Conservation Strategy for Forest-dwelling Bats in Tennessee

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Tennessee Ecological Services Field Office

December 17, 2015

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INTRODUCTION

The U.S. Fish and Wildlife Service (Service), Tennessee Ecological Services Field Office (TFO) has developed this Conservation Strategy (Strategy) to formalize our goals and priorities regarding the conservation and recovery of forest-dwelling bats in Tennessee. At this time, the Strategy addresses Indiana bats (*Myotis sodalis*, federally endangered) and northern long-eared bats (*Myotis septentrionalis*, federally threatened). It is an expansion and refinement of the TFO's January 2012 "Interim Indiana Bat Mitigation Guidance for the State of Tennessee". Although providing mitigation guidance for impacts to bats and their habitat resources is still an important purpose of this document, the term "Conservation Strategy" better communicates its primary focus on outcomes instead of processes. The mitigation associated with this Strategy is consistent with the "Strategy for Improving the Mitigation Policies and Practices of The Department of the Interior"[1] which we discuss in greater detail later.

The TFO relied heavily on the Indiana Bat Draft Recovery Plan: First Revision (Recovery Plan)[2] and the Northern Long-eared Bat Interim Conference and Planning Guidance (Interim Guidance)[3] while developing this Strategy. The "Conservation Strategy for Forest-Dwelling Bats in the Commonwealth of Kentucky" was also foundational in its development. However, it has been tailored to reflect the assessed needs of and threats to forest-dwelling bats in Tennessee. The Recovery Plan lists dozens of recovery actions needed to conserve and recover the Indiana bat. Most are either habitat-related activities (conservation, management and restoration) or research-related activities. The TFO reviewed these recovery actions and included in this Strategy those that best reflect the specific opportunities and needs of forest-dwelling bats in Tennessee. The TFO will continue to adjust and adapt the Strategy as new information relevant to the conservation and recovery of forest-dwelling bats becomes available.

A listing determination for the northern long-eared bat was published on Thursday, April 2, 2015 (Endangered and Treatened Wildlife and Plants; Threatened Species Status for the Northern Long-eared Bat With 4(d) Rule; Final Rule and Interim Rule; FR Vol. 80, No. 63). Several types of activities were exempted ("excepted") from take analysis by the interim 4(d) rule, and it is possible that other activities will be provided similar exemption when the final 4(d) rule is published in 2016. This Strategy addresses the activities that are not currently exempted from take analysis for the northern long-eared bat and that may be included in the final rule.

Many of Tennessee's forest-dwelling bats are dependent upon caves and cave-like structures for winter hibernation and primarily use trees for summer roosts (e.g., Indiana bat, northern long-eared bat, little brown bat, and tri-colored bat). Although the species share these general life history characteristics, their specific niches vary. The Indiana bat has been listed under the Endangered Species Act (ESA) since 1967, the northern long-eared bat was listed in April 2015, and the Service is preparing status assessments for the little brown bat and tri-colored bat. The Indiana bat is the only one of these species for which the Service has prepared a recovery plan. Recovery plans for other forest-dwelling bat species will be developed when and if those species

[1] Clement, J.P. et al. 2014.
[2] USFWS 2007.
[3] USFWS 2014.

are listed under the ESA. The recovery actions identified in the executive summary of the Recovery Plan that are applicable to these forest-dwelling bat species include:

1) Conserve and manage hibernacula and their winter populations
2) Conserve and manage summer habitat to maximize survival and fecundity
3) Plan and conduct research essential for recovery
4) Develop and implement public information and outreach programs

These actions, along with other aspects of the Indiana bat recovery program, were used in the development of this Strategy and are the primary components of the Strategy. Public information and outreach may be incorporated into the activities completed under these recovery actions, but not as a stand-alone program. Due to the similarities and overlap in life history aspects of forest-dwelling bat species, this type of broad recovery and conservation approach is considered appropriate in the absence of recovery or conservation plans for similar species. Biological information on each of the other species will also be used, when available and as appropriate, in the TFO's decision-making process regarding appropriate conservation goals and actions for other forest-dwelling bats that may be listed in the future.

The mitigation component of this Strategy provides options to project proponents for complying with the Endangered Species Act that are aligned with the conservation needs of forest-dwelling bats in Tennessee. The TFO implements this Strategy where its authorities allow as a means of enhancing the conservation and recovery of Indiana and northern long-eared bats in Tennessee. Authorities for the Strategy include:

The Endangered Species Act (16 U.S.C. 1531 *et seq.*) (ESA), Fish and Wildlife Act of 1956 (16 U.S.C. 742a. *et seq.*), and the Fish and Wildlife Coordination Act (16 U.S.C. 661 *et seq.*). Section 5 of the ESA provides that, "The Secretary…shall establish and implement a program to conserve fish, wildlife, and plants, including those which are listed as endangered species or threatened species…" and "shall utilize land acquisition and other authority under the Fish and Wildlife Act, as amended, and the Migratory Bird Conservation Act, as appropriate". Section 7(a)(1) of the ESA further directs Federal agencies to "utilize their authorities in furtherance of the purposes of this Act [ESA] by carrying out programs for the conservation of endangered species and threatened species." Additionally, section 7(a)(2) of the ESA directs Federal agencies to "insure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered species or threatened species."

The Fish and Wildlife Act of 1956 provides that the Secretary shall "...take such steps as may be required for the development, advancement, management, conservation, and protection of fish and wildlife resources…."

The Fish and Wildlife Coordination Act states that the Secretary is authorized "to provide assistance to, and cooperate with, Federal, State, and public or private agencies and organizations in the development, protection, rearing, and stocking of all species of wildlife, resources thereof, and their habitat…"

EXPLANATION OF TERMS

Throughout this document, specific terminology is used repeatedly to describe bat habitat. For the purposes of this document, the TFO provides the following definitions:

"Hibernacula", the plural of 'hibernaculum', refers to caves, cave-like structures or other features where forest-dwelling bats have been documented to spend some or all of the winter hibernation period.

"Known habitat" refers to suitable summer or winter habitat located within a determined distance of an occurrence record for a bat species. Distances will vary based on species and record type (e.g., maternity, swarming, winter, etc.).

"Maternity habitat" refers to suitable summer habitat used by juveniles and reproductive (pregnant, lactating, or post-lactating) females. For Indiana bats, known maternity habitat occurs within five miles of a capture location or 2.5 miles of a documented roost tree. For northern long-eared bats, maternity records are considered part of known "summer habitat" for this species.

"Non-maternity habitat" refers to suitable summer habitat used by non-reproductive adult females and/or males. For Indiana bats, the known habitat buffer around a non-maternity record (mist net or roost tree) is 2.5 miles. Northern long-eared bat non-maternity records are considered part of known "summer habitat" for this species.

"Occupied" refers to the timeframe in which suitable habitat is expected or assumed to be in use by the bats at the time of impact. This terminology is important when evaluating mitigation options for likely adverse effects. See Appendix A for more information regarding timeframes during which habitats are considered occupied and how it affects mitigation considerations.

"Potential habitat" occurs statewide where suitable roosting, foraging and travel/migration habitat for the Indiana bat and/or northern long-eared bats exists, but where use of such habitat by either species has not been documented. Known habitat may also include potential habitat for uses that are currently undocumented (e.g., summer use in known swarming areas, or use of known Indiana bat habitat by northern long-eared bats).

"Potential hibernacula" refers to suitable caves, cave-like structures or other features where forest-dwelling bats may spend some or all of the winter torpor/hibernation period. Features may be identified as potential hibernacula based on surveys.

"Suitable habitat" refers to summer, swarming and/or winter habitat that is appropriate for use by Indiana and/or northern long-eared bats.

"Suitable Indiana bat winter habitat" includes all known and potential hibernacula and is restricted to underground caves and cave-like structures (e.g., abandoned mines and railroad tunnels). These hibernacula typically have a wide range of vertical structures; cool, stable

temperatures, preferably between 4° C and 8° C; and humidity levels above 74 percent but below saturation.

"Suitable northern long-eared bat winter habitat" refers to all known and potential hibernacula and includes underground caves and cave-like structures (e.g., abandoned mines and railroad tunnels). These hibernacula typically have large passages with significant cracks and crevices for roosting; relatively constant, cool temperatures between 0° C and 9° C; high humidity; and minimal air flow.

"Suitable summer habitat" for Indiana and/or northern long-eared bats consists of the variety of forested/wooded habitats where they roost, forage and travel. This includes forested blocks as well as linear features such as fencerows, riparian forests and other wooded corridors. These wooded areas may be dense or loose aggregates of trees with variable amounts of canopy closure. Isolated trees are considered suitable habitat for Indiana and/or northern long-eared bats when they exhibit the characteristics of a suitable roost tree and are located within 1,000 feet of other suitable habitat. Northern long-eared bats may also roost in man-made structures such as houses. However, these types of habitats are not addressed in this Strategy.

"Suitable Indiana bat primary maternity roost tree" refers to a dead or partially dead tree that is at least nine inches diameter at breast height (DBH) and has crevices and/or loose bark. Trees in excess of 16 inches DBH are considered optimal for maternity colony roosts, but trees in excess of nine inches DBH are considered to provide suitable maternity roosting habitat.

"Suitable roost tree" refers to a tree (live or dead) that exhibits any of the following characteristics: loose bark, crevices or cracks. Indiana and/or northern long-eared bats typically roost under loose bark, in cavities of dead, dying, and live trees, and in snags (i.e., dead trees or dead portions of live trees). For Indiana bats, suitable roost trees will have a DBH of five inches or greater; for northern long-eared bats, the minimum DBH is three inches.

