

SUPPLEMENTAL¹ INDIANA BAT SURVEY GUIDANCE FOR KENTUCKY



(Photo courtesy of B. Hines, KDFWR)

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¹ This document does not replace the Range-wide Indiana Bat Summer Survey Guidance but is provided as a supplement to that document to provide additional direction where needed.

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BACKGROUND INFORMATION

The Indiana bat (*Myotis sodalis*) was listed as an endangered species by the U.S. Fish and Wildlife Service (FWS) on March 11, 1967 (32 FR 4001) and is currently protected under the Endangered Species Act of 1973, as amended (Public Law 93-205). 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). For additional information concerning the ecology and life history of the Indiana bat, please refer to the Indiana Bat Recovery Plan (Service 1983), the numerous scientific articles, books, and other publications relating to the species, and the recently released Draft Revised Indiana Bat Recovery Plan (Service 2007).

Over the past decade, the Kentucky Ecological Services Field Office (KFO) of the FWS has reviewed hundreds of Indiana Bat spring, summer, fall and winter survey results for development projects and other activities in the Commonwealth. In reviewing these survey results, it became evident that the survey guidance could be improved in three ways: (1) improve the accuracy of the survey data and results; (2) use improved survey methodologies and technologies; and (3) provide survey protocols for potential hibernacula. These are described in greater detail below.

Improving Data and Results

During the review of survey data and results, some results were determined to be insufficient, invalid, or of poor quality due to a variety of factors. These factors include, but are not limited to, (a) poor mist net/acoustic detector placement; (b) a lack of suitable mist netting/acoustic sampling locations on the project area (i.e., Indiana bats can be more difficult to detect and capture in heavily forested areas where high quality sampling sites do not exist.); (c) conducting surveys during unsuitable weather conditions; (d) not tending mist nets at frequent intervals; (e) overlooking potential hibernacula; (f) uncontrollable changes in site habitat conditions; (g) use of inadequately trained or experienced personnel to gather or develop survey results; and (h) lack of sufficient personnel and other resources to investigate potential hibernacula with many entrances (i.e., mine or quarry portals and their associated underground chambers). As a result, it became apparent that consistent, guidance on how, where, and when to conduct Indiana bat summer and winter habitat surveys was needed and that the guidance should be sufficiently detailed to control these types of data collection or survey errors.

Using Improved Methods and Technology

It is also well documented that Indiana bats, even when we know they are present, can be difficult to capture using currently accepted mist netting survey techniques. In response to this limitation, the FWS has recently finalized Range-wide Indiana Bat Summer Survey Guidelines in January 2015. These guidelines provide the FWS's recommended guidance on summer survey methodology and outlines additional reporting requirements for surveyors.

The 2015 range-wide survey guidance is designed to determine whether Indiana bats are present² or likely absent at a given site during the summer (May 15 to August 15). The phased-approach, which includes coordination with the FWS, habitat assessments, and acoustic, mist-net, radio-tracking, and emergence surveys, supersedes the 2007 and 2014

² The guidance is not intended to be rigorous enough to provide sufficient data to fully determine population size or structure.

Indiana Bat Mist-Netting Guidelines. The objectives of Indiana bat summer survey guidelines are to (1) standardize range-wide survey procedures; (2) maximize the potential for detection/capture of Indiana bats at a minimum acceptable level of effort; (3) make accurate presence/absence determinations; and (4) aid in conservation efforts for the species by identifying areas where the species is present. **Unless directed otherwise in this document, surveyors working within Kentucky must use the range-wide summer survey guidance found at the link below.** Future changes to this guidance may occur and will be posted on the FWS Indiana bat survey guidance website:

<http://www.fws.gov/midwest/endangered/mammals/inba/inbasummersurveyguidance.html>

Please check this website to ensure use of the most current version of the range-wide summer guidance.

