

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.

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. Excluding those state transportation projects that are evaluated under a programmatic biological opinion, the KFO reviews nearly 700 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 hibernacula, five (5) miles of a documented maternity capture record, or 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 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). 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.
- “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:
 - 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.

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.

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>Tygart Creek-Carter Caves SRP</i> – the assemblage of caves along Tygart Creek and within Carter Caves SRP, including caves on private lands within 10 miles of Tygart 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 ten mile radius 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 in Kentucky has shown that percent forest cover ranges between 16.6 and 94.3 percent with no discernable break in records of occurrence(see Appendix B). Similar analysis of Kentucky's P1 and P2 hibernacula found the percent forested cover above 60% (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.

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	\$2850/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 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.

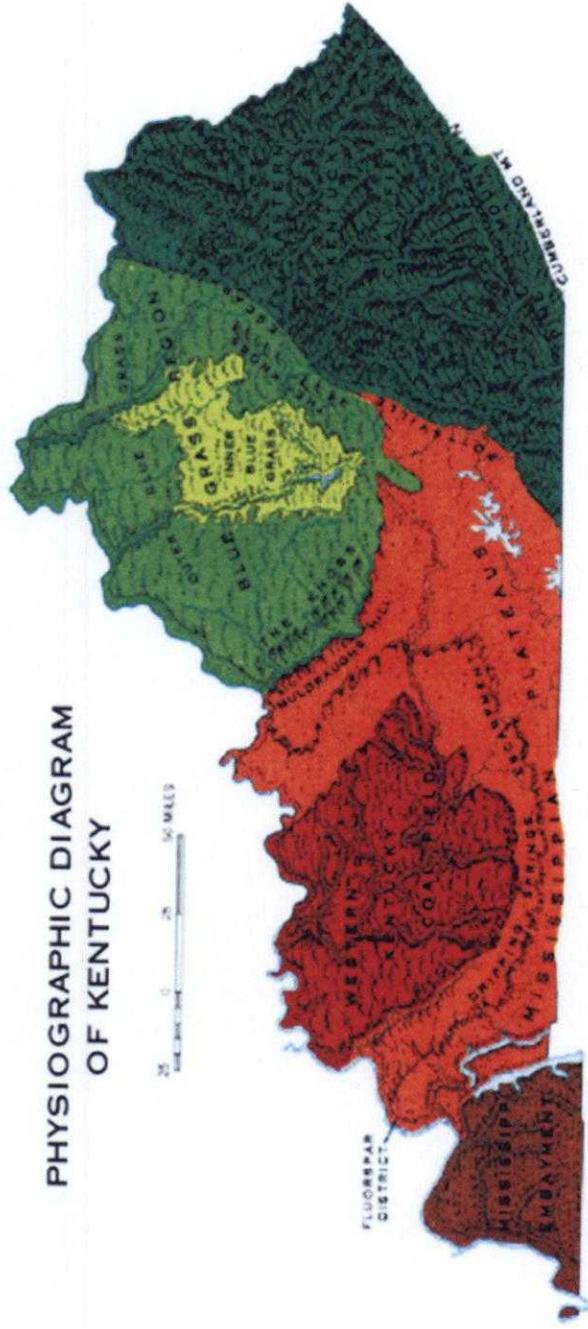
¹³ The Service determined that impacts to potential habitat during the occupied season require direct replacement of impacted acres. From that point, mitigation ratios were assigned based on the importance of the habitat type to the recovery of the Indiana bat and likelihood for direct versus indirect 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 University of Kentucky's Department of Agricultural Economics in the Agricultural Situation and Outlook. The current value is based on The 2009 Agricultural Situation and Outlook for Kentucky by Richard L. Trimble.