"Summer habitat" refers to suitable summer habitat used by any Indiana bat or northern long-eared bat, regardless of reproductive condition. For northern long-eared bats, known summer habitat occurs within three miles of a capture location or 1.5 miles of a documented roost tree.

"Summer 1 habitat" refers to known Indiana bat maternity habitat and/or northern long-eared bat summer habitat.

"Summer 2 habitat" refers to Indiana bat non-maternity summer habitat.

"Swarming habitat" refers to suitable roosting, foraging and travel habitat for Indiana bats or northern long-eared bats that is within a specific distance of a known hibernaculum. For Indiana bats, this distance is ten miles from a Priority 1 or Priority 2 hibernaculum and five miles from a Priority 3 or Priority 4 hibernaculum. For northern long-eared bats, this distance is five miles from a known hibernaculum.

"Swarming 1 habitat" refers to Indiana bat Priority 1 and Priority 2 swarming habitats.

"Swarming 2 habitat" refers to Indiana bat Priority 3 and Priority 4 swarming habitats and/or northern long-eared bat swarming habitats.

"Timeframe" refers to the range of dates during which Indiana and northern long-eared bats are expected to be going through certain phases of their annual life cycle such as hibernating, swarming, giving birth and raising young. These "timeframes" are used to determine if a particular habitat type is expected to be "occupied."

"Unoccupied" refers to the timeframe during which suitable habitat is not expected to be in use by Indiana and/or northern long-eared bats at the time of impact. This terminology is important when evaluating mitigation options for likely adverse effects. Please see Appendix A for more information regarding timeframes during which habitats are considered occupied and how it affects mitigation considerations.

BACKGROUND

Hibernacula

Tennessee lies south of the center of the Indiana bat's range and within the southeastern portion of the northern long-eared bat's range. Tennessee contains numerous caves and forestland habitats known to provide habitat for both species. The expansive karst within much of Tennessee's limestone-rich areas results in numerous caves that historically and currently provide winter habitat for Indiana and/or northern long-eared bats. Thirty-six hibernacula (including one Priority 1 and six Priority 2 caves) within the state are known to have extant Indiana bat populations. Currently, there are 59 caves that serve as known hibernacula for the northern long-eared bat. Most of these are caves where federally-listed bats are currently monitored by the Tennessee Wildlife Resources Agency (TWRA), the TFO, and their partners. It is likely that other, undocumented northern long-eared bat hibernacula exist in Tennessee, especially at caves and other cave-like structures that are not subject to routine monitoring for federally-listed bats. Documentation of the number of known hibernacula has increased during recent improvements in monitoring and survey frequency for bats in general, and the number of known hibernacula may continue to increase for some time.

Many of the caves for both species occur within existing conservation ownerships, both private and public. Of particular note are several caves within the Great Smoky Mountains National Park (GSMNP), several caves within Fall Creek Falls State Park that are managed by the Tennessee Department of Environment and Conservation, and several caves in various ownership in Fentress and Pickett Counties.

No priority hibernacula have been identified for the northern long-eared bat. Unlike the Indiana bat, the northern long-eared bat does not typically hibernate in large groups in Tennessee, which makes it difficult to estimate population size based on hibernacula counts. Barbour and Davis[4] found that the species is never abundant in a single hibernaculum and has rarely been observed in concentrations of over 100 individuals. Northern long-eared bats are also known to move

[4] Barbour and Davis. 1969

between hibernacula throughout the winter, which further complicates population estimates.[5] Additionally, northern long-eared bats appear more flexible than Indiana bats in their selection of hibernacula, which include not only caves, but also cave-like structures such as mines and railroad tunnels.

White-nose Syndrome[6]

White-nose syndrome (WNS) was first documented in New York in February 2006. Since then, WNS has spread rapidly across the eastern United States and Canada, and the fungus (*Pseudogymnoascus destructans*) that causes WNS had been detected as far west as Oklahoma as of June 2015. In Tennessee, WNS was first documented during the winter of 2009/2010 in Sullivan County. As of June 2015, WNS had been confirmed / suspected present in 47 Tennessee counties. WNS is considered to occur throughout Tennessee and is expected to be confirmed at additional sites.

Indiana bats were listed as endangered in 1967, primarily due to population declines associated with hibernacula disturbances. However, WNS has emerged as a significant threat to the existence of the species. White-nose syndrome is the most significant threat to the northern long-eared bat[7], and it is unlikely that the species would be proposed for listing under the ESA without the population declines that this species has experienced due to WNS. To date, the most extreme population declines have been in the northeastern U.S., but both species are expected to be impacted by WNS across their ranges.

Indiana Bat Maternity Colonies

Because Indiana bat records occur broadly across the State, nearly any project with suitable habitat has the potential to adversely affect the Indiana bat. The TFO reviews hundreds of projects annually that have potential impacts to Indiana bats. The majority of these projects involve the loss of suitable summer roosting and foraging habitat. Projects that impact known winter habitat are rare. Projects impacting known and potential summer and swarming habitats range from large block disturbances such as those associated with surface mining and development projects to linear impacts associated with roads, transmission lines, and pipelines. Although the small size of some of the disturbances makes direct adverse impacts to Indiana bats less likely, the cumulative and indirect effects of these projects as a whole can be detrimental to the species and limit its potential conservation and recovery.

Known Indiana bat maternity colonies are scattered through middle and eastern Tennessee. Notable groups of maternity colonies occur in and near the GSMNP and in Wilson County, McNairy County, and Benton County. Evidence of maternity colonies has also been documented during the last decade at the Fort Campbell Military Reservation, on the Arnold Air Force Base, and in Pickett County. Many of these maternity colonies occur in proximity to both large blocks of forested habitats and large streams/rivers. Otherwise, very little is known about

[5] Griffin 1940; Whitaker and Rissler 1992; Caceres and Barclay 2000.
[6] This information was taken from an internal memo on WNS in Tennessee, dated August 6, 2015 and is on file at the Tennessee Ecological Services Field Office.
[7] USFWS 2013

the attributes of maternity colonies in Tennessee, as most are documented only by mist-net captures or individual roost tree records.

As of May 2015, the TFO has identified approximately 20 maternity areas in Tennessee based on capture records. Whether each of these records represents a distinct maternity colony is not known. Many of the 2.5- and five-mile radius circles encompassing these records (i.e., "maternity buffers") are in close proximity to each other, and some overlap. Although we cannot specify the number of maternity colonies that are known to occur in Tennessee, the TFO believes that the documented maternity areas represent a small fraction of the habitat being used statewide by maternity colonies. This assessment is based primarily on data extrapolated from the range-wide population estimates, an assumed 50:50 (male: female) sex ratio, and an average maternity colony size of 60 to 80 adult females, and reveals that fewer than ten percent of maternity colonies have been documented range-wide[8] Note that, because of the relatively low level of survey effort expended in Tennessee compared to other states such as Kentucky, little area within the state is considered to be known maternity habitat – thereby affecting mitigation multipliers (See Appendix A).

Northern Long-eared Bat Maternity Colonies

Northern long-eared bat maternity colonies occur throughout Tennessee. Historically, the northern long-eared bat has been one of the most commonly-captured species during summer mist net surveys in the state. As a common species, little attention was given to these captures. A large number were simply reported to the TWRA (a condition of the state collecting permit) as species records, with no information regarding the individual's age, gender, or reproductive condition. Nearly all of the northern long-eared bat summer records in Tennessee are mist-net captures, which do not provide information regarding roost tree selection. Consequently, the species was seldom targeted in roost tree emergence counts, which would provide information regarding summer population levels at particular locations.

Data compiled by the Service's Kentucky Ecological Services Field Office shows that of 1,825 non-maternity summer captures of northern long-eared bats in Kentucky (adult males and non-reproductive females), 94 percent (1,712 individuals) occurred within three miles of a northern long-eared bat maternity capture record. Similar associations have been observed at the Catoosa Wildlife Management Area in Cumberland County, Tennessee[9] and in Ohio[10]. It is unknown how non-reproductive adult northern long-eared bats interact with maternity colonies, but the strong correlation between maternity and non-maternity capture records indicates concurrent usage of many summer habitat areas. Based on this strong correlation between maternity and non-maternity captures, the TFO concludes it is appropriate to treat all summer northern long-eared bat captures (May 15 to August 15) as indicative of maternity usage. We will re-evaluate as new information becomes available (particularly radio-telemetry and roost tree data); but until data indicates otherwise, the TFO considers all summer captures of northern long-eared bats to have occurred within Summer 1 habitat.

[8] USFWS 2007
[9] Lereculeur. A.E. 2013
[10] Keith Lott. 2014. Personal communication. Email dated 19 May 2014.

PURPOSE AND NEED

Tennessee, like many states, is experiencing significant human-related growth. Projects associated with growth can result in the loss, degradation, and fragmentation of natural habitats, such as forests, which may adversely affect forest-dwelling bats. Project proponents must often determine whether adverse effects to these bats are likely to occur and, if so, how to avoid, minimize, and/or compensate for such impacts. When impacts are unavoidable, project proponents should work with the Service to ensure compliance with the ESA.

Historically, ensuring ESA compliance for projects in Tennessee that affected Indiana bats outside of their hibernation period was handled very simply with surveys to demonstrate presence or probable absence, and if present or assumed present, avoiding any direct effects (e.g., injury or mortality) by cutting trees during the winter hibernation period. The timeframe for mist net surveys was May 15 to August 15, and the timeframe for cutting trees was October 15 to March 31 (for a project not within a known swarming area) and November 15 to March 31 (for a project within a known swarming area). This approach was inadequate in several respects:

1) It provided no flexibility to the TFO or project proponents for complying with the ESA. If bats were present or assumed present, cutting trees during the winter was the only option other than formal consultation.