Developing Protocols for Potential Hibernacula

Specific guidance related to surveys of potential winter habitat (i.e., caves, quarries, and/or abandoned mines) was needed, because no standardized range-wide guidance was available. Development of these protocols is important in Kentucky, because large areas of the state contain karst areas or abandoned mines from either coal or limestone mining that could be used by Indiana bats for hibernation. Some of these areas, such as the Mammoth Cave region of south-central Kentucky, the Cumberland Plateau (including the Daniel Boone National Forest), and Pine Mountain in the eastern Kentucky coalfield, are known to contain Indiana bat hibernacula. However, other areas of Kentucky which are subject to development and other activities that could adversely affect Indiana bat hibernacula have not been adequately surveyed and could, thus, benefit from the development of survey guidance for potential hibernacula.

Summary

As a result of these factors, the KFO and Kentucky Department of Fish and Wildlife Resources (KDFWR) developed this statewide supplemental survey guidance to assist Kentucky's federal and state permitted bat biologists in (a) consistently implementing surveys to document presence or absence of Indiana bats on proposed project areas and (b) using data gathered from these surveys to develop biological assessments or evaluations (BAEs) that are based on the best scientific and commercial data available for a proposed project area.

This statewide supplemental guidance provides recommendations to further assist with determining presence or absence of Indiana bats on a given site in Kentucky. This information is typically necessary for consultations under section 7(a)(2) of the ESA. Use of this information may also be useful to the KFO and project proponents in identifying actions that may avoid and/or minimize impacts to the Indiana bat resulting from a proposed project or activity or that may assist with the species' recovery. If implemented as described in the sections below, the KFO will generally accept the results of these surveys to determine presence or absence for the purposes of Section 7 consultation. Survey results that are derived using this guidance will be valid for two survey seasons (e.g., a survey completed in 2014 is accepted for the 2014 and 2015 survey seasons or through May 14, 2016) from the date the survey is completed.

[Project Proposal Forms \(or study plans\) and an 8.5" x 11" topographical map of action area with proposed sample locations identified must be submitted to the KFO and KDFWR at least 15 days prior to project initiation \(see Appendix 3\). Also, make sure all corresponding permit](#)

numbers (e.g., coal, KDFWR, and USFWS collecting permits) are included with the project proposal form and survey report. The USFWS Project Proposal Form must still be submitted to KDFWR per state permit requirements and a copy of the KDFWR approval/notification is still required when submitting your BAEs to the KFO for Indiana bat consultations.

Supplemental Guidance Modifications

This supplemental guidance is subject to change as more information on Indiana bat ecology, distribution, and habitat use is acquired. It is also likely that the survey protocols will be modified as more information is gained on their effectiveness and applicability in different situations. Since this document can be modified as new information becomes available, the KFO welcomes any comments or suggestions for improvement to the guidance. Any comments or suggestions should be sent to Mike Armstrong of the KFO at 502/229-4632 or Brooke Hines, KDFWR at 502/564-3400, ext. 4573.

WHITE-NOSE SYNDROME

Due to the rapid spread of white-nose syndrome (WNS) from the epicenter in New York (first discovered in February 2006) throughout all of the Northeast as well as much of the Midwest and Southeast United States and multiple Canadian Provinces, the KFO, in coordination with KDFWR, has decided to delay the start of the 2015 summer bat survey season until June 1, 2015. During the 2014-2015 winter WNS surveillance and monitoring season, the KFO and KDFWR have documented WNS presence at 79 sites within 22 counties of the Commonwealth. Observations of stress and mortality from WNS were prevalent at many of those sites. The decision to delay direct capture bat surveys was based on the widespread presence of WNS, including observed stress and mortality, within the state and the current research related to the transmission potential of WNS. Current information indicates that the *Pseudogymnoascus destructans* fungus actively grows on bats within caves as late as May 6th thus it is possible that transmission of WNS could occur during spring migration and possibly during the remainder of the summer. Infected bats captured during these first few weeks of the survey season could cause significant stress to WNS compromised individuals and contaminate survey gear which may have the potential to transfer WNS to other uninfected bats captured in the same or subsequent nights.