APPENDIX A

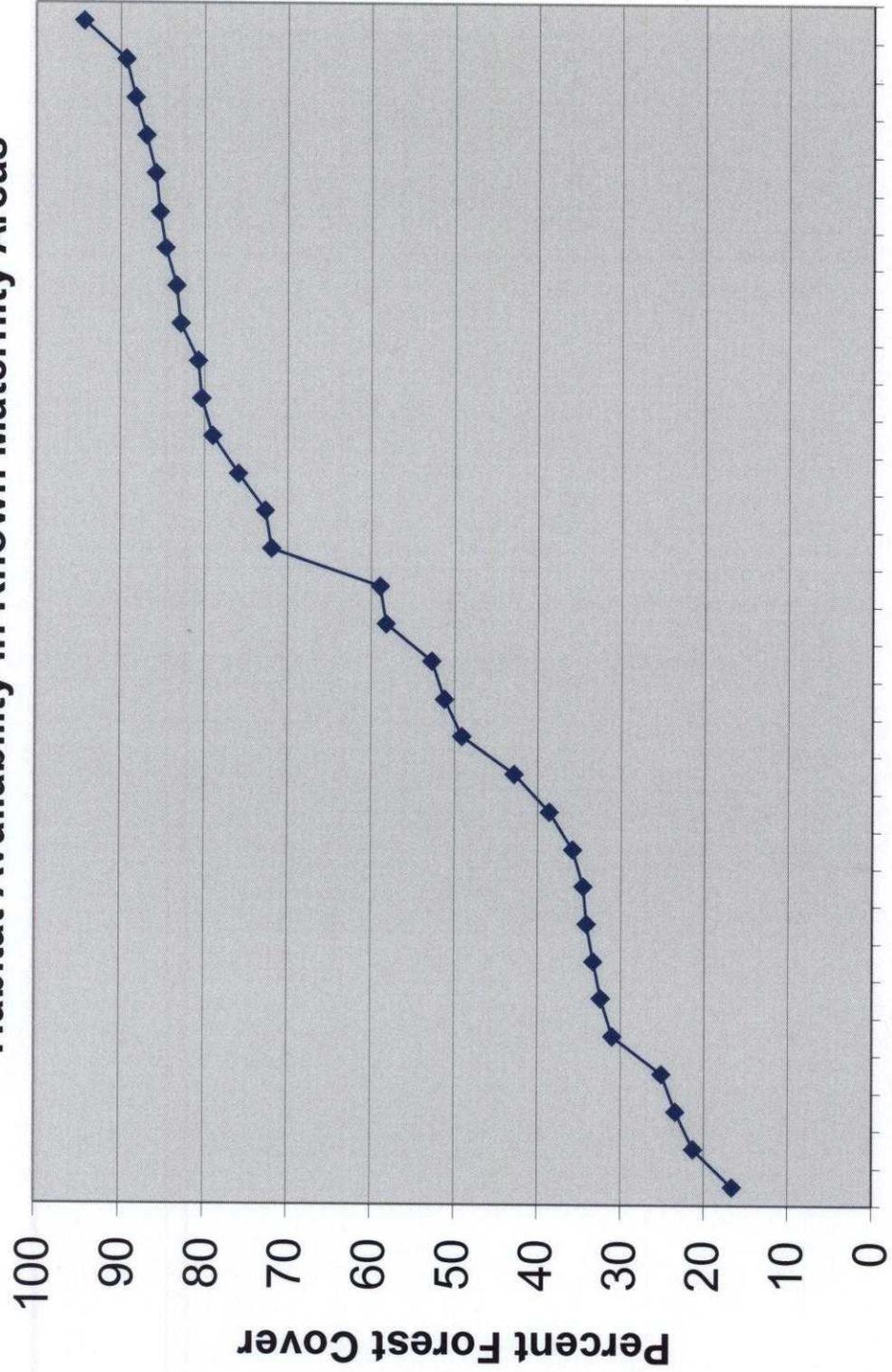
Kentucky Atlas & Gazetteer

PHYSIOGRAPHIC DIAGRAM
OF KENTUCKY



APPENDIX B

Habitat Availability in Known Maternity Areas

