

Programmatic Biological Assessment

Effects on the Indiana Bat Associated with Transportation Projects in Kentucky

Prepared by:



**KENTUCKY TRANSPORTATION CABINET
DIVISION OF ENVIRONMENTAL ANALYSIS**

For submittal to:



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EXECUTIVE SUMMARY

The Kentucky Transportation Cabinet (KYTC) is proposing to address Endangered Species Act (ESA) Section 7 consultation issues related to the Indiana bat (*Myotis sodalis*) for all road construction projects by using a two-tiered programmatic approach. The first tier involves the use of a Habitat Assessment Manual (HAM) developed by KYTC in 2006, and revised in 2012, to determine if habitat for Indiana bats is present within a proposed project site. If habitat is determined to not be present (as determined by the process contained within the HAM) then the project will have “no effect” on Indiana bats. Conversely, if habitat is present, then the project will be evaluated as part of the second tier of the programmatic approach. The second tier involves the analysis of potential impacts of proposed projects on Indiana bats and their habitats and outlines appropriate methods for KYTC to achieve ESA compliance.

It is KYTC’s intent to enter into a programmatic Conservation Memorandum of Agreement (CMOA) with the U.S. Fish and Wildlife Service’s Kentucky Field Office (USFWS-KFO) to account for adverse effects to Indiana bats that may occur as a result of the proposed project(s). The programmatic CMOA would, thus, provide KYTC with a stream-lined option for addressing situations during the second tier of the programmatic approach where it is likely or probable that unavoidable adverse effects to Indiana bats could occur and the other options that are typically available to attain compliance are impractical (e.g. project schedule doesn’t allow for presence/absence surveys, etc.). This two-tiered process is similar to the process that was implemented in 2006 through a previous programmatic Biological Opinion which expired in June 2011.

DESCRIPTION OF THE PROPOSED ACTION and ACTION AREA

KYTC and FHWA define the proposed action as the implementation and adherence to a two-tiered, programmatic project review process in order to address ESA Section 7 consultation issues related to the Indiana bat for construction and maintenance of highway/road projects in Kentucky or that terminate no more than 20 miles beyond the Kentucky border. In addition, KYTC requests to enter into a programmatic CMOA with the USFWS-KFO in order to account for adverse effects to Indiana bats that may occur as a result of highway/road projects within the aforementioned action area.

Background

KYTC maintains and constructs a wide variety of transportation infrastructure projects within 120 counties in Kentucky. Transportation projects are identified and scheduled in a master plan occurring in six-year increments. Project priorities and time schedules within the six-year plan vary greatly depending on several factors (i.e. purpose and need, safety concerns, funding, etc.). Trends in the types of projects planned from year to year are difficult to forecast due to the variance in available funding, among other limiting factors. Attempting to account for potential adverse effects to federally listed species also is increasingly difficult since the project schedules don’t always conveniently coincide with the rigid survey schedules needed to determine the presence or absence of Indiana bats so that a project can be approved in the environmental review process for construction. In order to address this difficulty, KYTC developed an Indiana bat HAM in 2006 (i.e., tier one of the programmatic process that

was implemented in 2006 through a previous programmatic Biological Opinion) that has been used throughout Kentucky. The 2006 version of the HAM allowed for several different decisions to be reached. For example, a project could have “No Effect” on Indiana bats, or the conclusion could be that project impacts were “Not likely to Adversely Affect” Indiana bats, or a KYTC Subject Matter Expert (SME) could be consulted to determine if impacts to bats were likely and if a Biological Assessment would be required to identify and analyze those impacts. The 2012 revision of the HAM for Indiana bats (attached as Appendix A) is more concise and results in either a “No Effect” or “Contact an SME” conclusion. The finding of “Not Likely to Adversely Affect” has been removed from the HAM process.

The aforementioned 2006 programmatic Biological Opinion expired in June 2011, and projects considered eligible for incidental take under the 2006 programmatic process were limited to only those projects that were considered “minor” and impacted no more than 25 acres of habitat per project. Furthermore, the 2006 process did not allow for incidental take of projects that occurred either entirely or partially within known maternity habitat areas without project specific consultation with the USFWS-KFO. KYTC now proposes that all transportation improvement projects, regardless of scope, scale or funding source (federal or non-federal), be considered eligible for incidental take under a programmatic CMOA. In addition, bi-state projects (those that cross the border of Kentucky but are within 20 miles of the border), and projects occurring in all types of Indiana bat habitat are proposed to be applicable under the programmatic CMOA.

Project Development Phases

Various steps are involved in the development of transportation projects, and most projects are conducted in phases that are tied directly to funding authorization. The phases in project development are: Planning, Preliminary Design and Environmental, Detailed Design (Right-of-Way (ROW) and Utilities), and Construction. These project development phases do not apply to every KYTC project. For example, a Planning phase is typically reserved for those projects where a large number of alternatives are assessed to fulfill a transportation need. The ROW phase is only programmed when additional land acquisition or easements will be required. Utilities phase is only necessary when relocation of existing utilities is required for construction. A brief description of each phase follows:

Planning Phase

The planning phase is comprised of gathering data, analysis and public involvement. Corridors for possible highway improvements, either along existing or on new alignments are analyzed for feasibility, public acceptability, and potential to meet project purpose and need, and environmental impacts. Review and compilation of existing data (crash data, traffic data, etc.) is undertaken with some field verification. No potential impacts to Indiana bats occur during this phase, because there is no alteration or removal of suitable Indiana bat habitat or no activity undertaken that would reasonably be expected to result in adverse effects on Indiana bats.

Preliminary Design and Environmental Phase

During the preliminary design phase of a project, potential solutions to address transportation needs are better defined and more thoroughly examined for feasibility. The design team creates alternatives for study and analysis. Environmental investigations, including Aquatic and Terrestrial species studies, are also conducted during this phase. Some of these activities, such as mist netting, cave exploration, etc. could affect Indiana bats but these activities are only conducted by a qualified biologist in possession of a Kentucky Department of Fish and Wildlife Resources (KDFWR) and USFWS Scientific collection permit. The outcome of this phase is the selection of the location and type of transportation improvement that will be implemented. No impacts to Indiana bat occur during the design phase, because there is no alteration or removal of suitable Indiana bat habitat or no activity undertaken that would reasonably be expected to result in adverse effects on Indiana bats. In addition, the adverse effects that could result from species studies and surveys would be covered by the collection permits issued to the people conducting the studies and surveys, and those adverse effects, and any associated take of Indiana bats, would be covered through the USFWS' ESA section 10(a)(1)(A) permitting process.

Detailed Design Phase

After establishing the preliminary alignment and grade of the proposed improvement, a more detailed level of design is undertaken. Two activities that result from the more detailed design are – (1) right of way acquisition and (2) initiation of utility relocations. Geotechnical investigations are sometimes conducted; ROW parcels adjacent to the project alignment are analyzed; utility impacts are further analyzed; line and grade are adjusted to better meet conditions; and drainage structures are designed. As plans are defined in greater detail, the land acquisition needs for the project are determined. Once these needs are defined, a negotiation with property owners and acquisition of land occurs.

During this phase, there are very few activities that could potentially impact Indiana bats. Geotechnical investigations may require the removal of some trees to access drilling areas and conduct drilling operations. This type of activity is typically minimized to prevent excessive habitat disturbance, primarily because KYTC often does not yet own or have an easement on the area where the activity is undertaken. Geotechnical investigations may also occur in the vicinity of Indiana bat winter habitat and that activity may involve increased human and equipment traffic around the entrance of a cave or mine as well as the potential to drill into an underground cavern or mine. However, the geotechnical contractors are well aware of the mines and caves in the area before they initiate drilling and take precautions to prevent such an event from happening. Nonetheless, these actions have the potential to adversely impact Indiana bats through the removal of small tracts of roosting habitat and/or the destruction or alteration of wintering habitat.

Construction Phase

New highway construction requires the clearing and grubbing of the area that will lie beneath the footprint of the new road and any areas within ROW that will need to be cleared for associated purposes. Improvements along existing alignments may require similar disturbances, and typically result in a lesser degree of impact. If trees are present, this removal of trees may have adverse effects on

Indiana bats through the removal of roosting and foraging habitat. KYTC defines an “existing alignment” as one where more than 50 percent of the total disturbance area associated with the project is within 500 feet of the edge of pavement of the road that is being improved. Projects will be considered “new alignment” if less than 50 percent of the total disturbance area associated with the project is within 500 feet of the edge of pavement of the road that is being improved. An analysis supporting the definition of “new” versus “existing” alignment is provided in the “Effects Analysis of the Proposed Action” section later in the BA.

In order to construct a highway improvement project in some areas of Kentucky, blasting may occur to remove large amounts of rock material. These blasting activities can cause adverse effects to Indiana bats if the blasting occurs in an area of known Indiana bat winter habitat. Blasting has the potential to disrupt bedrock and alter airflow and temperature regimes within a cave or mine system being used by Indiana bats.

Other KYTC Actions

Not all transportation activities follow this phased process of project development. Small-scale improvement projects do not typically involve a planning phase and may not include a detailed design phase. Maintenance work and emergency repairs are both examples of projects that fit into the “other actions” category. Some examples of maintenance activities common to KYTC are flattening slopes along roadways to allow for safer travel, installation of guardrails, lengthening of an existing culvert, etc.

Maintenance projects by nature are carried out along existing alignments and typically result in a lesser degree of habitat impacts. These projects typically result in less than two acres of habitat alteration, removal, or destruction in areas that have either been cleared, maintained, and/or disturbed previously and is normally within 500 feet of the paved road surface.

One maintenance activity frequently conducted is tree-trimming. Tree-trimming is defined as removal of limbs and does not include the removal or cutting of a tree trunk that results in a stump. This activity is more or less the trimming of limbs that hang over or near roadways that impede visibility or result in a hazard for motorists if those limbs were to fall.

In addition to maintenance work, KYTC also occasionally has emergency actions that require immediate attention and repair. These include, but are not limited to, bridge collapse or damage, rock fall or slides that endanger a roadway, etc. These activities often occur in concert with a federally issued state of emergency (usually after a large storm, ice storm, tornado, or snowfall) and have the potential to have adverse effects on Indiana bats, depending on project specific scenarios.

Section 7 Consultation Two-Tiered Programmatic Approach

The proposed two-tiered approach is intended to be a fluid process allowing KYTC maximum flexibility, through a programmatic process, to achieve ESA compliance relative to the Indiana bat. This process provides KYTC a stream-lined mechanism to identify those projects where a “no effect” determination for Indiana bats is anticipated and improved predictability when Indiana bat effects determinations for

projects are either “May Affect, Not Likely to Adversely Affect” or “May Affect, Likely to Adversely Affect”. The programmatic process also identifies several ESA compliance options that will assist KYTC in making species effects determinations and provides guidance on appropriate Indiana bat minimization and mitigation measures. A component of this tiered process is the development of a programmatic CMOA. The programmatic CMOA would, thus, provide KYTC with a stream-lined option for addressing situations during the second tier of the programmatic approach where it is likely or probable that unavoidable adverse effects to Indiana bats could occur and the other options that are typically available to attain ESA compliance are impractical (e.g. project schedule doesn’t allow for presence/absence surveys, etc.).

A summary of the tiered process is outlined below:

Tier 1

KYTC personnel that have received training on the implementation of the HAM may conduct project reviews to determine if potential Indiana bat summer and/or winter habitat is present and would be affected by a specific project.

- 1) “No Effect” reviews per the HAM may apply to any type or level of proposed project regardless of whether the project is located in known or potential Indiana bat habitat areas.
- 2) A “No Effect” determination is appropriate when the HAM review of a project results in a finding that NO trees with a diameter at breast height (dbh) five inches or greater would be impacted by the project and no winter habitat is present on-site or may be affected. No further consultation with USFWS-KFO is required when this type of effects determination is reached.
- 3) A “No Effect” determination is NOT necessarily appropriate, pending a KYTC biologist (Subject Matter Expert or SME) review, when the HAM review of a project results in a finding that tree(s) with a dbh of five inches or greater would be impacted by the project and/or winter habitat is present on-site or may be affected (see step 4 below).
- 4) A “No Effect” determination is appropriate for a project that is located entirely within potential Indiana bat habitat (i.e., the white or “potential” habitat areas shown on the known Indiana bat habitat in Kentucky map in Appendix B) where the removal and/or alteration of tree(s) with a dbh of five inches or greater is reviewed by a KYTC SME who determines that the tree(s) do not exhibit the characteristics of suitable Indiana bat summer roosting habitat, as defined in the HAM, and no winter habitat would be affected.
- 5) If known or potential Indiana bat habitat (winter and/or summer) is identified for a proposed project, then a KYTC SME will be contacted to provide assistance on how to address potential impacts via the Tier 2 process. (See Tier 2)

Tier 2

If the KYTC SME determines that a specific road project does not meet the criteria for a “no effect” finding, further analysis of the project will be pursued to determine the appropriate ESA compliance option pursuant to the Tier 2 programmatic process.