Researchers should follow the most recent decontamination protocols to minimize the potential for transmission of WNS after June 1st. Please regularly visit the Service's WNS Website (www.whitenosesyndrome.org) to ensure implementation of the most current decontamination protocols.

Given the temporary, voluntary moratorium on entering caves (see USFWS Cave Advisory from March 26, 2009), presence/absence surveys (see "Fall and Spring Survey Protocols for Identifying Potential Indiana Bat Hibernacula") of caves/abandoned mines have been temporarily modified. Until further notice, all caves/mines identified as potential bat habitat by a Phase 1 Habitat Assessment should be coordinated through the KFO and KDFWR as a further precaution related to the transmission of WNS.

As a reminder, the white fungus is only one of the signs of WNS, and finding bats with fungus on them during the summer (once they are active and grooming) is not expected. However, other abnormal characteristics may be indicative of WNS. Abnormal characteristics observed in summer may include: extremely underweight bats; flaky, dehydrated or wrinkled wing/tail

membranes; wing lesions; discolored spots /scarring of flight and tail membranes; multiple small to medium sized holes in wing membranes; torn or necrotic areas at the trailing edge of wing and tail membranes. If you capture a bat that exhibits signs of WNS or abnormal characteristics, inform the KDFWR or KFO personnel via the email addresses listed below, and:

- Record a wing score for each bat using the Wing Damage Index, found in Table 2 of *White-nose syndrome inflicts lasting injuries to the wings of little brown myotis (Myotis lucifugus)*. This publication can be found in [Acta Chiropterologica](#), Volume 11, Number 2, December 2009, pp. 457-464(8).
- Photograph and report all suspicious bats scoring a 2 or higher using the Wing Damage Index within 24 hr to: Brooke.Hines@ky.gov or Mike_Armstrong@fws.gov .

POTENTIAL WINTER HIBERNACULA SURVEY PROCESS

Indiana **and northern long-eared** bats have been documented using caves (and their associated sinkholes, fissures, and other karst features), quarries, and abandoned mine portals (and their associated underground workings) as winter hibernation habitat. Project proponents will evaluate whether potentially suitable winter Indiana **and/or northern long-eared** bat hibernation habitat exists within a proposed project area. This knowledge will be derived from, but not limited to, the following sources: on-site visits, review of aerial photography and other maps, previous mining records (if applicable), forest inventories, previous species survey reports, and the work of consultants or other designees. The following phased process should be followed to determine presence or absence of Indiana **and northern long-eared** bats in winter hibernation habitat:

PHASE 1 - INITIAL PROJECT SCREENING

Step 1. Conduct Habitat Assessment to Determine Presence of Suitable Winter Habitat (hibernacula).

A qualified biologist³ will determine whether potentially suitable winter habitat exists within the project area by conducting a Phase 1 Habitat Assessment on all potential hibernacula that could be affected by the proposed project as described below (see Appendix 1 for sample data sheet). These assessments can be completed at any time of year. The results of these assessments should be submitted to the FWS for review and approval. Results will be valid for a minimum of two years.

In general, openings can be dismissed from bat surveys when:

- a. There is only one horizontal opening, and it is less than 6 inches (15.2 centimeters) in diameter;
- b. Vertical shafts are < 1 foot (0.3 meters [m]) in diameter;
- c. Passage continues < 50 feet (15.2 m) and terminates with no fissures that bats can access;
- d. Openings are prone to flooding, collapsed shut and completely sealed, or otherwise are inaccessible to bats; and
- e. Openings that have occurred recently (i.e., within the past 12 months) due to creation or subsidence. (Include written documentation verifying this determination).

This assessment includes all entrances or openings that will be directly or indirectly impacted by the proposed project. This would include those caves, quarries, or portals that are within the project site or that are connected to any underground mine or quarry workings that will be directly or indirectly impacted by the proposed project.