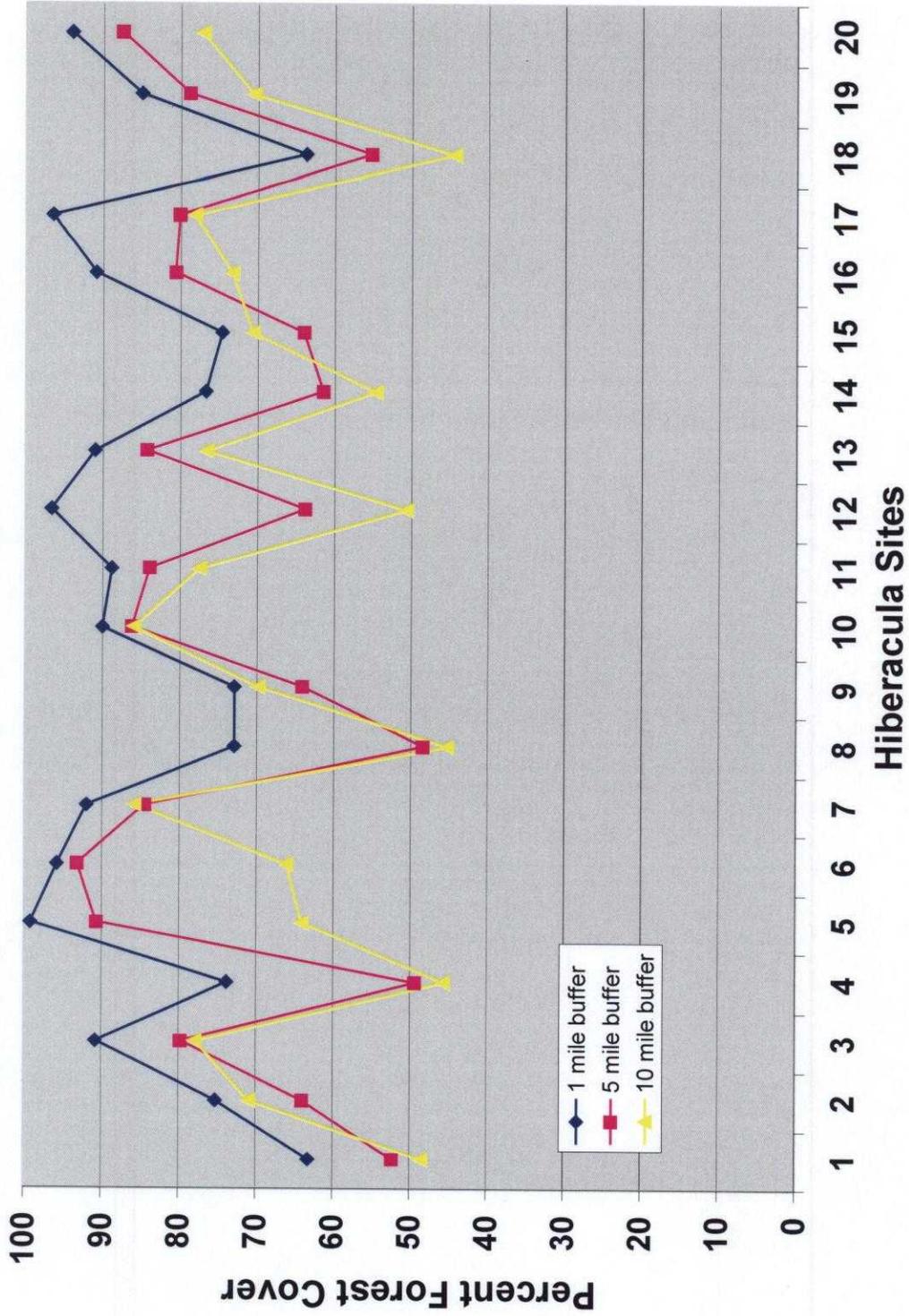


1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40

Maternity Colony Identification Number

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.