- 1) KYTC may review the project to determine if it meets the criteria for certain categories of projects that require implementation of standard minimization measures that would result in a “May Affect, Not Likely to Adversely Affect” determination. (An analysis supporting this determination for these categories of projects is provided in the “Effects Analysis of the Proposed Action” and “Projects Categorized as Not Likely to Adversely Affect” sections later in the BA, which proposes that the USFWS-KFO provide a programmatic concurrence on these categories of projects.)
- 2) A species survey and Biological Assessment, and/or other minimization measures may be conducted and prepared for USFWS-KFO review and concurrence. Presence/absence surveys for projects that lie entirely or partially within areas of known Indiana bat habitat may not be useful in determining effects to the species. FHWA and/or KYTC may wish to consult with the Service prior to conducting such surveys, to assess the importance that such survey results may have in making effect determinations.
- 3) If KYTC determines that a species survey or other minimization measures are impractical or the project is entirely or partially within areas of known Indiana bat habitat, then further analysis of the project will be pursued through the programmatic CMOA process.
- 4) KYTC may account for adverse impacts to Indiana bats by utilizing the incidental take provided via a programmatic CMOA issued by the USFWS-KFO. All KYTC projects in accordance with this BA, regardless of funding source or location within known or potential Indiana bat habitat, would be eligible under the programmatic CMOA.
- 5) Any project(s) that do not meet the descriptions provided in this BA will not be considered for authorization of incidental take under the programmatic CMOA and may need to undergo separate analysis in coordination with USFWS-KFO to ensure that ESA compliance is achieved.
- 6) Projects determined to be ineligible under the programmatic CMOA and are likely to result in adverse effects to the Indiana bat may achieve ESA compliance via (a) modification of the project to avoid adverse effects to Indiana bats so that a “No Effect” determination can be made, (b) modification of the project so that a “May Affect, Not Likely To Adversely Affect” determination can be made, (c) the development of a project specific CMOA, (d) an independent formal consultation and Biological Opinion, or (e) an incidental take permit (ITP) associated with a USFWS-approved Habitat Conservation Plan pursuant to section 10(a)(1)(B) of the ESA.

STATUS OF THE SPECIES

The 2012 revised HAM for the Indiana bat (attached as Appendix A) goes into great detail on the current status of the Indiana bat and its protected critical habitat. Additional information on the species and its status is available from many public sources, including the draft interim recovery plan for the species. Please refer to Appendix A and these other sources of information related to the species.

EFFECTS ANALYSIS OF THE PROPOSED ACTION

There are several effects the proposed action could potentially have on Indiana bats. Those effects are discussed below and broken down into phases of project development and other KYTC actions.

Planning Phase

It is KYTC's goal during this phase to consider all aspects of a potential road project including the environmental effects. Activities associated with the planning phase of project development take place off-site and consist entirely of data gathering and do not require any environmental disturbance. Therefore, no direct or indirect effects to Indiana bats would result during this phase. While no adverse effects to Indiana bats are assumed to occur during this phase, there are many positive effects to the Indiana bat that could result from early coordination and planning. For example, early planning would allow for the identification of Indiana bat summer and winter habitat that could be avoided during road construction, or could identify areas where potential cumulative effects may occur due to the urbanization that is typically associated with new roads and highway access. The KYTC GIS server will make available the most up-to-date Indiana bat habitat map (Appendix B) to the KYTC Division of Planning to aid them in the planning phase.

Preliminary Design and Environmental Phase

Design activities mostly occur off-site and do not pose any direct or indirect effects to Indiana bats. Occasionally, survey crews will be required to survey a site prior to the design alternatives being created; however, this activity does not involve the alteration or modification of Indiana bat summer or winter habitat.

Environmental investigations conducted during this phase, such as mist netting, may have direct effects on Indiana bats in the form of harm and/or mortality when capturing or handling the species. However, all survey activities are conducted by an individual in possession of a scientific collection permit from the Kentucky Department of Fish and Wildlife Resources (KDFWR) and USFWS, in order to minimize those effects. There are many positive outcomes of the environmental phase. For example, biologists assessing a transportation project may identify a previously unknown cave or abandoned mine with potential to harbor Indiana bats. The capture of an Indiana bat during the summer mist-net season may lead to the location of a new maternity roost tree through radio telemetry efforts. By KYTC identifying habitats that are actively being utilized by Indiana bats (caves, mines, roost trees), the USFWS-KFO can make better and more informed management decisions regarding Indiana bats and threats to their existence.

Detailed Design Phase

Right-Of-Way Investigation

Geo-technical investigations during this phase are the only activities identified that may require the removal and/or alteration of Indiana bat summer habitat. Geotechnical investigations may also occur in

the vicinity of Indiana bat winter habitat and that activity may involve increased human and equipment traffic around the entrance of a cave or mine as well as the potential to drill into an underground cavern or mine. The direct effects of the Detailed Design Phase's ROW investigations on Indiana bats for each project will be the same and are as follows:

1. Harm of Indiana bats due to alteration, removal, and/or destruction of foraging habitat
2. Harm of Indiana bats due to removal of summer roosting trees
3. Harm and/or mortality of roosting Indiana bats (especially non-volant young) due to the removal of summer roosting trees during the time period when they are occupied
4. Harm of Indiana bats due to alteration of travel corridor habitat
5. Harm of Indiana bats due to the destruction of winter habitat

The indirect effects of the Detailed Design Phase's ROW investigations on the Indiana bat for each project will be the same and are as follows:

1. Harassment of nearby Indiana bats utilizing either summer or winter habitat due to disturbances and noise generated by human presence and/or the operation of equipment necessary for geo-tech investigations
2. Harm of Indiana bats due to predation or increased mortality as a result of disturbing normal Indiana bat behavioral patterns
3. Harm of Indiana bats due to loss of trees that could potentially serve as either maternity roosting habitat or summer roosting habitat during a time when the habitat is considered unoccupied
4. Harm or Harassment of Indiana bats due to alteration of winter habitat

It should be noted that tree removal or habitat alteration during this stage of the Detailed Design Phase is typically minimal. Normally, this phase is dedicated solely to the goal of identifying landowners affected by the proposed project and compensating them for their losses. This phase also involves the process of defining in greater detail the potential impacts to existing utilities. Design engineers use this time to design drainage features and adjust the line and grade of the proposed road improvement, as needed.

Utilities

Relocation and/or installation of new utilities may require the removal of Indiana bat summer habitat. The direct and indirect effects of this phase on the Indiana bat would be similar to those previously discussed in the right-of-way investigation.

Construction Phase

The Construction Phase may involve the direct removal and/or alteration of Indiana bat habitat and could, therefore, result in adverse effects on the species. The direct effects of road construction on the Indiana bat are listed below:

1. Harm of Indiana bats due to alteration, removal, and destruction of foraging habitat

2. Harm of Indiana bats due to removal of summer roosting trees
3. Harm and/or mortality of roosting Indiana bats (especially non-volant young) due to the removal of summer roosting trees during the time period when they are occupied
4. Harm of Indiana bats resulting from alteration of normal behavior patterns caused by the removal and destruction of summer habitat
5. Harm of Indiana bats due to alteration of travel corridor habitat
6. Harm and/or mortality of Indiana bats due to the destruction of winter habitat

The indirect effects of road construction on the Indiana bat are listed below:

1. Harassment of nearby Indiana bats utilizing either summer or winter habitat due to disturbances and noise generated by human presence and/or the operation of equipment necessary for construction
2. Harassment of Indiana bats due to disturbances and noise generated by vehicle traffic on proposed projects that include new alignments
3. Harm of Indiana bats due to predation or increased mortality as a result of disturbing normal Indiana bat behavior patterns
4. Harm and/or mortality associated with future traffic mortalities
5. Harm of Indiana bats due to alteration of potential travel corridor habitat
6. Harm of Indiana bats due to loss of trees that exhibit the necessary characteristics for use as maternity roosting habitat
7. Harm, mortality, and/or Harassment of Indiana bat due to alteration of winter habitat.

KYTC considered many factors in determining that 500 feet was prudent when designating "existing alignment" vs. "new alignment" descriptions to transportation construction projects that occur entirely within Indiana bat potential habitat areas. The purpose of this designation was to assist in the programmatic effects analysis of road projects within potential habitat areas so that the nature and extent of these adverse effects (direct and indirect) could be determined. New highway construction requires the clearing and grubbing within the footprint of the new road and any areas within ROW that will need to be cleared for associated purposes. Improvements along existing alignments may require similar disturbances, but they may result in reduced impacts because some of the disturbance area has already been disturbed. In either case, the removal of trees may have adverse effects on Indiana bats through the removal of roosting and foraging habitat. However, some recent studies of bat roosting behavior in proximity to roads have shown that bats may avoid roosting adjacent to existing highways and may avoid travelling over highways while foraging. As a result, the trees located adjacent to an existing highway may have a reduced likelihood of providing summer roosting habitat for bats and may negatively influence bat use of potential foraging areas adjacent to highways. In general, the frequency of disturbance, fragmentation, and introduction of invasive species along existing highways limits the availability of roosting habitat within these areas by promoting younger trees, competition from undesirable species, and habitat structure that may not be suitable for Indiana bats.

In coordination with the USFWS-KFO, KYTC also determined that out of 47 known maternity roost trees in Kentucky, only 13 were within 1,000 feet of paved roads. Of these 13 known maternity roost trees,

one record was excluded from any sort of habitat analysis due to the date of observation, extensive modification of surrounding habitat since the record date, and additional details associated with the record. Thus, 12 known maternity roost trees or approximately 25 percent of all known maternity roost trees in Kentucky have been documented to occur within 1,000 feet of paved roads. In evaluating the distance of each of the 12 trees from the road surface, half were approaching 500 feet or more from the paved surface. Therefore, based upon the best data available, 87 percent of known maternity roost trees in Kentucky are approximately 500 feet or more from a paved surface. Based upon this information, in conjunction with our analysis of the likelihood of suitable roosting habitat and roosting behavior within these areas, KYTC determined that 500 feet was likely an appropriate distance to use in its evaluation of adverse effects on maintenance projects as well as road improvement projects entirely within potential habitat areas that are on existing alignment versus new alignment.

The majority of road projects proposed by KYTC occur entirely within areas defined as potential Indiana bat habitat. As discussed in Tier 2 step 1, KYTC may review projects to determine, based upon its type, if it meets the criteria for certain categories of projects that require implementation of standard minimization measures. One standard avoidance / minimization measure is the implementation and adherence to seasonal tree clearing between the dates of October 15 – March 31. This approach avoids direct effects to Indiana bats because the clearing of potential summer roosting habitat would occur when the species is not anticipated to occupy this type of habitat. However, it is difficult to identify specific potential indirect and cumulative effects to Indiana bats as a result of transportation projects occurring within potential habitat areas and when seasonal tree clearing restrictions are implemented due to the limited amount of literature on the effects of such projects on Indiana bats. Furthermore, because of the ephemeral nature of the Indiana bat's habitat, determining specifically whether or not these types of effects would occur and to what extent they would occur may be inconclusive.

Review of the consultation history of previous projects coordinated with the USFWS-KFO indicate that project specific level indirect effects analyses, when seasonal tree clearing restrictions in potential habitat areas were implemented, almost always resulted in an effects determination of "Not Likely to Adversely Affect" for the Indiana bat. These determinations at the project specific level are likely due to the limited action area being evaluated, size and scope of the individual action, and comparison of available habitat remaining in the action area. However, when analyzing transportation projects on a programmatic level as is done in this BA, the action area and impacts within that action area are collectively larger and distributed across the landscape. Therefore, KYTC assumes, on a programmatic level (i.e., instead of at the project specific level), that these types of projects are likely to result in some amount and extent of adverse effects, but the amount and extent of these adverse effects cannot be accurately defined.

Other KYTC Actions

Maintenance work and emergency repairs are both examples of projects that fit into the "other actions" category. Maintenance projects by nature are carried out along existing alignments and typically result in a lesser degree of habitat impacts than other road construction / improvement projects. These projects typically result in less than two acres of habitat alteration, removal, or destruction in areas that

either have been cleared, maintained, and/or disturbed previously or are normally within 500 feet of the paved road surface. Similar to the analysis in the Construction Phase, recent studies of bat roosting behavior in proximity to roads have shown that bats may avoid roosting adjacent to existing highways and may avoid travelling over highways while foraging. As a result, the trees located adjacent to an existing highway may have a reduced likelihood of providing summer roosting habitat for bats and may negatively influence bat use of potential foraging areas adjacent to highways. Also, the frequent disturbance, fragmentation, and introduction of invasive species adjacent to roadways have a negative effect on the likelihood of suitable habitat occurring immediately adjacent to an existing highway where these types of actions would occur.

Based on this information, KYTC has determined that maintenance projects where less than two acres of habitat would be impacted are "Not Likely to Adversely Affect" the Indiana bat. However, maintenance projects exceeding two acres of habitat alteration or removal within maintained areas may result in adverse effects on the Indiana bat similar to those previously discussed in the Construction Phase due to the amount of habitat that would be removed and increased likelihood of removing / altering suitable summer roosting habitat.