2) It addressed only direct effects to bats (e.g., injury or mortality resulting from tree clearing when bats were present), ignoring the indirect effects of reducing or degrading their summer habitat.

3) It did not accommodate legitimate needs unrelated to bats for clearing trees outside of the winter, such as the difficulty of mobilizing equipment and completing projects during winter weather conditions and the opportunity to reduce soil erosion by conducting tree removals during drier, growing season weather conditions.

4) Most importantly, seasonal tree clearing without compensation contributed to the trend[11] of forested habitat loss and fragmentation, which is one of several threats facing forest-dwelling bats. Because Indiana and northern long-eared bat records occur broadly across large portions of the state, nearly any project with suitable forest habitat has the potential to adversely affect these forest-dwelling bats. The TFO reviews project proposals for hundreds of projects annually for impacts to listed species. The majority of these projects involve the loss of forest cover that is suitable summer and/or swarming habitat for Indiana and northern long-eared bats. Projects affecting known and potential summer and swarming habitats vary in size and configuration, including those that remove blocks of habitat (e.g., surface mining and development projects), install linear infrastructure (e.g., roads and utility lines), and manage forest resources (e.g., timber harvest/thinning, burning).

Conversely, projects that could impact known or potential hibernacula have historically been rare, partly due to the protections afforded to caves by the Tennessee Cave Protection Act and the challenges of building in karst areas. While known Indiana bat hibernacula within Tennessee

are limited to natural caves, the northern long-eared bat appears more flexible in its hibernation requirements. Known hibernacula used by the northern long-eared bat within Kentucky include a railroad tunnel and, potentially, abandoned mine portals. This flexibility to hibernate in non-cave habitats could lead to an increase in actions that propose impacts to known and/or potential hibernacula for the northern long-eared bat.
While there is no consultation history associated with the northern long-eared bat, the species' life history is similar to that of the Indiana bat, which should make it amenable to this Strategy.

REGION OF STRATEGY APPLICABILITY

This Strategy applies to the state of Tennessee. However, the TFO also applies the ESA compliance options in this Strategy to certain interstate projects that occur within 20 miles of Tennessee's state boundary, where the TFO is the lead field office and application of the Strategy's mitigation approach is acceptable to Service field office(s) in the adjacent state(s).

ESA COMPLIANCE OPTIONS

Endangered Species Act compliance options available to project proponents under this Strategy include:

1) Avoidance
2) Survey for presence / probable absence
3) Technical assistance and/or informal consultation
4) Formal consultation (only available to federal action agencies / partners)
5) Conservation memorandum of understanding
6) Habitat conservation plan (HCP) (only available to non-federal entities / partners)

This Strategy is intended to: (1) provide guidance to project proponents whose actions have the potential to adversely affect forest-dwelling bats; and (2) outline appropriate mitigation for adverse effects to forest-dwelling bats and their habitats. When appropriate, compensatory mitigation measures included in the Strategy are designed to more than offset unavoidable adverse effects and, thereby, enhance the conservation and recovery of forest-dwelling bat populations in Tennessee. General information on each ESA compliance option is summarized below:

Avoidance

Project proponents are encouraged to avoid impacts to forest-dwelling bats and their habitats as a part of all ESA compliance options. Avoiding impacts means that take of federally listed species is not expected to occur. If adverse effects are likely to occur and it is not possible to avoid all of these potential impacts, the use of one or more of the other ESA compliance options is necessary.

Surveys

Project proponents wishing to demonstrate probable absence of Indiana and/or northern long-eared bats in potential habitat should follow the appropriate presence/probable absence survey

protocols for the project area. The presence/probable absence survey guidance as updated by the Service is posted online at fws.gov/cookeville. Project proponents may not survey known habitat to demonstrate probable absence of the known species, but may survey known habitat to provide additional information on how and when a species is using the habitat (e.g., it is known swarming habitat, but a survey may demonstrate probable absence of summer usage; or usage by northern long-eared bats, but not Indiana bats). However, surveys in known habitat should be coordinated with the TFO to ensure that the survey plan is adequate for the intended purpose.

If an approved survey does not result in the capture of Indiana and/or northern long-eared bats, the project proponent(s) may assume that the project is not likely to adversely affect the Indiana and/or northern long-eared bat and request concurrence from the Service under section 7 of the ESA (if there is a federal nexus) or proceed without further work/coordination under section 10(a)(1)(B) of the ESA (if a non-federal entity and there is no federal nexus). If Indiana and/or northern long-eared bats are captured during the survey and the project is likely to adversely affect the Indiana and/or northern long-eared bat, then additional work/coordination with the Service is needed to ensure compliance with the ESA.

Technical Assistance / Informal Consultation

The ESA directs all Federal agencies to work in conserving endangered and threatened species and to use their authorities to further the purposes of the Act. Section 7 of the ESA is the mechanism by which Federal agencies ensure the actions they take, including those they fund or authorize, do not jeopardize the existence of any listed species. Federal agencies and project proponents are encouraged to coordinate with the Service early during project planning to identify listed species that may occur in the affected area and measures that would avoid or minimize adverse effects. The TFO maintains a list of endangered, threatened, proposed, and candidate species which have the potential or are known to occur in each Tennessee county. These lists are available online via ecos.fws.gov/ecp/.

If a listed species is known or assumed to be present, the Federal agency must determine whether the project may affect it. If the action agency determines that the project is not likely to adversely affect a listed species or designated critical habitat, and the Service concurs with that determination in writing, then the consultation (informal to this point) is concluded. Additional information on technical assistance and informal consultations under section 7 of the ESA can be found on the Service's website at: http://www.fws.gov/endangered/what-we-do/consultations-overview.html, and in the Service's Endangered Species Consultation Handbook, which is available at: http://www.fws.gov/endangered/esa-library/pdf/esa_section7_handbook.pdf.

Consultation is not required for proposed species; however, if a proposed action is likely to adversely affect a proposed species or proposed critical habitat, the action agency may request a conference with the Service to ensure that the proposed action will not result in jeopardy to the species or the destruction or adverse modification of designated critical habitat. The results of this conference are documented in a conference report.

Formal Consultation

If the Federal agency determines that a project is likely to adversely affect a listed species or designated critical habitat, the agency initiates formal consultation by providing information about the anticipated effects, even if the proposed project's activities are excepted from take prohibitions under a section 4(d) rule for threatened species. The ESA requires that consultation be completed within 90 days, and the consultation regulations (50 CFR §402.14) allow an additional 45 days for the Service to prepare a biological opinion, which determines whether the proposed action is likely to jeopardize the continued existence of the species or result in the destruction or adverse modification of designated critical habitat. If a jeopardy or adverse modification determination is made, the biological opinion must identify any reasonable and prudent alternatives that could allow the project to move forward.

If the Federal agency determines, or agrees with the Service's determination, that a proposed action is likely to jeopardize a proposed species and/or adversely modify proposed critical habitat then conferencing is required. A Federal agency may request a conference that follows the procedures for formal consultation, which concludes with the Service issuing a conference opinion. Additional information on conferencing can be found within the ESA, its implementing regulations at 50 CFR §402.10, and in the Service's Endangered Species Consultation Handbook, which is available at: http://www.fws.gov/endangered/esa-library/pdf/esa_section7_handbook.pdf.

Conservation Memorandum of Understanding

To address the concerns identified in the Purpose and Need section above and to facilitate more effective cooperation between the TFO, its partners, and project proponents, the TFO has developed a conservation memorandum of understanding (CMOU) process that helps implement and support the Strategy.

CMOUs provide a streamlined option for ESA compliance to federal and non-federal project proponents through voluntary agreements (i.e., CMOUs) between the parties. The CMOU process is supported by a programmatic intra-Service biological opinion, which has evaluated the effects of the CMOU process on the Indiana bat and northern long-eared bat. The biological opinion provides a non-jeopardy determination and exempts incidental take of Indiana bats and northern long-eared bats. The CMOU and associated opinion also ensure that the process is compliant with other applicable laws and regulations (e.g., the National Environmental Policy Act, or NEPA). Ultimately, the programmatic intra-Service biological opinion allows the TFO to enter into programmatic and project-specific CMOUs with federal and non-federal entities, subject to the provisions of the conservation strategy and the section 7 consultation framework.

Since the CMOU process was established in 2011, numerous project proponents have entered into Indiana bat CMOUs (previously considered conservation memoranda of agreement, or CMOAs) with the TFO, and most have found that the process is beneficial to their interests while also providing tangible conservation benefits to the Indiana bat. Benefits provided to project proponents entering into a voluntary CMOU with the TFO may include:

1) Reducing project costs by providing a simplified and streamlined approach for ESA compliance;
2) Providing another option for ESA compliance when the timeframes for mist netting and seasonal tree clearing are impractical;
3) Reducing conflicts, improving relationships, and establishing new partnerships; and
4) Increasing predictability of project costs and timelines.

Benefits provided to the TFO and its mission include, but are not limited to:

1) Providing a uniform ESA compliance process for federal and non-federal project proponents;
2) Providing more consistent evaluations of adverse effects, especially indirect and cumulative effects;
3) Increasing funding for recovery opportunities for forest-dwelling bats in Kentucky;
4) Streamlining workloads for the TFO; and
5) Reducing conflicts, improving relationships, and establishing new partnerships.

