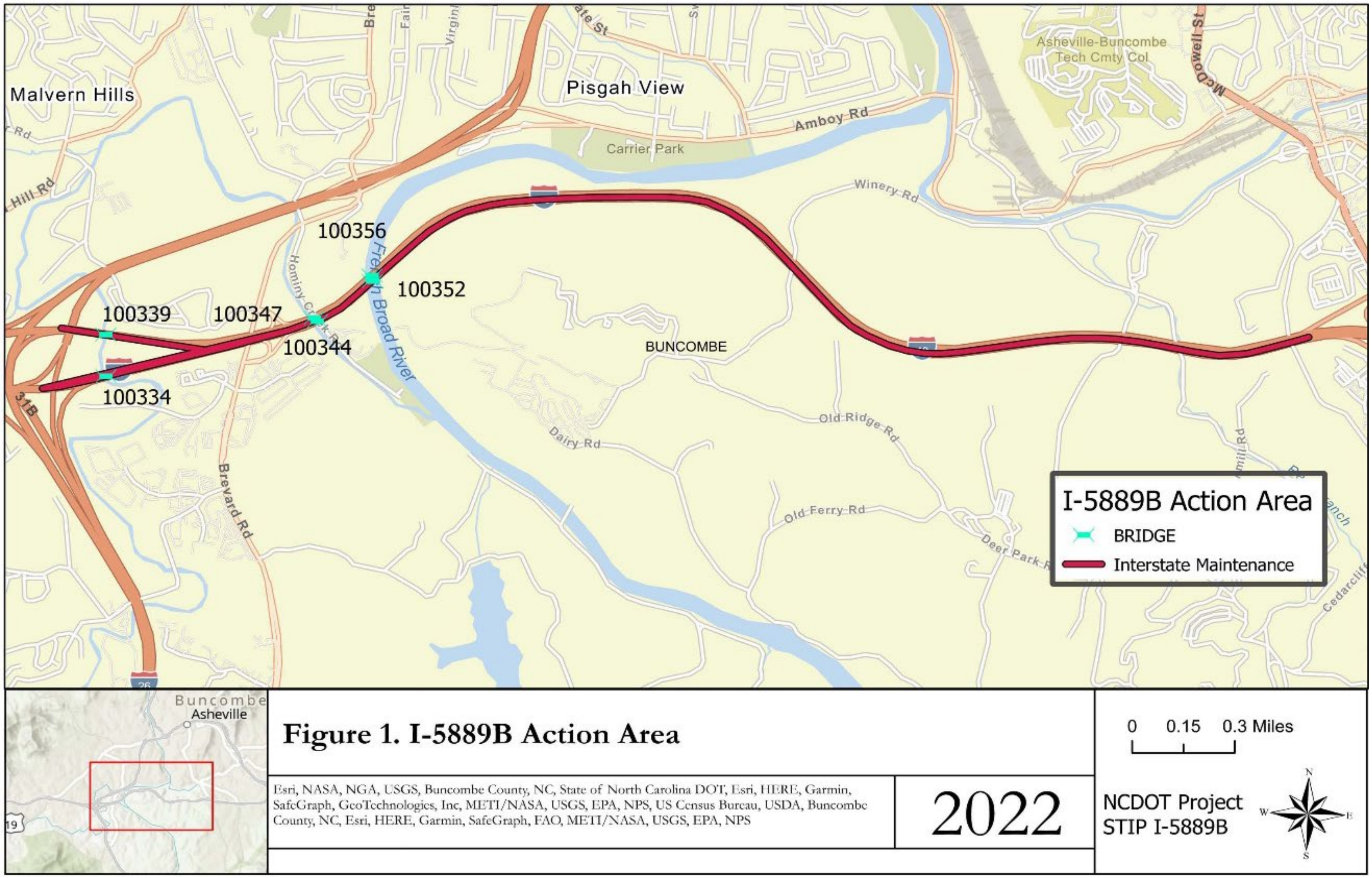

Figure 1. **I-5889B Action Area.** Bridges #347 and #344 and Bridges #356 and #352 are paired and appear as one blue bridge icon in this figure. In other words, there is a bridge on the east and west bound roads of the freeway at each of the three stream crossings.