One maintenance activity frequently conducted is tree-trimming. Tree-trimming is defined as removal of limbs and does not include the removal or cutting of a tree trunk that results in a stump. This activity is more or less the trimming of limbs that hang over or near roadways that could result in reduced visibility or a hazard for motorists if those limbs were to fall. The potential to have a direct and/or indirect effect on Indiana bats as a result of the limb trimming is greatly reduced due to limiting maintenance improvements to only the action of trimming overhanging limbs, which tend to be small and largely incapable of serving as roosting habitat. This approach avoids the total removal of potential maternity roost trees and does not reduce or fragment Indiana bat habitat. Further, there is recent evidence that the probability of Indiana bats utilizing trees directly adjacent to roads (i.e., < 100 feet) as maternal roosts is less likely than other equally suitable areas.

In addition to maintenance work, KYTC also occasionally has emergency actions that require immediate attention and repair. These include, but are not limited to, bridge collapse or damage, rock fall or slides that endanger a roadway, etc. These activities often occur in concert with a federally issued state of emergency (usually after a large storm, ice storm, tornado, or snowfall) and have the potential to have adverse effects on Indiana bats depending on project specific scenarios. Adverse effects of emergency actions would be similar to those previously discussed in the Construction Phase.

Cumulative Effects

Cumulative effects are those effects of future state, local or private actions that are reasonably likely to occur within the action area as a result of the proposed action. This BA only addresses road construction projects by KYTC at a programmatic level throughout Kentucky. Many of KYTC's projects will have no cumulative effects, as defined by ESA, but some may. Sometimes road projects are catalysts for new development which involves the further conversion of potential Indiana bat habitat. For example, an access road to an industrial park would be a case where KYTC would consider

cumulative effects. The access road alone may only involve minimal impacts to summer roosting and foraging habitat and no impacts to winter habitat. However, the industrial development that could occur as a result of the new access road could pose a higher threat of impacts to Indiana bats, thus those forecasted impacts would need to be discussed and mitigated for, as well. KYTC will address cumulative effects on a project by project basis in coordination with the USFWS-KFO to ensure all potential effects to Indiana bats are addressed for each proposed project.

Interrelated and Interdependent Effects

As defined by the ESA, interrelated and interdependent actions are those that are a) part of a larger action and depend on the larger action for their justification and b) have no independent utility apart from the proposed action, respectively. In the case of transportation projects, both types of actions may occur depending on the purpose and need of the road construction project. KYTC understands its obligations under the ESA and maintains that any analysis of interrelated or interdependent effects on the Indiana bat will occur on a project specific basis. Therefore, KYTC is unable to identify any interrelated and interdependent effects on the Indiana bat for those projects considered in this programmatic BA.

PROPOSED CONSERVATION and MITIGATION MEASURES

No specific avoidance and/or minimization measures are proposed for those transportation projects that are determined to have “No Effect” on Indiana bats. Similarly, no avoidance or minimization measures will be required on projects that result in a “not likely to adversely affect” determination for Indiana bats due to negative presence/absence surveys.

Projects Categorized as “Not Likely to Adversely Affect”

Tree Trimming Projects

Tree-trimming is defined as removal of limbs and does not include the removal or cutting of a tree trunk that results in a stump. Based on the effects analysis, KYTC has determined that tree trimming projects that lie within 100 feet of the edge of pavement are “not likely to adversely affect” the Indiana bat, and, as a result, such projects (a) would not require mitigation, (b) would apply state-wide and in areas of known and potential habitat, and (c) would not require additional USFWS-KFO clearance prior to their implementation.

Maintenance Projects

Based on the effects analysis, KYTC has determined that maintenance projects where less than two acres of habitat would be impacted are “not likely to adversely affect” the Indiana bat, and, as a result, such projects (a) would not require further mitigation, (b) would apply regardless of the Indiana bat habitat type impacted (i.e., potential or known habitat), and (c) would not require additional USFWS-KFO clearance prior to their implementation. However, maintenance projects exceeding two acres of habitat alteration or removal within maintained areas may result in adverse effects on the Indiana bat and would need to follow the Tier 2 process that is discussed previously in the BA.

Seasonal Tree Clearing in Potential Habitat

KYTC has determined that projects implementing and adhering to seasonal tree clearing between the dates of October 15 – March 31; that occur entirely within potential habitat areas, regardless if they are determined to be existing or new alignment are “not likely to adversely affect” the Indiana bat, and, as a result, such projects (a) will not be required to further mitigate, and (b) would not require additional USFWS-KFO clearance prior to their implementation.

In order to address the unknown indirect and cumulative effects on a programmatic level that KYTC projects might have on Indiana bats and develop a process for offsetting these impacts, KYTC evaluated several properties that were set aside as conservation areas as a result of the KYTC Stream and Wetland Mitigation program. In order to meet permitting requirements of the 404/401 Clean Water Act permitting process, KYTC funded stream and/or wetland restoration on large tracts of lands which are then preserved and protected in perpetuity, with many of the sites held by a third party conservation organization. A by-product of this restoration effort is the enhancement and preservation of additional forested habitat that is either known Indiana bat habitat or suitable for Indiana bat roosting, foraging and travel use and that is then set aside and protected from future development. This additional forest habitat is adjacent to but not considered part of the requirements of the 404/401 permitting process. An audit of these projects by KYTC’s Stream and Wetland Restoration Site Coordinator, with assistance from USFWS-KFO, found that KYTC has set aside over 1,300 acres of suitable Indiana bat forested habitat, much of which is within or near known Indiana bat habitat. Not only are those acres valuable to summer roosting Indiana bats but the stream and wetland systems that are restored will offer high-quality foraging habitat that is being preserved from further development and degradation. This program is ongoing and it is likely this rate of habitat protection and preservation will continue, if not increase in the coming years.

In order to determine if the current acres of habitat protection are appropriate to offset the effects of cumulative forest loss, KYTC conducted an audit of projects that implemented seasonal tree clearing restrictions and the amount of forest loss due to those projects. The audit results indicated that approximately 620 acres of forest were removed between the dates of October 15 – March 31 in a year when KYTC awarded a record amount of projects to be built. Furthermore, half of the 620 acres removed were the result of one large project. Large projects such as this typically occur once every decade, so it can be estimated that in a typical year an average of 300 acres of forest is anticipated to be removed between October 15 – March 31. Based on our analysis, KYTC believes this conservation of habitat around the state is in compliance with the USFWS-KFO Mitigation Guidance and satisfies the need to address potential indirect and cumulative effects to Indiana bats associated with (a) highway projects that impact potential Indiana bat habitat between October 15 – March 31 (i.e., the timeframe when such habitat is expected to be unoccupied by Indiana bats – “the unoccupied timeframe”), and (b) maintenance projects that alter and/or remove less than 2 acres of habitat so the potential cumulative effects of forest loss can be offset. Below is a table showing the amount of forested acres preserved through the aforementioned program by KYTC.

Preserved Forested Acres by KYTC	
Site Name	Estimated Forested Acreage
Beaver Creek	266
Bucy Tract	11
Durham (Horselick)	418
Exel Clark	18
Heath HS	66
Lincoln Co Wetland	44
Livingston County	60
Pine Mountain	10
Pumphrey	97
Sinking Creek	270
South Shore	18
Wayne Co Wetland	35
Welch's Creek	18
TOTAL	1331

Projects Determined to “May Affect, Likely to Adversely Affect”

These projects will be covered under the programmatic CMOA component of the Tier 2 portion of the programmatic process. In doing so, KYTC will contribute to the Indiana Bat Conservation Fund (IBCF) to offset unavoidable adverse effects on Indiana bats. The IBCF will be a dedicated source of funding that will:

1. Ensure that the direct, indirect and cumulative adverse effects of transportation projects covered by this programmatic agreement are adequately addressed;
2. Result in tangible conservation benefits to Indiana bats; and
3. Utilize funding that would otherwise be spent on other project costs (surveys, BA development, etc.) instead of recovery of Indiana bats.

Contributions to the IBCF will be determined and tallied on a project-by-project basis and will be based on the following formula: (Acreage) X (Median land cost) X (Mitigation Multiplier) = Amount of Contribution

The “Acreage” will be the number of acres of Indiana bat habitat that a proposed project will directly or indirectly impact (remove). This method of calculation is derived from the January 2011 Revised Indiana Bat Mitigation Guidance for Kentucky (attached as Appendix C). For impacts to: a) continuous, unbroken habitat areas, the “Acreage” will be the number of acres to the nearest hundredth acre; b) areas containing widely spaced or less than 20 trees, the “Acreage” will be the number of trees that have been determined to exhibit those characteristics suitable for Indiana bat summer habitat (any tree over 5” diameter at breast height) present within the impacted area multiplied by 0.09 (the area occupied by a tree with a 35-foot crown radius); and c) projects containing both continuous, unbroken habitat and widely spaced, fragmented or less than 20 tree, “Acreage” will be determined using a combination of both “Acreage” calculation methods described above.

The “Median Land Cost” will be the most recently published median agricultural land cost on a per acre basis. This cost is intended to provide an index of the estimated replacement cost of Indiana bat habitat in Kentucky. This number will be updated each time the United States Department of Agriculture publishes a new cost.

The “Mitigation Multiplier” factor is derived from the habitat type that will be impacted and season that project impacts occur. The Indiana bat habitat map (attached as Appendix B) shows several habitat types that are based on the known records of Indiana bat captures and hibernacula locations. Table 1 shows each mitigation multiplier, based on habitat type, and the seasonal dates of each habitat type depicting when that habitat is expected to be occupied or unoccupied by Indiana bats.

Table 1. MITIGATION MULTIPLIER BY HABITAT TYPE AND SEASON				
	November 15- March 31 (all habitats unoccupied)	April 1-August 15 (swarming unoccupied*; potential, maternity** and non-maternity occupied)	August 16- October 14 (swarming and potential occupied; maternity and non-maternity unoccupied)	October 15- November 14 (swarming occupied; potential, maternity and non-maternity unoccupied)
Known Maternity +P1&2 swarming	2.5	3.0 (4.0)*	3.5	3.5
Known Maternity +P3&4 swarming	2.0	2.5 (3.5)*	3.0	3.0
Known non-maternity +P1&2 swarming	2.0	2.5 (3.5)*	3.0	3.0
Known non-maternity +P3&4 swarming	1.5	2.0 (3.0)*	2.5	2.5
Swarming P1&2	1.5	2.0 (3.0)*	2.5	2.5
Swarming P3&4	1.0	1.5 (2.5)*	2.0	2.0
Known maternity	1.5	2.0	1.5	1.5
Known non-maternity	1.0	1.5	1.0	1.0
Potential	0.5(0.0)****	1.0 (0.5)***	1.0(0.5)***	0.5(0.0)****

*Spring emergence occurs close to the hibernacula entrances in the early spring with females emerging in early to mid-April and males emerging in late April-early May. Swarming habitat within 1 mile of P1 & P2 hibernacula entrances and within 1/2 mile of P3 & P4 entrances will be considered occupied between April 1 and May 14. Projects within these areas require project specific evaluation by the USFWS-KFO and may require additional mitigation.

**Projects within known maternity habitat that occur from June 1 through July 31 require project specific evaluation by the USFWS-KFO.

*** Projects that occur entirely within potential Indiana bat habitat areas and that are determined to be along an “existing alignment” will mitigate with a multiplier of 0.5 if the clearing of that habitat occurs from April 1-October 14.

****Projects that occur entirely within potential Indiana bat habitat areas, regardless if they are determined to be “existing alignment” or “new alignment”, will not be required to mitigate for impacts if the clearing of that habitat occurs from October 15 – March 31.

Tier 2 CMOA Projects / Project Specific Calculation Guidance

1. Projects that occur entirely within potential Indiana bat habitat areas and that are determined to be along an “existing alignment” will mitigate with a multiplier of 0.5 if the clearing of that habitat occurs from April 1 – October 14.
2. Projects that occur entirely within potential Indiana bat habitat areas, regardless if they are determined to be “existing alignment” or “new alignment”, will not be required to mitigate for impacts if the clearing of that habitat occurs from October 15 – March 31.
3. When determining whether a project is “existing alignment” or “new alignment”, KYTC’s calculation of the total disturbance area will include all areas that are impacted, including existing right-of-way areas where trees are sparse or normally not present, plus any other additional areas that will be impacted. For example, project impacts that are separate from, but associated with the project (i.e., KYTC designated waste areas, borrow sites, staging areas, etc.) will be considered and included in the calculation of disturbance area.
4. There are instances in which a KYTC road project will lie partially within a “known” Indiana bat area and partially within “potential” habitat. These projects will typically be addressed through the programmatic CMOA. In such instances, presence will be assumed for the entire length of the project. Presence/absence surveys for projects that lie entirely or partially within areas of known Indiana bat habitat may not be useful in determining affects to the species. FHWA and/or KYTC may wish to consult with the Service prior to conducting such surveys, to assess the importance that such survey results may have in making affect determinations.

When determining whether a project lies wholly or partially within the “potential” area, consideration shall be given to whether subparts of the project may have independent utility and logical termini, allowing them to stand alone as a single project. For portions meeting these criteria and lying wholly in areas of “potential” habitat, impacts to Indiana bat may be addressed through use of the programmatic CMOA or through presence/absence surveys, even if it’s part of a larger “parent” project that, at some point, encroaches a known Indiana bat area.