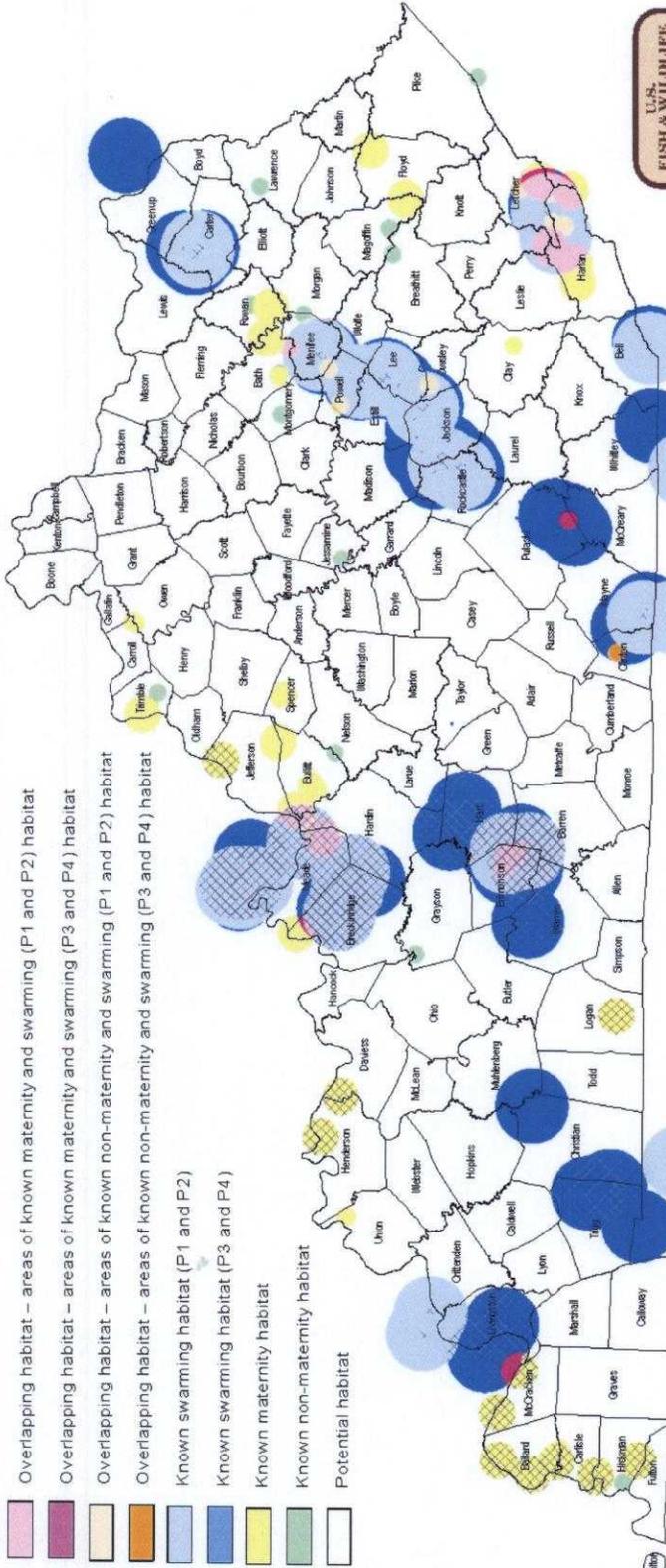
** Projects within known maternity habitat that occur from June 1 through July 31 require project-specific evaluation by the Service, please see page 7 for more information

APPENDIX E

Indiana bat Habitat in Kentucky (May 2010)

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 and P2) habitat
-  Overlapping habitat – areas of known maternity and swarming (P3 and P4) habitat
-  Overlapping habitat – areas of known non-maternity and swarming (P1 and P2) habitat
-  Overlapping habitat – areas of known non-maternity and swarming (P3 and P4) habitat
-  Known swarming habitat (P1 and P2)
-  Known swarming habitat (P3 and P4)
-  Known maternity habitat
-  Known non-maternity habitat
-  Potential habitat



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 most current version.