Habitat Conservation Plan

Section 10(a)(1)(B) of the ESA establishes a process for permitting the taking of listed species that is incidental to otherwise lawful non-Federal activities (i.e., an incidental take permit or ITP). Habitat Conservation Plans (HCPs) are planning documents required as part of an application for an incidental take permit. They describe the anticipated effects of the proposed taking; how those impacts will be minimized, or mitigated; and how the HCP is to be funded. HCPs can apply to both listed and non-listed species, including those that are candidates or have been proposed for listing. However, the incidental take permit will only cover species listed as endangered or threatened under the ESA. Conserving species before they are in danger of extinction or are likely to become so can also provide early benefits and prevent the need for listing. Additional information about HCPs can be found on the Service's website at: http://www.fws.gov/endangered/what-we-do/hcp-overview.html.

CONSERVATION GOALS FOR FOREST-DWELLING BATS IN TENNESSEE

Through implementation of this Strategy, the TFO intends to guide the ESA-related project review process beyond a singular focus on compliance (ESA sections 7 and 9) to create a more holistic approach that incorporates the conservation and recovery of the species. The TFO will generally rely on the Indiana Bat Recovery Plan, this Strategy, and other literature and data available on Indiana and northern long-eared bats to support the conservation and recovery activities for these species. The Indiana Bat Recovery Plan focuses primary attention on protection and management of Priority 1 (P1) and Priority 2 (P2) hibernacula. This Strategy expands the focus to additional recovery actions, including, but not limited to:

1) Conserve and manage hibernacula and their winter populations (Recovery Action 1.1 in the Recovery Plan);

2) Reduce threats by purchasing from willing sellers or leasing at-risk privately owned P1 and P2[11] hibernacula to assure long-term protection (1.1.3);
3) Conserve and manage areas surrounding hibernacula (1.1.4);
4) Purchase from willing sellers or lease privately owned lands surrounding P1 and P2 hibernacula identified as having inadequate buffers (1.1.4.4)[12];
5) Restoration and creation of hibernacula (1.2);
6) Conserve and manage summer habitat to maximize survival and fecundity (2.0);
7) Monitor and manage known maternity colonies (2.4); and
8) Minimize adverse impacts to the Indiana bat and its habitat during review of Federal, state, county, municipal, and private activities under the ESA, National Environmental Policy Act, Fish and Wildlife Coordination Act, and Section 404 of the Clean Water Act (2.6).

Collectively, these recovery actions address Indiana bat conservation and recovery needs in both winter and summer habitat, providing the foundation that supports this Strategy. Conversely, recovery priorities have not been established for the northern long-eared bat, because the species has only recently been listed under the ESA. Once a recovery plan is developed for the northern long-eared bat, the TFO will modify this Strategy to better incorporate the recovery actions specific to this species. In the interim, the TFO finds, based on the available data, that the recovery actions and priorities for the Indiana bat identified in the Recovery Plan are generally applicable to all forest-dwelling bats that hibernate in caves or cave-like structures and will use those actions and priorities to conserve all forest-dwelling bats in Tennessee.

Based on the background information above and the available information on these species, their status, and conservation[13], the TFO developed a list of general mitigation goals for forest-dwelling bats in Tennessee. If achieved, these goals would (a) support the Strategy as discussed above, (b) significantly contribute to forest-dwelling bat conservation and recovery in Tennessee, and (c) act as a guide for determining the appropriateness of any proposed mitigation measures. The goals are listed below, and Tier 1 goals have priority and are encouraged over Tier 2 goals:

Tier 1

- Protect and manage known priority hibernacula.[14]
- Protect and manage existing forested habitat:
- Known swarming habitat; and/or known Summer 1 habitat.

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[11] The northern long-eared bat is known to hibernate in the P1 Indiana bat site in Tennessee and in three of the six P2 hibernacula.
[12] The Recovery Plan does not identify specific hibernacula as having inadequate buffers, nor does it provide guidance in evaluating the adequacy of existing buffers.
[13] The TFO relied heavily on the draft revised Indiana Bat Recovery Plan, Northern Long-eared Bat Interim Conference and Planning Guidance, state heritage information, and the knowledge of experienced forest-dwelling bat biologists to derive this list; but a number of other sources of information, which are on file in the TFO, were used.
[14] This includes Priority 1 (P1) and Priority 2 (P2) hibernacula for Indiana bats. Priority hibernacula are yet to be determined for northern long-eared bats.

- Protect and manage additional conservation lands for forest-dwelling bats, especially habitat that is contiguous with or within the proclamation/acquisition/preserve boundaries of existing public and private conservation land which contain known bat habitat.
- Restore and/or enhance winter habitat conditions in degraded caves and mines that exhibit the potential for successful restoration such as, but not limited to, those caves identified as having High Potential (HP) in the Recovery Plan.

Tier 2

- Protect and manage known lower priority hibernacula.[15]
- Protect and manage additional conservation lands that contain potential habitat for forest-dwelling bats.
- Fund priority research and monitoring that support the six strategies above and/or Tennessee's forest-dwelling bat populations.

Forest-Dwelling Bat Recovery and Mitigation Focus Areas

The TFO's analyses also resulted in the delineation of Recovery and Mitigation Focus Areas (RMFAs) for forest-dwelling bats within Tennessee (Table 1 and Appendix F). RMFAs were identified specifically to support the general conservation priorities identified in the previous section and represent areas that:

1) Contain one or more public or protected private lands that are known to support forest-dwelling bat populations;

2) Currently support populations of forest-dwelling bats that are expected to support long-term recovery and conservation efforts of these species;

3) Contain adequate suitable habitat to support recovery and conservation efforts;

4) Provide opportunities for future protection, restoration, enhancement, and/or creation of additional summer and/or winter bat habitat; and/or

5) In the TFO's estimation, contain sites with conditions that generally are expected to contribute to the persistence of forest-dwelling bat populations and habitat into the future.

The identified RMFAs can be categorized as Summer Habitat RMFAs, Swarming (Winter Habitat) RMFAs, or as both and are shown in Table 1. Collectively, priority sites within the

[15] This includes Priority 3 (P3) and Priority 4 (P4) hibernacula for Indiana bats. Priority hibernacula are yet to be determined for northern long-eared bats; however, based on existing data, we would consider all known northern long-eared bat hibernacula to be equivalent to P3 and P4 Indiana bat hibernacula in terms of the value of these hibernacula to the range-wide northern long-eared bat population. As a result, all northern long-eared bat hibernacula are in the Tier 2 category.

RMFAs are key landscapes for forest-dwelling bat conservation and recovery in Tennessee. Therefore, most forest-dwelling bat compensatory mitigation efforts will be undertaken or attempted at these sites. The TFO expects, however, that efforts may also be undertaken or attempted at locations outside of these sites in circumstances where the conservation and/or recovery benefits to forest-dwelling bats can be clearly identified and justified. The merits of mitigation efforts will be determined on a case-by-case basis in coordination with the TFO and will depend on a variety of factors including, but not necessarily limited to: (a) location of the site; (b) the type and quality of the conservation opportunities available; and (c) new information that justifies the conservation effort. When possible and appropriate, compensatory mitigation efforts will be directed to RMFAs that are proximate to impact sites or to the RMFA that best mitigates the specific impact(s). New RMFAs may be added if data becomes available (e.g., new location records) that would support their inclusion.

Mitigation Implementation for the Forest-Dwelling Bat Conservation Strategy

In April 2014, The Energy and Climate Change Task Force released a report to The Secretary of the Interior titled: A Strategy for Improving the Mitigation Policies and Practices of The Department of the Interior (Report).[16] This Report recognizes mitigation as an important tool for the U.S. Fish and Wildlife Service (as a Department of the Interior bureau) in the management of trust resources. As in the Report, this document uses the term "mitigation" to represent to the full mitigation hierarchy of avoidance, minimization and compensation. For the sake of clarity, the TFO will refer to the final step as compensatory mitigation.

In this Strategy and the associated implementation of its mitigation components, the TFO has integrated the guiding principles of the Report in a landscape approach that involves the following:

1) Identification of key landscape-scale attributes (see Recovery and Mitigation Focus Areas, p. 15-16);

2) Development of landscape-scale goals and strategies (see Conservation Goals, p. 13-15);

3) Development of an efficient and effective compensatory mitigation program for impacts that cannot be avoided or minimized (see Mitigation Implementation, p. 17-21); and

4) Monitoring and evaluation of progress and making adjustments, as necessary to ensure that mitigation is effective despite changing conditions (see Strategy Modification, p. 23).

Avoidance and Minimization of Adverse Effects

Based on the importance of hibernacula to the conservation of the two bat species currently covered by the Strategy, the TFO determined that compensatory mitigation measures are

[16] Clement, J.P. et al. 2014.