REPORTING and DOCUMENTATION OF TAKE

KYTC will provide an accounting ledger to USFWS-KFO that identifies a monthly list of qualified projects covered under the programmatic process outlined in this document. This list will be specific to each month’s project letting schedule and will include those projects where mitigation measures were not required. USFWS-KFO will then prompt Kentucky Natural Lands Trust (KNLT) to invoice KYTC for all projects that will be utilizing a CMOA as mitigation. This line of communication and record-keeping will be the responsibility of both parties (KYTC/FHWA and USFWS-KFO) and will help ensure that all projects are addressed relative to their Indiana bat ESA compliance responsibilities. The report will identify those projects for which KYTC is prepared to make immediate payment and those for which payment will be

made at a later date when construction funding becomes available. This latter approach will most typically be used with projects having significant IBCF contributions that cannot be paid using available design funds. KYTC will develop and maintain all necessary documentation required by the USFWS-KFO in support of projects utilizing the CMOA.

ANALYSIS OF ANTICIPATED INCIDENTAL TAKE

KYTC proposes that 300 acres of Indiana bat habitat “take” be allotted per year in accordance with the programmatic CMOA. Review of KYTC’s use of authorized take from 2006 – 2011 under the now-expired 2006 Programmatic Biological Opinion and Incidental Take Statement indicates that a total of approximately 500 acres over 5 years (an average of 100 acres per year) was utilized. However, we must consider that the aforementioned programmatic approach limited the use of authorized take to those projects that were considered “minor”, and impacting no more than 25 acres of habitat per project. As proposed, the new programmatic agreement will not have those limiting factors; therefore, it is reasonable to assume that KYTC will utilize the programmatic CMOA to account for potentially more than 100 acres of take per year.

Since the expiration of the 2006 programmatic biological opinion, KYTC has executed approximately 20 project specific CMOAs accounting for adverse effects to Indiana bats. From mid-year 2011 to July 2012, these project-specific CMOAs have accounted for approximately 185 acres of take. Upon review, some of these project-specific CMOAs would have been eligible under the previous programmatic approach, and, thus, the acreage of take would have counted towards the average of 100 acres of take per year and reduced the amount of take authorized in our analysis of the project-specific CMOAs. Based on previous data indicating an average of approximately 100 acres per year plus an additional approximate 185 acres per year in recent project specific CMOA’s, KYTC assumes that in an average year of project reviews and ESA compliance that 300 acres of incidental take is appropriate.

Take Issued Under the 2006 Biological Opinion

Invoice Period	Acres	# Trees - #Acres
Jan. 1, 2006-June 30, 2006	0	0 – 0
July 1, 2006-Dec. 31, 2006	47.46	0 – 0
Jan. 1, 2007-June 30, 2007	52.26	158 – 14.22
July 1, 2007-Dec. 31, 2007	95.84	188 – 16.92
Jan. 1, 2008-June 30, 2008	56.83	32 – 2.88
July 1, 2008-Dec. 31, 2008	1.28	10 – 0.9
Jan. 1, 2009-June 30, 2009	20.31	24 – 2.16
July 1, 2009-Dec. 31, 2009	7.1	23 – 2.07
Jan. 1, 2010-June 30, 2010	97.2	15 – 1.35
July 1, 2010-Dec. 31, 2010	41.01	7 – 0.63
Jan. 1, 2011-June 30, 2011	50.07	9 – 0.81
TOTAL	469.36	466 – 41.94
TOTAL Acreage:	511.30	

Conclusion

The KYTC is proposing to address ESA Section 7 consultations involving the Indiana bat for road construction activities by using a two tiered programmatic approach. The first tier is the use of a habitat assessment manual to determine if habitat for Indiana bats is present within a project site. If habitat is deemed to be present then tier 2 is utilized to analyze the potential impacts the project may have on the Indiana bat. This second tier outlines several methods for which KYTC may achieve ESA compliance. The implementation of a programmatic CMOA would provide KYTC with a stream-lined approach for addressing situations during the second tier of assessment where it is likely that unavoidable adverse effects to Indiana bats could occur and other options that are typically used to attain ESA compliance are impractical.

Within the effects analysis of the BA, KYTC considered certain categories of projects that we have determined are "not likely to adversely affect" the Indiana bat. Our determination is based on the effects analysis and implementation of standard avoidance and minimization measures without the need to further mitigate. These categories of projects are: 1) implementation of seasonal tree clearing restrictions for projects that occur entirely within "potentially" habitat areas, 2) maintenance activities resulting in the removal of less than 2 acres of habitat within 500 feet of the road surface, and 3) tree trimming projects within 100 feet of the paved road surface. KYTC requests USFWS-KFO review of the proposed programmatic process and concurrence with the aforementioned effects determinations.

Appendix A

KYTC 2011 Revised Indiana bat Habitat Assessment Manual

2012 KYTC Indiana bat Habitat Assessment Manual

Species Description

The Indiana bat was listed as an endangered species by the United States Fish and Wildlife Service on 11 March 1967 (USFWS 2007) and is currently protected under the Endangered Species Act of 1973, as amended (Public Law 93-205). The range of the Indiana bat includes Alabama, Arkansas, Connecticut, Florida, Georgia, Illinois, Indiana, Iowa, Kentucky, Maryland, Massachusetts, Michigan, Missouri, New Jersey, New York, North Carolina, Ohio, Oklahoma, Pennsylvania, Tennessee, Vermont, Virginia, West Virginia, and Wisconsin. Most capture records of reproductively active female and juvenile Indiana bats have occurred in the upper Midwest including southern Iowa, northern Missouri, much of Illinois, most of Indiana, southern Michigan, western Ohio, and in Kentucky. Even though the winter range is dispersed across the eastern U.S., over 90 percent of the estimated range-wide population (in 2005) hibernated in just five states: Indiana, Missouri, Kentucky, Illinois, and New York (USFWS 2007). Critical habitat was designated for the species on September 24, 1976 (41 FR 41914) and included 11 caves and 3 mines in six states. In Kentucky, these critical habitat designations include Bat Cave (Carter County) and Coach Cave (Edmonson County) (USFWS 1976). Five of the 23 Priority 1 hibernacula identified in the Indiana bat Draft Recovery Plan (2007) lie within Kentucky's borders. Three of these hibernacula occur within the Mammoth Cave system. The two other Priority 1 hibernacula occur in Kentucky's eastern coalfields with Bat Cave in the northeast portion of the state and Line Fork Cave in the southeast.

The species uses different habitats during the summer and winter months. In addition, male and female bats may use different habitat types. Both sexes overwinter in caves or open mines. During late spring/early summer, female bats form maternity colonies in characteristic trees (Figures 1, 2 and 3). Males roost singly or in small groups in trees and small caves and require less specific roost habitat. During mid-fall the bats migrate to their winter habitat and begin the mating behavior known as swarming. Both males and females require forested areas and wetland/riparian areas for foraging (USFWS 2007).

Commuting habitat that connects summer foraging and roosting areas is necessary to maximize foraging success and conserve energy. As a general rule, the Indiana bat does not cross large open areas and will follow tree lines or fencerows to reach foraging areas despite increased energy expenditures and commuting distances (Murray and Kurta 2004, Winhold et al. 2005), although exceptions to this have been noted. Variable distances to foraging areas may be attributed to range wide differences in habitat type, interspecific competition, and landscape terrain. Fall swarming also requires the presence of suitable roost trees, foraging areas, and water in the vicinity of each occupied hibernaculum. Adequate habitat connectivity is needed to allow for movement of bats among these various elements (USFWS 2007).

Summer roosting habitat potentially includes any tree greater than five inches diameter at breast height (dbh), which possesses any or all of the following characteristics: exfoliating bark (e.g., shagbark hickory); dead or dying trunk/branches (species of vegetation which do not normally possess exfoliating bark can develop this characteristic as the bark dies and begins to separate from the dying trunk/branch); or cavities/fissures (e.g., woodpecker holes, lightning damage, heart rot). Primary roosts

usually receive direct sunlight for more than half the day. Roost trees are typically within canopy gaps in a forest, in a fence line, or along a wooded edge. Habitats in which maternity roosts occur include riparian zones, bottomland and floodplain habitats, wooded wetlands, and upland communities (USFWS 2007).

Foraging habitat for both sexes is comprised of closed to semi-open forest and forest edges. There does not appear to be a preference for the type of wooded habitat, and foraging has been noted in multiple wooded habitat types including floodplain, riparian, lowland, and upland forests. Although some observations of foraging have been documented from open areas, numerous studies have shown the dominant use of wooded edge habitat over open areas (USFWS 2007).

The Indiana bat shows fidelity to summer roosting and foraging areas (USFWS 2007, Winhold et al 2005). Benefits of site familiarity include reduction in time spent searching for new sites, more profitable exploitation of local food resources, and greater awareness of resident predators. Whenever roosts and foraging sources are eliminated, bats are forced to seek new habitat and expand their foraging range, potentially reducing foraging success and exposing bats to increased predation and competition. Availability of traditional roosting and foraging areas, at least at the landscape level, are important to survival and productivity (USFWS 2007).

The Indiana bat hibernates colonially in caves and mines in the winter. During the winter months, Indiana bats are restricted to suitable underground hibernacula typically consisting of caves located in karst areas of the east-central United States; however, this species also hibernates in cave-like locations, including abandoned mines. Hibernacula tend to have large volumes with large rooms and vertical or extensive passages, often below the lowest entrance. Cave volume and complexity help buffer the cave environment against rapid and extreme changes in outside temperature, and vertical relief helps provide a range of temperatures and roost sites. Most Indiana bats hibernate in caves or mines where the ambient temperature is relatively stable and remains below 10°C (50.0°F) but infrequently drops below freezing. In these caves, tight groups are formed that can consist of hundreds to thousands of individuals (USFWS 2007). It is generally accepted that most Indiana bats return to the same hibernaculum each year (LaVal and LaVal 1980). These bats also tend to hibernate in the same cave or mine at which they swarm, although there are exceptions to this pattern. Colonization of new hibernacula has been documented (Hall 1962, Hicks and Novak 2002, Kath 2002), indicating that this species has some capacity to exploit unoccupied habitats and expand their winter distribution.

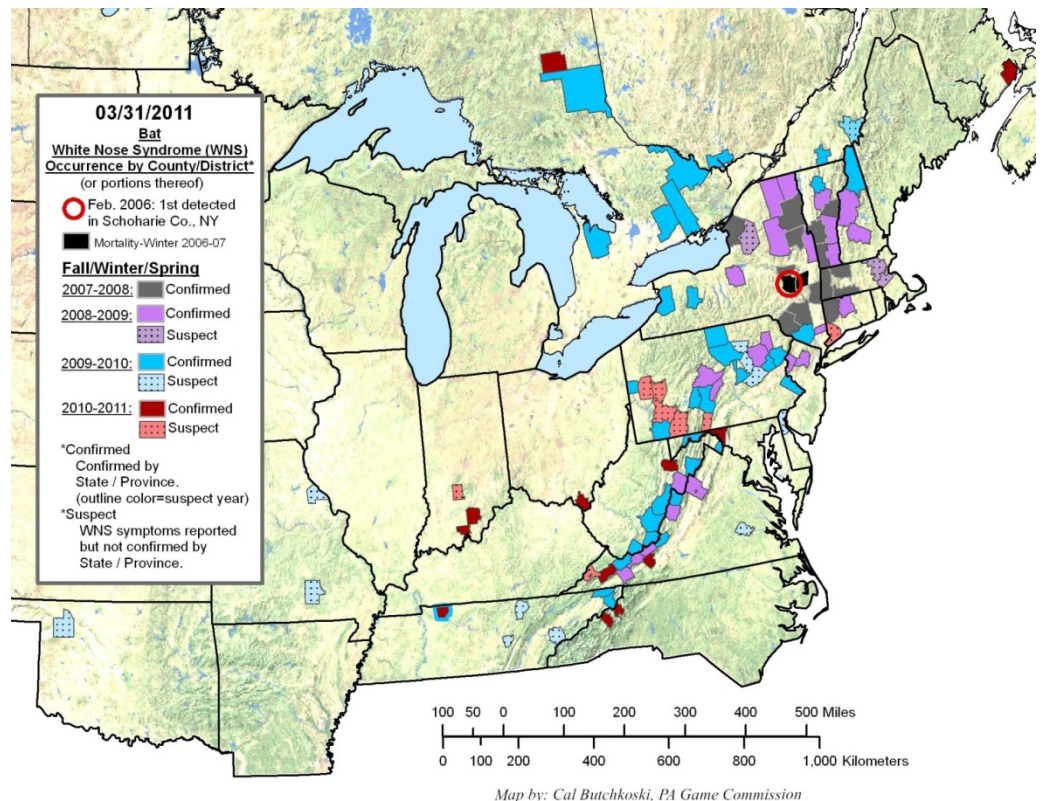
Cluster density may also be limiting for hibernating bats. Indiana bats roost in dense clusters in hibernacula, potentially for thermal benefits or the conservation of water. Although the link between cluster size and overwinter survival has not been quantified, there are several benefits to being a member of a large hibernating population, including the social and energetic advantages of roosting in dense clusters, and having many individuals available during fall swarming to help ensure reproductive success (USFWS 2007).