³ A qualified biologist is an individual that holds a FWS Recovery Permit (Federal Fish and Wildlife Permit) for federally listed bats in Kentucky and has been authorized by the KDFWR to survey for bats.

Step 2. Coordinate with the KFO and KDFWR regarding existing federally listed bat hibernacula or other occurrence information.

Prior to initiating presence/absence surveys (Phase 2) of potential Indiana and northern long-eared bat hibernacula (as determined by the Phase 1 Habitat Assessment), the KFO and KDFWR must be contacted to determine if any identified cave or abandoned underground mine portal, quarry (and their associated underground workings), or other feature have been previously documented as hibernation or other habitat for federally listed bat species. Any proposed surveys of previously documented hibernacula must be coordinated directly with these agencies to ensure that adverse effects to listed species do not occur as a result of the survey.

PHASE 2 - PRESENCE/ABSENCE SURVEYS

Surveys to Confirm Use of Suitable Winter Habitat

If suitable winter habitat is discovered as a result of the Phase 1 Habitat Assessment above, do not alter, modify, or otherwise disturb entrances or internal passages of caves, mines, or other entrances to underground voids (potential hibernacula) within the action area until a “Determination of Suitable Winter Habitat for Indiana and northern long-eared bats” is completed. The survey protocols to make this determination are provided below and should be followed to determine if the suitable habitat is in fact, occupied. **Some surveys may require modification (or clarification) of these guidelines; therefore, coordination with the KFO and KDFWR is necessary prior to initiating suitable winter habitat surveys.** Results of completed summer and winter surveys should be submitted to the KFO prior to clearing of identified habitat. The KFO will accept the results of these surveys for the purposes of determining whether and to what degree take is anticipated.

FALL AND SPRING SURVEY PROTOCOLS FOR IDENTIFYING POTENTIAL INDIANA AND NORTHERN LONG-EARED BAT HIBERNACULA

A temporary, voluntary moratorium has been placed on entering any caves/mines in the majority of states within the Indiana and northern long-eared bat's range due to WNS. All research conducted in caves/mines should be coordinated with the KFO and KDFWR prior to initiation (see Appendix 3, KDFWR Project Proposal Form).

Entry of abandoned mine portals, quarries, or caves can be extremely dangerous because of the potential for ceiling collapse and presence of toxic gases. Safety or health problems may occur as a result of entering abandoned mines. The Service does not authorize or require anyone to enter any potential hibernaculum that is or could be unsafe while implementing these survey protocols. These guidelines do not require any applicant or applicant employee, consultant, lessee, or other such designee to enter into any cave, quarry, or mine portal.

Indiana and northern long-eared bats have been documented using caves, quarries, and abandoned mine portals (and their associated underground workings) as winter hibernation habitat. A survey of such potential hibernacula is necessary to determine if such sites are utilized by Indiana and/or northern long-eared bats. Caves that have large enough openings to allow the safe entrance of surveyors should be directly surveyed for the presence of federally listed bat species during mid-winter (i.e., beginning January 1st and ending prior to March 1st of the same calendar year). Only properly trained and qualified individuals with the appropriate equipment should attempt these surveys. If the Qualified Biologist⁴ does not have the necessary experience to complete cave survey work, then this portion of the project should be subcontracted to another individual or group that does. If the cave is impossible to enter or it is believed that significant portions of the cave system are inaccessible, it should be treated like an abandoned mine portal or quarry and the following guidance should be used to determine presence or probable absence of federally listed bat species, including the Indiana and/or northern long-eared bat (also see Appendix 2 for sample data sheet).