Table 1: Table of Recovery and Mitigation Focus Areas (RMFAs) & Available Habitat Types for Indiana Bat and Northern Long-eared Bat

RMFA Name and Description	Summer Habitat RMFA	Swarming RMFA
Northwest (Montgomery/Stewart Counties area) – the assemblage of caves including Bellamy, Coleman, Cooper Creek, Blue Spring, and Tobaccoport Saltpeter Caves; and maternity colonies on private lands Primary Conservation Ownership – Tennessee Wildlife Resources Agency and Tennessee Department of Environment and Conservation	yes	yes
Southwest (Perry/Hickman/McNairy Counties area) - caves in the vicinity of Blowing, Jaybird, and Alexander Caves; and maternity colonies on private lands Primary Conservation Ownership – private	yes	yes
South Central (Coffee/Franklin Counties area) – caves in the vicinity of Signature Cave and Trussell Caves; and maternity colonies on private lands Primary Conservation Ownership – Tennessee Wildlife Resources Agency, Department of Defense, and private	yes	yes
Central (White/Van Buren/Warren/Wilson Counties area) – caves in the vicinity of Rose, Virgin Falls, Camps Gulf, Great Expectations, Lost Creek, Foxhole, and Hubbards Caves; and maternity colonies on private lands Primary Conservation Ownership – Tennessee Wildlife Resources Agency and Tennessee Department of Environment and Conservation	yes	yes
North Central (Fentress and Pickett Counties area) - assemblages of caves including Wolf River, Cornstarch, East Fork Saltpeter, Xanadu, Yggdrasil, and Zarathustras Caves; and maternity colonies on private lands Primary Conservation Ownership – Tennessee Division of Forestry and private	yes	yes
Northeast (Anderson/Campbell/ Union Counties area) – caves in the vicinity of New Mammoth and Norris Dam Caves; and maternity colonies on private lands Primary Conservation Ownership – private	yes	yes
Southeast (Blount and Monroe Counties area) – the assemblage of caves including White Oak Blowhole, Kelley Ridge, and Bull Caves; and maternity colonies on public and private lands Primary Conservation Ownership – National Park Service and private	yes	yes

generally not appropriate for adverse effects to hibernacula. Complete avoidance of impacts to caves and other potential hibernacula is preferred, based on the following reasons:

1) P1 and P2 hibernacula are critical to Indiana bat recovery and conservation;

2) adverse effects to Indiana bat P1 and P2 hibernacula have the potential to cause significant, (and likely irreversible) negative effects on Indiana bat populations range-wide;

3) sufficient technology and funding does not currently exist to recreate the habitat conditions that exist in most hibernacula, especially Indiana bat P1 and P2 hibernacula;

4) current Indiana bat P3 and P4 hibernacula may have historically been P1 or P2 hibernacula, so allowing impacts to restorable P3 and P4 hibernacula could limit Indiana bat recovery; and

5) the importance of hibernacula to the recovery and conservation of northern long-eared bats has not yet been determined.

Compensatory mitigation measures are generally appropriate for most other adverse effects that typically occur in association with land management, agriculture, and development projects in Tennessee. Exceptions that require extra project-specific scrutiny include:

1) Individual projects resulting in the loss of more than 100 acres of forest-dwelling bat habitat.[17]

2) Projects occurring within 1 mile of P1 or P2 Indiana bat hibernacula.[18]

3) Projects occurring within ½ mile of P3 or P4 Indiana bat hibernacula[18] or any northern long-eared bat hibernacula.

4) Projects resulting in impacts to known Summer 1 or potential habitat.[19] All suitable habitats are considered known Summer 1 or potential habitat unless site-specific information demonstrates otherwise.

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[17] 100 acres represents approximately two percent of the area within the 1.5 mile radius circle used to define the known habitat area around a northern long-eared bat summer roost. Limiting impacts to this scale minimizes the negative impact of a given project to the species. Historically, the Indiana bat Mitigation Guidance restricted projects to 250 acres, which represented approximately two percent of the area within the 2.5 mile habitat radius around known Indiana bat roosts, but the TFO has chosen to use a more restrictive acreage associated with northern long-eared bat habitat to further minimize impacts to forest-dwelling bats.

[18] Separate analyses for projects within one-half or one mile of hibernacula will: (a) ensure that impacts to occupied swarming habitat are not underestimated (i.e., most bat activity occurs close to a hibernaculum entrance, so adverse effects are most likely to occur there); and (b) will help the Service better determine if direct impacts to known hibernacula are likely.

[19] June 1 through July 31 is the timeframe when non-volant pups are expected to occupy roost trees.

Compensatory Mitigation Measures

The following compensatory mitigation measures are applicable to the CMOU process and any of the other ESA compliance options for forest-dwelling bats. Their use in the ESA compliance process for actions that may adversely affect forest-dwelling bats requires close coordination with the TFO.

1) Protect known and previously unprotected Indiana and/or northern long-eared bat habitat with a demonstrated significance to either or both species.

   Purchase or otherwise acquire fee title interest in one or more land parcels that meet the intents and priorities of this Strategy.

   Secure perpetual conservation easements and associated land management agreements on one or more land parcels that meet the intents and priorities of this Strategy.

   Note: Property acquired or protected in these ways must adjoin or be within the preserve design or acquisition boundary of an existing conservation ownership. Easement or fee simple lands shall include all surface and mineral rights to the property and clear and unencumbered ownership of these rights. The applicant or project proponent shall pay for all fees and/or other costs associated with title work, recording, transferring, surveying, and/or acquiring of the easement or property. Compensatory mitigation measures that involve land acquisition or easement require donation of the property or easement to a conservation organization approved by the Service. A financial endowment must accompany the donation at a level sufficient for perpetual management of the preserved lands, and must include any other funds identified by the receiving conservation organization that may be necessary for that entity to accept title or easement (e.g., contaminants surveys, fencing, trash removal, etc.) to the property.

2) Contribute funding to Tennessee's Imperiled Bat Conservation Fund (IBCF) sufficient to achieve identified mitigation needs.

3) Other activities that will provide a tangible conservation benefit to forest-dwelling bats may be proposed to the TFO for a case-by-case evaluation.

Acceptability of Compensatory Mitigation Measures

Terms used in the following table are defined in the Explanation of Terms section (see page 3). Table 2 provides guidance on the applicability of compensatory mitigation measures to specific types of actions or impacts. Mitigating impacts to summer habitat with the protection of hibernation habitat may be appropriate but requires a project-specific determination in coordination with the TFO.

Determination of Compensatory Mitigation

Table 3 below assists project proponents in determining the amount of compensatory mitigation needed to offset the specific impacts of a given project. The project's impact(s) should be

Table 2. Table of Project Actions/Impact Types & Types of Appropriate Habitat Mitigation Measures.

<table>
<tr><th>ACTION / IMPACT TYPE</th><th colspan="3">HABITAT MITIGATION MEASURE</th></tr>
<tr><td></td><td>Protect Hibernacula</td><td>Protect Summer and/or Swarming Habitat</td><td>IBCF Contribution</td></tr>
<tr><td>Summer Habitat Loss</td><td rowspan="4">Contact the Service for review of the appropriateness of these measures.</td><td colspan="2" rowspan="8">These are appropriate minimization and mitigation measures for the impacts listed and any overlapping habitats.</td></tr>
<tr><td>Known Summer 1</td></tr>
<tr><td>Known Summer 2</td></tr>
<tr><td>Potential habitat</td></tr>
<tr><td>Swarming Habitat Loss</td><td colspan="2" rowspan="3"></td></tr>
<tr><td>Known Swarming 1</td></tr>
<tr><td>Known Swarming 2</td></tr>
</table>

Summer 1 = Indiana bat maternity and/or northern long-eared bat summer habitat
Summer 2 = Indiana bat non-maternity summer habitat
Swarming 1 = Indiana bat priority 1 & 2 hibernacula swarming areas
Swarming 2 = Indiana bat priority 3 & 4 and/or northern long-eared bat hibernacula swarming areas

divided into the action or impact types (by habitat type) and then quantified to yield the acreage of impact for each action. Information regarding known habitat types has been provided in Appendices B, C, and D. Appendices B and C reflect the individual known habitat uses for Indiana bats and northern long-eared bats, respectively. Appendix D combines the maps for both species maps showing all areas in Tennessee where habitat is known to be occupied by forest-dwelling bats.

Project proponents that need to mitigate for impacts to both species should apply the appropriate forest-dwelling bat habitat type reflected in Appendix D to determine the appropriate compensatory mitigation multipliers. In Appendix D, these habitat types are combined to reflect all known forest-dwelling bat habitat (Indiana and northern long-eared bats). For example, impacts to suitable habitat in known Indiana bat Swarming 1 habitat (i.e., the category for P1/P2 Indiana bat swarming habitat) that is also known northern long-eared bat Summer 1 habitat is considered Swarming 1 + Summer 1 habitat in the forest-dwelling bat habitat map. Projects with impacts to suitable habitat with the same known use for multiple species apply the highest

Table 3. Table for Calculation of Impact Acres & Mitigation Acres.[20]

ACTION / IMPACT TYPE	IMPACT ACRES	MULTIPLIER	MITIGATION ACRES
Habitat Loss			
Select Action/Impact Type based on location and current map of bat habitat in TN (See Appendices B, C, and D)		**See Appendix A to select appropriate multiplier based on location and timing of impact.**	
Mitigation Measures			
Purchase, protect, or conserve hibernacula	**Value determined on a case by case basis**		
Purchase, protect, or conserve summer or swarming habitat			
Contribute to IBCF	**$3,650/acre mitigation[21] (please contact the TFO to confirm current cost per acre)**		

known use multiplier. For example, impacts to suitable habitat in known Indiana bat Swarming 1 habitat and known northern long-eared bat Swarming 2 habitat will use the known Swarming 1 habitat multiplier since it is the higher-value multiplier and would better address the impacts to swarming habitat for both species of forest-dwelling bats. This is also reflected in the forest-dwelling bat habitat map. Additional examples are provided in Appendix E.

In some cases, a project proponent may need to mitigate only for impacts to the Indiana bat, where the proposed activities are "excepted" (i.e., exempted) from take prohibitions under a 4(d) rule for the northern long-eared bat. Consultation is still required for activities covered under a

[20] The Service determined that impacts to potential habitat during the occupied season require direct replacement of impacted acres due to the risk of take through injury or death. From that point, mitigation ratios were assigned based on the importance of the habitat type to the recovery of forest-dwelling bats and likelihood for direct versus indirect impacts. Direct impacts (occupied) require more mitigation than indirect impacts for each habitat type.