The minimum size of a forest patch that will sustain Indiana bat maternity colonies has not been established. However, in highly fragmented landscapes the loss of connectivity among forested blocks

may degrade the quality of the habitat for the Indiana bat. Patterson et al. (2003) noted that the mobility of bats, associated with flight, allows them to exploit fragments of habitat. However, they cautioned that reliance on already diffuse resources (e.g., roost trees) leaves bats highly vulnerable, and that energetics may preclude the use of overly patchy habitats. Connectivity of habitats has been demonstrated to be important to this species. Murray and Kurta (2004) noted that bats within their maternity habitat in Michigan did not fly over open fields but traveled along wooded corridors, even though use of these corridors increased commuting distance by over 55 percent. Sparks et al. (2005) also noted the importance of a wooded riparian travel corridor to the Indiana bat in the maternity colony at their study site in Indiana. In addition, the distance and wooded connectivity between roosts and foraging areas may be limiting for this species at some sites (Murray and Kurta 2004, Sparks et al. 2005).

Threats to the species vary with its annual cycle. At the hibernacula, threats include modifications to the caves, mines, and surrounding areas that result in changes in airflow and alteration of the microclimates in the hibernacula (Humphrey 1978, Richter et al. 1993, Johnson et al. 2002). Human disturbance and vandalism pose significant threats to the species during hibernation by inducing arousal and consequent depletion of fat reserves (Thomas et al. 1990, Speakman et al. 1991, Thomas 1995) and through direct mortality (Greenhall 1973, Humphrey 1978, Murphy 1987). Natural catastrophes (flooding and freezing events) can also have a significant effect on the population during winter because of the large number of individuals that hibernate in a relatively few sites (Hall 1962, DeBlase et al. 1965, Humphrey 1978, Richter et al. 1993, Johnson et al. 2002).

A new threat to bats emerged in upstate New York in the winter of 2006 and has since spread far across the eastern and Midwestern U.S. Referred to as White Nose Syndrome (WNS), given the name because of the white fungus growth observed on affected bats, it is caused by the bats contracting a fungus identified as *Geomyces destructans*. In as little as four years WNS has claimed the lives of at least a



million bats and infected hibernacula in the northeast have exhibited mortality upwards of 95%. It's not clearly known, but the fungus appears to disrupt bats hibernation by causing them to repeatedly awake thereby depleting essential fat reserves. Once the fat reserves have been depleted bats attempt to emerge early to forage and are met with unfavorable weather conditions that almost always leads to mortality.

During summer months, possible threats relate to the loss and degradation of forested habitat (Gardner et al. 1990, Garner and Gardner 1992, Drobney and Clawson 1995, Whitaker and Brack 2002). Migration pathways and swarming sites can also be affected by habitat loss and degradation (Hall 1962, Fleming and Eby 2003). Habitats surrounding swarming sites may be particularly important in that these sites are discrete areas that apparently must be suitable to support large numbers of bats that, in addition to engaging in swarming activities, must forage to build up sufficient fat reserves to sustain them through the hibernation period (Hall 1962).

Potential Impacts

The most likely impacts associated with transportation projects are disturbance and removal of forested summer habitat, disturbance of caves and cave-like openings, and alterations to foraging habitat. The loss of summer habitat could result in direct mortality if the area being cleared is inhabited by bats at the time of clearing. Foraging habitat can also be impacted through tree clearing that removes forested travel corridors that potentially connect foraging sites to roost sites or removes forested borders from streams or other water bodies. New corridor construction, widening of an existing roadway that requires clearing, bridge replacements that require tree removal, and excess fill areas that are located in wooded or partially wooded areas are all activities that could impact Indiana bats. Bridge and culvert construction can also affect stream foraging areas either through the loss of riparian vegetation or the production of in-stream sediment that could potentially reduce the aquatic insect production of that waterway.

Construction activities such as blasting, diversion of surface water away from or toward a cave or mine system, altering of airflow or temperature within a cave system, and altering cave or mine passages are all potential impacts to Indiana bat winter habitat.

Habitat Descriptions

Winter habitat: Caves, or deep mines (including coal and limestone as well as other mineral recovery operations) are the typical wintering habitat for Indiana bats.

Summer habitat: Indiana bat summer habitat includes any tree greater than or equal to 5" dbh that possesses any or all of the following characteristics; exfoliating bark, dead or dying trunk/limbs, cavities and fissures associated with lightning strikes or ice/wind damage, woodpecker holes, and heart rot. These trees can be found in various landscapes including floodplains and bottomlands, slopes and ridges, as well as upland areas. Some representative pictures of suitable Indiana bat summer roosting habitat are on the following page.

Figure 1: Pictures of suitable Indiana bat roosting habitat



Habitat Assessment Methods

KYTC personnel that have received training on the implementation of the HAM may conduct project reviews to determine if potential Indiana bat summer and/or winter habitat is present and would be affected by a specific project.

Effects Determination Guidance

- 1) "No Effect" reviews per the HAM may apply to any type or level of proposed project regardless of whether the project is located in known or potential Indiana bat habitat areas.
- 2) A "No Effect" determination is appropriate when the HAM review of a project results in a finding that NO trees with a diameter at breast height (dbh) five inches or greater would be impacted by the project and no winter habitat is present on-site or may be affected. No further consultation with USFWS-KFO is required when this type of effects determination is reached.
- 3) A "No Effect" determination is NOT necessarily appropriate, pending a KYTC biologist (Subject Matter Expert or SME) review, when the HAM review of a project results in a finding that tree(s) with a dbh of five inches or greater would be impacted by the project and/or winter habitat is present on-site or may be affected (see step 4 below).
- 4) A "No Effect" determination is appropriate for a project that is located entirely within potential Indiana bat habitat (i.e., the white or "potential" habitat areas shown on the known Indiana bat habitat in Kentucky map) where the removal and/or alteration of tree(s) with a dbh of five inches or greater is reviewed by a KYTC SME who determines that the tree(s) do not exhibit the characteristics of suitable Indiana bat summer roosting habitat, as defined in the HAM, and no winter habitat would be affected.
- 5) If known or potential Indiana bat habitat (winter and/or summer) is identified for a proposed project, then a KYTC SME will be contacted to provide assistance on how to address potential impacts via the Tier 2 process. (See Tier 2)

Office Assessment

Review geologic quads for indications of potential winter habitat such as karst/cave features, presence of karst bearing strata (Ordovician and Mississippian age limestone), quarry sites, mine adits, and elevations of coal seams. Review should also include accessing Natural Resource Environmental Protection Cabinet (NREPC) Division of Mines for the presence of active and abandoned deep mines near the project area. Begin with best available remote-sensing data including; aerial photography, topographic quadrangles, right-of-way strip maps, plan sheets indicating vegetation, etc.

Field Assessment

On-site inspections should include walking the project area to locate potential winter and/or summer roosting habitat. Known openings identified during office assessment as well as identifying the presence of unknown openings (wildcat mines, collapsed adits, open-throat sinkholes, etc.) should be documented.

Tier 1 Decision Key

- 1) Does the project require the removal of any tree(s) greater than or equal to 5" diameter at breast height regardless of the structure and characteristics of the tree(s)?
 - A. Yes: Contact a DEA Subject Matter Expert
 - B. No: Go to #2

- 2) Did survey of the project area, USGS quad, or any other resource (document all resources consulted or agency coordination undertaken) identify any of the following within 1 km of the project area?
 - Caves
 - Open throated sinkholes
 - Mine adits
 - Other karst features
 - A. Yes: Contact a DEA Subject Matter Expert
 - B. No: Prepare a No Effect finding

Tier 2 Decision Key-DEA Subject Matter Expert

If the KYTC SME determines that a specific road project does not meet the criteria for a "no effect" finding, further analysis of the project will be pursued to determine the appropriate ESA compliance option pursuant to the Tier 2 programmatic process.

Effects Determination Guidance

- 1) KYTC may review the project to determine if it meets the criteria for certain categories of projects that require implementation of standard minimization measures that would result in a "May Affect, Not Likely to Adversely Affect" determination
- 2) A species survey and Biological Assessment, and/or other minimization measures may be conducted and prepared for USFWS-KFO review and concurrence. Presence/absence surveys for projects that lie entirely or partially within areas of known Indiana bat habitat may not be useful in determining affects to the species. FHWA and/or KYTC may wish to consult with the Service prior to conducting such surveys, to assess the importance that such survey results may have in making affect determinations.
- 3) If KYTC determines that a species survey or other minimization measures are impractical or the project is entirely or partially within areas of known Indiana bat habitat, then further analysis of the project will be pursued through the programmatic CMOA process.
- 4) KYTC may account for adverse impacts to Indiana bats by utilizing the incidental take provided via a programmatic CMOA issued by the USFWS-KFO.
- 5) Projects determined to be ineligible under the programmatic CMOA and are likely to result in adverse effects to the Indiana bat may achieve ESA compliance via (a) modification of the project to avoid adverse effects to Indiana bats so that a "No Effect" determination can be made, (b) modification of the project so that a "May Affect, Not Likely To Adversely Affect"

determination can be made, (c) the development of a project specific CMOA, (d) an independent formal consultation and Biological Opinion, or (e) an incidental take permit (ITP) associated with a USFWS-approved Habitat Conservation Plan pursuant to section 10(a)(1)(B) of the ESA.

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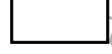

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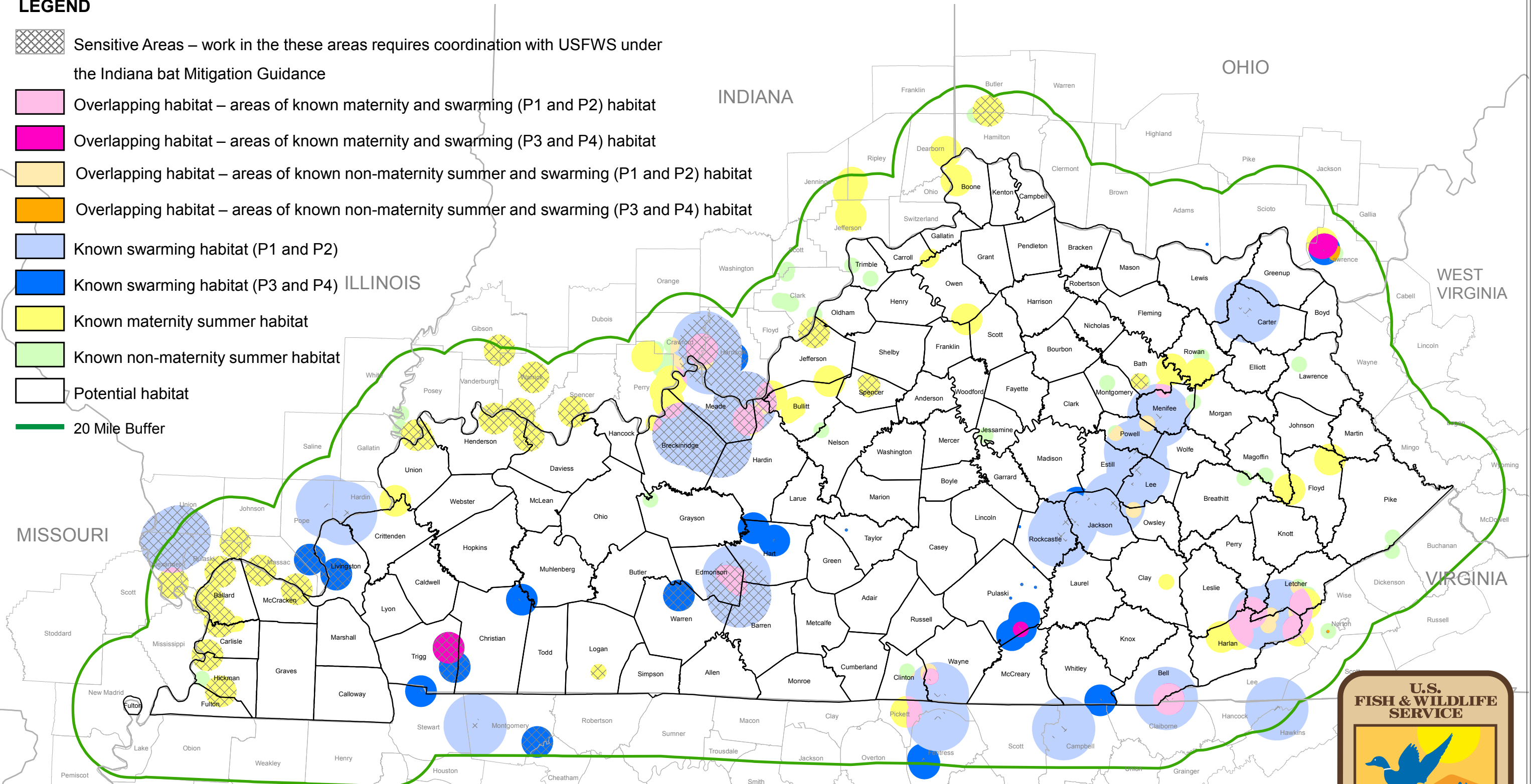
Appendix B

Indiana bat habitat in Kentucky and within 20 miles (map)

Indiana bat Habitat in Kentucky and within 20 miles (August 2011)

LEGEND

-  Sensitive Areas – work in the these areas requires coordination with USFWS under the Indiana bat Mitigation Guidance
-  Overlapping habitat – areas of known maternity and swarming (P1 and P2) habitat
-  Overlapping habitat – areas of known maternity and swarming (P3 and P4) habitat
-  Overlapping habitat – areas of known non-maternity summer and swarming (P1 and P2) habitat
-  Overlapping habitat – areas of known non-maternity summer and swarming (P3 and P4) habitat
-  Known swarming habitat (P1 and P2)
-  Known swarming habitat (P3 and P4)
-  Known maternity summer habitat
-  Known non-maternity summer habitat
-  Potential habitat
-  20 Mile Buffer



NOTE: This map is based on species occurrence information and is subject to change as new data becomes available. Please contact our office at 502/695-0468 to ensure you are working with the most current version.