The following protocols shall apply to all such surveys:

1. For linear projects (e.g., transmission lines, natural gas pipelines, highways, haul roads), a field survey, where access can be obtained, of all land within one-half mile of the edge of the project footprint and documentation (i.e., literature search) of all known caves and abandoned mine portals within 3 miles of the outside edge of the project footprint should be conducted.
2. Fall portal/cave surveys must be conducted between September 1 and October 31 and prior to any tree clearing by the project applicant. A minimum of two nights of sampling is required at each suitable entrance as determined by the Phase 1 Habitat Assessment. Each night of sampling must be separated by at least two weeks of the

⁴ A qualified biologist is an individual that holds a FWS Recovery Permit (Federal Fish and Wildlife Permit) for federally listed bats in Kentucky and has been authorized by the KDFWR to survey for bats. Qualified biologists should refer to their federal permits for specific conditions/requirements of winter cave surveys for federally listed species.

survey window. This sampling is in addition to any summer presence/absence survey that is required.

3. Spring portal/cave surveys must be conducted between April 1 and April 21 and prior to any tree clearing by the project applicant. Conducting surveys during the spring emergence is typically more complex than conducting fall surveys due to a greater number of uncontrollable factors (e.g., weather related factors). Thus, a minimum of three nights of sampling per week for three weeks (i.e., 9 nights of sampling) is required at each suitable entrance as determined by the Phase 1 Habitat Assessment. Due to the need to monitor weather conditions closely, each proposed spring portal/cave survey must be coordinated with the KFO and KDFWR prior to sampling to ensure that adequate survey results are achieved. This sampling is in addition to any summer presence/absence survey that is required.
4. The sampling period should begin at sunset and continue for at least 5 hours each night. During this time, harp traps and/ or mist nets should be monitored for captured bats on 10-minute intervals to minimize the number of bats that escape the nets.
5. If bat activity or captures increase during the survey or if 6 or more bats of any species were captured during the last hour of monitoring, the survey effort must continue until activity declines or fewer than 6 bats are captured per hour. If bat activity declines during the first 2.5 hours, the survey must be postponed. The KFO can accept partial night surveys but only if a minimum of 2.5 hours of survey, beginning at sunset, has been accomplished and all other requirements in this potential hibernaculum survey guidance are met. However, a total of 10 (fall) or 45 (spring) hours of sampling must take place for a portal/cave survey to be approved.
6. Severe weather adversely affects the activity levels of bats. If any of the following weather conditions exist during the fall or spring cave/portal survey, the time and duration of such conditions must be noted on the data sheets and in the survey report, and the survey effort for that night must be repeated: (a) winds sufficiently strong and variable to move equipment more than 50 percent of the time; and (b) precipitation, including rain and/or fog, that does not stop within 30 minutes or continues intermittently during the survey period; and (c) temperatures that are less than 50° F (10° C) for the first 2 hours, and that drop below 35° F (1.6° C) at any point during the survey.
7. Harp traps are the preferred method for sampling entrances as they are less stressful on captured bats. Mist nets can also be deployed along corridors immediately adjacent to the entrance to increase survey effectiveness. Mist nets may also be used at the entrance but only when the portal or cave configurations are not suitable to harp trapping. The use of mist nets must be approved by the KFO and KDFWR prior to initiation of survey. Mist nets should be made of the finest, lowest visibility mesh commercially available. Currently, this is 2-ply, 50-denier nylon (denoted 50/2). The

mesh should be approximately 1.5-inch in size. No other specific mist netting hardware is required.