[21] This dollar amount is subject to change based on Tennessee's average value of farm real estate as published annually by the U.S. Department of Agriculture in the Land Values and Cash Rents document. The current value is based on the Land Values and Cash Rents, 2015 Summary released by the USDA in August 2015. (ISSN 1949-1867)

4(d) rule. In these situations, close coordination is needed with the TFO to ensure that the consultation requirements for both species are met.

For impacts where suitable habitat is sparse, each suitable roost tree should be counted, and the number of suitable roost trees should be multiplied by 0.09 acres/tree to determine the acreage of suitable habitat loss (i.e., the single tree method). For impacts involving the loss or alteration of blocks of forested habitat, the acreage of the impact is determined by identifying the perimeter and area of the impact with Global Positioning System or Geographic Information System technology (i.e., the habitat block method).

Once the acreage of habitat loss has been determined for each action using the single tree and/or habitat block method(s), the impact information should then be inserted into Table 3 and multiplied by the appropriate multiplier to yield the amount of mitigation required for each action or impact type. The TFO will assist project proponents in determining how the single tree and habitat block (acreage) methods for calculating impact acreages should be applied on their project(s) so that an accurate mitigation estimate can be determined. Note that the acreage calculation method will be the default method used except in exceptional situations such as those with discrete, widely-separated suitable bat roosting structures as observed in savannah-like habitats.

The value of a particular hibernaculum or maternity or swarming habitat proposed for protection depends on the circumstances applicable to that particular site; therefore, standard multipliers are not provided and must be determined on a case-by-case basis by the TFO. Factors that influence the value of a particular protection site include, but are not limited to: (1) the relative significance of the site to the conservation and recovery of forest-dwelling bats; (2) the quality of the habitat; (3) the level of protection afforded; (4) the degree of risk to the site without the proposed mitigation measure; and (4) the site's position within the landscape and proximity to RMFAs.

Inter-state Mitigation

Projects involving impacts to forest-dwelling bats in more than one state will need to work with the Service Field Office for each state to determine the appropriate mitigation measures. If a project proponent choses to mitigate with a voluntary contribution to an IBCF, the above-referenced cost per acre is only applicable to Tennessee. The average value of farm real estate in that state (see footnote 21) or another appropriate land price established by the state's FO will need to be determined and used for impacts in the adjacent state. The mitigation ratios set forth in Appendix A were established for use in Tennessee. Impacts in adjacent states may follow this table or have different ratios as determined appropriate by that state's FO. Alternatively, the project proponent could choose an option to contribute to an IBCF for impacts in one state while implementing the land conservation option in another state.

TANGIBLE CONSERVATION BENEFITS

The compensatory mitigation measures set forth in this Strategy are intended to go above and beyond one-to-one replacement. The net conservation benefits realized programmatically by this

process are expected to aid in the recovery of the covered species. The process was established so that conservation benefits can be attained in several ways, including the following:

1) Participation in the process is often based on assumed, rather than known, presence, and the discontinuous distribution of bats within Kentucky means that not all suitable habitats will contain the species. As a result, mitigation that contributes to conservation of the species is provided when no actual impacts have occurred or will occur.

2) The mitigation multipliers used in the process were established so that adverse effects to known habitat are mitigated at a minimum of 1:1 and are most often mitigated at a ratio greater than 1:1, reaching a ratio as high as 4.5:1. This helps ensure that known habitats used by the species are conserved at a rate that exceeds that at which it is lost or otherwise affected.

3) When adverse effects occur, they are typically to marginal or potential habitats because the process is structured to eliminate or discourage impacts to the most important habitats or to large amounts of habitat. Conversely, the compensation that is provided for these impacts is directed to clarify measures for the protection and/or conservation of high quality bat habitat, especially occupied habitat and existing forests that contain the requisite habitat needs of species and contribute to landscape conservation and forest connectivity.

4) Research, monitoring, and other activities that would support the conservation and recovery of the species are only funded after all habitat compensation requirements are considered.

The process the TFO used in association with this Strategy's precursor, the January 2012 "Interim Indiana Bat Mitigation Guidance for the State of Tennessee" (2012 Guidance), has yielded conservation benefits to the Indiana bat. These benefits result primarily from implementation of Tennessee's Indiana Bat Conservation Fund, which is being replaced by Tennessee's Imperiled Bat Conservation Fund. This funding source has supported bat research, including the purchase of a radio telemetry receiver and transmitters and the funding of Tennessee's Indiana bat spring tracking project. Because our knowledge of habitats used by Indiana bats (especially during summer) has been rather limited, this research is providing valuable information.

Since the approach to be taken by the TFO under this Strategy will be the same as that described in the 2012 Guidance, we expect that the compensation from this Strategy will result in similar benefits to Indiana and northern long-eared bats, promoting the recovery and conservation of both species. Building of our knowledge base for these species will continue, and we expect to realize greater opportunity for conservation of physical habitat features (e.g., protection of hibernacula and installation of artificial summer roosting structures).

SUMMARY

This Strategy has been developed by the TFO to provide direction to project proponents whose actions have the potential to adversely affect imperiled and/or federally-listed forest-dwelling bats and to enhance the conservation and recovery of imperiled forest-dwelling bat populations in Tennessee. This will be accomplished by the implementation of the processes and mitigation measures set forth in this document.

These measures were developed to support the recovery actions identified in the draft, revised recovery plan for the Indiana bat and address both summer and winter habitat. The TFO has identified those impacts to forest-dwelling bats where avoidance is most appropriate as well as impacts that will need individual evaluations to determine whether other mitigation measures are appropriate (e.g., impacts to hibernacula). The mitigation measures prescribed in this conservation strategy vary by the type of habitat impacted, its relative importance to the conservation and recovery of forest-dwelling bats, and the likelihood of take. Recovery and Mitigation Focus Areas (RMFAs) have been identified for application of the mitigation measures that ensure an appropriate distribution relative to both where impacts occur and where the measures are most likely to benefit forest-dwelling bat species.

The protection of hibernacula, swarming and summer/maternity areas is critical to ensuring the conservation and recovery of forest-dwelling bats. This conservation strategy establishes a process by which impacts that may directly or indirectly result in adverse effects to forest-dwelling bats are offset to help ensure the long-term survival of the species. The implementation of this Strategy and its mitigation measures can help achieve the conservation and recovery of forest-dwelling bats.

STRATEGY MODIFICATION

This Strategy is subject to modification as new information relative to forest-dwelling bats, their conservation statuses, and their conservation and recovery becomes available. Modifications may be needed if additional bat species, such as the little brown bat (*Myotis lucifugus*) and/or tri-color bat (*Perimyotis subflavus*) are proposed and/or become listed under the ESA. This strategy is closely linked to the December 17, 2015 final Biological Opinion on the Tennessee Field Office's Participation in Conservation Memoranda of Understanding for the Indiana Bat and/or Northern long-eared Bat.

Additionally, as part of the terms and conditions of the associated biological opinion, the TFO will monitor and evaluate the compensatory mitigation achieved through CMOUs implementing this Strategy to ensure that the intended outcomes are achieved. Should the results of these monitoring and evaluation efforts reveal that the mitigation objectives are not being achieved or that the outcome of the mitigation fail to produce the intended benefits to forest-dwelling bats, then the TFO will modify the Strategy to address the identified shortcomings and/or failures. This Strategy replaces the January 2012 "Interim Indiana Bat Mitigation Guidance for the State of Tennessee".