Appendix C

Revised Indiana bat Mitigation Guidance for the Commonwealth of Kentucky

**Revised¹ Indiana Bat Mitigation Guidance
for the
Commonwealth of Kentucky**

Introduction

This guidance is to be used when assessing minimization and mitigation needs for the endangered Indiana bat (*Myotis sodalis*) relative to development, forestry, and other land use or land management projects that have the potential to alter or otherwise affect Indiana bat habitat in Kentucky. The Service will pursue similar minimization goals and options for Indiana bat conservation and recovery during informal and formal consultations with Federal action agencies pursuant to section 7(a)(2) of the Endangered Species Act of 1973 (ESA), subject to the acceptability of the minimization measures to the Federal action agencies. *Additionally, the Service will use this Guidance, to the extent appropriate, for its assessment of interstate projects (within 20 miles of Kentucky) where the KFO is the lead Service office and use of the Guidance is acceptable to the adjacent state's field office.*

The intent of this guidance is to (1) provide direction to project proponents whose actions have the potential to adversely affect the Indiana bat and (2) enhance conservation and recovery of Indiana bat populations in Kentucky by providing minimization and mitigation for adverse effects to Indiana bats that occur in Kentucky. The guidance is subject to modification as new information relative to the species, its conservation status, and its conservation and recovery becomes available.

Kentucky, like most states, is experiencing significant growth. Projects associated with growth can cause the loss, degradation, and fragmentation of natural habitats as the alteration or development of these formerly natural to semi-natural habitats occur. These types of impacts have the potential to adversely affect the Indiana bat, so project proponents must often determine if potential adverse effects to Indiana bats are likely to occur and, if so, how they can avoid, minimize, and/or mitigate for those adverse effects. If avoidance of all likely adverse effects is not achievable, project proponents must follow these guidelines below to ensure compliance with the ESA and avoid an illegal "take" of Indiana bats, a federally listed species. "Take" of federally listed species is prohibited pursuant to section 9 of the ESA. As a result, the supporting rationale for this guidance is that future recovery, conservation, and mitigation efforts for the Indiana bat undertaken by the Service and others using this guidance will improve conservation and recovery of Indiana bat populations in Kentucky in spite of adverse effects that occur, as these adverse effects would require avoidance, minimization, and/or mitigation.

¹ Revised text shown in blue

Background

Kentucky lies near the center of the Indiana bat's range and contains numerous caves and forestlands known to contain and provide habitat for the species. Five out of the 23 Priority 1 hibernacula identified in the draft, revised Indiana bat recovery plan² lie within Kentucky's borders. Three of these hibernacula occur within the Mammoth Cave System, located in the Pennyriple region of the state. Cave researchers have suggested that the Mammoth Cave System historically may have provided winter roosts for millions of Indiana bats.^{3, 4} The two other Priority 1 hibernacula are found in Kentucky's Eastern Coalfields⁵ with Bat Cave in the northeast portion of Kentucky and Line Fork Cave in the southeast. The expansive karst within much of Kentucky's limestone geology results in numerous caves that historically and currently provide winter habitat for Indiana bats. Over 100 caves (5 Priority 1 and 15 Priority 2) within the state have historic Indiana bat records and 74 of these caves have extant winter populations. Many of these caves occur within areas of existing conservation ownerships, both private and public. Of particular note are the Daniel Boone National Forest that is managed by the U.S. Forest Service, Mammoth Cave National Park that is managed by the National Park Service, Carter Cave State Resort Park that is managed by the Kentucky Department of Parks, and several parcels along Pine Mountain. Like the hibernacula, known maternity colonies are scattered throughout the state with notable clusters of maternity colonies occurring near the Fort Knox Military Reservation, Mammoth Cave National Park, Daniel Boone National Forest, Pine Mountain, the Eastern Coalfields, and along the Ohio River floodplain in the Pennyriple (Mississippian Plateaus) and Jackson Purchase (Mississippi Embayment) regions of the state.

Because Indiana bat records occur broadly across the Commonwealth, nearly any project with suitable habitat has the potential to adversely affect the Indiana bat. The KFO reviews **between 800 and 1,000** projects annually for 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 transmission lines and pipelines. Additionally, the KFO annually reviews numerous impacts that vary in size. 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 are or can be detrimental to the species and limit the potential conservation and recovery of the species.

² U.S. Fish and Wildlife Service. 2007. Indiana Bat (*Myotis sodalis*) Draft Recovery Plan: First Revision. U.S. Fish and Wildlife Service, Fort Snelling, MN. 258 pp.

³ Toomey, R.S., III, M.L. Colburn, and R.A. Olson. 2002. Paleontological evaluation of use of caves: a tool for restoration of roosts. Pp. 79-85 in A. Kurta and J. Kennedy (eds.), The Indiana bat: biology and management of an endangered species. Bat Conservation International, Austin, TX.

⁴ Tuttle, M.D. 1997. A mammoth discovery. Bats 15:3-5.

⁵ Physiographic Regions of Kentucky. Kentucky Atlas and Gazetteer. 3/5/2007 (see Appendix A)

<http://www.uky.edu/KentuckyAtlas/kentucky-atlas.html>

Explanation of Terms

Throughout this document, certain terms are used repeatedly to describe Indiana bat habitat. For the purpose of this document the Service provides the following definitions:

- “Known habitat” refers to suitable summer or winter habitat located within 10 miles of a documented priority 1 or 2 hibernacula, within five (5) miles of a documented maternity capture record or documented priority 3 or 4 hibernacula, or within 2.5 miles of a documented maternity roost tree or non-maternity capture record.
- “Maternity habitat” refers to suitable summer habitat used by juveniles and reproductive (pregnant, lactating, or post-lactating) females.
- “Non-maternity habitat” refers to suitable summer habitat used by non-reproductive females and/or males.
- “Occupied” refers to suitable habitat that is expected or assumed to be in use by Indiana bats at the time of impact. Please see Appendix D for more information on when habitats are considered occupied.
- “Potential habitat” occurs statewide where suitable roosting, foraging and travel habitat for the Indiana bat exists. Known habitat also includes potential habitat for those currently undocumented uses.
- “Suitable habitat” refers to summer and/or winter habitat that is appropriate for use by Indiana bats.
 - Suitable winter habitat (hibernacula) is restricted to underground caves and cave-like structures (e.g. abandoned mines, 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 summer habitat for Indiana 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 when they exhibit the characteristics of a suitable roost tree.
- “Suitable primary maternity roost tree” refers to a dead or partially dead tree that is at least 9 inches DBH and has cracks, crevices, and/or loose or exfoliating bark. Trees in excess of 16 inches diameter at breast height (DBH) are considered optimal for maternity colony roosts, but trees in excess of 9 inches DBH appear to provide suitable maternity roosting habitat.
- “Suitable roost tree” refers to a tree (live or dead) with a diameter at breast height (DBH) of 5 inches or greater that exhibits any of the following characteristics: exfoliating bark, crevices

or cracks. Indiana bats typically roost under exfoliating bark, and in cavities of dead, dying, and live trees, and in snags (i.e., dead trees or dead portions of live trees).

- “Unoccupied” refers to suitable habitat not expected to be in use by Indiana bats at the time of impact. Please see Appendix D for more information on when habitats are considered unoccupied.

Conservation Strategy and General Minimization and Mitigation Goals for Indiana Bats in Kentucky

The Service’s Kentucky Field Office will generally rely on the draft, revised Indiana Bat recovery plan and other literature and data available on the Indiana bat to support its conservation and recovery activities for the species. For example, the draft, revised recovery plan’s primary recovery actions focus on protection and management of Priority 1 and Priority 2 hibernacula, which will also be the primary conservation focus in Kentucky. However, there are a number of other recovery actions that this guidance supports, including, but not limited to: (a) Conserve and manage hibernacula and their winter populations (Recovery Action 1.1); (b) Reduce threats by purchasing from willing sellers or leasing at-risk privately owned P1 and P2 hibernacula to assure long-term protection (1.1.3); (c) Conserve and manage areas surrounding hibernacula (1.1.4); (d) Purchase from willing sellers or lease privately owned lands surrounding P1 and P2 hibernacula identified as having inadequate buffers (1.1.4.4); (e) Restoration and creation of hibernacula (1.2); (f) Conserve and manage summer habitat to maximize survival and fecundity (2.0); (g) Monitor and manage known maternity colonies (2.4); and (h) 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. As a result, they provide the foundation that supports this guidance. The Service will use its existing authorities, especially those under the ESA, when implementing this guidance.

Based on the background information above and the available information on the species, its status, and conservation⁶, the Service developed a list of general minimization and mitigation goals for Indiana bats in Kentucky. If achieved, these goals would (a) support the conservation strategy discussed above, (b) significantly contribute to Indiana bat conservation and recovery in Kentucky, and (c) act as a guide for determining the appropriateness of any proposed minimization and mitigation measures. The goals are listed below:

Tier 1

1. Protect and manage known Priority 1 (P1) and Priority 2 (P2) hibernacula.
2. Protect and manage existing forested habitat:

⁶ The KFO relied heavily on the draft revised Indiana Bat Recovery Plan, state heritage information, and the knowledge of experienced Indiana bat biologists to derive this list, but a number of other sources of information, which are on file in our office, were used.

- a. Swarming habitat within 10 miles of a known hibernacula; and/or
 - b. Summer habitat within 2.5 miles of a documented maternity roost tree or within 5.0 miles of a maternity capture (mist-net) record.
3. Protect and manage additional conservation lands for Indiana bats, especially habitat that is contiguous with or within the proclamation/acquisition/preserve boundaries of existing public and private conservation lands occupied by Indiana bats.
 4. Restore winter habitat conditions in degraded caves that exhibit the potential for successful restoration such as, but not limited to, those caves identified as having High Potential (HP) in the draft revised Indiana bat Recovery Plan.

Tier 2

5. Protect and manage known Priority 3 (P3) and Priority (P4) hibernacula.
6. Protect and manage additional conservation lands that are currently suitable for but unoccupied by Indiana bats.
7. Fund priority Indiana bat research and monitoring that support the six strategies above and/or Kentucky's Indiana bat populations.

Tier 1 goals would have priority over Tier 2 goals and are encouraged.

Indiana Bat Recovery and Mitigation Focus Areas

The Service's analyses also resulted in the delineation of Indiana Bat Recovery and Mitigation Focus Areas (RMFAs) within the Commonwealth of Kentucky (Figure 1). RMFAs were identified specifically to support the general minimization and mitigation 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 Indiana bat populations;
2. Currently support populations of Indiana bats that are expected to support long-term recovery and conservation efforts of the 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 Indiana bat habitat; and/or
5. In the Service's estimation, contain conditions that generally are expected to contribute to the persistence of the Indiana bat population and habitat into the future.

The identified RMFAs can be categorized as Summer Habitat RMFAs, Winter Habitat RMFAs, or as both and are shown in Table 1. Collectively, these RMFAs are key landscapes for Indiana bat conservation and recovery in Kentucky. Therefore, RMFAs will be those areas where most Indiana bat minimization and/or mitigation efforts will be undertaken or attempted. The Service expects, however, that minimization and/or mitigation efforts may also be undertaken or attempted at locations outside of the Indiana bat RMFAs in circumstances where the conservation and/or recovery benefits to Indiana bats can be clearly identified and justified. The applicability of minimization and/or mitigation efforts outside of RMFAs will be determined on a case-by-case basis in coordination with the Service 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) the existence of new information that would help justify the conservation effort. In addition, minimization and/or mitigation efforts will generally be directed to the RMFA closest to the impact site or to the RMFA that best minimizes and/or mitigates the specific impact(s).