8. When harp trapping, entrances must be entirely enclosed by the survey gear. If mist nets are used, entrances should not be entirely enclosed by the survey gear.
9. All entrances that are potentially inter-connected should be surveyed on the same night. In cases where one team of surveyors cannot feasibly sample all entrances in one night, a modified method could also be used. This method can only be used in situations where the entrances are known to be interconnected. In this modified method, half of the interconnected entrances are surveyed on the first night, and the other half of the entrances are completely blocked using plastic or other impervious material. On the second night, survey efforts are reversed. Plastics or other materials used to block the entrances should be removed each night immediately after conducting the survey. Disconnected entrances do not have to be surveyed simultaneously.
10. If Indiana [and/or northern long-eared](#) bats (or other federally listed species) are captured during fall or spring portal/cave surveys, notification to the KFO and KDFWR is required within 24 hours. Radio telemetry of captured Indiana [and/or northern long-eared](#) bats is optional.
11. A bat detector should be on site to monitor bat activity when trapping or netting. Bat passes should be monitored and tallied hourly. Bat tallies should be reported along with the time sampled. Report the beginning time and number of bat passes in hour blocks.
12. Noise, the use of lights, or other potential disturbances should be kept to a minimum within 300 feet (91.4 m) of the sampling site.
13. At least one member of each survey crew must hold, and have in his or her possession, a valid endangered species collection permit issued by FWS and the KDFWR that allows the qualified biologist to collect bats, including federally listed species.
14. The capture of an Indiana [and/or northern long-eared](#) bat during a fall or spring portal survey requires that the applicant complete three additional nights of sampling per week for three consecutive weeks in order to determine the significance of the portal(s) and/or cave(s) and their associated underground workings to the Indiana [and/or northern long-eared](#) bat. If the portal/cave survey season (i.e., September 1 to October 31 for fall sampling and April 1 to April 21 for spring sampling) ends prior to the completion of the required sampling, any additional sampling must be completed the following fall or spring.
15. All survey efforts must follow FWS decontamination protocols regarding WNS.

Appendix 1. Phase I Habitat Assessment Sample Data Sheet

Location _____

Observers

(include permit numbers)

Latitude _____ **Longitude** _____

Date _____ **Time** _____ **Temp (outside)** _____

	Portal #1	Portal #2	Portal #3	Portal #4
Opening (e.g., cave, quarry, shaft)				
Opening Size: Height x Width (or Diameter)				
Internal Dimensions: Height x Width				
Slope (up or down from entrance)				
Entrance Stable?				
Direction of Airflow (In or out?)				
Amount of Airflow (e.g., none, slight, heavy)				
Air warmer or cooler than outside temp.				
Evidence of collapse?				
Ceiling Condition				
Amount of water in opening				
Evidence of past flooding?				
Observed length of portal				
Distance to nearest water source				
% Canopy Cover at portal entrance				
Foraging Signs? (e.g., moth wings)				

Are any portals suspected or known to be connected? Which ones?

Any observable side passages?

Additional comments:

Entry of abandoned mine portals, quarries, or caves can be extremely dangerous because of the potential for ceiling collapse and presence of toxic gases. Safety or health problems may occur as a result of entering abandoned mines. The FWS does not authorize or require anyone to enter any potential hibernaculum that is or could be unsafe while implementing surveys. These guidelines do not require any applicant or applicant employee, consultant, lessee, or other such designee to enter into any cave, quarry, or mine portal.

Appendix 3: USFWS Project Proposal Form

CONTACT INFORMATION

Permittee Name: _____
KDFWR SC Permit # _____ Section 10 USFWS Permit # _____
Institution/Company Name (as on Permit): _____
Address: _____
City: _____ State: _____ Zip: _____
Email address: _____
Phone #: _____

PROPOSED PROJECT OR ACTIVITY INFORMATION

County: _____ Quad: _____
Project location: latitude: _____ longitude: _____

(Please include an 8.5" x 11" topo or aerial map with project/activity location and proposed sites identified)

USFWS Project Number (if known): _____
Mining Project SMCRA Permit Number: _____
Transportation Project KYTC Item Number: _____
Utility Project: _____
AML Project: _____
Other: _____
Acres of suitable Indiana bat habitat within project/activity area: _____
Is the project/activity linear? Yes: No:
If yes, indicate length of suitable Indiana bat habitat in km (mi): _____
Are caves or portals present? Yes: No:

METHODOLOGY & SURVEY EFFORT

Coordinates of cave/portal (if multiple, please provide locations on project map): latitude: _____ longitude: _____
Name of cave (if known): _____
Estimated Start Date of Fieldwork: _____
Number of Acoustic Nights: _____ Number of Mist Net/Harp Trap Nights: _____
Approved acoustic analysis software utilized for bat call identification (please ensure you are using the latest version):
BCID EchoClass Kaleidoscope Pro
Other _____

Signature

Date