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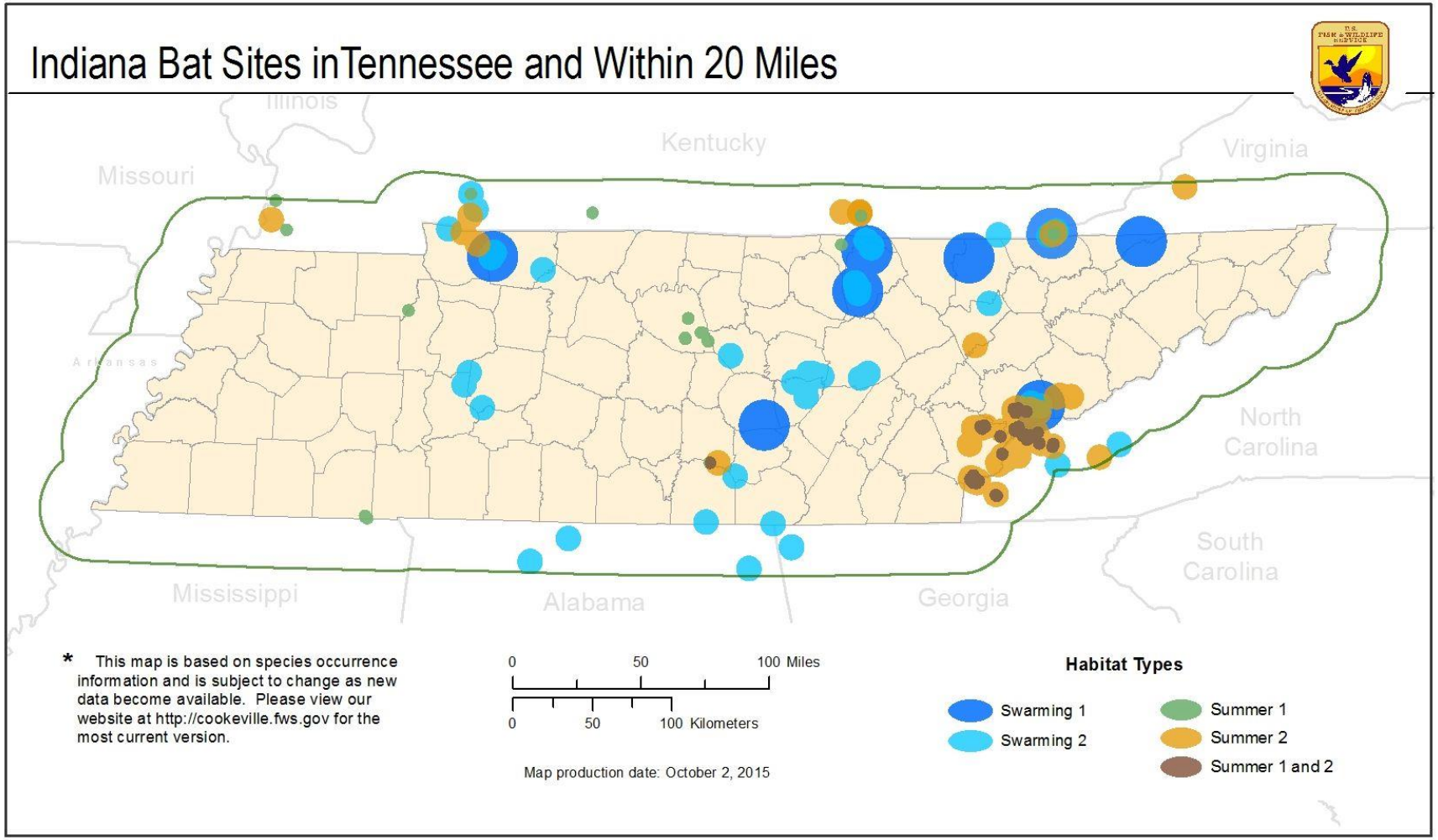
APPENDIX A: Mitigation Multipliers by Habitat Type and Season.

	Nov.15 - Mar.31 All habitats unoccupied	**April 1 - Aug. 15** Swarming unoccupied*; potential & summer occupied**	**Aug.16 - Oct.14** Swarming & potential occupied; summer unoccupied	**Oct.15 - Nov.14** Swarming occupied; potential & summer unoccupied
Summer 1 + Swarming 1	2.5	3.0 (4.0+)	3.5	3.5
Summer 1 + Swarming 2	2.0	2.5 (3.5+)	3.0	3.0
Summer 2 + Swarming 1	2.0	2.5 (3.5+)	3.0	3.0
Summer 2 + Swarming 2	1.5	2.0 (3.0+)	2.5	2.5
Swarming 1	1.5	2.0 (3.0+)	2.5	2.5
Swarming 2	1.5	1.5 (2.5+)	2.0	2.0
Summer 1	1.5	2.0+	1.5	1.5
Summer 2	1.0	1.5+	1.0	1.0
Potential	1.0	1.0+	1.0	1.0

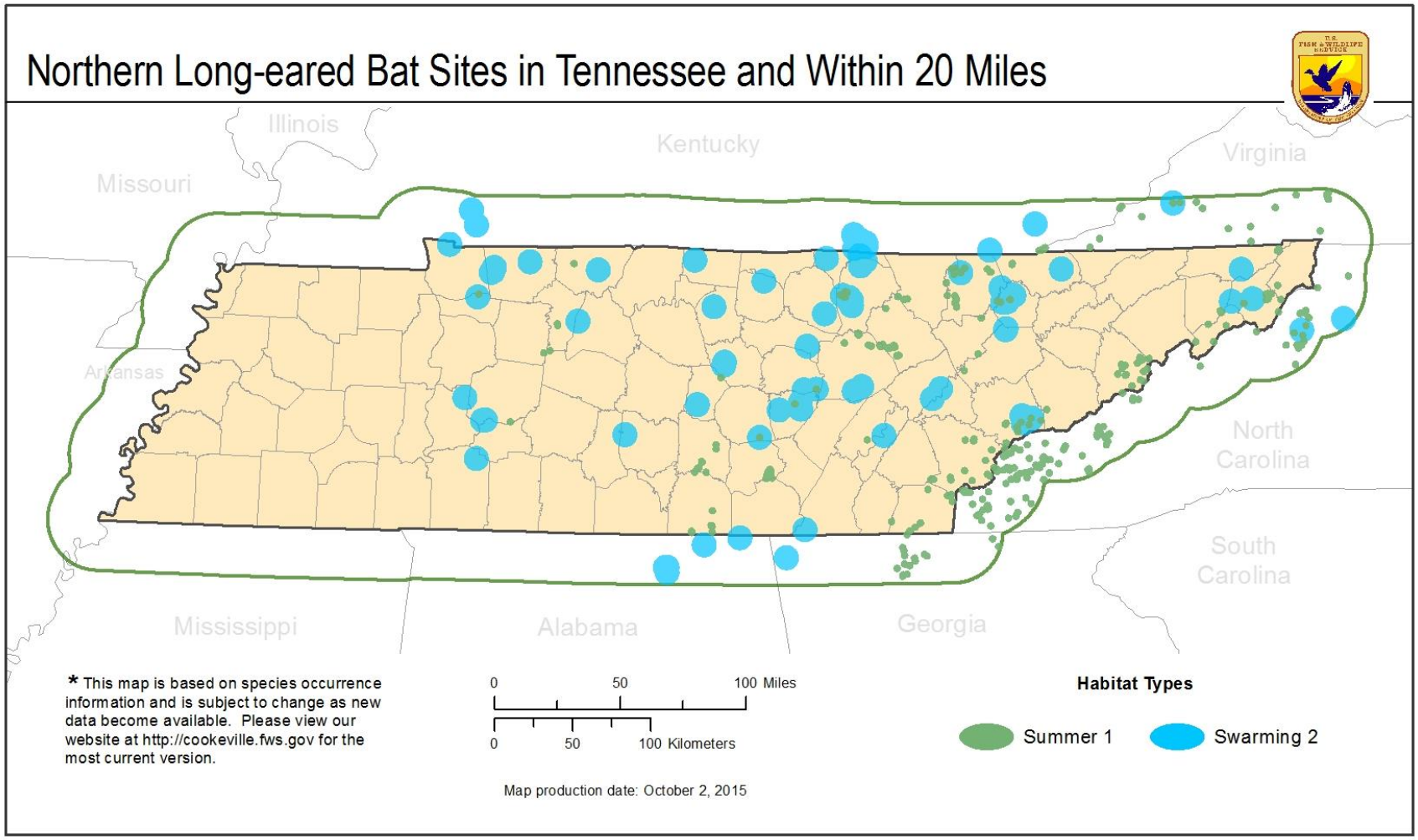
Summer 1 = Indiana bat maternity and/or northern long-eared bat summer habitat
Summer 2 = Indiana bat non-maternity summer habitat
Swarming 1 = Indiana bat priority 1 & 2 hibernacula swarming areas
Swarming 2 = Indiana bat priority 3 & 4 and/or northern long-eared bat hibernacula swarming areas

*Spring emergence activities occur near the hibernacula entrances during early spring, females emerging in mid-March to mid-April and males emerging mid-April to early May. Swarming 1 habitat within one mile of Indiana bat P1 and P2 hibernacula entrances and Swarming 2 habitat within ½ mile of Indiana bat P3 and P4 hibernacula entrances or any northern long-eared bat hibernacula entrances will be considered occupied between April 1 and May 14. *Projects within these areas require project-specific evaluation by the Service and may require additional mitigation.* See page 17 for more information.
** Projects impacting Summer 1 or potential habitat between June 1 and July 31 may affect non-volant juvenile bats and require project-specific evaluation by the Service with likely increases in mitigation amounts. See page 17 for more information.