Table 1: Table of Recovery and Mitigation Focus Areas (RMFAs) & Available Habitat Types

RMFA Name and Description	Summer Habitat RMFA	Winter Habitat RMFA
<i>Tygarts Creek-Carter Caves SRP</i> – the assemblage of caves along Tygarts Creek and within Carter Caves SRP, including caves on private lands within 10 miles of Tygarts Creek and/or Carter Caves SRP Primary Conservation Ownership – Carter Caves SRP	no	yes
<i>Daniel Boone National Forest</i> – the area within the DBNF proclamation boundary, including caves and maternity colonies on private lands within 10 miles of the proclamation boundary Primary Conservation Ownership – Daniel Boone National Forest	yes	yes
<i>Pine Mountain</i> – the assemblage of caves along Pine Mountain, including caves and maternity colonies on private lands within 10 miles of the crest of Pine Mountain Primary Conservation Ownership – Kentucky State Parks and Kentucky State Nature Preserves Commission	yes	yes
<i>Mammoth Cave National Park</i> – the assemblage of caves within MCNP, including caves and maternity colonies on private lands within Barren, Edmonson, Hart, and Warren counties Primary Conservation Ownership – Mammoth Cave National Park	yes	yes
<i>Barrens-Fort Knox</i> – the assemblage of caves and maternity colonies in Breckinridge, Bullitt, Hardin, Jefferson, Meade, and Spencer counties Primary Conservation Ownership – Fort Knox, Taylorsville Lake WMA	yes	yes
<i>Big Rivers</i> – the assemblage of caves and maternity colonies in Christian, Livingston, Lyon, Marshall, and Trigg counties Primary Conservation Ownership – Land Between the Lakes NRA, Fort Campbell, and Clarks River National Wildlife Refuge	yes ⁷	yes
<i>Lower Ohio River</i> – the assemblage of maternity colonies in Daviess, Henderson, and Union counties Primary Conservation Ownership – Sloughs WMA	yes	no
<i>Mississippi River</i> – the assemblage of maternity colonies in Ballard, Carlisle, Hickman, and McCracken counties Primary Conservation Ownership – Ballard, Boatwright, Doug Travis, and West Kentucky WMAs	yes	no

⁷ Maternity colony exists on Fort Campbell in Tennessee.

Types of Adverse Effects That Are Appropriate for Minimization and Mitigation

Based on the importance of hibernacula, the Service determined that development of minimization and mitigation measures would not be appropriate for projects resulting in adverse effects to hibernacula; avoidance of caves and other potential hibernacula is preferred. However, minimization and mitigation of certain adverse effects to hibernacula or potential hibernacula may be appropriate but must be coordinated with the Service. The reasons minimization and mitigation measures would be inappropriate at hibernacula include, but are not limited to:

1. P1 and P2 hibernacula are critical to Indiana bat recovery and conservation;
2. Adverse effects to 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 P1 and P2 hibernacula; and
4. Current 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.

Minimization and mitigation measures would be appropriate for most other adverse effects that typically occur in association with development projects in Kentucky. However, certain groups of impacts will require project-specific evaluation by the Service to assess the appropriateness of the minimization and mitigation measures. These groups include:

1. Projects resulting in the loss of more than 250 acres of Indiana bat habitat⁸
2. Projects occurring within 1 mile of a priority 1 or 2 hibernacula⁹
3. Project occurring within ½ mile of a priority 3 or 4 hibernacula⁹
4. Identified hibernacula with percent forest cover less than 60 percent in the [swarming buffer](#) surrounding the entrance⁸
5. Identified maternity areas with percent forest cover less than 45 percent⁸.
6. Projects resulting in impacts to known maternity habitat between June 1 and July 31. Limited clearing during this time may be approved only after a detailed survey to ensure that no primary maternity roosts would be adversely affected during this sensitive period.

⁸ Analyses by the Service and KDFWR relating to the amount of forested habitat available to known Indiana bat maternity colonies [within and adjacent to Kentucky](#) has shown that percent forest cover ranges between 9 and 95 percent with no discernable break in records of occurrence(see Appendix B). Similar analysis of P1 and P2 hibernacula found the percent forested cover [between 44 and 86 percent with no discernable breaks](#) (see Appendix C). Based on the data (unpublished USFWS data, 2008), the Service determined that projects that (a) were greater than 250 acres, (b) occurred within the swarming area of a hibernaculum with less than 60 percent forest cover, or (c) occurred within known maternity habitat areas containing less than 45 percent forest cover warranted a separate analysis relative to these guidelines in order to further minimize potential adverse effects to [Indiana bats](#).

⁹ Separate analyses for projects within ½ or 1 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.

Determine Habitat Mitigation Need

The following mitigation needs have been identified in order of preference.

1. Protect known and previously unprotected Indiana bat hibernacula^{10,11,12}
 - a. Purchase or otherwise acquire fee title
 - b. Secure perpetual conservation easements and land management agreements
2. Protect known Indiana bat maternity or swarming habitat^{10,11,12}
 - a. Purchase or otherwise acquire fee title (typically at an acre for acre ratio)
 - b. Secure perpetual conservation easements and land management agreements (typically at a ratio of two acres protected for each acre impacted)
3. Contribute funding to the Indiana bat Conservation Fund (IBCF) sufficient to achieve identified mitigation needs.
4. Other activities that will provide a tangible conservation benefit to the Indiana bat may be proposed to the Service for a case-by-case evaluation.

Acceptability of Mitigation and Minimization Measures

The Service defined the terms used in the following table in Explanation of Terms section. Table 2 provides guidance on whether a minimization and mitigation measure can be used for a specific type of action or impact. In some cases, minimizing and mitigating impacts to summer habitat with the protection of winter habitat may be appropriate, but this must be determined on a case-by-case basis. Impacts to known Indiana bat hibernacula will require a project specific analysis of suitable mitigation options and may not be appropriate or allowed under these Guidelines at the Service's sole discretion.

¹⁰ Property acquired or protected must adjoin or be within the preserve design or acquisition boundary of an existing conservation ownership.

¹¹ Easement or fee simple lands shall include all surface and mineral rights to the property and clear an unencumbered ownership of these rights. The applicant shall pay for all fees and/or other costs associated with title work, recording, transferring, surveying, and/or acquiring of the easement or property.

¹² Mitigation and minimization measures that involve land acquisition or easement require the donation of the property (or easement) to a conservation organization approved by the Service. Accompanying the donation must be a cash endowment sufficient to provide perpetual management of the preserved lands and 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.).

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

ACTION / IMPACT TYPE	HABITAT MITIGATION MEASURE		
	Protect Hibernacula	Protect Maternity and/or Swarming Habitat	IBCF Contribution
Summer Habitat Loss	Contact the Service for review of the appropriateness of these measures.		These are appropriate minimization and mitigation measures for the impacts listed and any overlapping habitats.
Known maternity habitat			
Known other habitat			
Potential habitat			
Swarming Habitat Loss			
P1 or P2			
P3 or P4			

Determination of Minimization and Mitigation Amounts

Table 3 below assists project proponents in determining the amount of minimization and mitigation needed to offset the specific impacts of a given project. The project's impact(s) should be divided into the actions or impact types and then quantified to yield the acreage of impact for each action. 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 Service will provide assistance to project proponents in determining how the single tree and habitat block methods for calculating impact acreages should be applied on their project(s) so that an accurate mitigation estimate can be determined.

The value of a particular hibernacula or maternity or swarming habitat proposed for protection depends on the circumstances applicable to that particular site. As such, standard multipliers are not provided but must be determined on a case-by-case basis by the Service. Factors that influence the value of a particular protection site include, but are not limited to: the relative significance of the site to the conservation and recovery of the Indiana bat, the quality of the habitat, the level of protection afforded, the degree of risk to the site without the proposed mitigation and minimization measure, and the site's position within the landscape and proximity to RMFAs.

Table 3. Table for Calculation of Impact Acres & Mitigation Acres.¹³

ACTION / IMPACT TYPE	IMPACT ACRES	MULTIPLIER	MITIGATION ACRES
Habitat Loss			
Select Action/Impact Type based on location and current map of Indiana bat Habitat in KY(see Appendix E)		Please see Appendix D to select appropriate multiplier based on location and timing of impact.	
Minimization & Mitigation Measures			
Purchase or protect hibernacula	Value determined on a case by case basis		
Purchase or protect maternity or swarming habitat			
Contribute to IBCF	\$2880/mitigation acre ¹⁴ (please contact the KFO to confirm current cost per acre)		

Summary

This Guidance has been developed by the Service to provide direction to project proponents whose actions have the potential to adversely affect the Indiana bat and to enhance the conservation and recovery of Indiana bat populations in Kentucky. This will be accomplished by the implementation of the minimization and mitigation measures set forth in this Guidance.

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. This document also establishes the conservation strategy that the Kentucky Field Office (KFO) will employ, which is the foundation for the Guidance.

The KFO has identified those impacts to the Indiana bat where avoidance is more appropriate than minimization and mitigation as well as those projects that will need individual evaluations to determine if minimization and mitigation measures are appropriate. For any impacts that may be allowed, the level of minimization and mitigation that is established in the Guidance varies according to the relative importance of the habitat type that will be impacted to the conservation and recovery of the Indiana bat and likelihood of take. Recovery and Mitigation Focus Areas have been developed to support the identified minimization and mitigation measures as well as to

¹³ The Service determined that impacts to potential habitat during the occupied season require direct replacement of impacted acres. From that point, mitigation ratios were assigned based on the importance of the habitat type to the recovery of the Indiana bat and likelihood for direct versus indirect impacts. Direct impacts (occupied) require more mitigation than indirect impacts for each habitat type.

¹⁴ This dollar amount is subject to change based on Kentucky'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, 2010 Summary released by the USDA in August 2010. (ISSN 1949-1867)

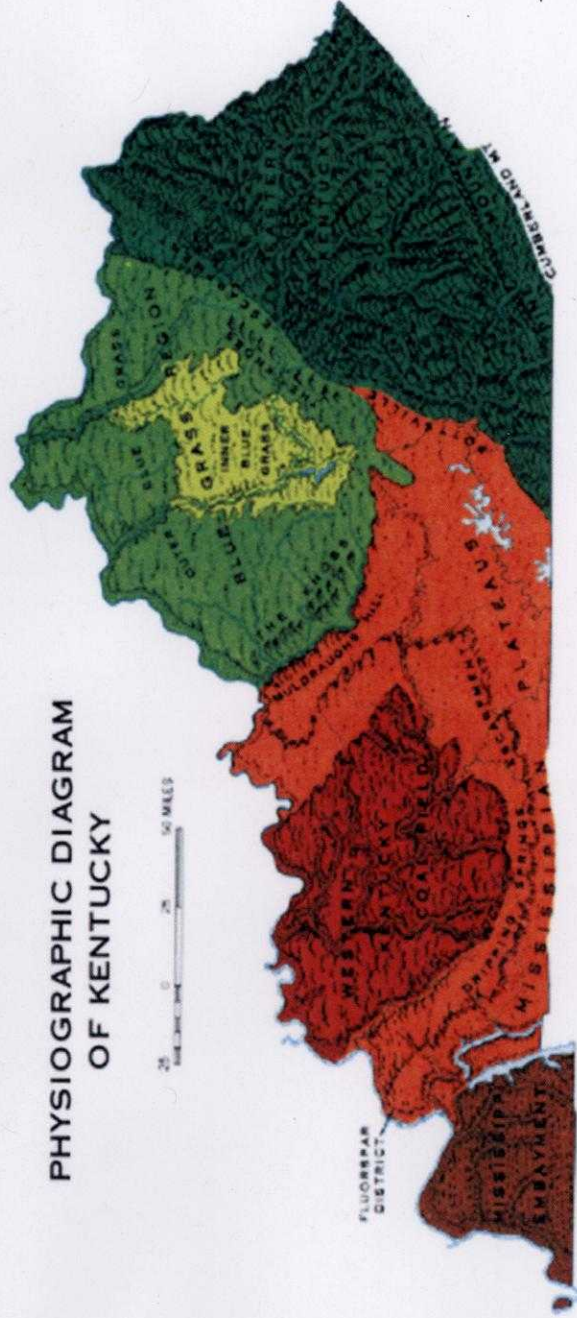
ensure appropriate distribution and implementation of these measures relative to the locations of the impacts.

The protection of hibernacula, swarming and maternity areas is critical to ensuring the conservation and recovery of the Indiana bat. These guidelines set forth a process by which impacts that may directly or indirectly result in adverse effects to the Indiana bat can also help ensure the long-term survival of the species. The Service believes the implementation of this Guidance can help achieve that goal.