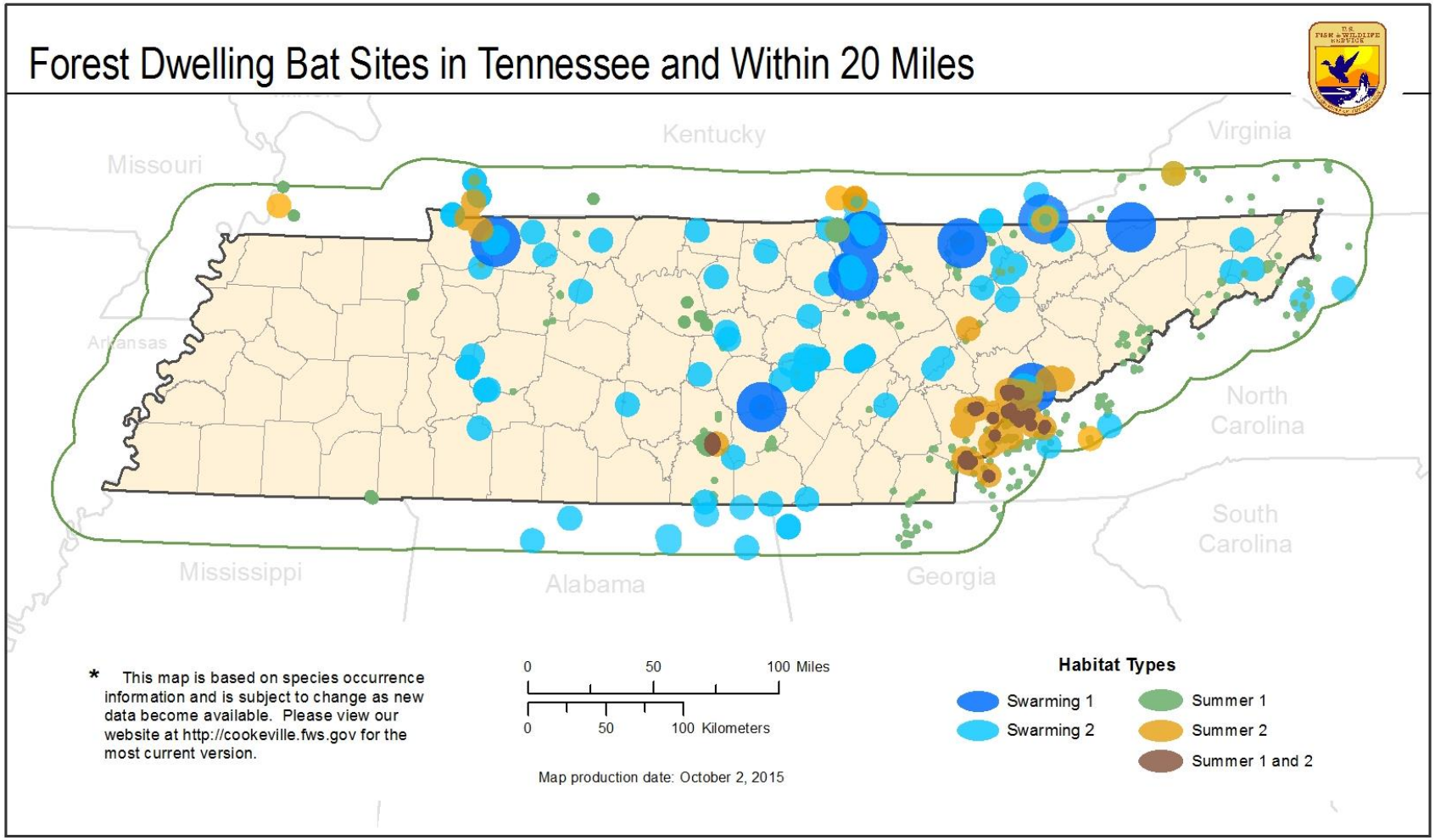
APPENDIX B: Map of Indiana Bat Sites



APPENDIX C: Map of Northern Long-eared Bat Sites



APPENDIX D: Map of Forest-Dwelling Bat Sites



APPENDIX E: Example Impacts with IBCF Contribution Worksheet

These examples are intended to provide insight and clarity on the evaluation of habitat types, timing and the calculation of compensatory mitigation ratios (found in Appendix B) for projects where the proposed mitigation is a voluntary contribution to the Imperiled Bat Conservation Fund (IBCF). These examples are not intended to cover every possible scenario, and project proponents are encouraged to contact the TFO at any time to discuss the specifics of their project.

Example A

Project Proponent A has a project that will result in the loss of 1 acre of suitable habitat. This acre occurs within Indiana bat Summer 1 habitat and northern long-eared Summer 1 habitat. The impact to forest-dwelling bat habitat would be 1 acre of impact to Summer 1 habitat. Habitat removal would occur between November 15 and March 31.

	Impact (acres)	**Mitigation Ratio**	**Current Rate / Acre**	**IBCF Contribution Amount**
Forest-Dwelling Bat Habitat Type				
Summer 1	1.0	1.5	$3,650	$5,475
TOTAL				**$5,475**

Example B

Project Proponent B has a project that will result in the loss of 5 acres of suitable habitat. This project occurs within Indiana bat Swarming 1 habitat and northern long-eared bat Swarming 2 habitat. Because Swarming 1 is the higher-value multiplier, the impact to forest-dwelling bat habitat would be 5 acres of impact to Swarming habitat. Habitat removal would occur between April 1 and August 15.

	Impact (acres)	**Mitigation Ratio**	**Current Rate / Acre**	**IBCF Contribution Amount**
Forest-Dwelling Bat Habitat Type				
Swarming 1	5	2.0	$3,650	$36,500
TOTAL				**$36,500**

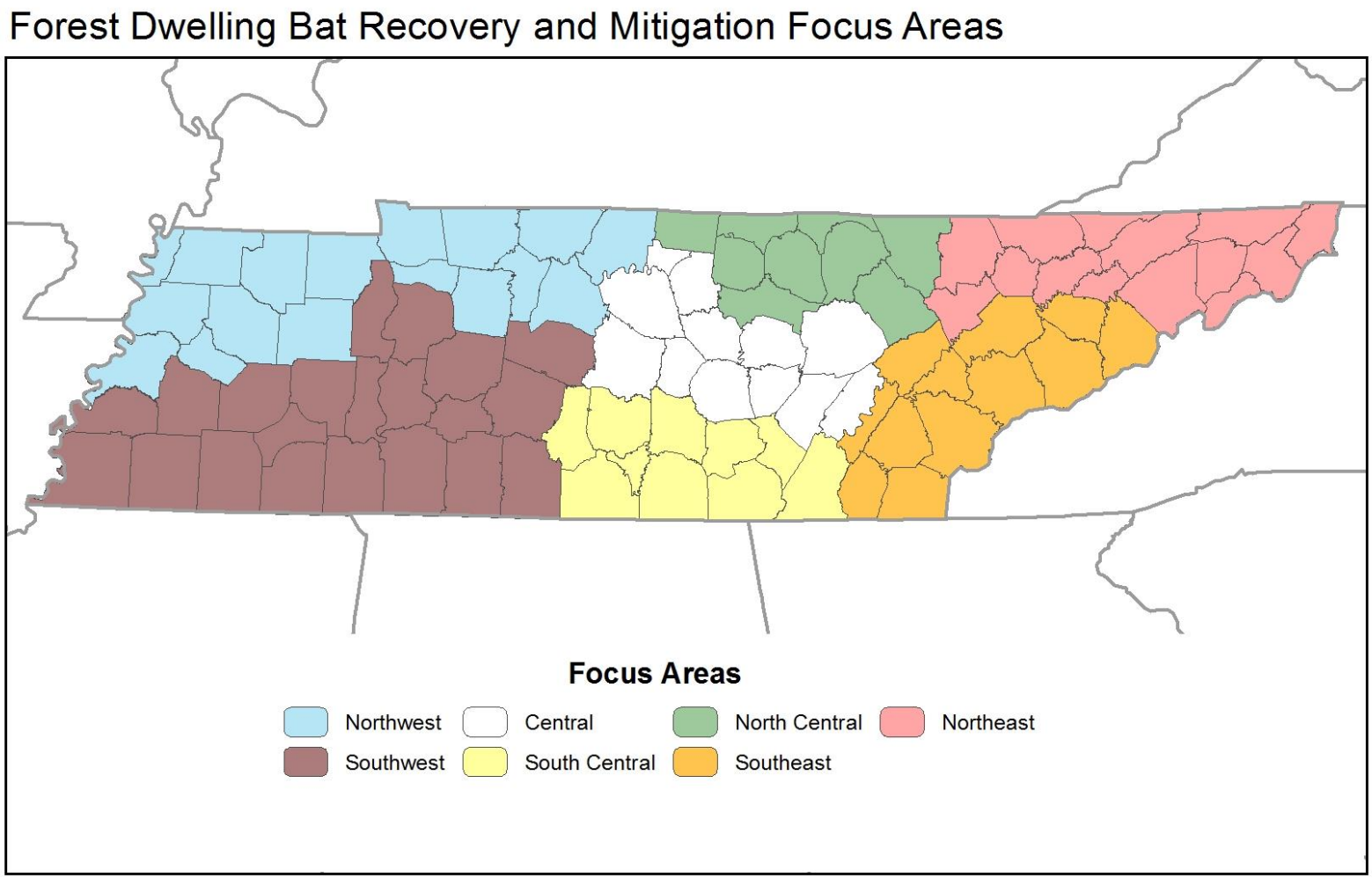
Example C

Project proponent C has a project that will result in the loss of 20 acres of suitable habitat. All 20 acres occur within northern long-eared bat Summer 1 habitat. Ten of these acres are also within Indiana bat Swarming 1 habitat. To calculate the IBCF mitigation amount, the impacts to forest-dwelling bats would include 10 acres of Summer 1 habitat loss and 10 acres of overlapping Summer 1 + Swarming 1 habitat. Habitat removal would occur between August 16 and October 14.

	Impact (acres)	**Mitigation Ratio**	**Current Rate / Acre**	**IBCF Contribution Amount**
Forest-Dwelling Bat Habitat Type				
Summer 1	10	1.5	$3,650	$54,750
Summer 1 + Swarming 1	10	3.5	$3,650	$127,750
TOTAL				**$182,500**

Example D

Project Proponent D has a project that will result in the loss of 10 acres of suitable habitat. This project occurs within Indiana bat Swarming 1 habitat and northern long-eared bat Swarming 2 habitat. So the impact to forest-dwelling bat habitat would be 10 acres of impact to Swarming 1 habitat. Five acres of habitat removal would occur between April 1 and August 15, and five acres would occur between August 16 and October 14.

	Impact (acres)	**Mitigation Ratio**	**Current Rate/ Acre**	**IBCF Contribution Amount**
Forest-Dwelling Bat Habitat Type				
Swarming 1	5	2.0	$3,650	$36,500
Swarming 1	5	2.5	$3,650	$45,625
TOTAL				**$82,125**

APPENDIX F: Map of Recovery and Mitigation Focus Areas for Forest-dwelling Bats in Tennessee