APPENDIX A

Kentucky Atlas & Gazetteer

PHYSIOGRAPHIC DIAGRAM
OF KENTUCKY

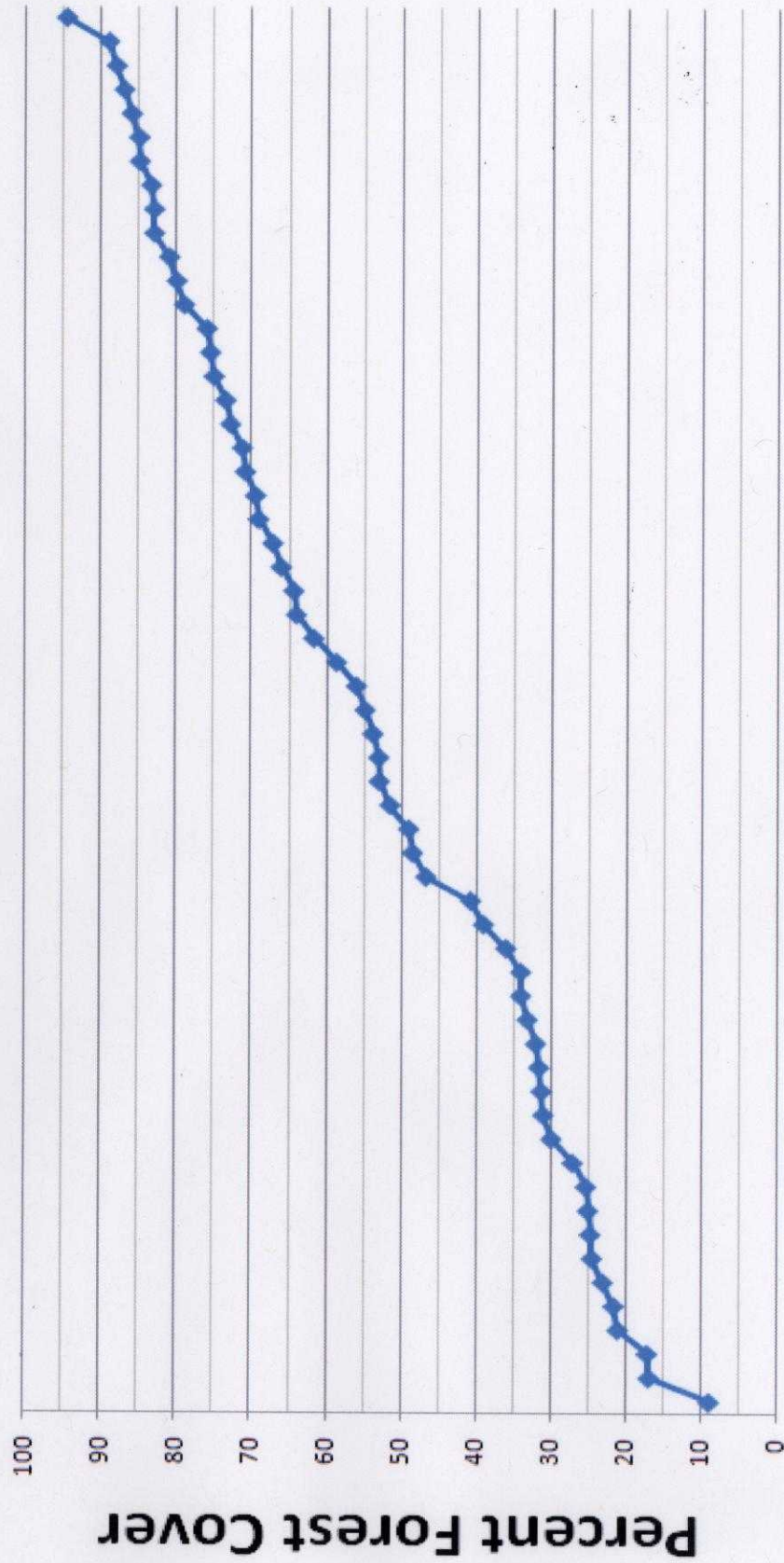


http://www.uky.edu/KentuckyAtlas/kentucky/physiographic.map?568_243

Internet

APPENDIX B

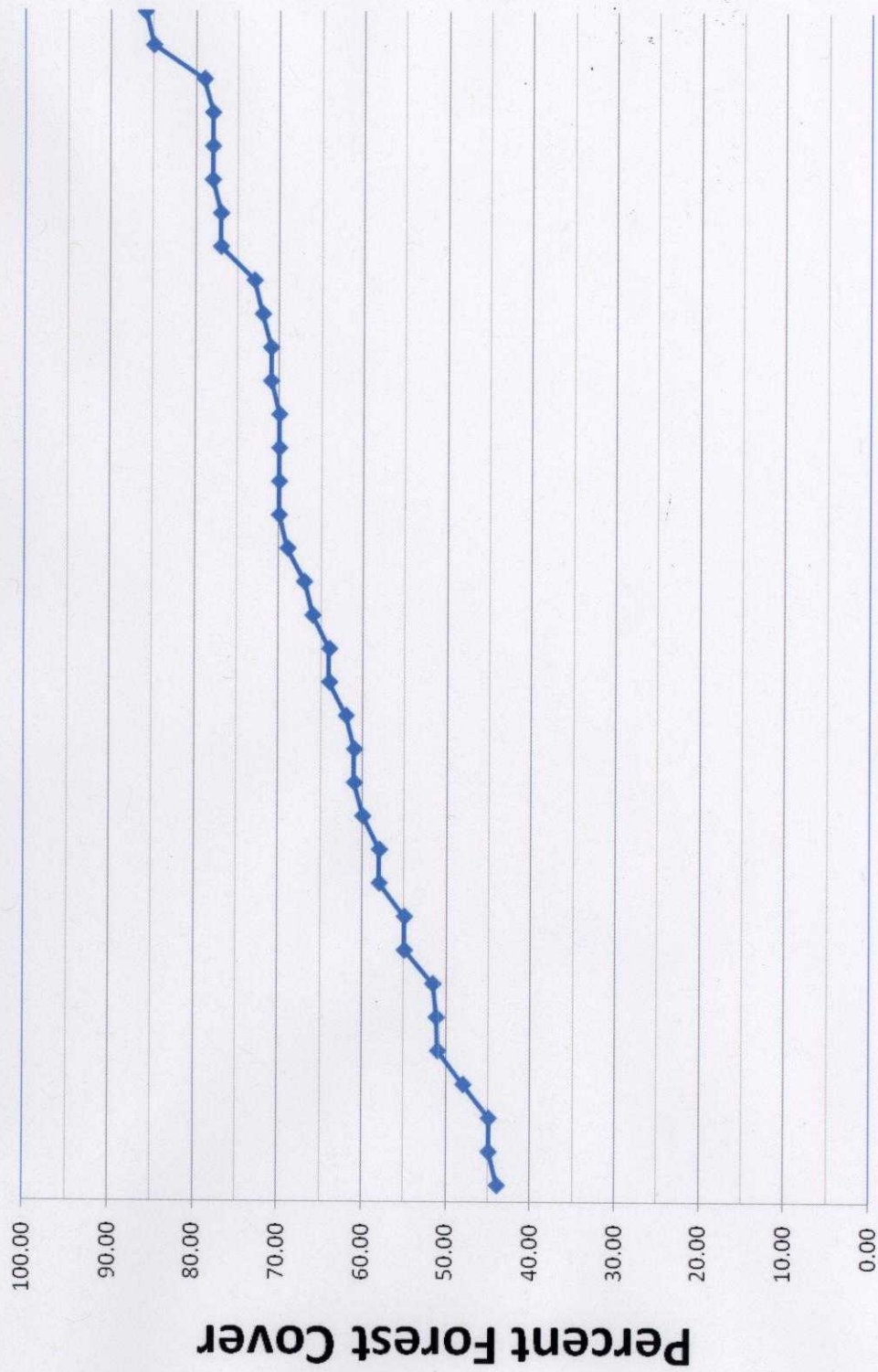
Habitat Availability in Known Maternity Areas



Maternity Colonies

APPENDIX C

Habitat Availability at Priority 1 & 2 Hibernacula



APPENDIX D

Mitigation Multiplier by Habitat Type and Season

	November 15 – March 31 (all habitats unoccupied)	April 1 – August 15 (swarming unoccupied*; potential, maternity** & non-maternity occupied)	August 16 – October 14 (swarming & potential occupied; maternity & non- maternity unoccupied)	October 15 – November 14 (swarming occupied; potential, maternity & non-maternity unoccupied)
Known maternity + P1&2 swarming	2.5	3.0 (4.0)*	3.5	3.5
Known maternity + P3&4 swarming	2.0	2.5 (3.5)*	3.0	3.0
Known non-maternity + P1&2 swarming	2.0	2.5 (3.5)*	3.0	3.0
Known non-maternity + P3&4 swarming	1.5	2.0 (3.0)*	2.5	2.5
Swarming P1&2	1.5	2.0 (3.0)*	2.5	2.5
Swarming P3&4	1.0	1.5 (2.5)*	2.0	2.0
Known maternity	1.5	2.0	1.5	1.5
Known non-maternity	1.0	1.5	1.0	1.0
Potential	0.5	1.0	1.0	0.5












*Spring emergence occurs close to the hibernacula entrances in the early spring with females emerging in early to mid-April and males emerging in late April – early May. Swarming habitat within 1 mile of P1 and P2 hibernacula entrances and within ½ mile of P3 and P4 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, please see page 7 for more information.

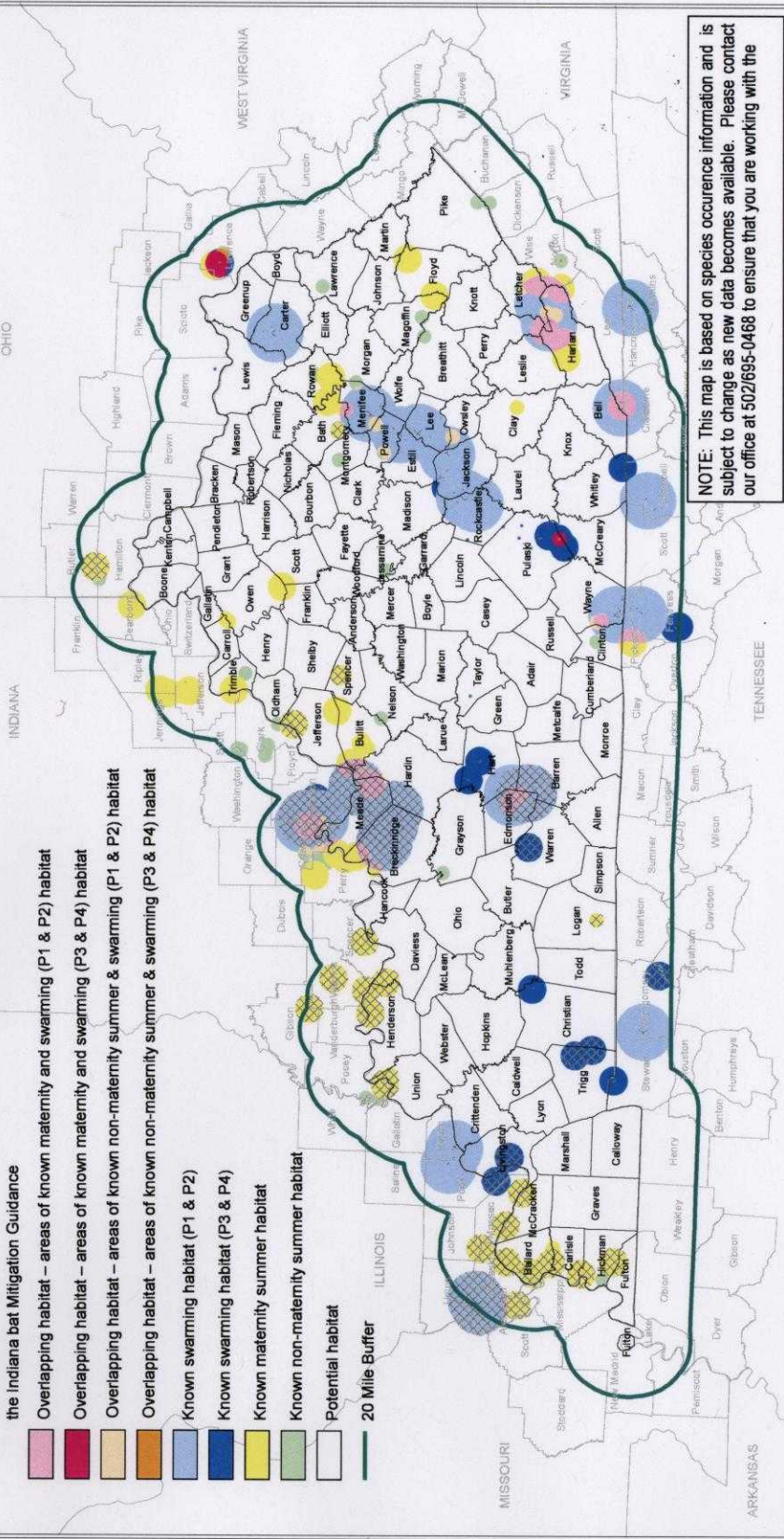
** Projects within known maternity habitat that occur from June 1 through July 31 require project-specific evaluation by the Service, please see page 7 for more information

APPENDIX E

Indiana bat Habitat in Kentucky and within 20 mi. (January 2011)

LEGEND

-  Sensitive Areas – work in these areas requires coordination with USFWS under the Indiana bat Mitigation Guidance
-  Overlapping habitat – areas of known maternity and swarming (P1 & P2) habitat
-  Overlapping habitat – areas of known maternity and swarming (P3 & P4) habitat
-  Overlapping habitat – areas of known non-maternity summer & swarming (P1 & P2) habitat
-  Overlapping habitat – areas of known non-maternity summer & swarming (P3 & P4) habitat
-  Known swarming habitat (P1 & P2)
-  Known swarming habitat (P3 & P4)
-  Known maternity summer habitat
-  Known non-maternity summer habitat
-  Potential habitat
-  20 Mile Buffer



NOTE: This map is based on species occurrence information and is subject to change as new data becomes available. Please contact our office at 502/695-0468 to ensure that you are working with the